The following supplements accompany the article

Seasonal vertical strategies in a high-Arctic coastal zooplankton community

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Supplement 1. Sources of additional hydrographic data

Table S1. Sensors of the mooring from which temperature and salinity data were obtained for August 27 and September 07, 2008, and March 23, 2009

Parameter	Sensor	Moored depth(s) (m)
Temperature	Seabird 16plus SeaCAT recorder	30
	VEMCO minilog-II-T thermal logger	43, 53, 63, 73, 111, 126, 152
	SBE 37-SM MicroCAT recorder	20, 88.5, 186
Salinity	Seabird 16plus SeaCAT recorder	30
	SBE 37-SM MicroCAT recorder	20, 88.5, 186

Supplement 2. Potential influences of Atlantic Water (AW) advection during the study

We used the temperature and salinity data measured in the study and identified different water masses that prevailed in Billefjorden. However, we didn't find any signatures of AW in during the study (see Fig. S1 below). Other investigations conducted in Billefjorden in the same period (e.g. Bailey 2010, Grigor et al. 2014) have also suggested that the influence of AW advection was negligible.

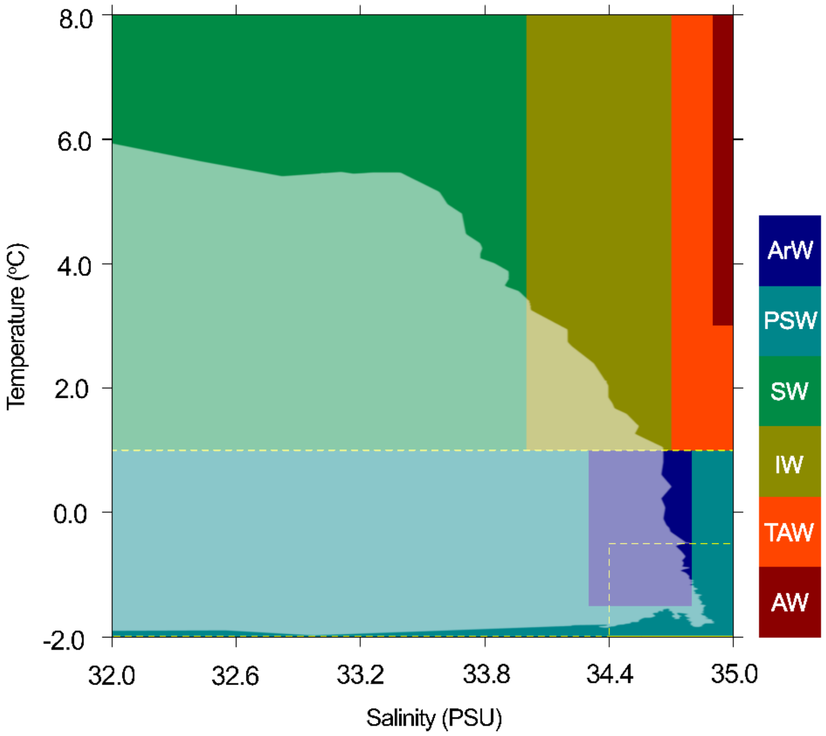

Fig. S1. The range of temperature and salinity measurements recorded in the study (opaque white polygon), and their water mass associations (colored polygons). The abscissa is cropped at 32 PSU. ArW: Arctic water, PSW: polar surface water, SW: surface water, IW: intermediate water, (T)AW: (transformed) Atlantic water. Dashed line: local water (LW, above), and winter cooled water (WCW, below). Water mass associations were adopted from Swift (1986), Hopkins (1991), Svendsen et al. (2002), and Nilsen et al. (2008)

Supplement 3. The PL based separation of *Calanus* taxa

We observed three components in CV and adult female *Calanus* PL distributions (Fig. S2a, b), and two components in that of adult males (Fig. S2c). Although we fitted normal distribution models for all the components, the fraction of the *Calanus* community represented by the smallest component (*Calanus* sp. in Table 2 in the text) was not used in the analyses because the PL boundaries separating it from the other two did not match any literature in Table S3, and its abundance was extremely low. These may be mis-staged smaller copepodites.

