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Supplementary Materials

Biochemical Composition of Seston Reflecting the Physiological Status and Community Composition of Phytoplankton in a Temperate Coastal Embayment of Korea

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Supplementary Information Contents

Table S1. Distributions of temperature, salinity, dissolved inorganic nitrogen (NH_4^+, NO_2^-, NO_3^-), silicate (SIO_2), and phosphate (PO_4^{3-}) in Gwangyang Bay during the study period.

Date.	Station	T (°C)	Salinity	NH_4^+ μM	NO_2^- μM	NO_3^- μM	SIO_2 μM	PO_4^{3-} μM
Spring	S1	24.8	8.0	0.4	0.3	20	46.4	0.0
2017	S2	23.8	16.9	0.6	0.2	4.6	28.5	0.1
	S3	27.6	23.3	1.2	0.3	4.1	19.6	0.7
	S4	21.5	31.9	0.7	0.2	2.6	10.2	0.4
	S5	21.0	31.9	0.8	0.2	2.2	9.8	0.4
	S6	20.8	32.1	0.5	0.2	2.9	11.1	0.3
	S7	19.9	32.1	0.3	0.0	1.3	8.5	0.1
	S8	19.6	32.2	0.4	0.0	1.1	6.9	0.1
	S9	19.1	32.4	0.3	0.0	1.2	7.0	0.1
Summer	S1	26.7	0.1	0.2	0.2	115.8	153.9	1.2
2017	S2	27.8	4.5	1.7	0.6	107.9	137.4	2.0
	S3	28.8	10.3	2.0	1.1	89.2	112.4	1.9
	S4	28.2	21.9	0.9	1.7	37.5	67.2	1.1
	S5	27.7	26.2	0.4	1.3	12.6	34.1	0.0
	S6	27.3	29.2	0.3	0.1	1.7	2.3	0.0
	S7	26.8	29.8	0.1	0.2	1.3	2.2	0.0
	S8	26.7	29.6	0.1	0.0	1.4	1.0	0.0
	S9	27.0	30.8	0.3	0.0	1.5	1.9	0.0
Fall	S1	8.3	4.8	0.7	0.2	83.8	24.8	0.2
2017	S2	11.1	20.9	1.3	0.8	48.8	45.5	1.0
	S3	12.2	25.8	1.9	0.4	14.5	20.6	1.0
	S4	13.7	30.4	2.7	1.0	10.1	25.1	1.3
	S5	14.2	31.3	1.8	1.0	5.6	16.4	1.0
	S6	13.7	31.4	1.8	1.2	7.3	19.6	1.0
	S7	13.9	31.5	1.0	0.9	4.7	13.5	0.8
	S8	14.2	31.8	0.5	0.4	2.8	7.2	0.4
	S9	14.9	32.3	0.4	0.8	4.6	12.4	0.4
Winter	S1	3.1	0.0	0.5	0.4	44.4	28	0.1
2018	S2	4.6	18.8	0.4	0.4	37.4	25.2	0.1
	S3	6.6	32.8	0.3	0.1	4.1	2.2	0.0
	S4	6.9	34.1	0.4	0.0	1.2	0.2	0.1
	S5	7.0	34.2	0.2	0.0	1.7	0.3	0.1
	S6	7.6	34.8	0.3	0.0	1.3	0.5	0.1
	S7	8.2	35.2	0.4	0.0	1.5	1.0	0.2
	S8	8.2	35.3	0.3	0.0	1.8	1.3	0.2
	S9	8.2	35.4	0.2	0.0	1.5	1.2	0.2

Table S2. Distributions of suspended particulate matter (SPM), phytoplankton biomass (Chl*a*), particulate organic carbon (POC) and nitrogen (PN) concentrations, and molar POC:PN ratio (C:N), primary productivity (PP), $\delta^{13}C_{POM}$ **and** $\delta^{15}N_{POM}$ values in Gwangyang Bay during the study period.

