Supplementary Material

Araújo CAS, Belzile C, Tremblay J-É and Bélanger S (2022) Environmental niches and seasonal succession of phytoplankton assemblages in a subarctic coastal bay: Applications to remote sensing estimates. *Front. Mar. Sci.* 9:1001098. doi: 10.3389/fmars.2022.1001098

This supplementary material consists of:

TABLE S1. Mean and (plus or minus) standard deviation of phytoplankton pigments concentrations (normalized by Chla) and pico- and nano-cells (eukaryotic and cyanobacteria) abundances, for each of the seven clusters obtained by the Hierarchical Cluster Analysis (PraD, PryD, Cy, Dia, Cry, CryP, and Chlo).

TABLE S2. Pigment and nutrient concentrations from samples collected in the phytoplankton spring bloom (April-May), including surface and deep waters in selected stations of the Bay of Sept-Îles.

FIGURE S1. Bar plots showing the percentage distribution of phytoplankton classes as assigned by the light microscopy technique. The names in the x-axis refer to the phytoplankton groups and respective field campaigns (refer to **Table 1**). The number above each bar is the total phytoplankton cell count (in cells L^{-1}). Other flagellates include chlorophytes, chrysophytes, dictyophytes, euglenophytes, prasinophytes, prymnesiophytes and raphidophytes.

FIGURE S2. (**A**) Cells concentration comparison of nanophytoplankton counts from flow cytometry (FC) versus light microscopy (LM) methods. Unidentified cells with sizes lower than 20 µm were included in the LM nanophytoplankton abundances. (**B**) Ternary plot showing the relative contribution (or fraction) of phytoplankton size classes to total cell concentration and for each phytoplankton cluster. Concentration of cells was derived from flow cytometry measurements for the pico- and nano-size classes, while micro-size classes concentration was obtained by counts using LM technique (n = 16). The phytoplankton clusters are denoted by PraD (purple), PryD (red), Cy (blue), Dia (yellow), Cry (orange), CryP (teal), and Chlo (green).

FIGURE S3. Vertical profiles of density of sea water ($\rho = \rho(S, T, p)$) and chlorophyll-*a* fluorescence (f_{Chla}, in Relative Fluorescence Units, RFU, as measured by the HS6 instrument). Captions (**A**) and (**B**) refer to two stations from 4 May 2017 (BSI-1 campaign), where the presence of a subsurface chlorophyll maximum (SCM) can be noticed. From these two stations, the concentrations of Chla, major nutrients, and the Fucoxanthin to Chla ratio are found in **Table S2**, for water samples collected at two different depths.

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Phytoplankton counts (cell mL^{-1}) and pigments to Chla ratios ($\times 10^2$ g g^{-1})	PraD	PryD	Cy	Dia	Cry	CryP	Chlo
Picoeukaryotes	**26917 ±9541**	**24646 ±4389**	**19094 ±9800**	6418 ±7490	1417 ±804	2234 ±1569	944 ±449
Nanoeukaryotes	**4238 ±1233**	**4833 ±1825**	3703 ±982	2980 ±1615	844 ±392 *	1618 ±454 *	1457 ±542 *
Pico phycoerythrin-containing cyanobacteria	478 ±367	744 ±166	**46894 ±33257**	4400 ±585	101 ±22	120 ±70	53 ±42
Nano phycoerythrin-containing cyanobacteria	132 ±81	226 ±98	**920 ±145**	75 ±82	36 ±24	131 ±94	53 ±42
Chlorophyll c_3	0.76 ±0.63 *	2.76 ±1.27	**3.39 ±1.04**	2.13 ±1.25	0.34 ±0.72 *	1.81 ±0.96	0.5 ±0.94 *
Mg 2,4 divinyl pheoporphyrin *a*5 monomethyl ester (MgDVP)	0.11 ±0.33	0 ±0	1.19 ±0.74	0.59 ±0.65	0 ±0	**1.40 ±1.05**	0.49 ±1.40
Chlorophyll c_2	9.54 ±2.24	12.23 ±2.31	9.62 ±1.58	**12.80 ±3.37**	8.10 ±0.99	7.67 ±1.58	2.64 ±4.39 *
Chlorophyll c_1	**2.23 ±1.40**	**2.39 ±0.94**	1.08 ±0.57	**3.01 ±0.86**	0.34 ±0.96	0.38 ±0.59	0.33 ±0.16
Peridinin	**12.11 ±6.58**	**16.02 ±8.58**	3.83 ±1.42	3.76 ±4.78	1.26 ±2.33	5.18 ±2.31	1.99 ±3.92
19'-Butanoyloxyfucoxanthin	0.02 ±0.11	0.46 ±0.53	0.54 ±1.45	0.38 ±0.47	0 ±0	0.10 ±0.29	0 ±0

