Climatic variations and condition of zooplankton in the Barents Sea

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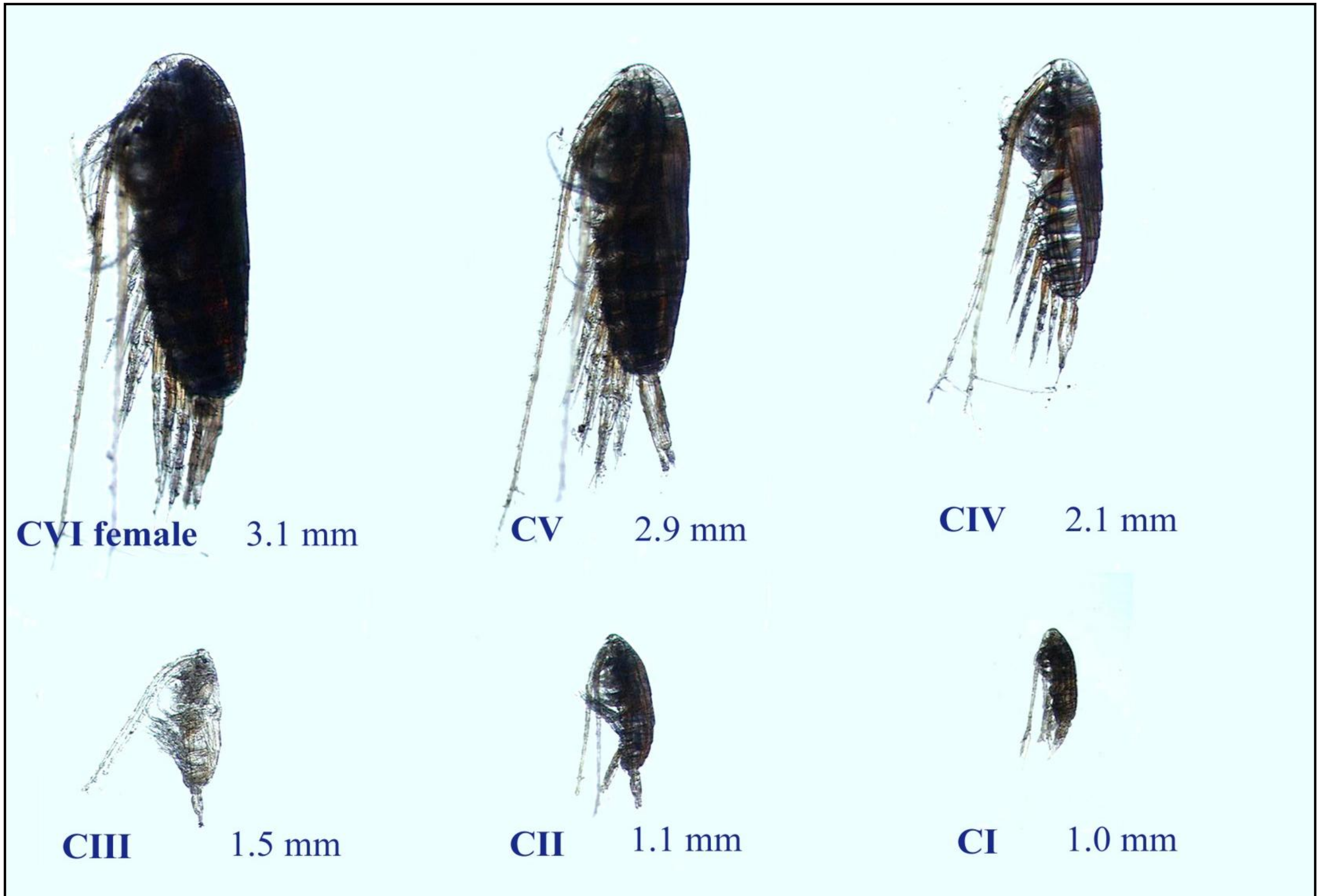
Calanus spp. - dominated both in numbers and in biomass -

a major link between phytoplankton and predators



Krill - a main link between phytoplankton and predators

***Thysanoessa inermis* (30 мм)**
***Thysanoessa longicaudata* (20 мм)**
***Thysanoessa raschii* (30 мм)**
***Meganyctiphanes norvegica* (40 мм)**

