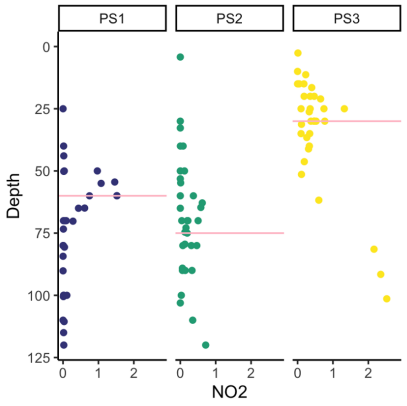
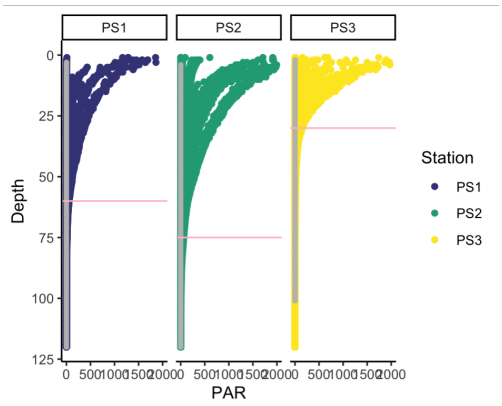
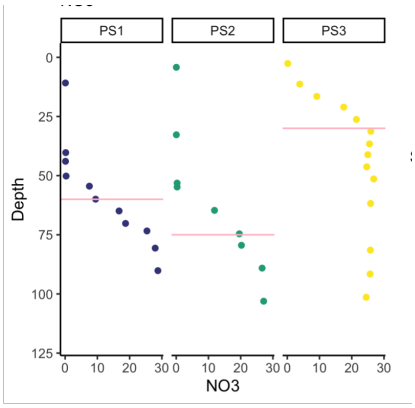
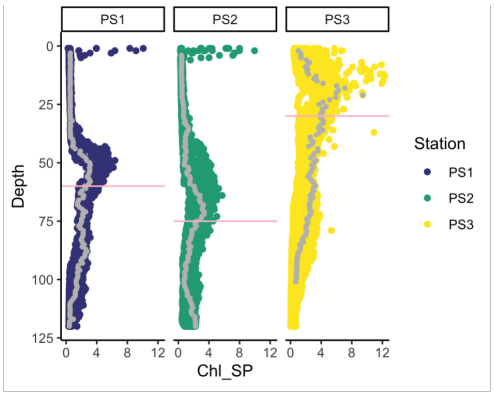
# Supplemental Figures and Tables

**Figure S1. Experimental station nitrite profiles** - Station profiles of nitrite data collected at PS1,PS2,PS3, FK2 and FK9.



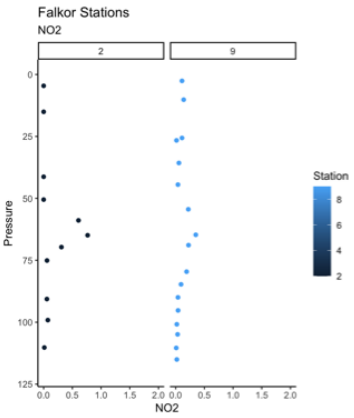



**Table S1. Station characteristics** - Station water column features (PNM maximum concentration, PNM depth, top of nitracline, depth of 1% surface irradiance, Chl maxima, Chl depth, $NH_4^+$ maximum, $NH_4^+$ depth, *amoA* gene copy maximum, *amoA* gene copy number depth). Gene copy number data from Frey et al., 2023.

| Station ID | PNM $NO_2^-$ (µM) | PNM depth (m) | Nitracline (m) | 1% sPAR (m) | Chl a max (mg $m^3$) | Chl a depth (m) | $NH_4^+$ max (nM) | $NH_4^+$ depth (m) | *amoA* max (copies $mL^{-1}$) | *amoA* max depth (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| PS3 | 1.3 | 25 | 10 | 31.3 | 12.3 | 13 | 525 | 11.3 | 10835 | 30 |
| PS2 | 0.62 | 64.7 | 55 | 52 | 5.72 | 64 | 52 | 64.7 | 14976 | 95 |
| PS1 | 1.52 | 60 | 53 | 59.3 | 6.37 | 49 | 89.8 | 54.5 | 51992 | 100 |
| FK2 | 0.76 | 65 | 53 | | 0.88 | 58 | 37 | 70 | nd | nd |
| FK9 | 0.39 | 68 | 55 | | 0.22 | 10 | 420 | 70 | nd | nd |

