

Vertical distribution of ontogenetically migrating copepods during late summer in the western subarctic Pacific

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Comparison between ALOHA and K2

	ALOHA	K2
Primary productivity	Low	High
Zooplankton biomass	Low	High
Dominant migrants	Small copepods?	Medium to Large copepods
Vertical migration	Diel	Diel + Seasonal
Max. migrating depth	< 300m	< 2000m

Ecological efficiency is high at K2.
Particles are much deeper transported by zooplankton at K2.

Fig. 1. Ontogenetically migrating copepods predominated in the subarctic Pacific.

Life cycle patterns

Adults dead in the twilight zone. = They are significant biological pump.

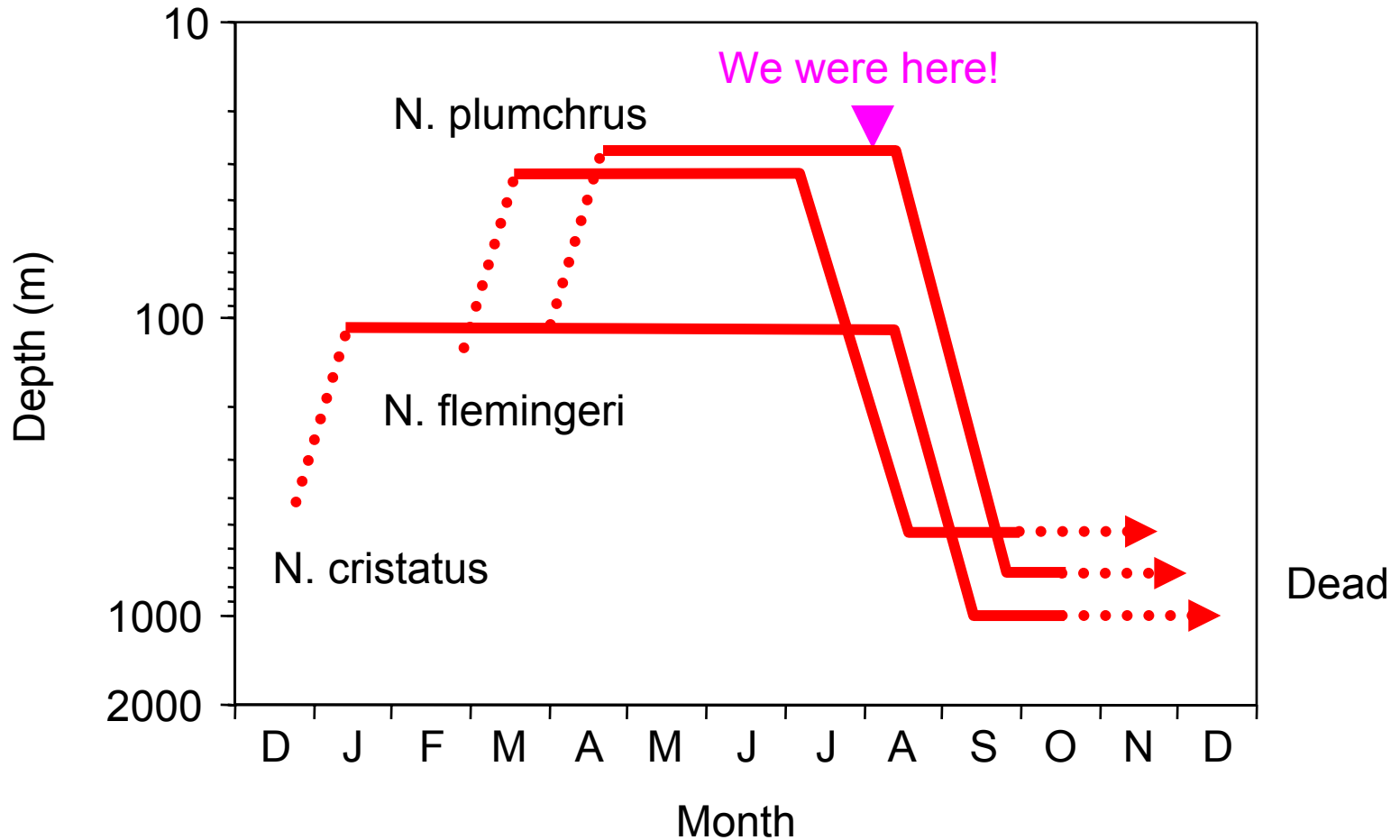


Fig. 2. Schematic diagrams of annual vertical distributions for Neocalanus copepods.

