Table S1. Inorganic nutrient concentrations during the long-term acclimation of *N. lecointei* to three pCO_2 treatments. Values represent average ±standard deviation (n=2). One sample was lost due to technical error.

Day	pCO_2	$NO_2^- + NO_3^-$	PO_4^{3-}	$Si(OH)_4$
97	280 µatm	831 (±27)	28 (±0.4)	146 (±25)
	390 µatm	878 (±6)	28 (±0.04)	150 (±10)
	960 µatm	858 (±44)	28 (±1)	149 (±11)
147	280 µatm	905 (±23)	30 (±0.3)	190 (±4)
	390 µatm	857 (±3)	30 (±0.4)	179 (±0)
	960 µatm	994 (±192)	26 (±6)	204 (±37)
187	280 µatm	858 (±11)	32 (±1)	183 (±17)
	390 µatm	913	32	191
	960 µatm	874 (±33)	32 (±0.3)	191 (±14)

Table S2. Inorganic nutrient concentrations during the switched treatment assay of *N. lecointei*. Cultures have been acclimated to 390 and 960 µatm pCO_2 for 194 days, and subsequently short-term assayed for 13 days with the opposite treatment to study sustained effects of pCO_2 acclimation. Values represent average ±standard deviation (n=2). One sample was lost due to technical error.

pCO_2 acclimation	pCO_2 assay	$NO_2^- + NO_3^-$	PO_4^{3-}	$Si(OH)_4$
390 µatm	390 µatm	944	32	186
390 µatm	960 µatm	1002 (±6)	31 (±1)	194 (±4)
960 µatm	390 µatm	1048 (±93)	29 (±6)	202 (±25)
960 µatm	960 µatm	1010 (±6)	32 (±0.1)	193 (±20)

