



*Supplement of*

**Role of phosphorus concentration and the nitrogen to phosphate ratio in the synergistic stimulation of alkaline phosphatase activity in Laizhou Bay, China, coastal waters**

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## Sect. S1 Tables

Table S1 Initial nutrient status in enclosed culture experiments.

Experimental condition	DIN ( $\mu\text{mol}\cdot\text{L}^{-1}$ )	PO <sub>4</sub> -P ( $\mu\text{mol}\cdot\text{L}^{-1}$ )	DIN : PO <sub>4</sub> -P
Control group (CG)	1.90	0.04	55
Treatment group (TG)	50.01	1.78	28

Table S2 Light, temperature, and rainfall conditions during enclosure experiment.

Date	Culture time	Light intensity	Temperature	Weather	Precipitation
	d	$\times 10^3$ lux	$^{\circ}\text{C}$		mm
2021.7.23	0	135	\	Cloudy to overcast	
2021.7.24	1	140	\	Cloudy to sunny	
2021.7.25	2	110	31.0	Overcast to clear	
2021.7.26	3	103	31.6	Cloudy to overcast	
2021.7.27	4	75	30.8	Cloudy to overcast	
2021.7.28	5	50	30.8	Cloudy	
2021.7.29	6	50	29.8	9:00~17:00 Heavy rainfall	15.41
2021.7.30	7	33	28.2	Cloudy to light rain	2.27
2021.7.31	8	137	29.6	Sunny to thundery	24.93

				shower	
2021.8.2	10	130	28.8	Sunny	
2021.8.4	12	84	30.0	Cloudy	
				15:00~17:00	
2021.8.5	13	50	\	Heavy rainfall	21.78
2021.8.6	14	80	29.0	Sunny to cloudy	
2021.8.8	15	120	30.4	Sunny	
2021.8.11	16	134	\	Cloudy to overcast	
2021.8.14	19	79	\	Sunny	
2021.8.16	22	121	\	Sunny	
2021.8.18	26	138	29.8	Sunny to cloudy	
2021.8.21	29	135	28.6	Sunny	