TABLE S1. (Cont.)

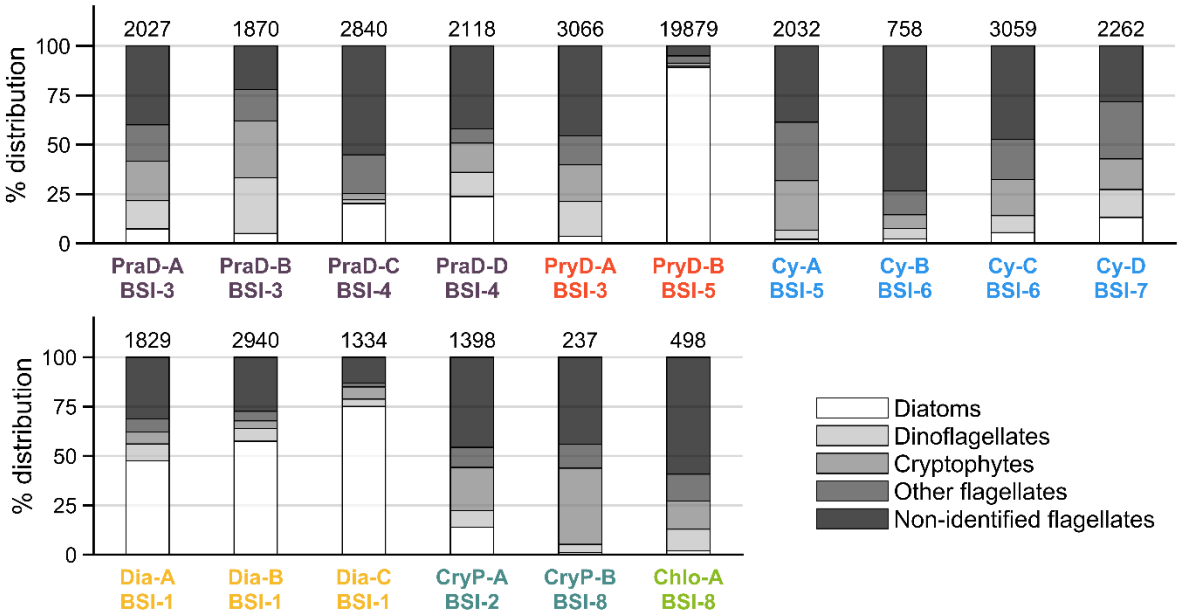
Phytoplankton counts (cell mL^{-1}) and pigments to Chla ratios ($\times 10^2$ g g^{-1})	PraD	PryD	Cy	Dia	Cry	CryP	Chlo
Fucoxanthin	10.17 ±4.97	13.04 ±4.29	21.00 ±8.04	**30.12 ±9.72**	4.84 ±3.47 *	11.52 ±3.53	23.14 ±7.10
Neoxanthin	**2.09 ±0.63**	1.00 ±0.33	**1.36 ±0.55**	0.66 ±0.38	0 ±0 *	0.20 ±0.41 *	0 ±0 *
Prasinoxanthin	**4.20 ±1.50**	**2.96 ±1.24**	**3.22 ±0.81**	0.79 ±0.87	0.26 ±0.49	1.54 ±1.15	0 ±0 *
Violaxanthin	**4.51 ±1.80**	0.67 ±0.90	2.40 ±0.59	1.00 ±0.50	0.36 ±0.55	1.50 ±1.03	1.81 ±2.50
19'-Hexanoyloxyfucoxanthin	0.45 ±1.04	**10.16 ±6.92**	3.04 ±2.28	0.71 ±0.56	0.37 ±0.70	3.70 ±2.46	1.49 ±2.78
Diadinoxanthin	8.50 ±2.96	**14.41 ±2.97**	5.43 ±1.21	7.12 ±1.96	3.29 ±1.74 *	5.34 ±1.37	7.32 ±2.01
Alloxanthin†	10.61 ±3.57	8.25 ±3.32	8.20 ±2.30	4.21 ±4.11 *	**22.94 ±3.82**	**15.34 ±2.59**	5.69 ±4.31
Diatoxanthin	1.33 ±0.68	1.51 ±0.67	0.48 ±0.30	1.02 ±0.38	0.38 ±0.34	0.56 ±0.59	1.83 ±2.27
Zeaxanthin	1.20 ±0.61	1.32 ±0.58	**4.57 ±2.50**	0.65 ±0.50	1.08 ±0.44	1.39 ±0.91	**4.46 ±3.09**
Lutein	0.47 ±0.57	0.32 ±0.47	0 ±0	0.17 ±0.22	0.16 ±0.24	0.69 ±0.47	**1.90 ±1.77**
Crocoxanthin	0.76 ±0.26	0.64 ±0.38	0.62 ±0.34	0.36 ±0.38	**1.83 ±0.29**	**1.31 ±0.30**	0.17 ±0.48
Chlorophyll *b*	**15.66 ±5.16**	8.70 ±2.01	**14.39 ±3.47**	5.53 ±1.78	2.63 ±1.49 *	7.53 ±2.39	4.56 ±2.76
α-Carotene	1.59 ±2.75	2.56 ±3.10	1.93 ±2.17	1.00 ±1.85	**15.15 ±10.67**	0.99 ±1.99	0 ±0
ß-Carotene	**4.06 ±0.62**	**4.30 ±0.89**	**4.37 ±0.76**	2.74 ±0.68	1.08 ±0.75 *	2.21 ±0.47	2.27 ±1.23