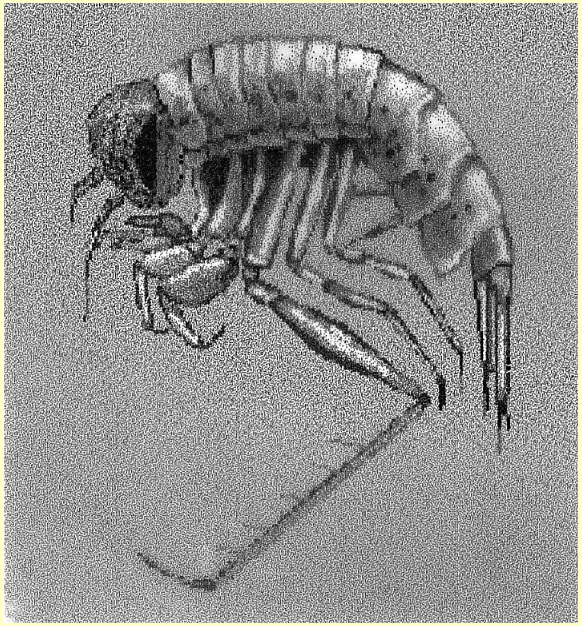
Photo by U.Kils

Amphipods - major carnivores

Themisto abyssorum **(17mm)**

Themisto libellula **(45mm)**

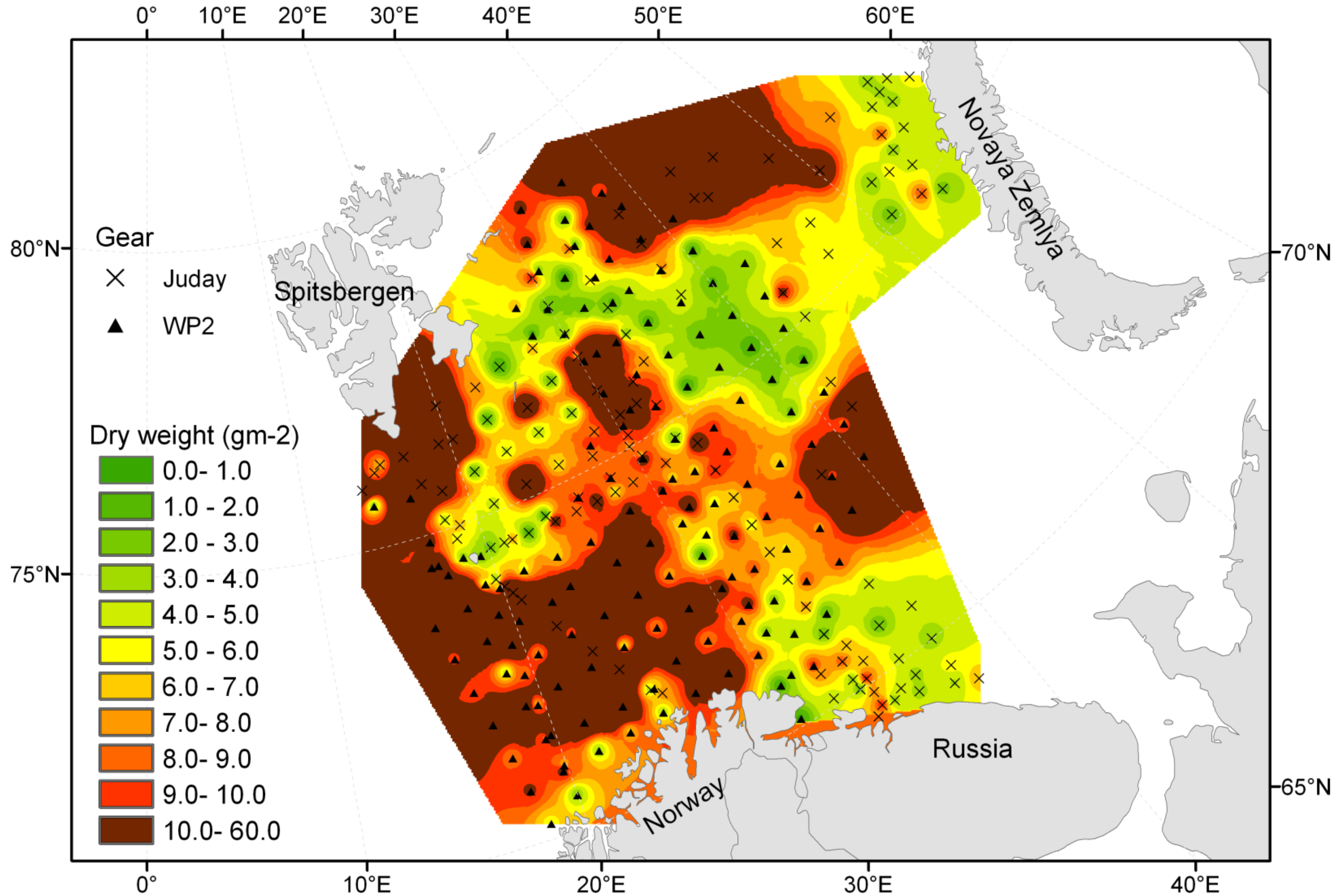
Themisto compresssa **(17mm)**



Plankton studies in the North Barents Sea were carried out by PINRO and IMR

	IMR		PINRO	
	WP2	MOCNESS	WP2	JUDAY
year	N stations			
1982				52
1983				78
1984				79
1985				260
1986				88
1987				91
1988				169
1989				42
1990	107	27		143
1991	129	25		
1992	123	28		138
1993	112	30		156
1994	141	33		
1995	117	42		
1996	113	54		
1997	129	44		
1998	201	44		
1999	169	39		
2000	139	56		
2001	142	50		
2002	129	43		62
2003	88	37	86	
2004	157	34	35	37
2005	134	48	51	41
2006	150	43		133

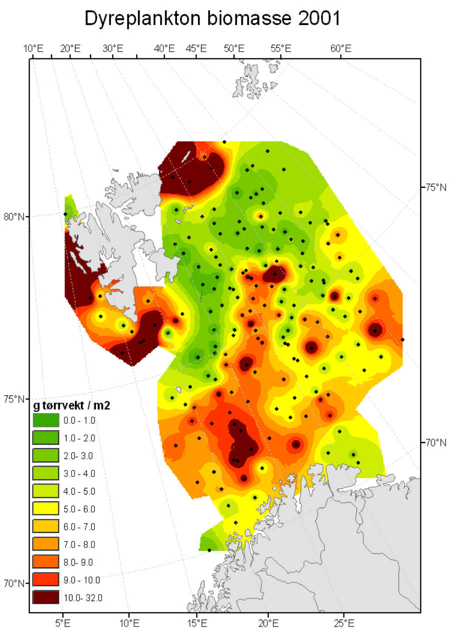
Zooplankton biomass distribution in 2006 - combined WP2 and Juday