Date	Station	SPM (mg L^{-1})	Chl*a* (μg L^{-1})	POC (μg L^{-1})	PN (μg L^{-1})	C:N	PP (mg C m^{-2} d^{-1})	$\delta^{13}C_{POM}$ (‰)	$\delta^{15}N_{POM}$ (‰)
Spring 2017	S1	5.3	12.9	495.9	87.4	6.6	1999.3	-25.6	7.3
	S2	12.0	6.0	471.2	81.2	6.8	960.4	-22.5	6.6
	S3	13.1	5.0	453.7	99.8	5.3	974.8	-22.5	3.5
	S4	18.2	2.6	418.9	96.4	5.1	761.0	-22.1	3.2
	S5	26.4	3.9	437.9	95.4	5.4	544.6	-21.3	6.5
	S6	20.3	3.4	444.4	96.0	5.4	588.0	-21.3	4.1
	S7	13.9	4.8	444.2	94.7	5.5	567.7	-21.1	4.0
	S8	18.9	2.9	416.4	96.6	5.0	643.2	-20.9	3.1
	S9	26.8	3.9	419.1	83.3	5.9	658.8	-20.8	3.0
Summer 2017	S1	2.2	7.9	228.2	47.8	5.6	215.6	-26.0	3.4
	S2	7.4	2.9	254.7	71.5	4.2	258.9	-25.2	4.6
	S3	7.5	4.8	285.2	57.8	5.8	332.3	-24.8	4.0
	S4	19.0	4.5	363.4	60.8	7.0	667.2	-24.2	8.7
	S5	18.3	1.6	346.3	72.3	5.6	630.4	-23.0	4.1
	S6	27.4	3.1	354.6	58.8	7.0	717.8	-23.0	5.4
	S7	25.0	1.8	385.8	57.3	7.9	817.5	-21.5	4.2
	S8	34.5	2.9	414.5	54.3	8.9	910.4	-20.7	4.1
	S9	20.0	3.1	449.0	63.0	8.3	1012.1	-19.6	3.9
Fall 2017	S1	4.7	2.4	154.0	64.2	5.4	47.0	-25.0	7.6
	S2	17.8	3.1	198.6	44.3	4.1	68.3	-24.3	4.1
	S3	10.6	1.3	254.5	55.4	5.4	114.7	-24.1	4.1
	S4	9.8	3.2	202.4	47.5	5.0	119.7	-23.3	4.5
	S5	18.6	2.8	206.5	43.5	5.5	124.3	-23.5	5.6
	S6	19.0	2.6	200.0	47.4	4.9	133.8	-22.7	4.1
	S7	26.2	1.3	298.0	58.0	6.0	130.9	-21.9	5.1
	S8	30.4	0.7	221.0	36.2	7.1	156.1	-19.7	7.5
	S9	24.1	1.1	305.5	45.3	7.9	256.8	-19.22	4.62
Winter 2018	S1	5.1	0.4	482.0	96.7	5.8	203.4	-26.0	7.0
	S2	8.4	1.7	452.1	84.6	6.2	259.0	-25.4	5.9
	S3	9.6	1.8	446.3	87.3	6.0	348.3	-24.5	7.3
	S4	8.2	1.4	442.2	95.3	5.4	339.6	-24.2	9.6
	S5	11.6	2.2	430.2	86.3	5.8	579.6	-23.7	7.9
	S6	19.1	2.2	487.5	97.0	5.9	546.2	-23.3	7.6
	S7	22.2	2.6	433.2	83.4	6.1	558.8	-23.2	7.6
	S8	22.4	1.4	420.0	65.9	7.4	643.3	-22.9	8.3
	S9	28.8	1.4	426.5	85.6	5.8	645.0	-22.2	7.5

Table S3. The concentrations of biochemical compounds (carbohydrates: CHO, proteins: PRT, lipids: LIP), biopolymeric carbon (PBC), their ratios (PRT:CHO, CHO:LIP, and POC:Chl*a*) of seston at nine selected stations in Gwangyang Bay during the study period.