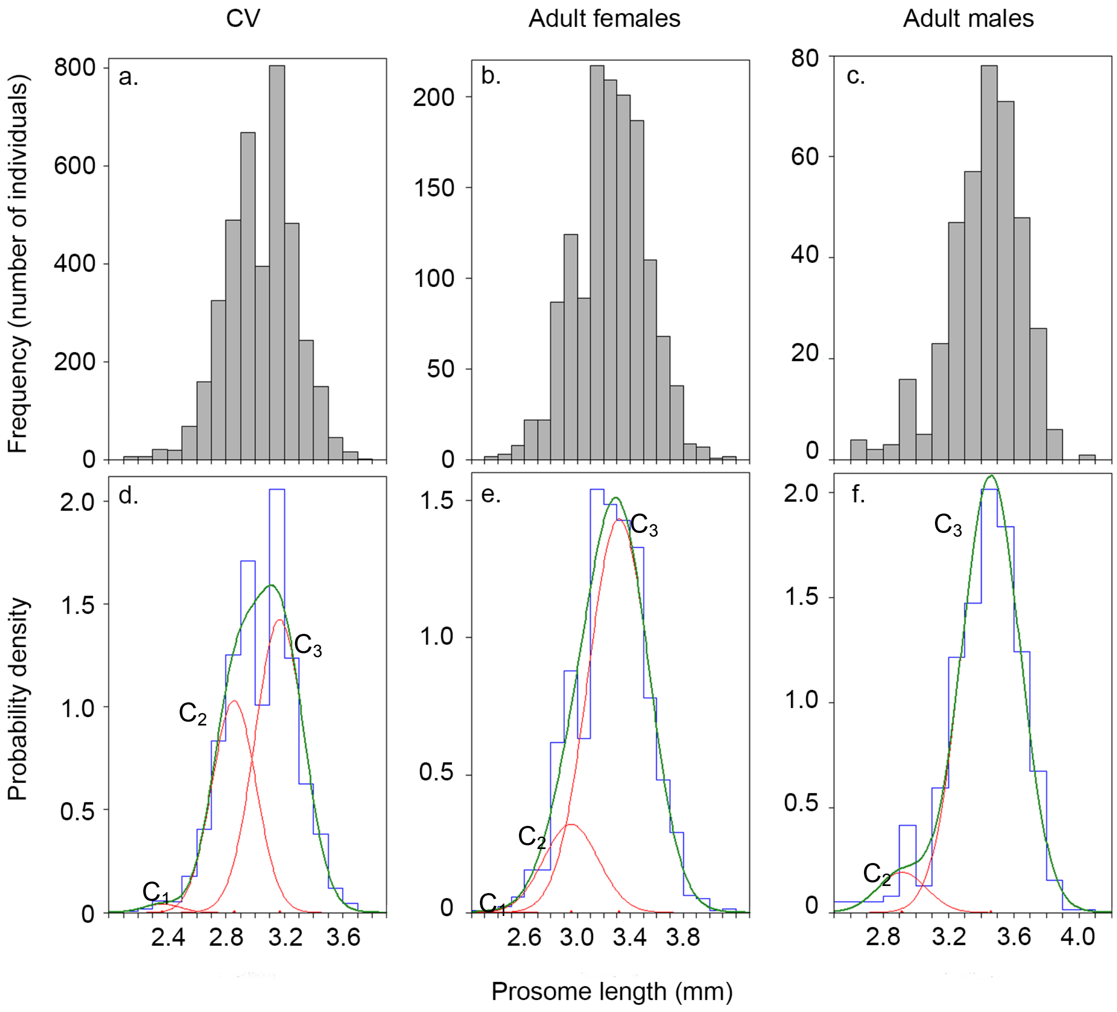

Fig. S2. Overlapped components within the PL distributions of *Calanus* spp. (a–c), and normal distribution models fitted to represent each component (d–f). The means of each fitted normal component model are presented by red ticks on the abscissae of the bottom panels