**Table S2. Experiment list and source water conditions –** List of experiments conducted at stations during two cruises to the ETNP in 2018. Treatment conditions and characteristics of the experimental source water. Source water for each experiment was collected from PNM depths on casts that were exemplary of the station hydrography, but experimental casts did not always collect full profiles. Data from adjacent casts from a station were used and aligned using density. Gene copy number data from Frey et al., 2023.

| Station ID | Expt ID | Cast # | Depth (m) | SigmaT (kg $m^{-3}$) | $NO_2^-$ (µM) | $NO_3^-$ (µM) | $NH_4^+$ (nM) | Chl (mg $m^{-3}$) | sPAR (%) | Oxygen (µM) | Temp (C) | *amoA* (copies $mL^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PS3 | RM4 | 75 | 30 | 24.75 | 0.47 | 19 | 29 | 3.28 | 1.3766 | 31.64 | 18.83 | 10835 |
| PS2 | RM2 | 36 | 75 | 24.75 | 0.745 | 16 | 5 | 1.47 | 2.2 | 63.17 | 18.39 | 905 |
| PS1 | RM1 | 17 | 60.4 | 23.86 | 0.8 | 12.08 | 19.7 | 2.42 | 0.508 | 88.53 | 21.63 | 7794 |
| FK2 | EX1 | 5 | 70 | 24.28 | 0.31 | 13.8 | 25 | 0.4 | 2.65 | 79 | 20.34 | |
| FK9 | EX2 | 16 | 65 | 22.7 | 0.39 | 7.5 | 20 | 0.65 | 0.75 | 150 | 24.8 | |

**Figure S2. Extra data from coastal station PS3, experiment RM5**. Ambient nitrate conditions only. Source water was collected at 25m depth.

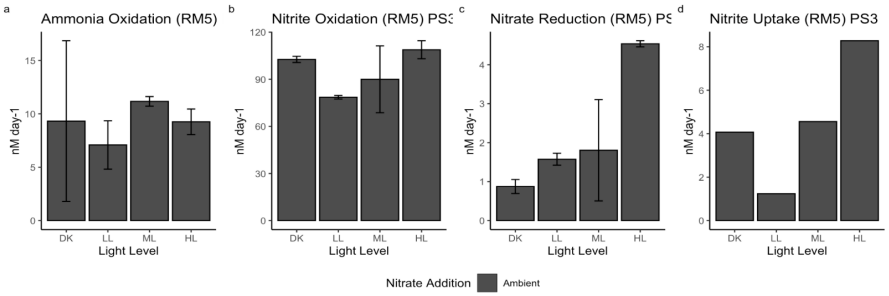



**Figure S3. Extra data from offshore station PS1, experiment RM3.** Ambient nitrate conditions only. (Depth = 80m, deeper than other PS1 data). Nitrate reduction data not available.

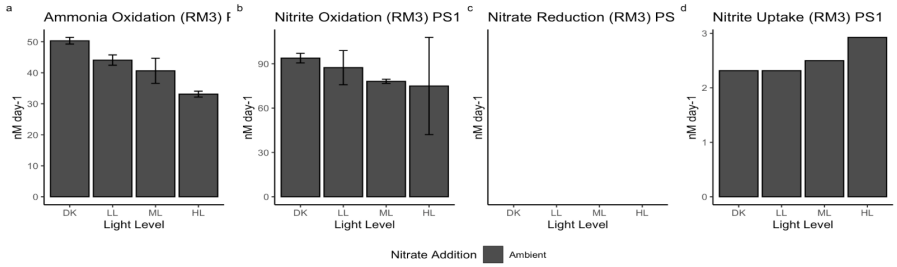



**Figure S4. Falkor Station 2 (top row) and Station 9 (bottom row) for ammonia oxidation (a,c) and nitrite oxidation (b,d).** Ambient nitrate (dark bars), 20 μM $NO_3^-$ (white bars). Measurements of nitrate reduction and nitrite uptake not available. NetNit with SE.