Objectives in VERTIGOK2

- ❑ Which life cycle timing of the ontogenetic vertical migrants could we observe?
 - Stage composition
 - Vertical distribution
- ❑ How much phytoplankton and other particles did the copepod community feed on?
 - Gut pigments
- ❑ How much biomass will be decreased during overwintering in the twilight zone?
 - Mortality and respiration at depth

Functional roles of ontogenetic vertical migrants
to carbon flux in the subarctic systems.

Copepod community

Copepod community concentrated the biomass at surface.
No DVM was observed for the dominant copepods.

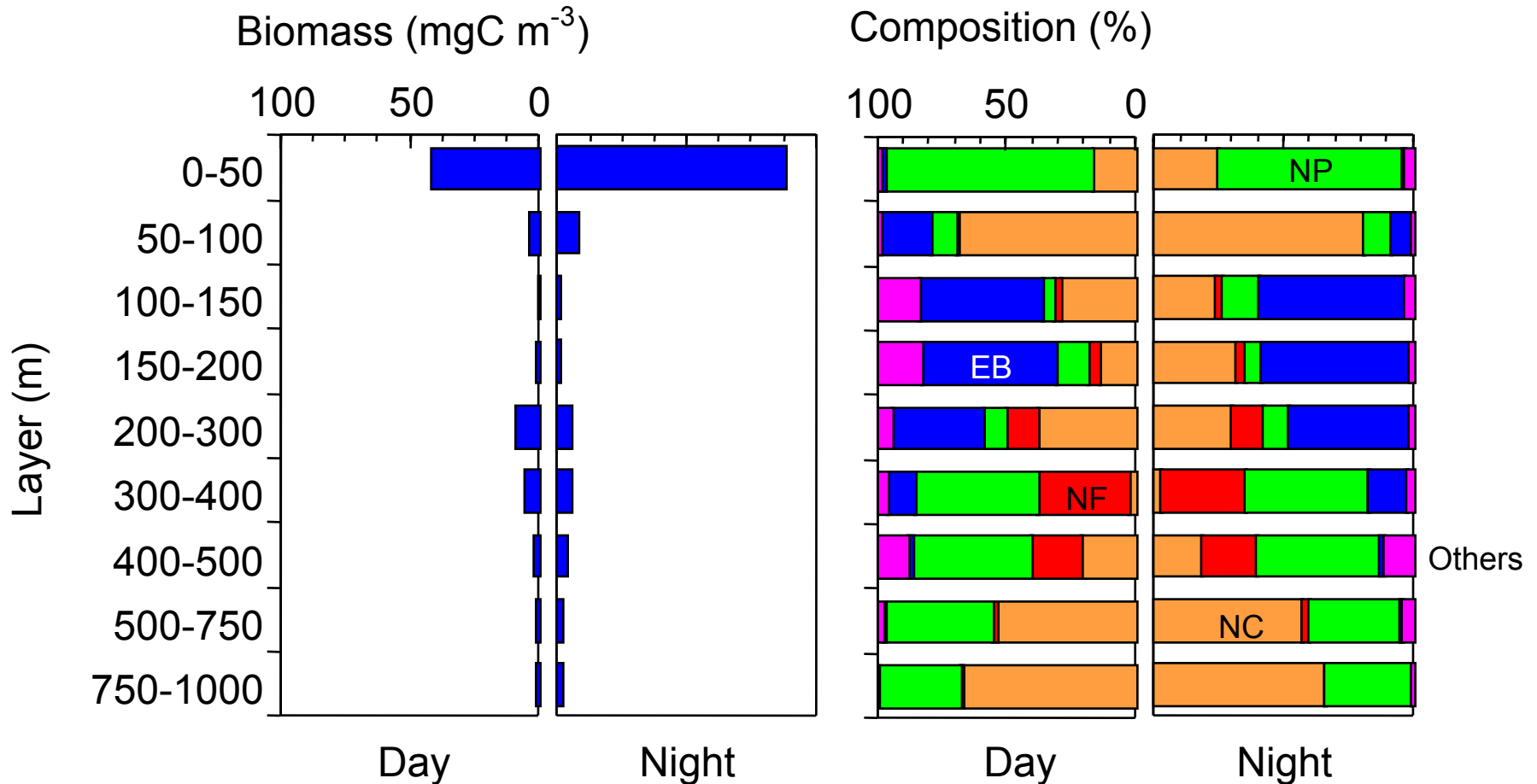


Fig. 3. Vertical distribution of the copepod biomass and species composition.

Vertical distribution

NP was in surface, whereas NF had already stayed at depth.
NC & EB were gradually migrating downward.

Copepod community was just before or in overwintering period.