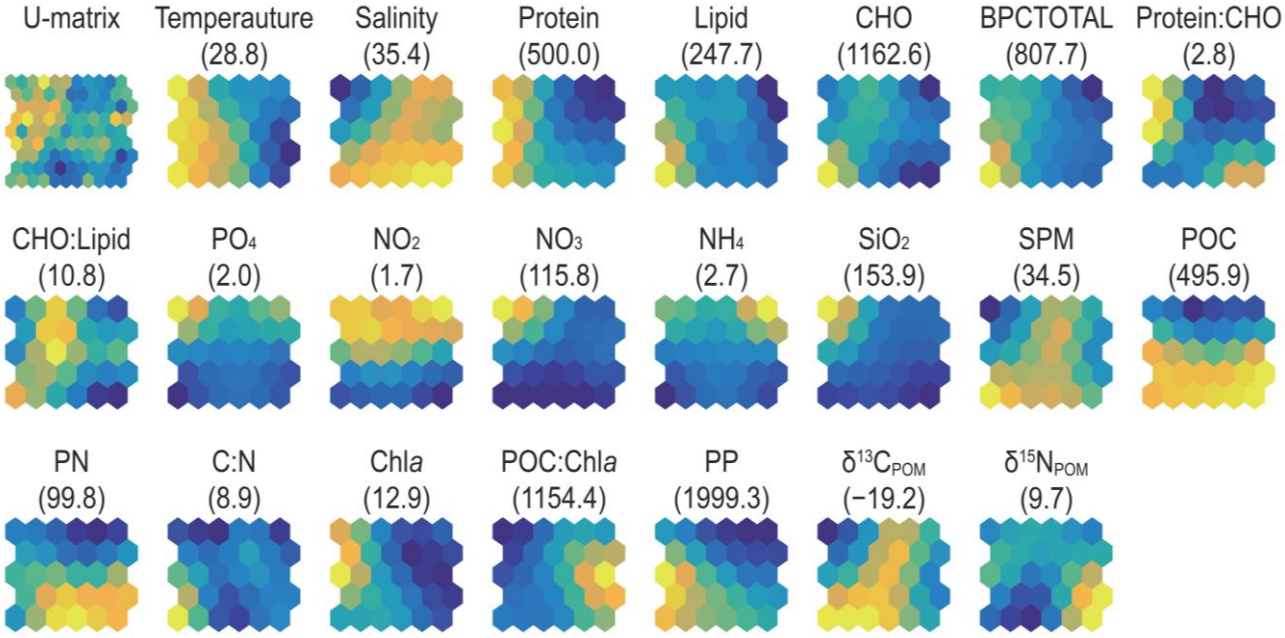
Date	Station	CHO ($\mu g\ L^{-1}$)	PRT ($\mu g\ L^{-1}$)	LIP ($\mu g\ L^{-1}$)	BPC ($\mu g\ CL^{-1}$)	PRT:CHO	CHO:LIP	POC:Chl*a*
Spring 2017	S1	149.2	421.4	163.2	392.1	2.8	0.9	38.4
	S2	150.7	333.2	107.3	309.5	2.2	1.4	78.5
	S3	183.3	107.9	106.9	211.3	0.6	1.7	90.9
	S4	179.9	230.1	97.9	276.6	1.3	1.6	163.8
	S5	274.0	253.5	126.4	316.2	0.9	2.9	111.1
	S6	294.6	220.5	94.5	331.3	0.7	2.3	131.0
	S7	317.4	160	115.2	291.4	0.5	3.2	92.1
	S8	235.4	190.8	121.6	286.5	0.8	1.9	141.7
	S9	304.7	178.0	88.9	288.3	0.6	3.4	107.2
Summer 2017	S1	242.9	237.5	99.0	297.4	1.0	2.5	29.0
	S2	136.1	284.3	94.1	269.3	2.1	1.4	87.2
	S3	340.3	337.4	118.9	405.1	2.1	2.9	59.5
	S4	471.4	500.0	213.2	611.4	1.1	2.2	80.5
	S5	741.9	107.9	68.6	435.8	0.1	10.8	211.2
	S6	750.5	425.6	183.1	678.7	0.6	4.1	112.6
	S7	740.8	382.0	247.7	697.8	0.5	3.0	211.7
	S8	1162.6	338.5	164.7	807.7	0.3	7.1	141.0
	S9	541.5	238.6	186.5	493.5	0.4	2.9	142.9
Fall 2017	S1	439.2	112.2	84.4	312.8	0.3	5.2	65.2
	S2	528.4	221.6	119.7	432.4	0.4	4.4	63.1
	S3	121.5	45.2	61.9	120.6	0.4	2.0	201.5
	S4	86.3	85.6	79.1	137.0	1.0	1.1	64.3
	S5	69.1	47.4	64.5	99.9	0.7	1.1	74.0
	S6	142.9	67.5	112.5	176.8	0.5	1.3	78.0
	S7	308.8	55.9	141.5	266	0.2	2.2	222.4
	S8	555.3	53.7	185	406.2	0.1	3.0	306.3
	S9	130.5	89.9	118.2	186.4	0.7	1.1	275.6
Winter 2018	S1	686.1	86.7	92.3	416.7	0.1	7.4	1154.4
	S2	288.6	69.7	67.9	212.3	0.2	4.3	262.1
	S3	244.4	83.5	107.7	227.1	0.3	2.3	254.0
	S4	233.1	93.0	94.1	217.3	0.4	2.5	312.3
	S5	111.0	152.5	107.3	201.3	1.4	1.0	193.3
	S6	118.5	201.4	102.0	225.4	1.7	1.2	220.0
	S7	157.8	280.0	106.5	285.6	1.8	1.5	168.5
	S8	72.0	126.0	79.1	150.8	1.8	0.9	290.5
	S9	55.6	126.0	165.9	204.2	2.3	0.3	312.3

Table S4. Output marker pigment:chlorophyll *a* ratio for phytoplankton groups as calculated by CHEMTAX in each cluster in Gwangyang Bay based on the self-organizing map. DIAT, diatoms; DINO, dinoflagellates; CRYP, cryptophytes; PELA, pelagophytes; PRYM, Prymnesiophytes; CHLO, chlorophytes; CYAN, cyanobacteria; PRAS, prasinophytes.