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## Sect. S2 Figures

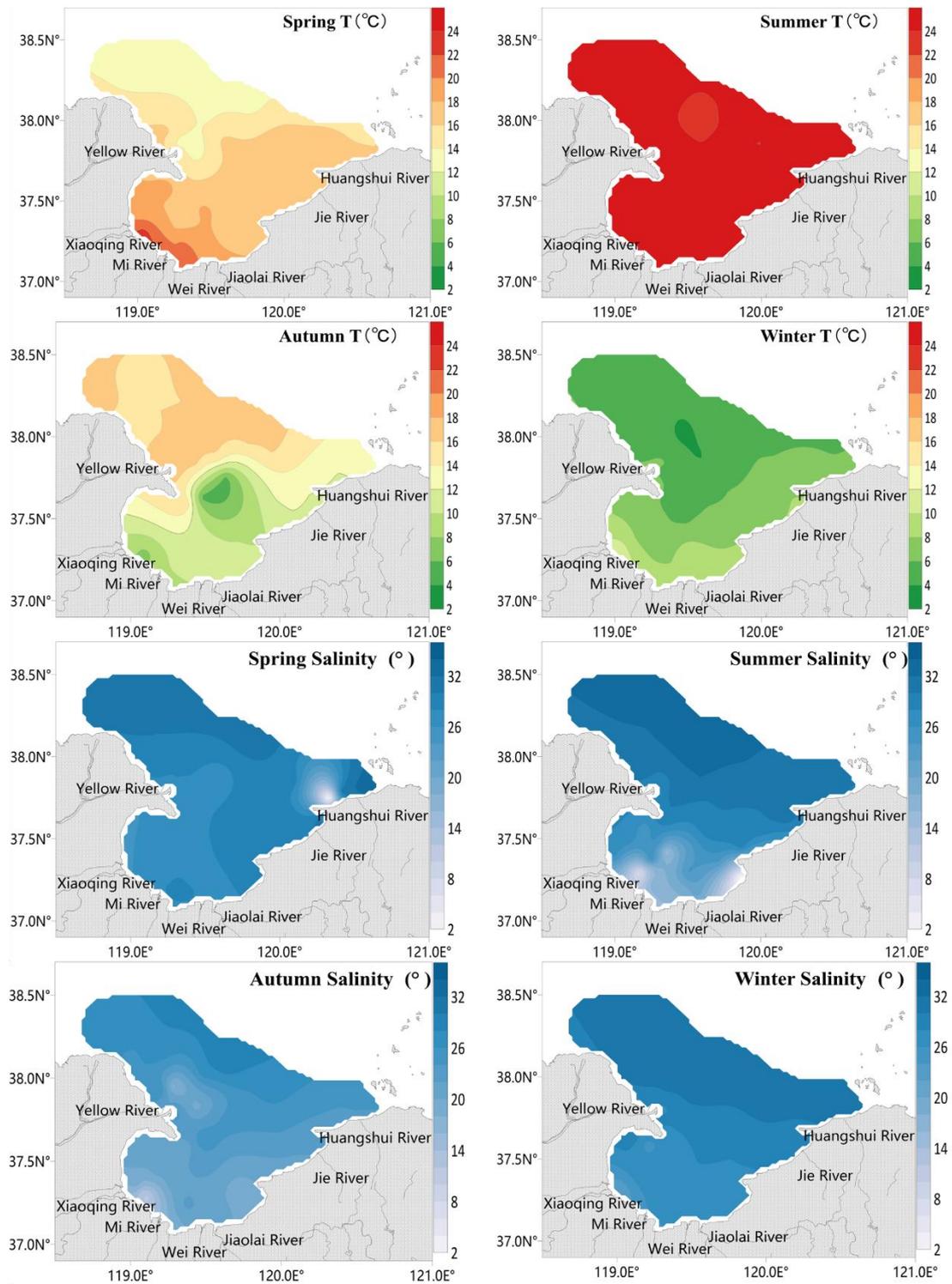


Figure S1 Seasonal variation of surface seawater temperature and salinity in Laizhou Bay.