Table S2. The % overlap between the fitted normal components (C_i) in the *Calanus* spp. PL distributions (see Fig. S2 for reference) estimated by numerical integration

Component	C_1 & C_2	C_1 & C_3	C_2 & C_3
CV	6.36	1.26	33.17
Adult females	12.20	0.00	39.97
Adult males	–	–	10.12

Table S3. PL boundaries (mm) used in some high latitude investigations for separation of coexisting *C. finmarchicus* (CF) and *C. glacialis* (CG) populations. These PL boundaries are comparable with those derived in the present investigation (cf. Table 3 in the text). However, note that the mesh widths of the nets/filters used in these investigations are lesser (50–300 µm) than that of our investigation (1000 µm)

Authors	CV		Adult females		Adult males	
	CF	CG	CF	CG	CF	CG
Jaschnov (1972)	–	–	2.20–3.00	3.60–4.50	–	–
Hirche (1991)	< 3.10	> 3.10	< 3.10	> 3.20	–	–
Unstad and Tande (1991)	< 3.00	3.00–3.40	< 3.20	3.20–4.50	–	–
Koszteyn and Kwasniewski (1992)	< 3.05	3.05–3.95	2.85–3.00	3.50–4.40	–	–
Hirche et al. (1994)	1.95–3.05	2.95–3.90	2.35–3.20	3.20–4.60	–	–
Madsen et al. (2001)	1.75–2.70	2.73–3.90	< 3.00	> 3.00	–	–
Kwasniewski et al. (2003)	< 2.90	≥ 2.90	< 3.20	≥ 3.20	–	–
Daase and Eiane (2007)	< 2.94	> 2.94	< 3.24	> 3.24	–	–
Hirche and Kosobokova (2011)	1.70–2.85	2.90–3.50	2.90–3.15	3.20–4.60	1.85–2.90	2.95–3.60