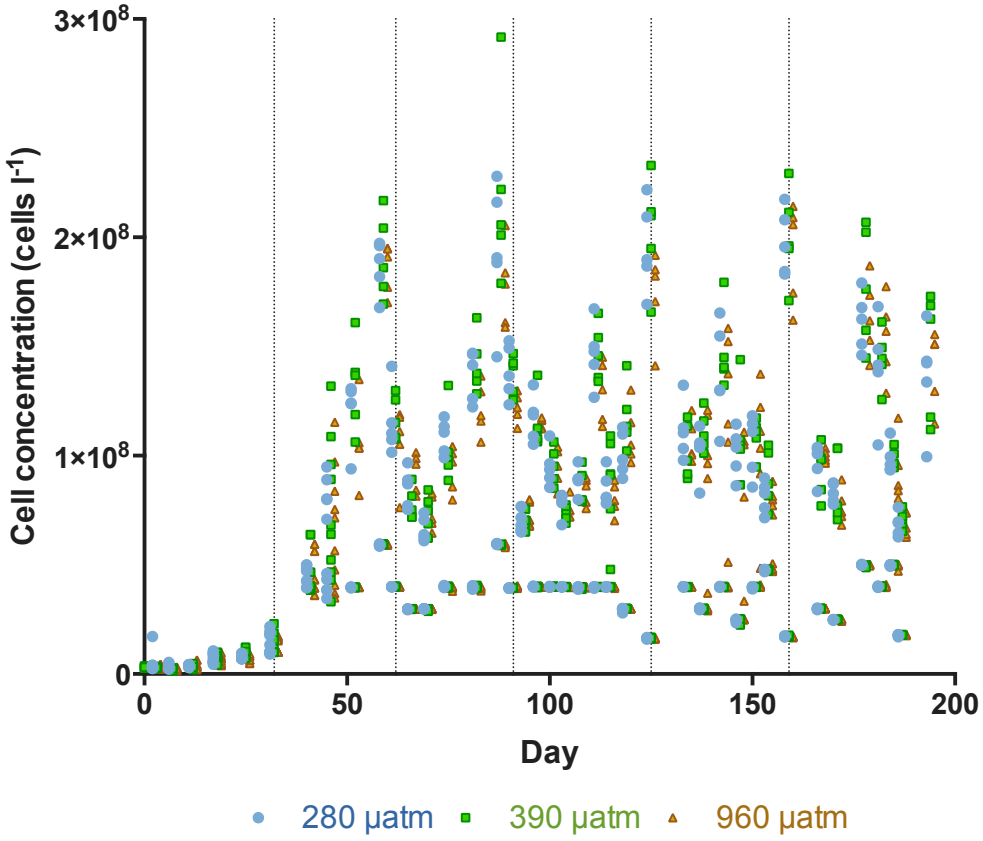

Figure S1. Cell densities in each flask before and after dilutions. Note that points in the respective treatment are slightly nudged (±1 day) across the x-axis for better visualization. Dashed vertical lines show the days where the culture flasks were acid-washed.

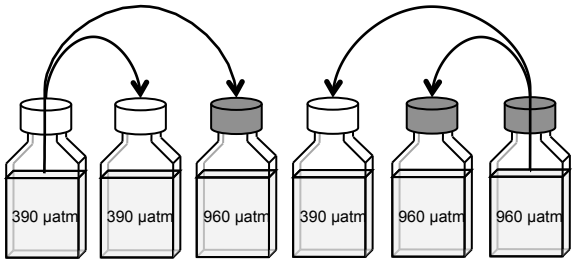

Figure S2. Schematic view of the switched treatment assay. At the end of the long-term acclimation, each sample from the 390 and 960 µatm treatments was transferred into two new experimental flasks. One of the flasks was switched to the opposite pCO_2, and the other one maintained at the same treatment to act as a control. The switched treatment assay lasted for 13 days to study sustained effects of increased pCO_2 after long-term acclimation.