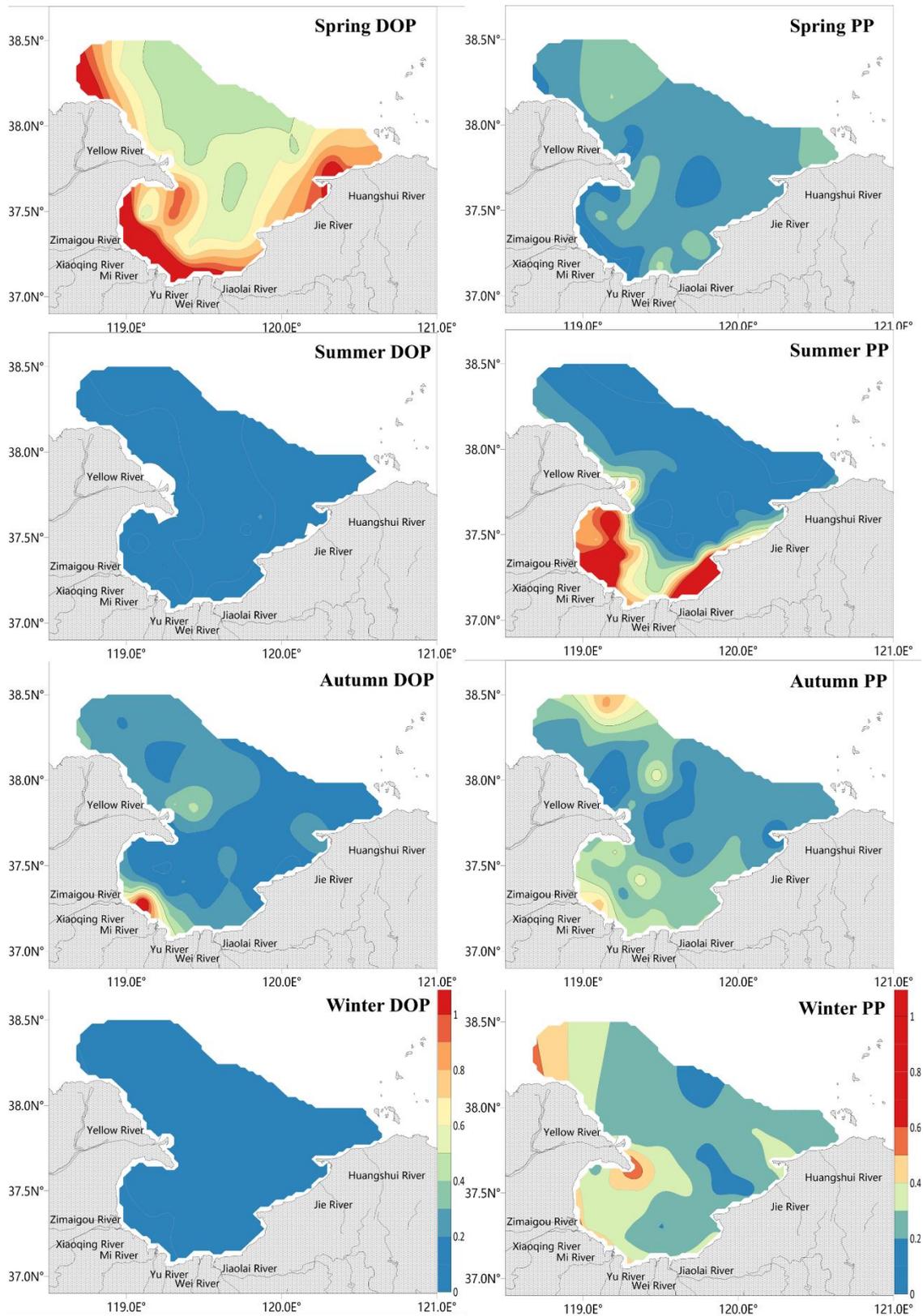


Figure S2 Seasonal variation in surface seawater dissolved organic phosphorus and particulate phosphorus in Laizhou Bay.