Supplement 4. The TL based separation of *P. elegans* size groups

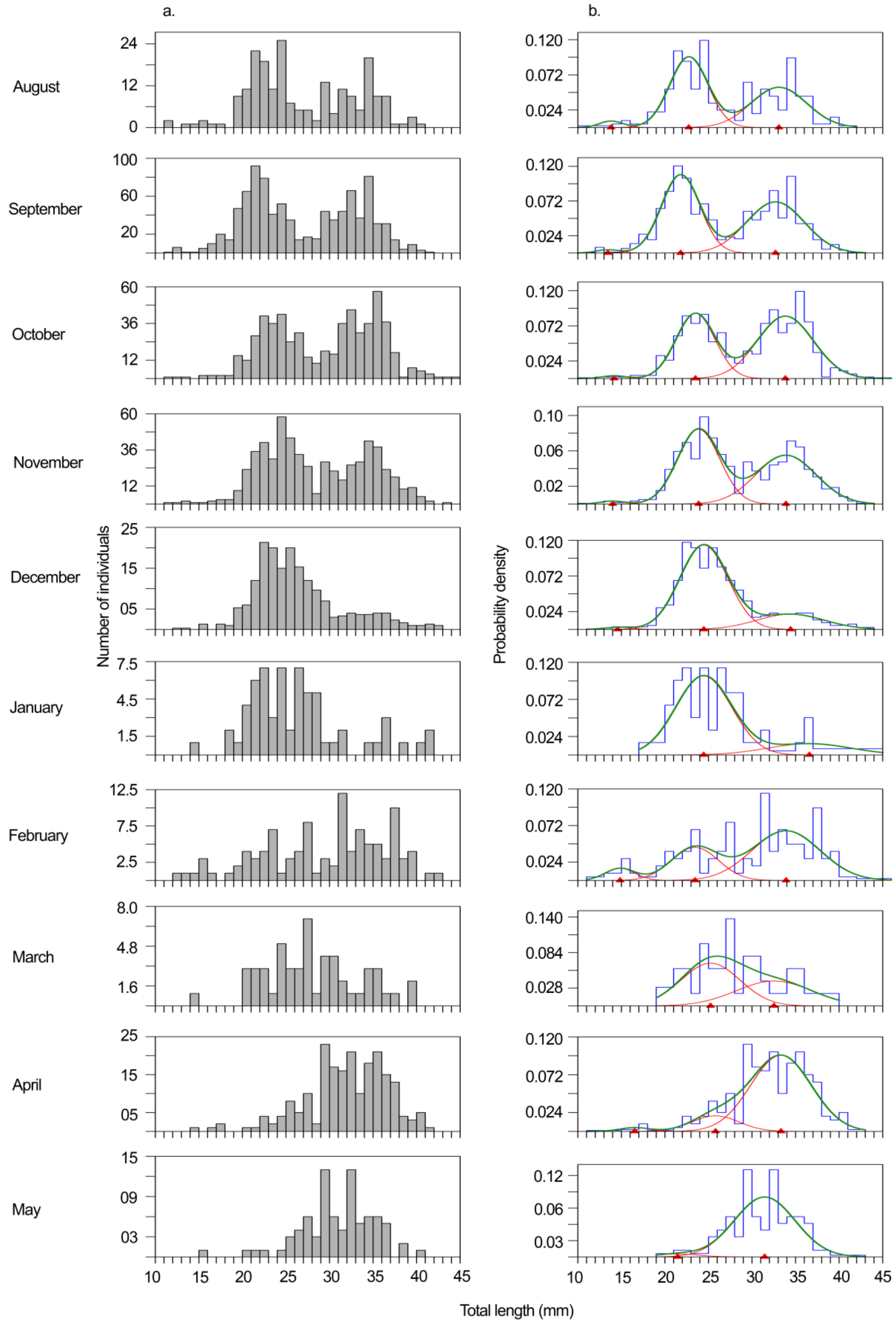

Fig. S3. Overlapped components within monthly TL distributions of *P. elegans* (a), and normal distribution models fitted to represent each component (b). The mean PLs of each fitted component model are presented as red ticks on abscissae of the right panels

Table S4. The number individuals (n) used in the length frequency analysis, and the chi-square statistics (χ^2) with the degrees of freedom (df) of the fitted component distribution models for monthly TL distributions of *P. elegans* (see Fig. S3 for reference). The monthly mean TLs (mm) of each size group is given in the three right columns

Month	n	df	χ^2	Mean TL ± SD		
				G_0	G_1	G_2
August	210	21	47.55***	14.16 ± 1.83	23.18 ± 2.04	33.62 ± 3.04
September	915	24	91.37***	13.22 ± 0.83	22.21 ± 2.27	33.30 ± 3.01
October	574	26	63.52***	14.20 ± 1.79	23.79 ± 2.19	34.28 ± 3.11
November	589	25	42.89**	14.00 ± 1.41	24.27 ± 2.38	34.60 ± 3.08
December	546	22	20.54	15.17 ± 1.33	24.97 ± 2.70	35.60 ± 3.19
January	63	16	17.95	–	24.69 ± 3.31	37.27 ± 3.52
February	105	22	33.72*	15.28 ± 1.38	23.45 ± 2.31	34.30 ± 3.86
March	52	15	14.25	–	24.87 ± 3.11	33.77 ± 3.24
April	208	18	36.26**	17.00 ± 1.41	25.04 ± 1.72	33.84 ± 3.33
May	82	14	26.07*	–	19.67 ± 2.38	31.92 ± 3.59

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A note on the *P. elegans* size groups

The mean TLs of each size group we derived for *P. elegans* from the length frequency analysis matched those described by Grigor et al. (2014) for this species in this fjord following the same time series. We termed the three size groups as G_0, G_1, and G_2 in comparison with the cohorts 0, 1, and 2 of their investigation. As a WP-2 net was used in their study, they captured higher numbers of G_0 (cohort 0) individuals. See the above work for a detailed account of the population dynamics of this species.