Bold values indicate groups that were significantly higher (Tukey's HSD criterion) than at least four or more other groups. Conversely, the asterisk (*) indicate when a group of samples were significantly lower than at least four or more other groups.

† Smirnov-Kolmogorov test rejects the null hypothesis at the 5% significance level, but Lilliefors test does not.

TABLE S2. Pigment and nutrient concentrations from samples collected in the phytoplankton spring bloom (April-May), including surface and deep waters in selected stations of the Bay of Sept-Îles.

Station (Lat. / Long.)	Depth (m)	Date of sampling (2017)	Chla (mg m^{-3})	Fuco:Chla (g g^{-1})	$[NO_3^-]$ (µM)	$[Si(OH)_4^{4-}]$ (µM)	$[PO_4^{3-}]$ (µM)
PT-02 (50.14º / -66.40º)	0	19 April	12.92	0.32	-	-	-
PT-01 (50.19º / -66.43º)	0	19 April	5.45	0.41	-	-	-
PT-5.1 (50.07º / -66.38º)	0	4 May	3.21	0.39	0.03	0.96	0.14
PT-5.1	27	4 May	5.51	0.45	0.15	0.67	0.22
PT-02	0	4 May	1.67	0.34	0.05	1.09	0.12
PT-02	41	4 May	8.76	0.46	0.66	1.09	0.28