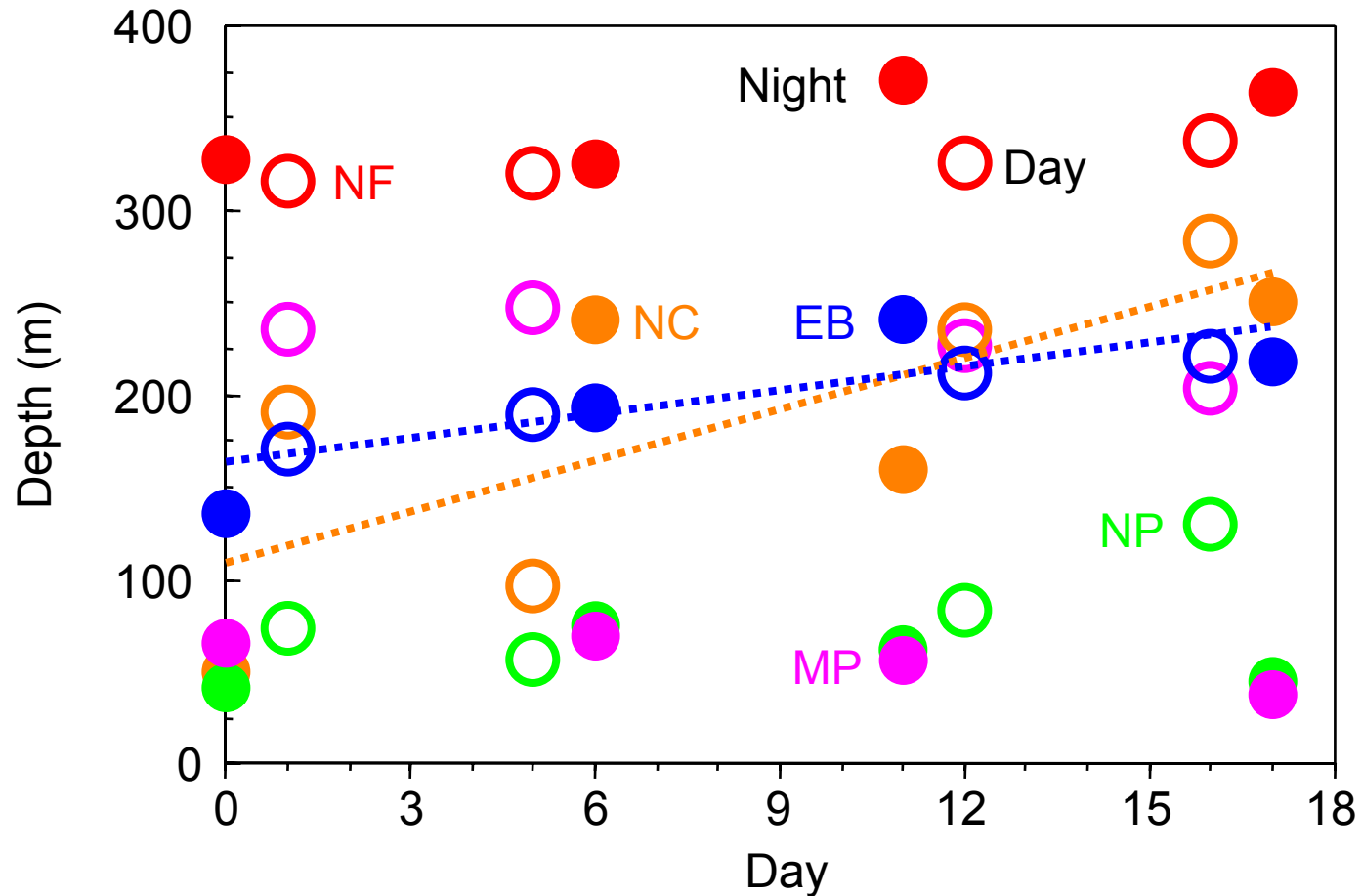


Fig. 4. Daily changes of weighted mean depth (center of vertical distribution).

Gut fluorescence

High gut pigments of surface animals reveal still grazing on phytoplankton.
Deep NC retained gut pigments = **They transport particles much deeper.**