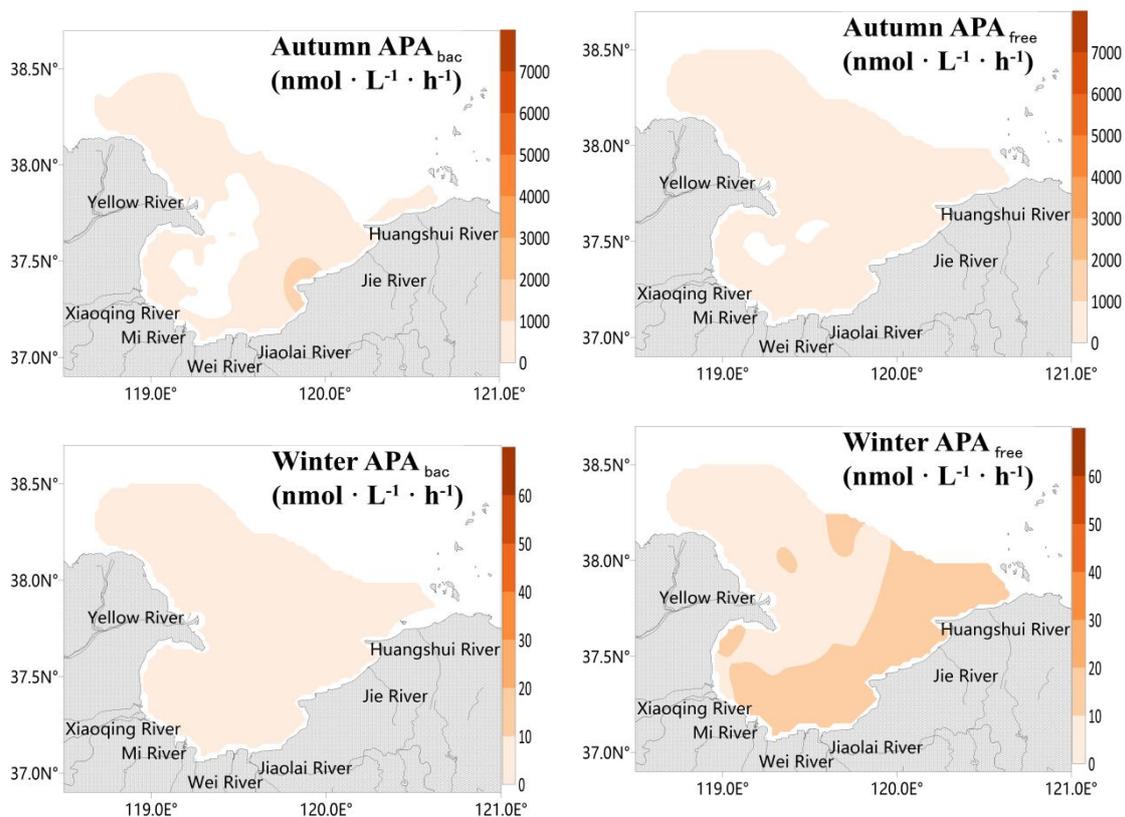


Figure S3 Spatial distribution of surface seawater APA<sub>bac</sub> and APA<sub>free</sub> in Laizhou Bay during autumn and winter.

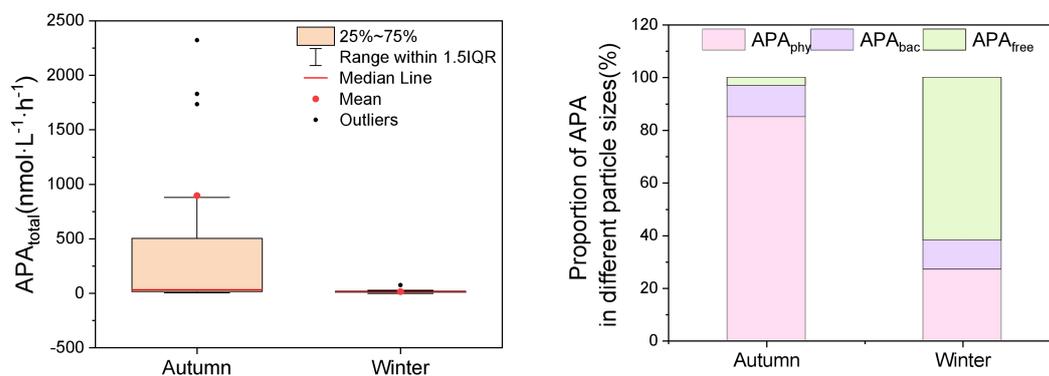


Figure S4 Relative contribution of different APA size fractions to total activity in Laizhou Bay during autumn and winter.

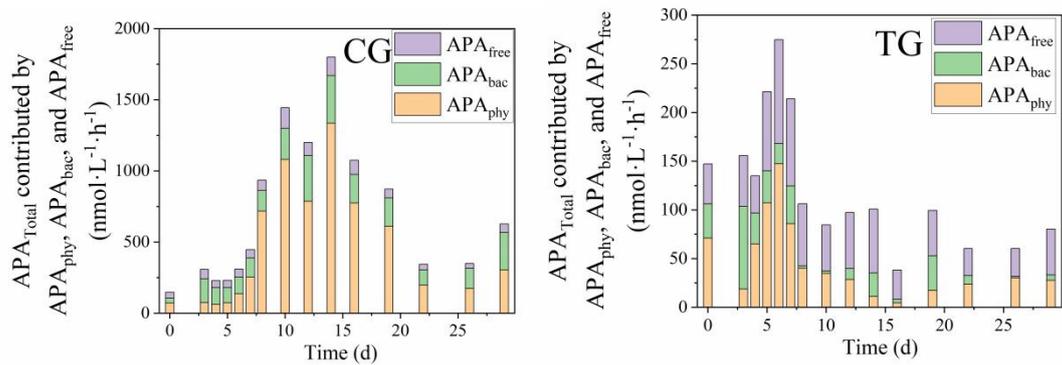


Figure S5 Temporal variation in  $APA_{total}$  and its partitioning into  $APA_{phy}$ ,  $APA_{bac}$ , and  $APA_{free}$  during the 29-day enclosure experiments for the control group (CG) and the treatment group (TG).