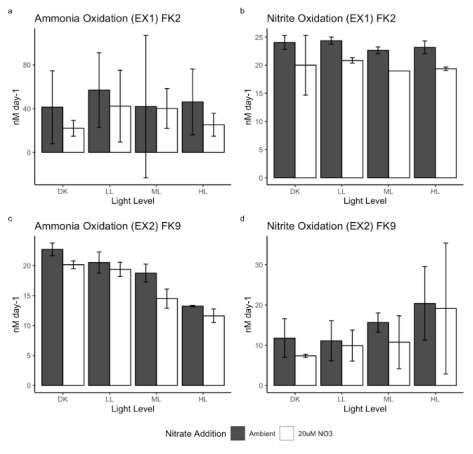


**Figure S5. Percent inhibition or enhancement of each rate process (columns) for each station (rows).** Percent inhibition of ammonia oxidation at PS3 (a), PS2 (e) and PS1 (i). Percent inhibition of nitrite oxidation at PS3 (b), PS2 (f) and PS1 (j). Percent inhibition of nitrate reduction at PS3 (c), PS2 (g) and PS1 (k). Percent inhibition of nitrite uptake at PS3 (d), PS2 (h) and PS1 (i). Bars are colored by ambient $NO_3^-$ (solid bars) and 20 µM $NO_3^-$ addition (open bars).