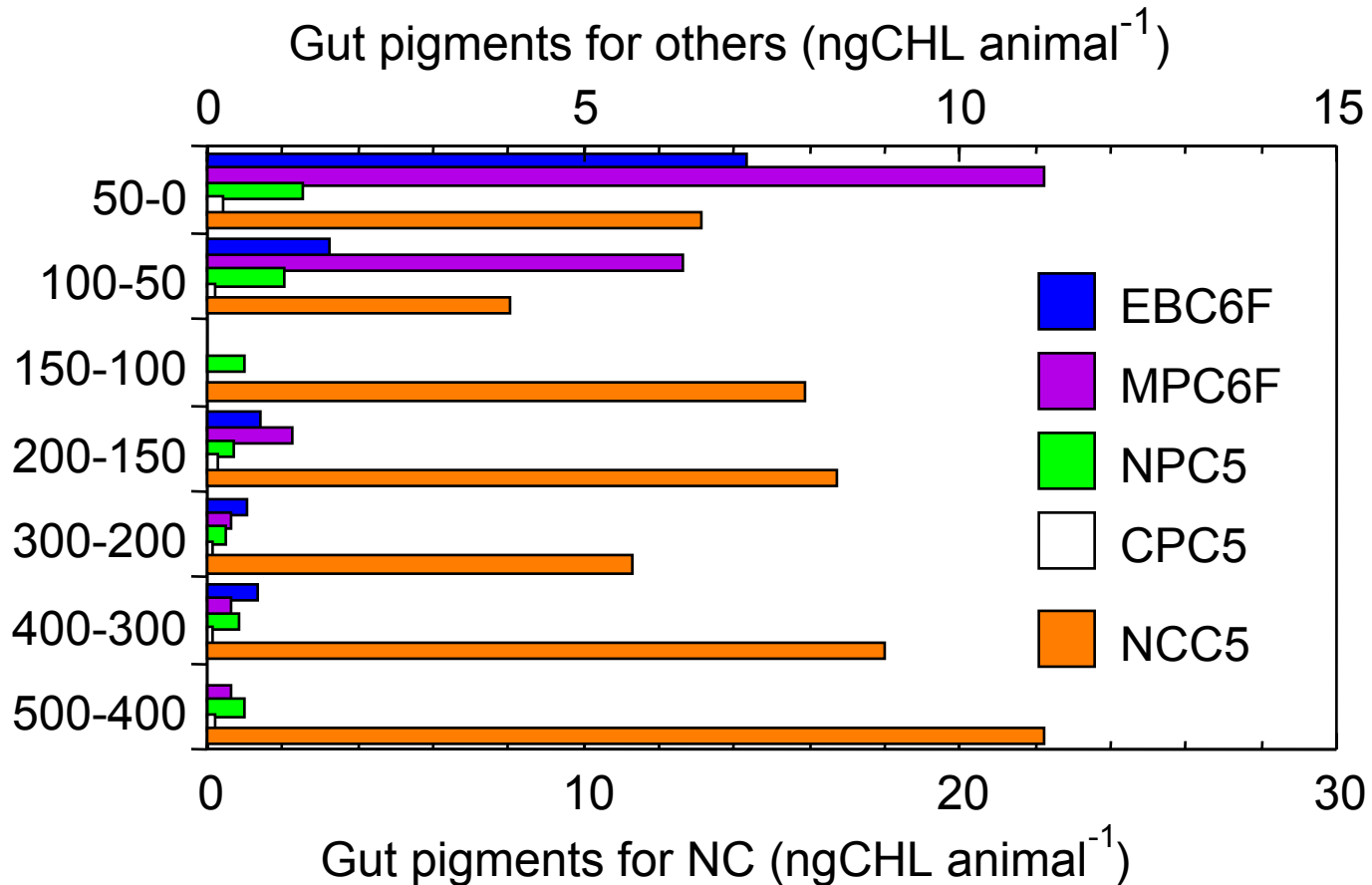


Fig. 4. Vertical changes of gut pigments estimated from fluorescence method.

Carbon loss during overwintering

93% of the overwintering biomass will be decreased by mortality and respiration in the twilight zone.

Deep mortality of ontogenetically migrating copepods is one of significant carbon flux.