Supplement 5. The vertical distribution index: additional data

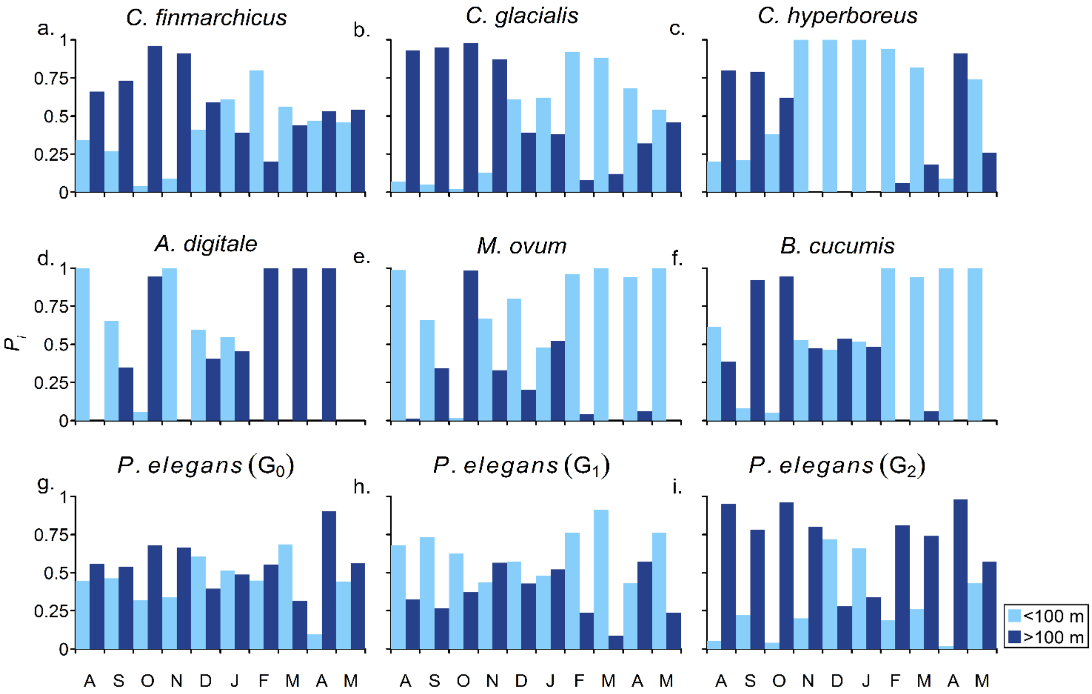

Fig. S4. Proportion of the population (P_i of dominant taxa) distributed in the two vertical regions of the water column during the study. For a given species in a given month, the difference between its population proportions of the shallower region and the deeper region was calculated as the vertical distribution index (V: See Table S5 below).

Table S5. Seasonal variability in vertical distribution index (V) of the dominant zooplankton taxa during the study. V ranges from -1 to 1, in which the former represents the entire population distributed in the shallower region, and latter represents the opposite scenario. *A. digitale* was not captured to compute its V in May

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
C. finmarchicus	-0.32	-0.46	-0.91	-0.82	-0.19	0.21	0.59	0.12	-0.06	-0.08
C. glacialis	-0.86	-0.90	-0.95	-0.73	0.22	0.23	0.84	0.77	0.35	0.09
C. hyperboreus	-0.59	-0.57	-0.24	1.00	1.00	1.00	0.89	0.64	-0.81	0.48
Calanus spp.	-0.77	-0.83	-0.93	-0.73	0.13	0.23	0.79	0.64	0.26	0.04
A. digitale	1.00	0.31	-0.89	1.00	0.19	0.09	-1.00	-1.00	-1.00	–
M. ovum	0.97	0.31	-0.97	0.34	0.60	-0.04	1.00	1.00	0.88	1.00
B. cucumis	0.23	-0.84	-0.89	0.06	-0.07	0.03	1.00	0.88	1.00	1.00
P. elegans (G$_0$)	-0.11	-0.07	-0.36	-0.32	0.21	0.03	-0.10	0.37	-0.81	-0.12
P. elegans (G$_1$)	0.35	0.47	0.25	-0.13	0.14	-0.04	0.52	0.82	-0.14	0.52
P. elegans (G$_2$)	-0.90	-0.56	-0.92	-0.60	0.44	0.32	-0.63	-0.48	-0.96	-0.15

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