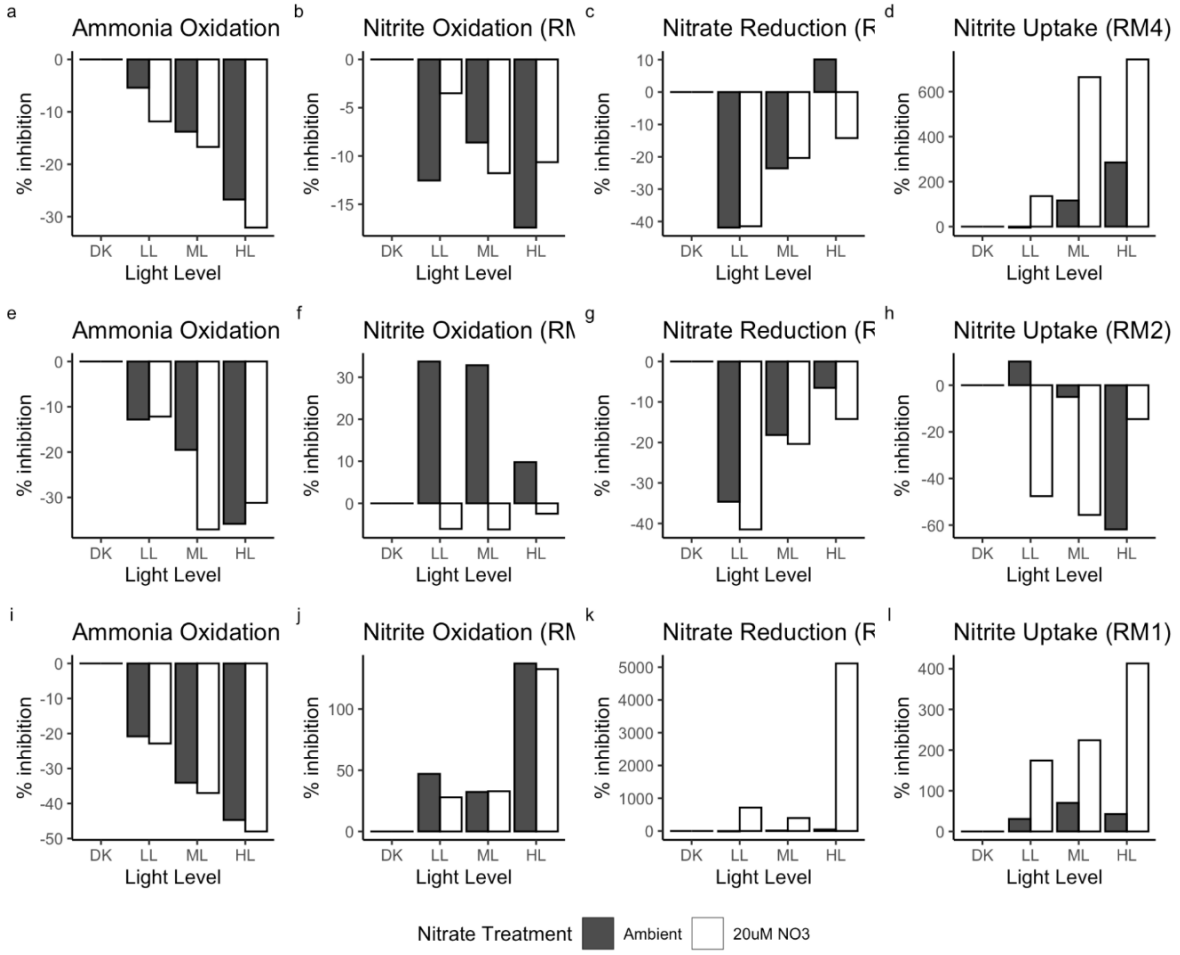



**Table S3. Percent inhibition in rates due to light (relative to DK) –** Summary of percent inhibition data across all stations and depths for each rate process (as plotted in whisker plots).

| Treatment_2 | Light | pi_in_AOX | se_AOX | pi_in_NOX | se_NOX | pi_in_NR | se_NR | pi_in_NO2up | se_up |
|---|---|---|---|---|---|---|---|---|---|
| Ambient | DK | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ambient | HL | -0.22 | 0.08 | 0.34 | 0.24 | 2.41 | 1.38 | 0.51 | 0.82 |
| Ambient | LL | -0.03 | 0.05 | -0.34 | 0.51 | -0.11 | 0.24 | -0.12 | 0.26 |
| Ambient | ML | -0.10 | 0.06 | 0.12 | 0.09 | 0.31 | 0.25 | 0.28 | 0.41 |
| 20uM NO3 | DK | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 20uM NO3 | HL | -0.28 | 0.11 | 0.55 | 0.37 | -0.54 | 0.39 | 2.70 | 1.90 |
| 20uM NO3 | LL | 0.08 | 0.21 | 0.12 | 0.08 | -0.31 | 0.11 | 0.46 | 0.64 |
| 20uM NO3 | ML | -0.07 | 0.23 | 0.11 | 0.12 | -0.17 | 0.04 | 1.89 | 1.73 |

**Figure S6. Net nitrification rates (NetNit)** for ambient treatments. Rates of ammonia oxidation (black bars), nitrite oxidation (gray bars) and NetNit (white dots) across light treatments, for ambient nitrate treatment only (20 µM $NO_3^-$ treatments shown in Fig. S7). The data are plotted separately for (a) the coastal station (PS3), (b) central station (PS2) and (c) offshore station (PS1). Error bars on NetNit (d) are the pooled SE from ammonia oxidation and nitrite oxidation rates.