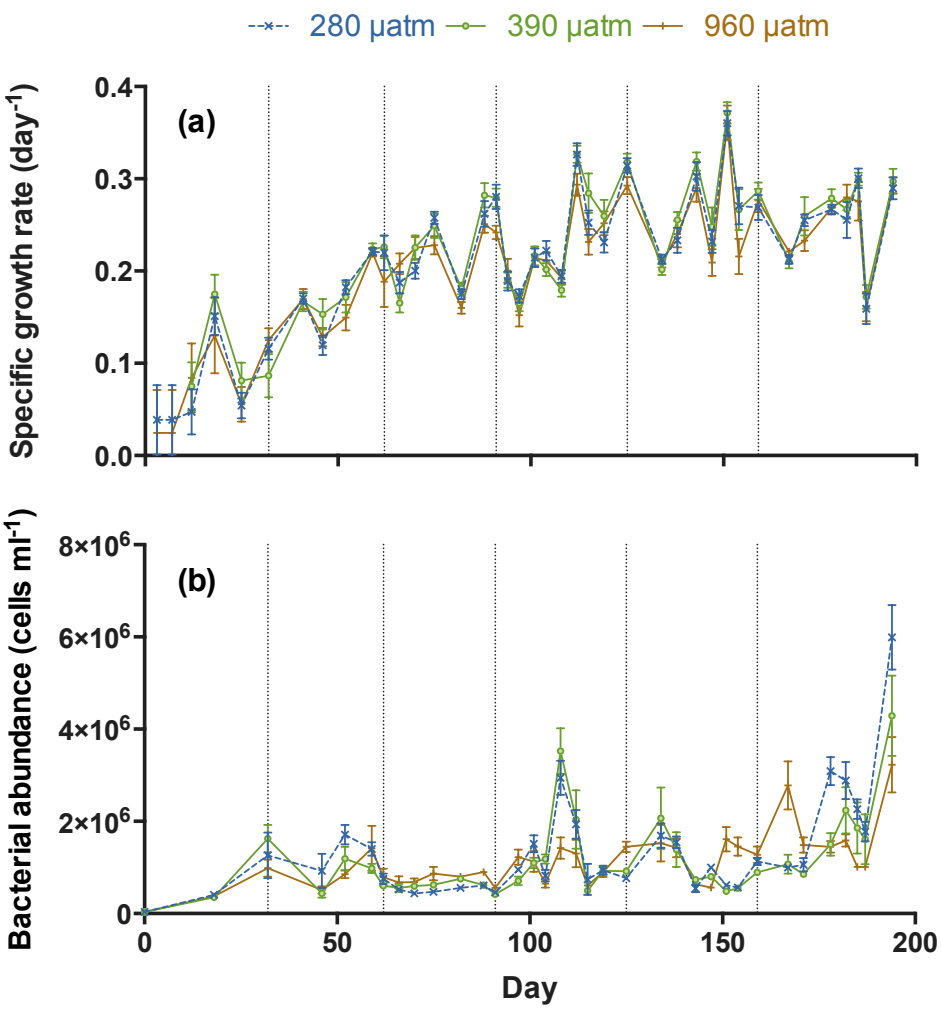

Figure S3. Specific growth rate of *Nitzchia lecointei* (a) and bacterial abundance (b) under the experiment. Specific growth rate is calculated between every sampling day. Dashed vertical lines show the days where the culture flasks were acid-washed. Error bars represent standard errors (n=5).

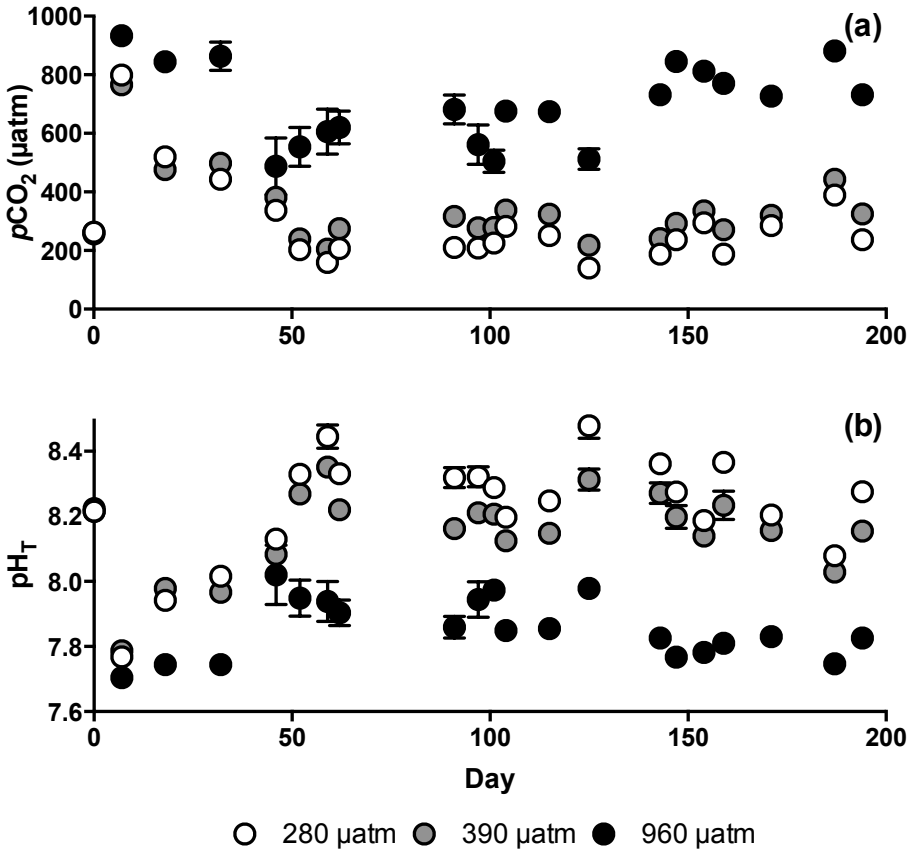

Figure S5. Carbonate system parameters during the long-term pCO_2 perturbation experiment (at -1.8 °C, salinity 33). (a) Calculated pCO_2 in the different treatments, derived from pH_T and total alkalinity with the software CO2SYS. (b) Measured pH_T in the different treatments. Error bars represent standard error (n=5).