Table S1. Environmental and sediment characteristics at sampling stations in St. Anna Trough.

St	D, m	T. °C	S, psu	O2		W, %	Sediment (sedimentation rate)	Sim, day	OW, day	Water masses, % in the water column				
				mg/l	%					ArW	WWM	FJLSW	AW	BW
2	334	–0.7	34,78	8.78	106.75	54.7	Brown sandy silt, gray and black clay, stones, foraminiferal sand (1)	98	134	9	6	0	72	14
3	497	–0.6	34,80	8.20	99.98	64.8	Brown silt, brown and gray clay, foraminiferal sand (2)	133	134	11	0	0	48	41
4	435	–0.6	34,81	7.52	91.89	62.5	Greenish-brown silt (thin layer), gray clay, stones (3)	91	176	0	14	0	0	86
5	500	–0.6	34,81	7.54	91.92	63.8	Grayish-brown silt (thin layer), gray clay, pebbles (3)	77	197	0	14	0	0	86
6	430	–0.6	34,81	8.34	101.85	74.7	Grayish-brown silt (thin layer), gray clay, stones, pebbles (3)	84	197	0	15	0	0	85
7	348	–0.7	34,77	7.19	87.85	58.6	Brown silt, brown clay, pebbles, foraminiferal sand (1)	147	127	14	0	0	64	22
8	218	–1.6	34,67	8.50	100.84	63.2	Brown sandy silt, gray clay, foraminiferal sand (1)	147	85	41	0	59	0	0
9	178	–1.6	34,64	8.21	97.26	60.4	Brown sandy silt, gray dense clay, pebbles, foraminiferal sand (1)	147	85	35	0	65	0	0
10	296	–0.2	34,82	10.06	124.21	58.8	Dark grayish-green silt (thin layer), gray clay, shell fragments (4)	77	190	0	25	0	28	47
13	515	–0.7	34,80	7.50	91.27	65.6	Brown silt, brown, gray and reddish clay, foraminiferal sand (1)	126	92	11	0	0	46	44
14	480	–0.5	34,81	8.23	100.83	71.5	Dark gray silt (thin layer),	133	113	0	16	0	25	59

St	D, m	T. °C	S, psu	O2		W, %	Sediment (sedimentation rate)	Sim, day	OW, day	Water masses, % in the water column				
				mg/l	%					ArW	WWM	FJLSW	AW	BW
							gray and brown clay (4)							
15	555	–0.7	34,80	7.70	93.70	59.8	Brown silt, brown clay, foraminiferal sand (1)	133	106	17	0	0	48	35
16	229	–1.1	34,78	7.60	91.54	58.8	Brown sandy silt, gray and brown clay, rubble, pebbles, gravel, foraminiferal sand (1)	135	106	22	0	54	0	24
17	390	–0.8	34,80	8.43	102.42	62.6	Greenish-brown silt (thin layer), gray clay, small stones (3)	77	218	11	4	0	14	71
19	367	–0.5	34,81	6.82	83.43	58.5	Greenish-gray silt (thin layer), gray clay, pebbles and gravel (4)	84	232	5	17	0	11	66
21	347	–0.3	34,82	7.28	89.50	69.5	Grayish-brown sandy silt (thin layer), gray clay, small stones (3)	56	239	0	23	0	10	67
22	125	–1.7	34,60	6.23	73.83	52.7	Brown sandy silt, gray and brown clay, rubble, pebbles, gravel, foraminiferal sand (1)	140	92	48	0	52	0	0
23	277	–0.7	34,73	7.38	89.71	67.3	Brown watery silt, gray clay, stones, foraminiferal sand (1)	84	155	20	9	0	46	26
24	385	–0.3	34,82	6.74	82.78	60.9	Dark grayish-brown silt (thin layer), gray viscous clay (3)	98	141	6	11	0	28	55
25	345	–0.7	34,80	8.77	106.83	54.2	Brown silt, gray difficult-to-wash clay, stones (1)	98	176	15	0	0	35	50

Note: D – Depth, T- bottom water temperature, S – bottom water salinity, O2 – bottom dissolved oxygen, w – water content, n – the number of layers of water masses in a water column, OW – duration of the open water period, Sim – duration of vegetation of sea-ice algae, ArW – Arctic subsurface water, WWM –Summer Warm waters, FJLSW – waters of the Franz Josef Land shelf, AW – Intermediate Atlantic water, BW – Barents Sea water.

Table S2. Sedimentaty pigment content (μg g^{-1} d.w.).

No	Chl-a	Chl'-a	Phe-a	Chl-b	Chl-c1,2	Car	Chl-a+Phe-a
Oligotrophic part of the St. Anna Trough							
2	0.36	2.63	3.87	1.11	0.80	3.74	4.23
3	0.47	4.14	6.28	1.93	1.32	5.75	6.75
7	0.13	2.90	4.74	0.93	1.16	3.81	4.86
8	0.44	3.68	5.53	2.02	2.04	6.14	5.97
9	0.23	1.21	1.66	0.78	0.85	3.16	1.90
13	0.67	4.92	7.25	1.96	2.39	5.86	7.93
15	1.39	2.21	1.42	0.94	0.87	2.87	2.81
16	0.39	3.18	4.77	2.01	1.73	4.52	5.16
17	0.03	0.88	1.46	0.44	0.53	2.13	1.48
19	0.94	3.68	4.69	0.36	0.83	6.97	5.63
22	0.27	3.15	4.93	0.84	0.62	4.90	5.20
23	0.64	2.00	2.34	0.72	1.00	3.37	2.98
25	0.16	1.82	2.83	0.38	0.54	3.14	2.99
Av.	0.47±0.10	2.80±0.32	3.98±0.53	1.11±0.18	1.13±0.16	4.34±0.41	4.45±0.54
Mesotrophic part of the St. Anna Trough							
4	1.51	12.46	18.72	2.16	3.35	20.82	20.23
5	0.45	12.02	19.76	2.90	3.16	20.42	20.21
6	1.77	10.21	14.43	3.97	4.35	14.16	16.20
10	1.13	14.51	22.86	3.00	4.22	29.19	23.99
14	0.84	33.61	55.98	3.98	8.71	50.39	56.82
21	8.64	34.97	45.05	3.67	7.08	54.57	53.68
24	0.36	12.35	20.49	2.39	3.32	17.84	20.85
Av.	2.10±2.93	18.59±10.80	28.18±15.78	3.15±0.74	4.88±2.16	29.63±16.30	30.28±6.51