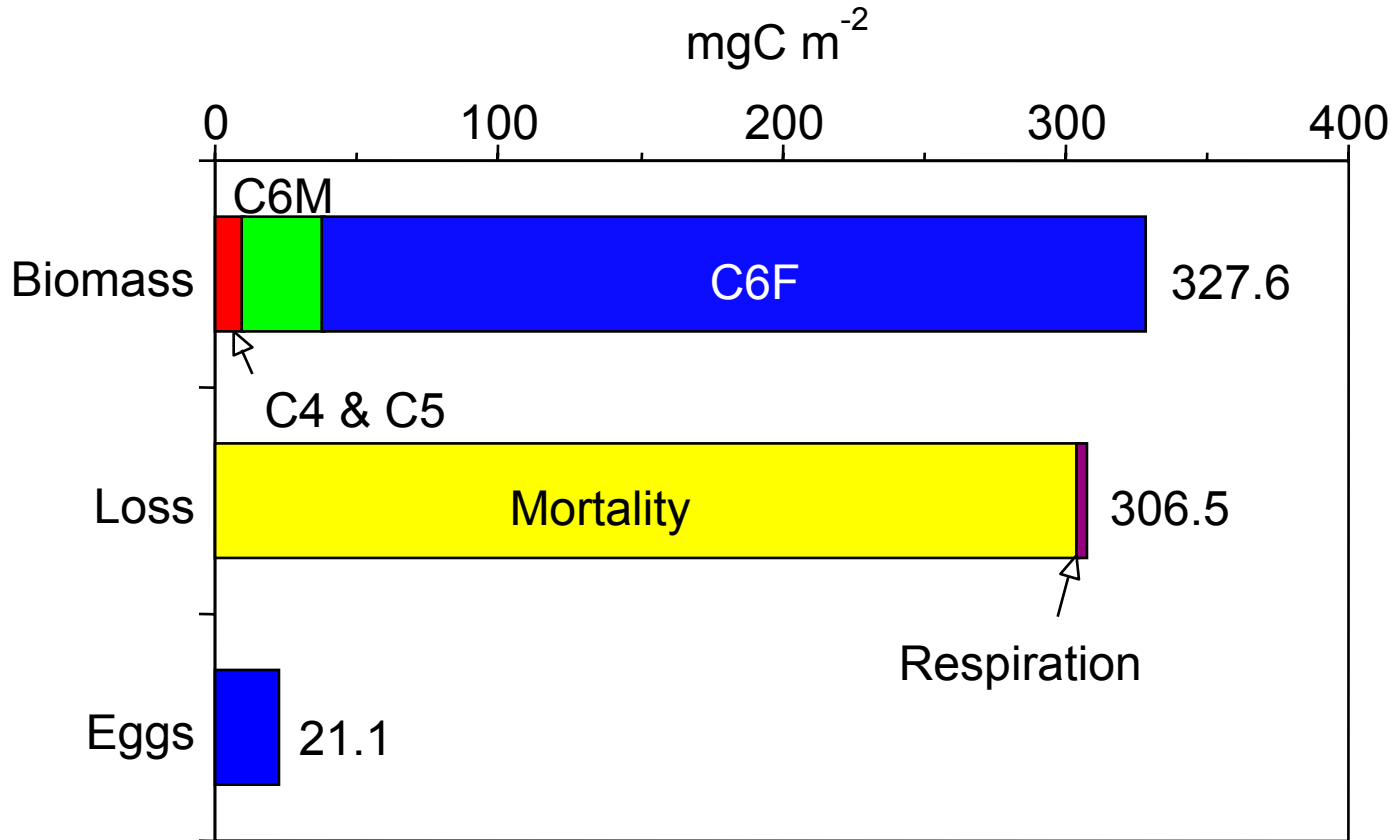


Fig. 5. Biomass of the observed overwintering animals, and the estimated mortality, respiration and offspring.

Community feeding rates & fecal pellets productions

Table 1. Community feeding rates and fecal pellets productions on phytoplankton and the other particles in the water column above 150-m depth.

Parameter	Resource	1.Aug	5.Aug	12.Aug	16.Aug
Biomass		5659.8	2780.8	2803.6	2981.0