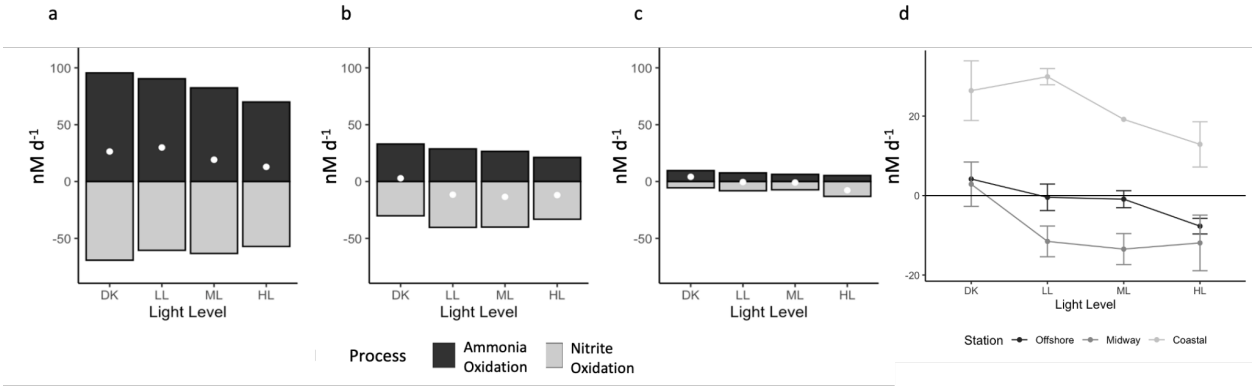



**Figure S7. Net nitrification rates (NetNit)** for 20uM $NO_3^-$ treatments. Ammonia oxidation (black bars), nitrite oxidation (grey bars) and NetNit values (white dots) are shown in panel a) coastal PS3, b) central PS2, and c) offshore PS1. NetNit is presented in panel d for each station with pooled SE.

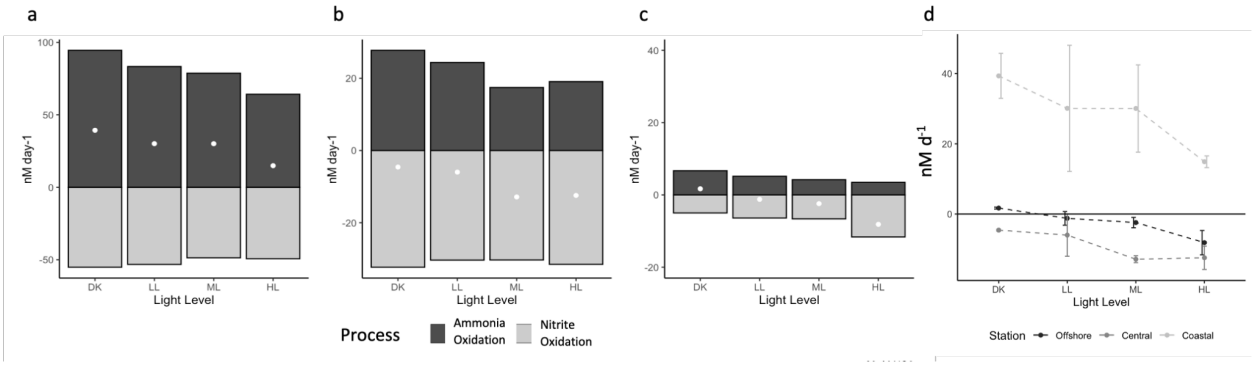


**Figure S8. Net phytoplankton nitrite production rates (NetPhy)** for ambient treatments. Rates of nitrate reduction (gray bars), nitrite uptake (black bars) and NetPhy (white dots) across light treatments from the a) coastal station PS3, b) central station PS2 and c) offshore station PS1. NetPhy for each station is shown in panel d with error bars are from nitrate reduction rates since nitrite uptake measurements did not have replicates to contribute to a pooled SE. Ambient nitrate only, does not include 20 µM nitrate treatments which are presented in Fig. S9.

