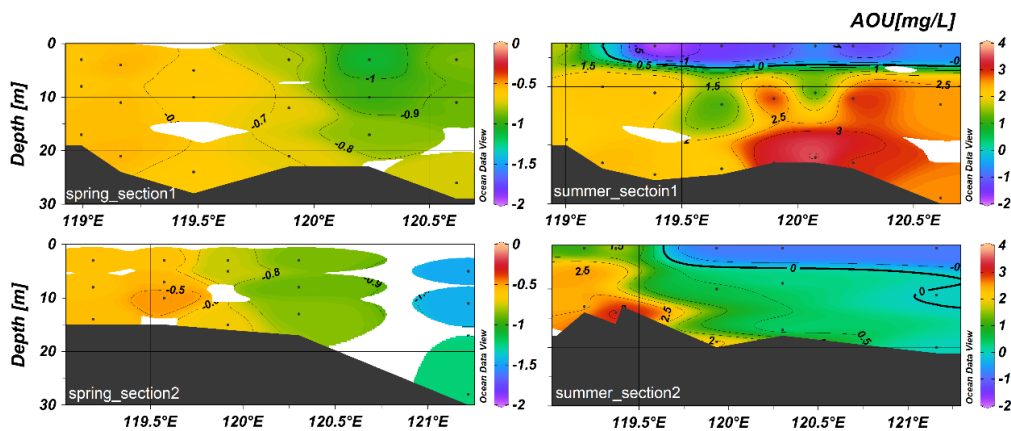


Supplement 1: Dissolved oxygen and apparent oxygen utilization

For comparing the spatial and seasonal variability of DO, we use AOU to eliminate the temperature effect on solubility. In spring, the average AOU was -0.77 ± 0.26 mg/L ($n=57$) and ranged from -1.47 mg/L to -0.48 mg/L, respectively. The AOU pattern was homogeneous over the water column (Fig. S1) and decreased in southeast and eastward direction to the BH strait (Fig. S2).

In summer, the average AOU was 0.82 ± 1.58 mg/L ($n=76$) and ranged between -1.89 to $+3.58$ mg/L. AOU vertical distribution mirrored stratification with significant negative values below the thermocline caused by respiration processes such as remineralization and nitrification.



10 Fig. S1 Profiles of AOU in spring and summer in the BHS (for showing a better pattern, the eastern most station of section 2 in spring was changed from site B36 to site B35 due to missing DO data at B36)

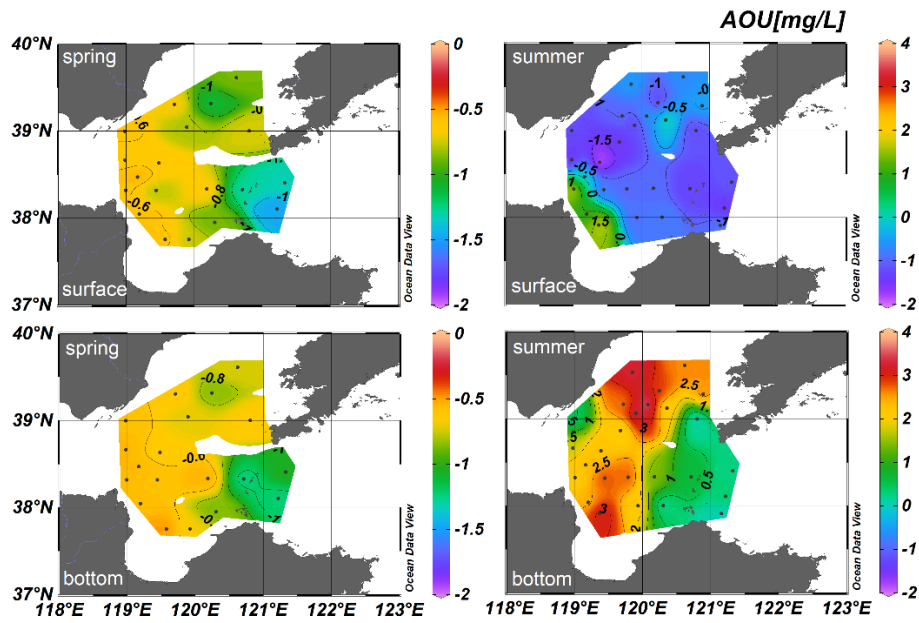
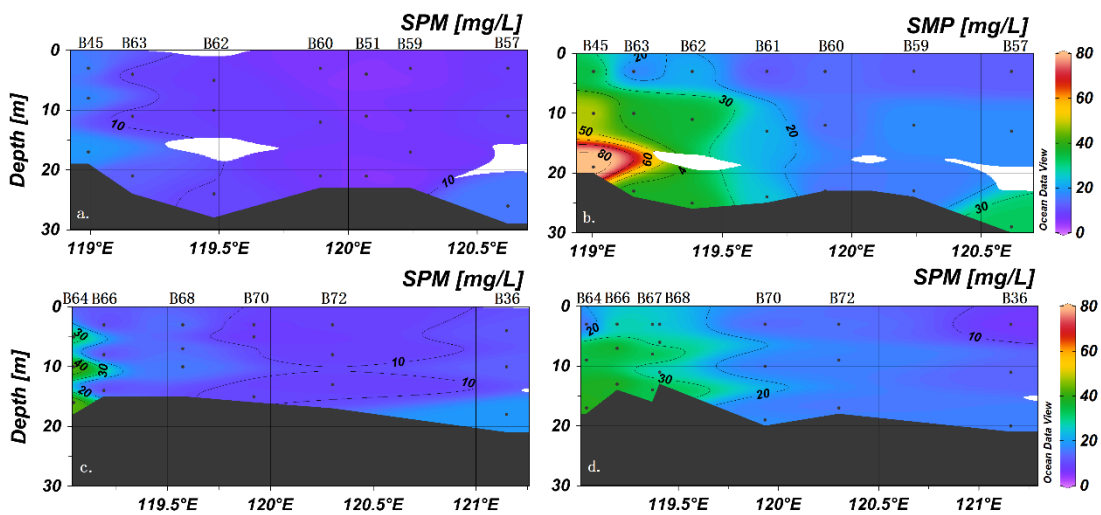