Biomass distribution (g/m²) dry weight

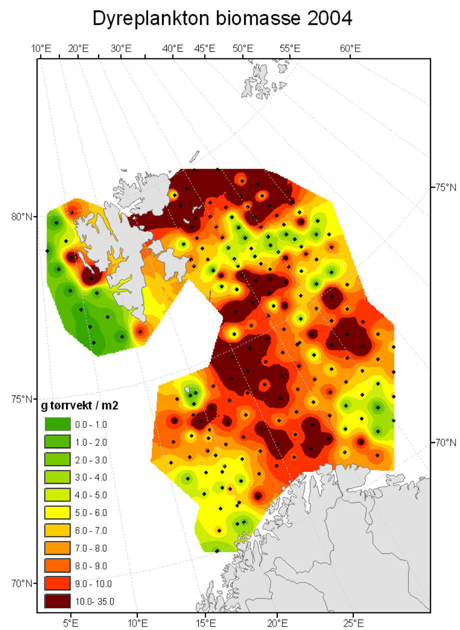
– WP2 + MOCNESS

2001



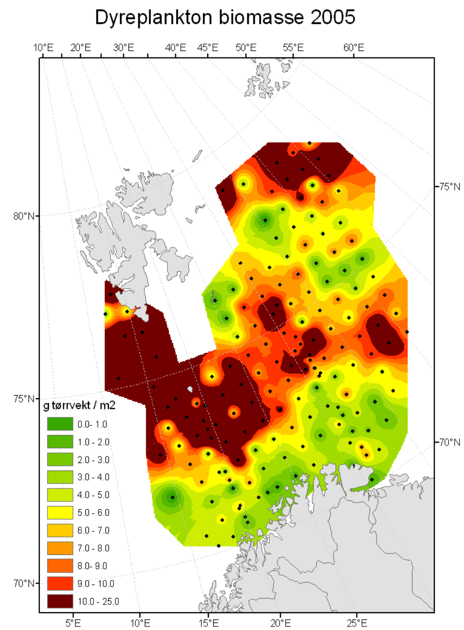
7.3 г/м²

2004



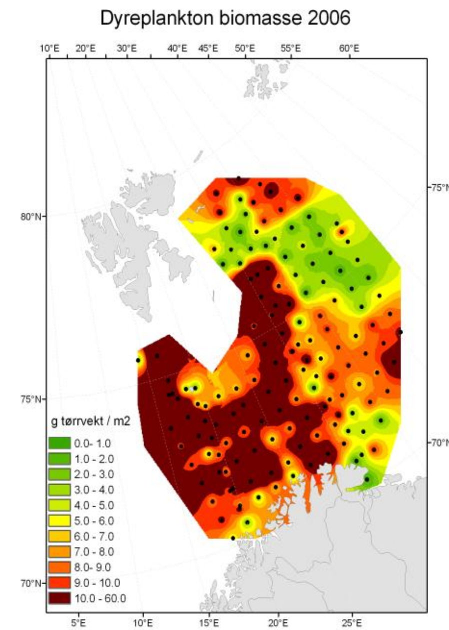
