Table S1 Split-beam single-unit echo detection identifies specific parameters in this study

Parameters	Setting
Time Varied Gain,TVG	40lgR
Echo Threshold	-70dB
Foreground Filter	[1,3]
Background Filter	[55,1]
Target Smoothing Filter	[1,3]
Signal Length	[3,50]
Maximun Gain Compensation	6dB
Minimum Track Length	2
Maximun Ping Gap	2
Gating Rang	0.3

Table S2 GAMs stepwise regression analysis

Step	Added Variables	df	AIC	R^2adj	Deviance explained	Explanatory variables
1	s(WD)	3.0	259.7	0.28	29.4%	WD
2	season	6.5	239.4	0.43	46.4%	WD,season
3	s(DO)	10.0	231.9	0.50	54.5%	WD,season,DO
4	s(Z_Bi)	14.2	222.5	0.57	62.8%	WD,season,DO,Z_Bi
5	s(Cond)	19.0	209.5	0.64	70.9%	WD,season,DO,Z_Bi，Cond
6	s(PO4)	21.4	200.2	0.69	75.1%	WD,season,DO,Z_Bi,Cond,PO4
7	s(NH4)	23.4	197.2	0.70	77.0%	WD,season,DO,Z_Bi,Cond,PO4,HN4
8	s(TN)	26.0	196.4	0.71	78.5%	WD,season,DO,Z_Bi,Cond,PO4,HN4,TN