## **Supplementary Material to Nordic Seas Acidification**

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**Figure S1.** Temperature (in  $^{\circ}$ C) evolution in the six different basins across different depth intervals in the Nordic Seas from 1981 to 2019. Red dots with error bars show observations. The solid and dashed black lines show the calculated trend with error estimates from the observations. The trend is indicated in the lower left of each panel. Bold indicates that the trend is significantly different from zero.



**Figure S2.** Salinity evolution in the six different basins across different depth intervals in the Nordic Seas from 1981 to 2019. Red dots with error bars show observations. The solid and dashed black lines show the calculated trend with error estimates from the observations. The trend is indicated in the lower left of each panel. Bold indicates that the trend is significantly different from zero.



**Figure S3.** Dissolved Inorganic Carbon (DIC, in  $\mu$ mol kg<sup>-1</sup>) evolution in the six different basins across different depth intervals in the Nordic Seas from 1981 to 2019. Red dots with error bars show observations. The solid and dashed black lines show the calculated trend with error estimates from the observations. The trend is indicated in the lower left of each panel. Bold indicates that the trend is significantly different from zero.



**Figure S4.** Alkalinity (ALK, in  $\mu$ mol kg<sup>-1</sup>) evolution in the six different basins across different depth intervals in the Nordic Seas from 1981 to 2019. Red dots with error bars show observations. The solid and dashed black lines show the calculated trend with error estimates from the observations. The trend is indicated in the lower left of each panel. Bold indicates that the trend is significantly different from zero.



Figure S5. Evolution of calcite saturation state ( $\Omega_{Ca}$ ) in the six different basins across different depth intervals in the Nordic Seas from 1981 to 2019. Red dots with error bars show observations. The solid and dashed black lines show the calculated trend with error estimates from the observations. The trend is indicated in the lower left of each panel. Bold indicates that the trend is significantly different from zero.



**Figure S6.** Evolution of  $pCO_2$  (in  $\mu$ atm) in the six different basins across different depth intervals in the Nordic Seas from 1981 to 2019. Red dots with error bars show observations. The solid and dashed black lines show the calculated trend with error estimates from the observations. The trend is indicated in the lower left of each panel. Bold indicates that the trend is significantly different from zero. The dashed blue line shows the atmospheric pCO<sub>2</sub> from the Mauna Loa records.



Figure S7. Distribution of surface a) temperature b) salinity, c) DIC, d) ALK and e) DIC/ALK from the GLODAPv2 climatology.



**Figure S8.** Contribution of observed changes in temperature, salinity, DIC, ALK to the observed trend in pH (OBS) over the 1981-2019 period. The contribution of DIC and ALK has been divided into a freshwater (fw) component and a biogeochemical (bg) component. Bars showing trends that are significantly different from zero are outlined with a black line. TOT indicates the total trend in pH calculated as the sum of the trends associated with these four driving factors. The dashed line indicates the trend in pH expected from the change in atmospheric  $CO_2$  during the same period for the whole area.



**Figure S9.** Contribution of modelled changes in temperature, salinity, DIC, ALK to the modelled trend in pH (OBS) over the 1850-2005 period. Bars showing trends that are significantly different from zero are outlined with a black line. TOT indicates the total trend in pH calculated as the sum of the trends associated with these four driving factors. The dashed line and black stars indicate the trend in pH expected from the change in atmospheric  $CO_2$  during the same period for the whole area and for the separate basins, respectively.



**Figure S10.** Contribution of modelled changes in temperature, salinity, DIC, ALK to the modelled trend in pH (OBS) over the 2006-2100 period for the RCP2.6 scenario. Bars showing trends that are significantly different from zero are outlined with a black line. TOT indicates the total trend in pH calculated as the sum of the trends associated with these four driving factors. The black dashed line and black stars indicate the pH trend expected from the change in atmospheric  $CO_2$  during the same period for the whole area and for the separate basins, respectively. The dotted line/gray stars show the expected trend in pH if assuming that the atmospheric  $CO_2$  from 2006 to 2100 linearly increases to a value corresponding to the maximum  $CO_2$  value under the RCP2.6 scenario.



**Figure S11.** Contribution of modelled changes in temperature, salinity, DIC, ALK to the modelled trend in pH (OBS) over the 2006-2100 period for the RCP8.5 scenario. Bars showing trends that are significantly different from zero are outlined with a black line. TOT indicates the total trend in pH calculated as the sum of the trends associated with these four driving factors. The dashed line and black stars indicate the trend in pH expected from the change in atmospheric  $CO_2$  during the same period for the whole area and for the separate basins, respectively.