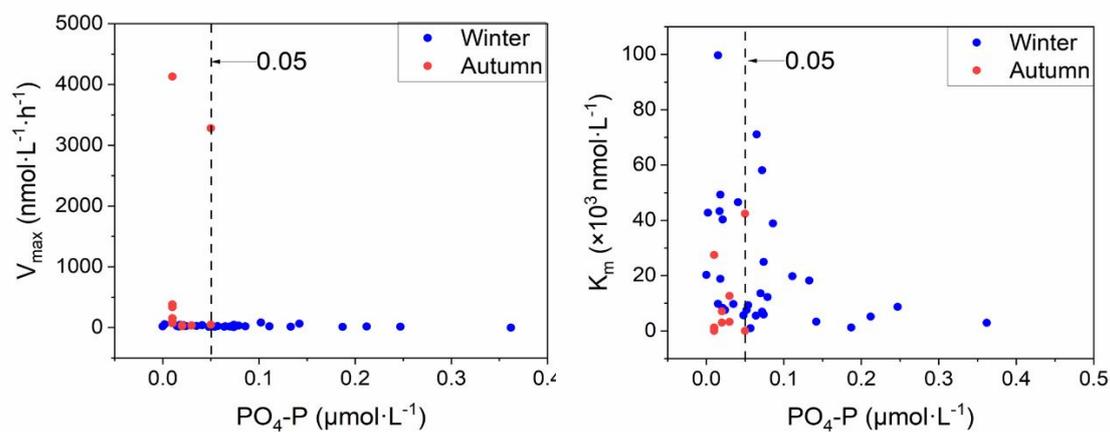


Figure S6 Relationship between alkaline phosphatase kinetic parameters ( $V_{max}$ ,  $K_m$ ) and phosphate concentration ( $PO_4\text{-P}$ ) in Laizhou Bay.

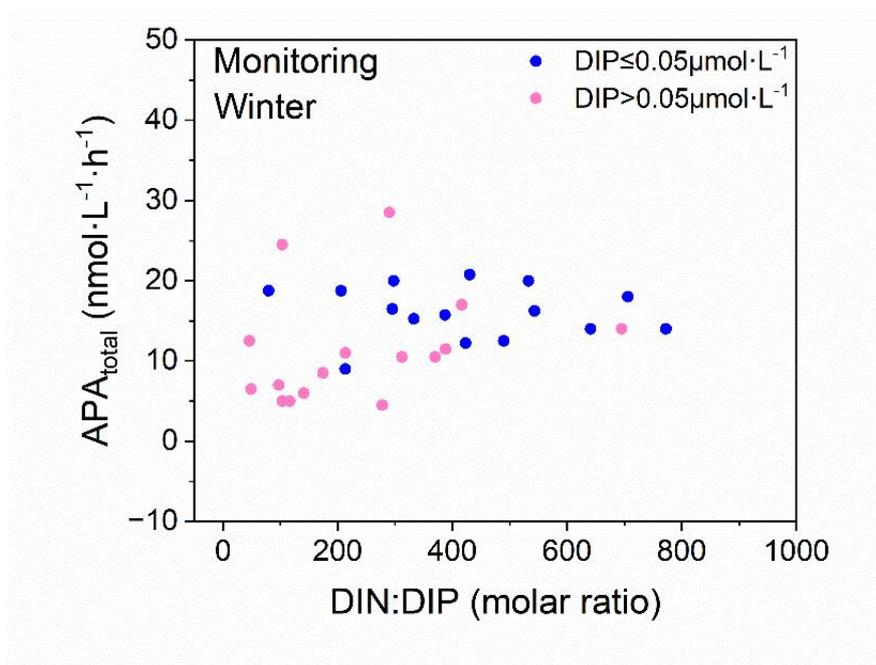


Figure S7 Correlation between alkaline phosphatase activity (APA) and DIN/DIP in Laizhou bay, winter.