Table 1. Observed climate trends and their effects on marine life within the NW Atlantic. Table references are in the supplementary materials.

Phenomenon	Pattern or Trend	References
Range expansion or contraction	- By 2060, 55% of species are projected to lose thermal habitat, 21% gain and 24% remain constant.	(Nye *et al.*, 2009, 2011; Cheung *et al.*, 2013b; Pinsky *et al.*, 2013; Shackell *et al.*, 2014; Morley *et al.*, 2018; Allyn *et al.*, 2020; Mills *et al.*, 2024)
Latitudinal range shifts	- Northward range shifts - 'Borealization' of Arctic, 'tropicalization' of temperate ecosystems - A shift in the spatial distribution of larvae for 43% of taxa in the northeastern US; mostly northward	(Nye *et al.*, 2011; Shackell *et al.*, 2012; Pinsky *et al.*, 2013; MacKenzie *et al.*, 2014; Walsh *et al.*, 2015; Kleisner *et al.*, 2017; Morley *et al.*, 2018)
Depth distribution	- A shift towards inhabiting deeper, colder waters	(Shackell *et al.*, 2012; Pinsky *et al.*, 2013; Morley *et al.*, 2018)
Species invasions	- New arrivals from US waters on the Scotian Shelf associated with latitudinal range shifts - New arrivals in the Arctic from the south, with effects on low diversity ecosystems there	(MacKenzie *et al.*, 2014; Bernier *et al.*, 2018)
Seasonal	- A shift in seasonal timing of larval occurrence for 49% of taxa in the northeastern US shelf - Earlier melting of sea ice in the year - Trophic mismatch between phytoplankton spring bloom and larval haddock and shrimp.	(Platt *et al.*, 2003; Edwards *et al.*, 2004; Koeller *et al.*, 2009; Walsh *et al.*, 2015; Niemi *et al.*, 2019; Record *et al.*, 2019; Staudinger *et al.*, 2019)
Trophic amplification	- Increased zooplankton grazing - Increased predation of ectotherms relative to endotherms - A shift towards resource control of marine ecosystems - Stronger adverse climate impacts on high trophic species relative to low	(Frank *et al.*, 2006, 2007; Kirby and Beaugrand, 2009; Petrie *et al.*, 2009; Boyce *et al.*, 2015; Grady *et al.*, 2019; Kwiatkowski *et al.*, 2019; Lotze *et al.*, 2019)
Size structure	- Reduction in size of primary and secondary producers	(Drinkwater, 2005; Li *et al.*, 2009; Shackell *et al.*, 2010; Sheridan and Bickford, 2011; Cheung *et al.*, 2013a)
Temperature	- Warming almost everywhere - Rapid warming in the Gulf of Maine, Gulf of St. Lawrence, Scotian Shelf - Increasing frequency and severity of marine heatwaves	(Hutchings *et al.*, 2012; Saba *et al.*, 2016; Frölicher *et al.*, 2018; Oliver *et al.*, 2018, 2019; Greenan *et al.*, 2019; Cheung and Frölicher, 2020; Amaya *et al.*, 2023)
Freshwater flux	- Increased at high latitudes from hydrological cycle intensification	(Durack and Wijffels, 2010; Durack *et al.*, 2012)
Sea ice	- Melting Arctic ice and Greenland ice sheet, leading to a freshening of the Arctic - Spatially variable changes in sea ice type (old versus seasonal), thickness, and extent in the Arctic	(Bamber *et al.*, 2012; Hutchings *et al.*, 2012; Stroeve *et al.*, 2012; Bernier *et al.*, 2018; Niemi *et al.*, 2019)
Stratification	- Increased, especially at low latitudes - Associated with nutrient limitations at low to mid-latitudes	(Behrenfeld *et al.*, 2006; Polovina *et al.*, 2008)
Acidification	- Increasing, especially in the Gulf of St. Lawrence and Arctic - Negative effects on calcifying species	(Doney *et al.*, 2009; Steinacher *et al.*, 2009; Wanninkhof *et al.*, 2015; Bernier *et al.*, 2018; Peck and Pinnegar, 2018; Niemi *et al.*, 2019)
Deoxygenation	- Follows the global deoxygenation trends with widespread spatial variability driven by natural oscillations. - Deoxygenation is driven by the retreat of the Labrador Current and a slowdown of the Atlantic Meridional Overturning Circulation.	(Johnson and Gruber, 2007; Frölicher *et al.*, 2009; Hoegh-Guldberg and Bruno, 2010; Stendardo and Gruber, 2012; Stramma *et al.*, 2012; Bernier *et al.*, 2018; Claret *et al.*, 2018; Niemi *et al.*, 2019)
Primary production	- Spatially variable but declining, especially at low latitudes - Complex responses in the Arctic, including changes from ice algae to phytoplankton, moderate declines in some areas but increases in others - More frequent, intense, and widespread blooms.	(Gregg *et al.*, 2003; Behrenfeld *et al.*, 2006; Boyce *et al.*, 2010, 2014; Niemi *et al.*, 2019; Dai *et al.*, 2023)
Disease transmission	- Increased, especially at high latitudes.	(Ward and Lafferty, 2004; Frommel *et al.*, 2012; Burge *et al.*, 2014; Vezzulli *et al.*, 2016)
Growth and demography	- Faster growth - Earlier age at maturity	(Atkinson, 1994; Ohlberger, 2013; Niu *et al.*, 2023)

Notes: "Borealization" = Northward expansion or increased dominance of species adapted to boreal (cold-temperate) conditions into Arctic or high-latitude ecosystems. "Tropicalization" = An increase in warm-water (tropical or subtropical) species or expansion of their ranges into temperate ecosystems. "Deepening" = The downward movement of marine species into deeper, cooler waters. "Species invasion" = The arrival, establishment, and spread of species into new regions.