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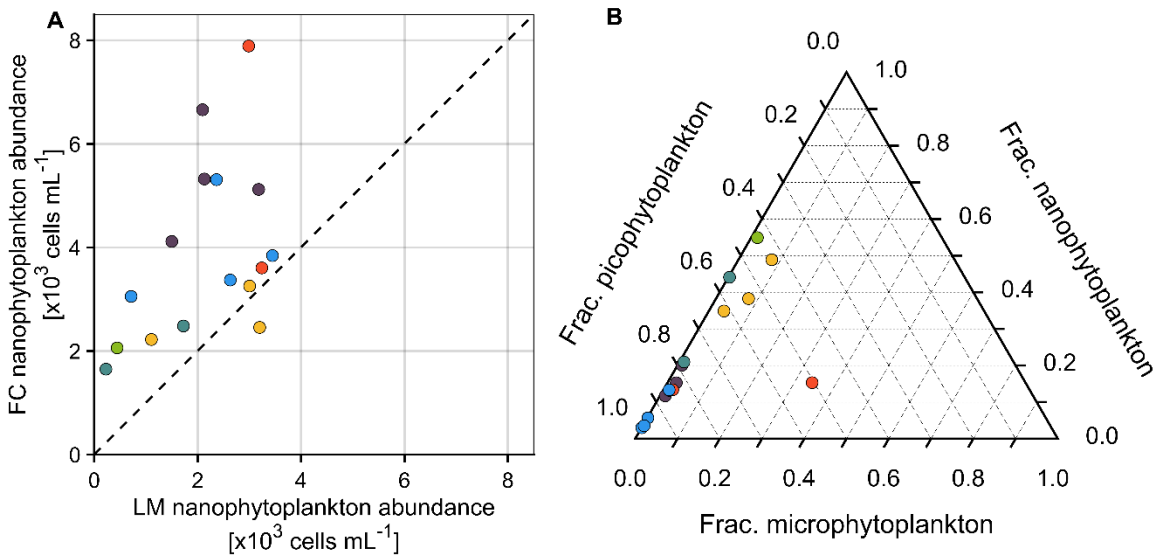

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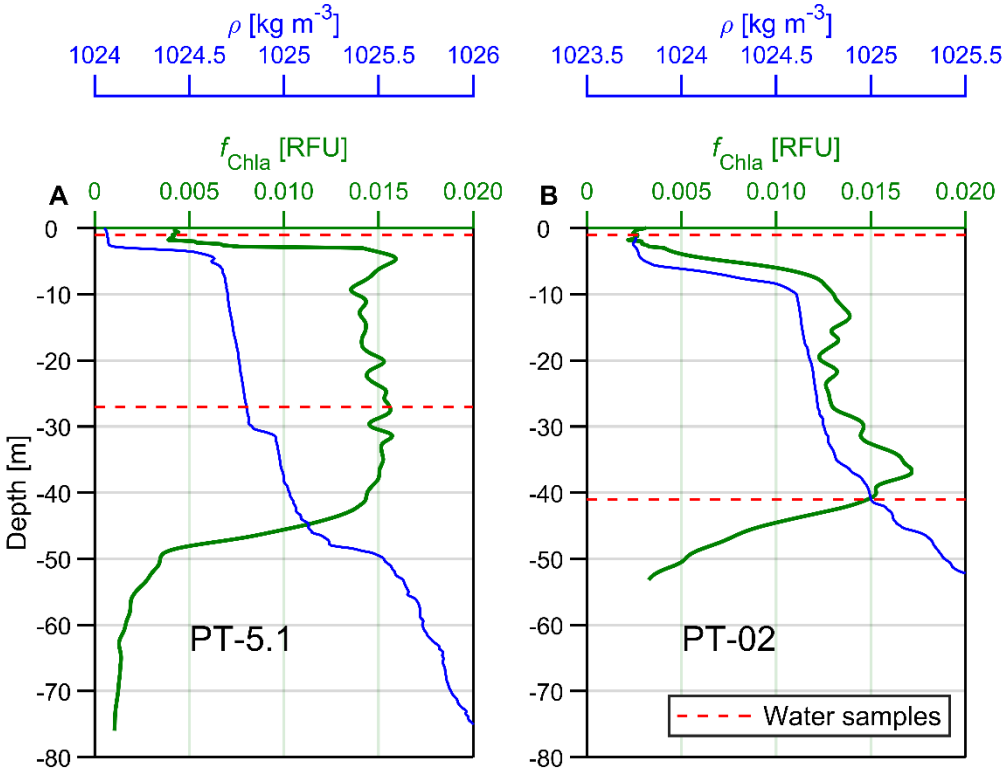

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