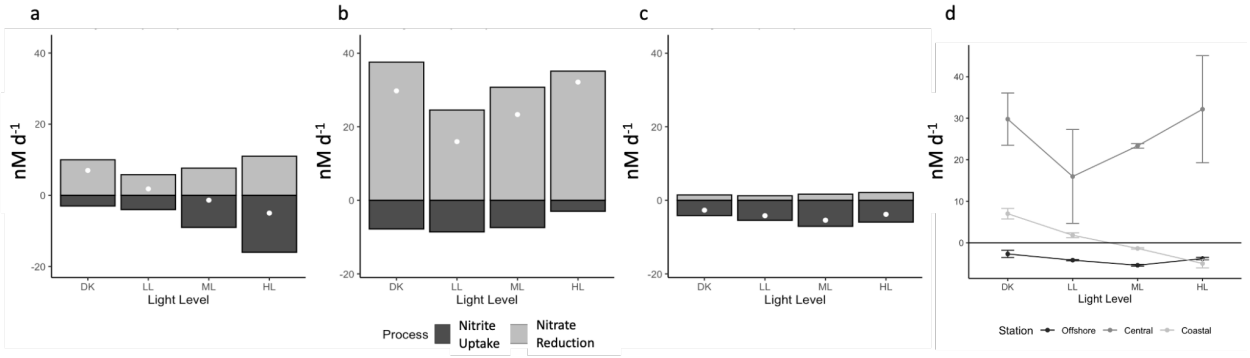



**Figure S9. Net phytoplankton nitrite production rates (NetPhy)** for 20uM $NO_3^-$ treatments. Nitrite uptake (black bars), nitrate reduction (grey bars) and NetPhy values (white dots) are shown in panel a) coastal PS3, b) central PS2, and c) offshore PS1. NetPhy is presented in panel d for each station with error bars from nitrate reduction only.

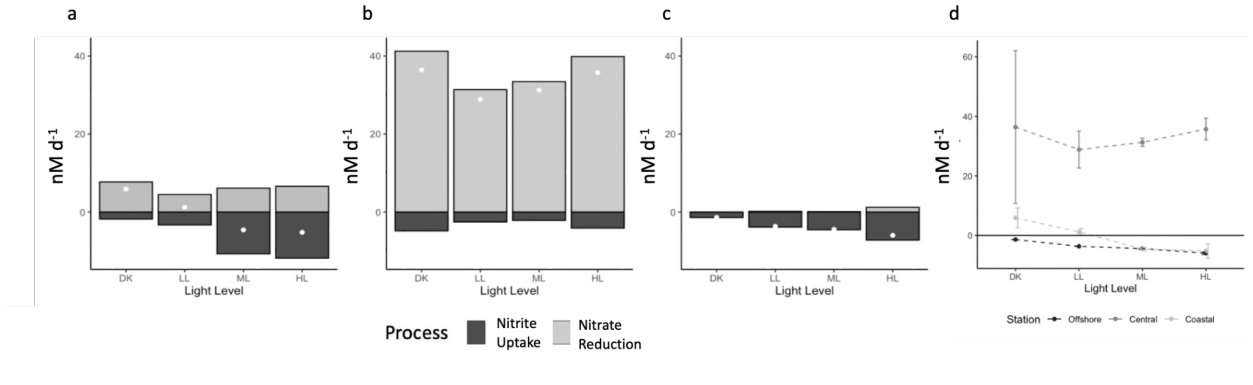


**Figure S8. Nitrite release** – Nitrite release (Nitrate Reduction) as a percentage of nitrate uptake at the coastal station PS3. Previous work has suggested that ~10% of nitrate uptake by phytoplankton is released as nitrite, but a wide range of nitrite release percentages have been reported over a variety of growth conditions (Collos 1998).

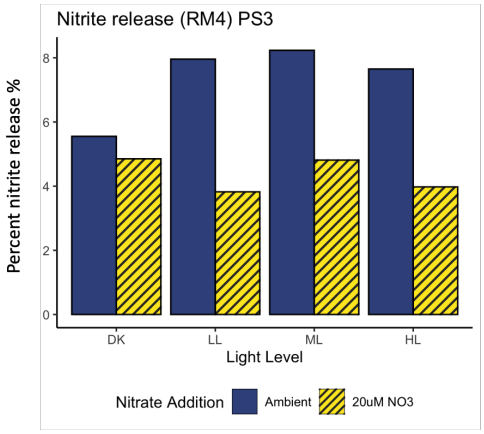



**Figure S9. Net nitrite production rates calculated from the direct measurement of the 4 major nitrite cycling processes measured at each station during the SR1805 cruise.** Offshore station (PS1, dark grey) central station (PS2, grey) and coastal station (PS3, light grey). Ambient $NO_3^-$ treatment is solid line and 20 µM $NO_3^-$ addition is dashed line.