Respiration requirement		367.7	180.5	182.0	193.6
Community grazing rate	Phytoplankton	2.2	1.4	1.9	2.6
	Others	523.1	256.5	258.1	273.9
Ratio grazed	Phytoplankton	0.4	0.6	0.7	0.9
	Others	99.5	99.4	99.3	99.1
Fecal pellet production	Phytoplankton	0.7	0.4	0.6	0.8
	Others	156.9	76.9	77.4	82.2

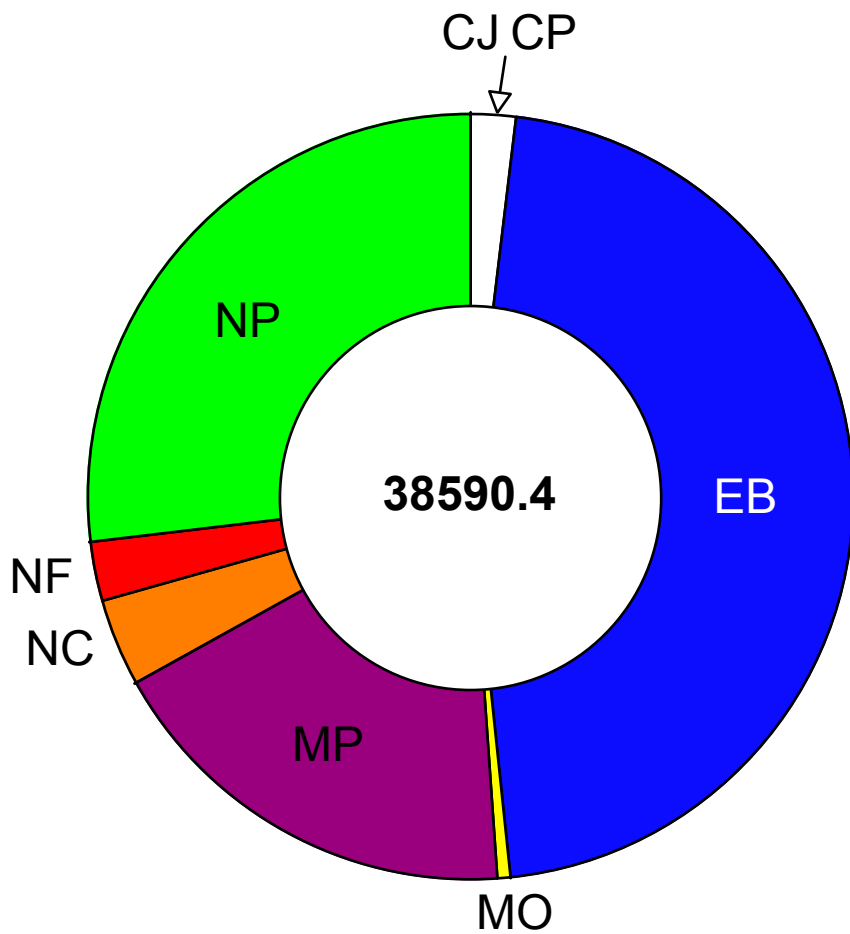
Copepod community were grazing on non-phytoplankton.
They transformed non-phytoplankton to fecal pellets.