Note: Chl-a - chlorophyll-a without pheophytin-a, Chl'-a - chlorophyll-a with pheophytin-a, Phe-a - pheophytin-a, Chl-b –chlorophyll-b, Chl-c1,2 –chlorophyll-c1,2, Car –carotenoids, I430/664 – pigment index, Av. –average value.

Table S3. Indicators of taxonomical composioin and physiological status of microalage.

No	Chl'-a, %	Chl-b, %	Chl-c1,2, %	Phe-a, %	Chl-c1,2/Chl'-a	Chl-b/Chl'-a	I430/664	Car/Chl'-a
Oligotrophic part of the St. Anna Trough								
2	58	24	18	91	0,30	0,42	5.4	1.44
3	56	26	18	93	0.32	0.47	4.8	1.38
7	58	19	23	97	0.40	0.32	4.9	1.32
8	48	26	26	92	0.55	0.55	4.5	1.68
9	42	28	30	83	0.70	0.65	16.4	4.14
13	53	21	26	92	0.49	0.40	4.1	1.20
15	55	23	22	41	0.39	0.42	4.4	1.32
16	46	29	25	92	0.54	0.63	4.3	1.43
17	48	24	28	93	0.60	0.50	5.9	2.32
19	76	7	17	82	0.23	0.10	5.4	1.89
22	68	18	13	95	0.20	0.27	4.9	1.57
23	54	19	27	79	0.50	0.36	6.0	1.68
25	67	14	20	93	0.30	0.21	6.9	1.72
Av.	56±3	21±2	23±1	87±4	0.42±1.5	0.41±1.2	6.0±0.9	1.8±0.1
Mesotrophic part of the St. Anna Trough								
4	69	12	19	92	0.27	0.17	4.53	1.73
5	66	16	17	98	0.26	0.24	4.34	1.71
6	55	21	23	92	0.43	0.39	4.13	1.43
10	67	14	19	95	0.29	0.21	4.54	2.02
14	73	9	19	98	0.26	0.12	3.70	1.52
21	76	8	15	85	0.20	0.10	3.45	1.58
24	68	13	18	98	0.27	0.19	3.83	1.44
Av.	68±3	13±2	19±1	94±2	0.28±0.03	0.20±0.04	4.1±0.2	1.6±0.1

Note: Chl'-a - chlorophyll-a with pheophytin-a, Phe-a - pheophytin-a, Chl-b –chlorophyll-b, Chl-c1,2 – chlorophyll-c1,2, I430/664 – pigment index, Av. – average value.

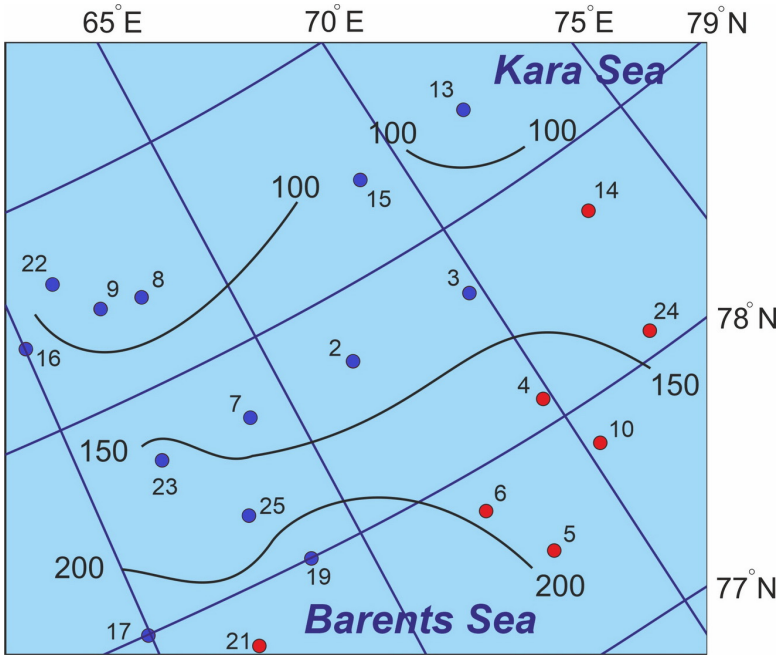


Figure S1. Isolines showing the duration of the open water period within the St. Anna Trough area in 2022–2023. Red circles: mesotrophic zone stations; blue circles: oligotrophic zone stations. Data from the Arctic and Antarctic Research Institute website (https://data.aari.ru/odata/_d0004.php, accessed June 18, 2025).