Clusters	Station	DIAT	DINO	CRYP	PELA	PRYM	CHLO	CYAN	PRAS
Cluster I	A1	4.2	0.3	0.4	0.3	0.0	2.6	0.0	0.0
	A2	1.6	0.0	0.8	0.1	0.0	0.3	0.0	0.0
	A3	3.5	0.6	0.2	0.1	0.0	0.3	0.0	0.0
	A4	3.1	1.2	0.0	0.1	0.0	0.1	0.0	0.1
	N1	0.2	0.0	1.9	0.0	0.0	0.2	0.0	0.1
	N2	0.5	0.0	2.4	0.0	0.0	0.1	0.0	0.1
Cluster II	N3	0.5	0.0	0.5	0.0	0.0	0.0	0.2	0.0
	N4	1.7	0.1	1.0	0.0	0.0	0.0	0.1	0.2
	N5	2.4	0.1	0.0	0.1	0.0	0.0	0.0	0.1
	N6	2.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	N7	1.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	N8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	N9	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cluster III	F1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	F2	0.7	0.0	0.8	0.0	0.0	0.1	0.1	0.1
	F3	0.7	0.0	0.6	0.0	0.0	0.0	0.0	0.4
	F4	1.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
	F5	1.8	0.0	0.2	0.0	0.0	0.0	0.0	0.2
	F6	1.7	0.0	0.2	0.0	0.0	0.1	0.0	0.2
	F7	2.0	0.0	0.3	0.1	0.0	0.1	0.0	0.1
	F8	1.2	0.0	0.1	0.0	0.0	0.0	0.0	0.1
	F9	0.8	0.0	0.2	0.1	0.0	0.0	0.0	0.2
Cluster IV	M1	6.0	0.7	4.6	0.2	0.1	0.4	0.2	0.9
	M2	3.5	1.0	0.4	0.6	0.0	0.1	0.1	0.4
	M3	3.2	0.4	1.1	0.0	0.0	0.0	0.0	0.2
	M4	0.9	0.0	1.1	0.0	0.0	0.0	0.0	0.5
	M5	2.7	0.9	0.1	0.1	0.0	0.1	0.0	0.0
	M6	1.8	0.0	1.2	0.0	0.0	0.0	0.0	0.3
	M7	2.3	0.0	1.6	0.1	0.0	0.1	0.0	0.6
	M8	1.5	0.0	0.9	0.1	0.0	0.0	0.0	0.4
	M9	1.6	0.0	1.8	0.0	0.0	0.1	0.1	0.4
	A5	1.1	0.0	0.1	0.1	0.0	0.0	0.0	0.3
	A6	2.3	0.6	0.1	0.1	0.0	0.0	0.0	0.0
	A7	1.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0
	A8	2.3	0.4	0.1	0.1	0.0	0.0	0.0	0.1
	A9	2.3	0.5	0.2	0.1	0.0	0.0	0.0	0.1

Table S5. The generalized additive models (GAMs) analysis of phytoplankton community composition and biochemical components of seston measured in Gwangyang Bay. Bold values indicate that correlation is significant at $p < 0.05$. Microphytoplankton (diatoms and dinoflagellated); Nanophytolankton, (cryptophytes, pelagophytes and prymnesiophytes); Picophytolankton (chlorophytes, cyanobacteria and prasinophytes).

Y	Selectedmodel	AIC	Deviance explained (%)	*F*-test			
				Terms	df/edf	*F*	*P*-value
CHO	Y~s(Micro)	500	39.4	s(Micro)	7.5	1.6	0.134
PRT	Y~s(Micro)	433	43	s(Micro)	1.0	25.6	**0.000**
LIP	Y~s(Micro)+s(Pico)	370	32.2	s(Micro)	1.0	6.2	**0.019**
				s(Pico)	2.5	2.9	**0.044**
PRT:CHO	Y~s(Micro)	71	41.7	s(Micro)	3.8	4.2	**0.000**
CHO:LIP	Y~s(Nano)	161	7.9	s(Nano)	2.5	0.5	0.606



Supplementary Figure S1. Visualization of physical and biogeochemical variables on trained Self Organizing Map units.