Findings at VERTIGOK2

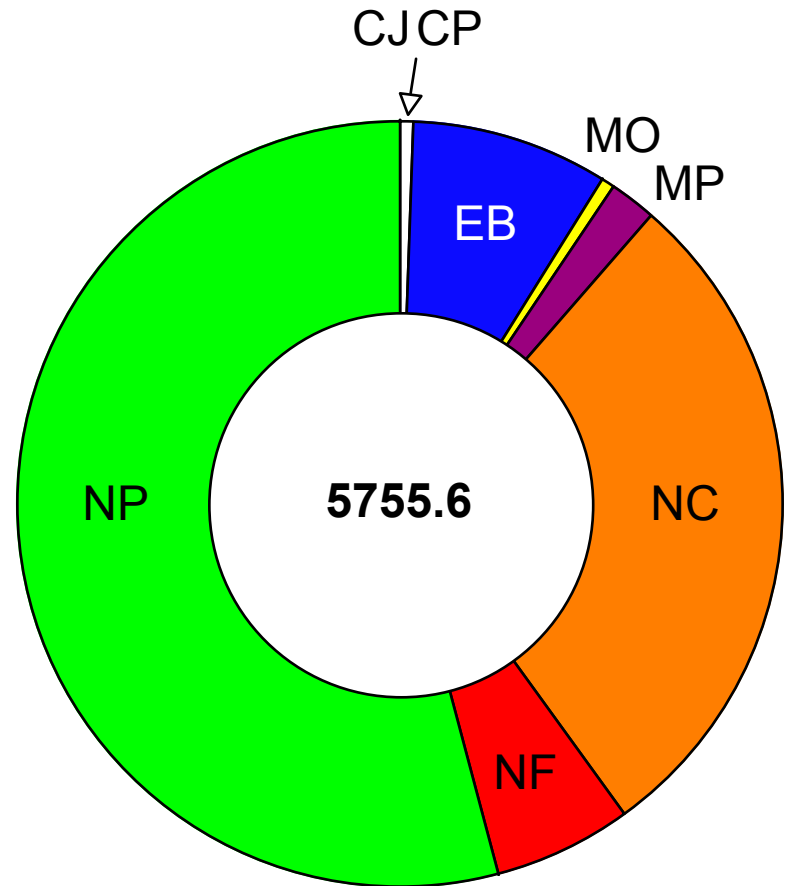
- ❑ Copepod community concentrated and continued grazing at surface.
 - Most of them were just before or at the beginning of dormant period.
- ❑ Deep animals of the largest copepods retained gut pigments.
 - They can transport gut contents much deeper than other species.
- ❑ Copepod community were grazing on non-phytoplankton.
 - They transform non-phytoplankton to fecal pellets.
- ❑ Most of the overwintering biomass will be decreased by mortality in the twilight zone.
 - Deep mortality could be one of significant carbon flux.

Ontogenetic vertical migrants contribute to carbon flux through grazing and overwintering mortality in the subarctic systems.

Species composition



Abundance (inds m⁻²)



Biomass (mgC m⁻²)

Vertical distribution