Fig. S2 Horizontal distributions of spring and summer in the BHS

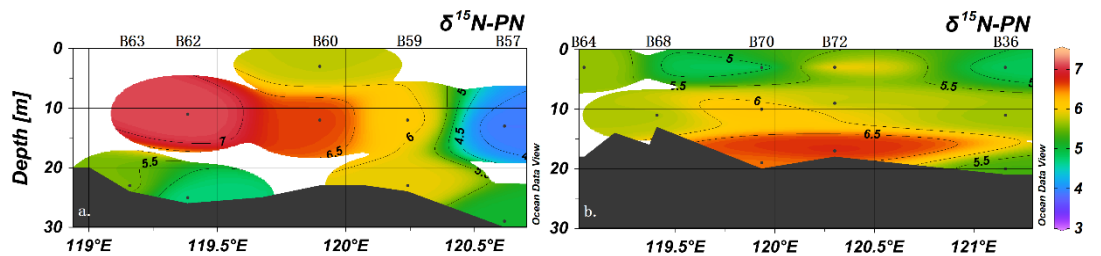
Supplement 2 Summary of results of this study

	Spring		Summer	
	Range	Average± Std Dev	Range	Average± Std Dev
Salinity/psu	29.9-32.8	32.3±0.5 (n=72)	28.5-32.5	31.6±0.8 (n=88)
Temperature/°C	2.9-6.7	4.7±0.8°C (n=72)	9.5-30.1	22.4±4.2 (n=88)
NO_3^- /μmol/L	0.3-31.1	6.5±5.8 (n=72)	0.1-13.6	1.9±2.7 (n=85)
NO_2^- /μmol/L	0.0-1.0	0.2±0.2 (n=72)	0.0-4.6	0.8±1.1 (n=85)
NH_4^+ /μmol/L	0.2-2.7	0.8±0.5 (n=72)	0.1-7.8	1.6±1.9 (n=85)
PO_4^{3-} /μmol/L	0.1-0.7	0.4±0.2 (n=72)	0.0-0.3	0.1±0.1 (n=85)
SiO_3^- /μmol/L	0.2-13.9	5.3±3.1 (n=72)	1.3-17.0	7.7±3.2 (n=85)
$\delta^{15}N$ /‰	5.7-9.7	7.5±1.3 (n=52)	3.5 - 23.9	9.9±3.5 (n=23)
$\delta^{18}O$ /‰	5.0-19.8	11.3±2.5 (n=52)	3.1 - 18.4	8.7±3.3 (n=23)
SPM/ mg/L	2.3 - 44.3	10.6±8.0 (n=72)	5.7 - 82.9	22.2±16.5 (n=85)
TOC/%	0.6 - 6.9	2.7±1.7 (n=72)	0.8 - 6.3	2.1±1.2 (n=83)
TN/%	0.1 - 1.8	0.5±0.4 (n=72)	0.1 - 1.4	0.4±0.3 (n=83)
$\delta^{15}N$ -SPM/‰	3.2 - 6.2	4.8±0.9 (n=14)	3.9 - 7.2	5.7±0.8 (n=34)
DO/mg/L	10.27 - 11.47	10.84±0.35 (n=57)	3.84 - 8.86	6.22±1.37 (n=57)
AOU/mg/L	-0.48 - -1.47	0.77±0.26 (n=57)	-1.89 - +3.58	0.82±1.58 (n=76)

Supplement 3 The distribution of SPM and its nitrogen isotope



20 Fig. S3 Suspended particulate matter concentrations of section 1 (a) and section 2 (c) of spring and section 1 (b) and section 2 (d) of summer.



25 Fig. S4 Profiles of $\delta^{15}\text{N}$ of particulate nitrogen in summer (a. section 1, b. section 2)