8.04 г/м²

2005



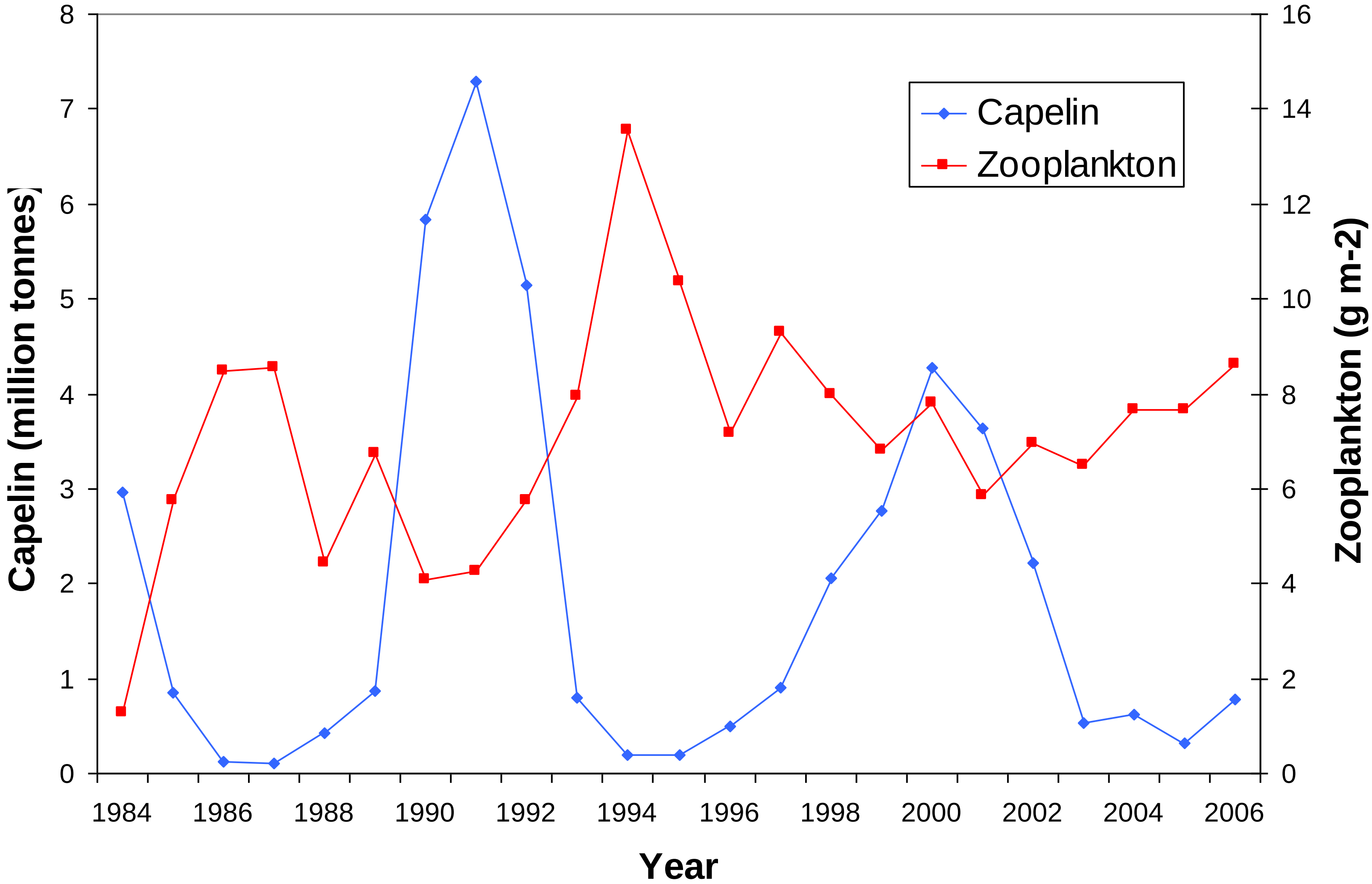
8.3 г/м²

2006



9.2 г/м²

Annual fluctuations in zooplankton biomass (WP2) and size of capelin stock in the Barents Sea



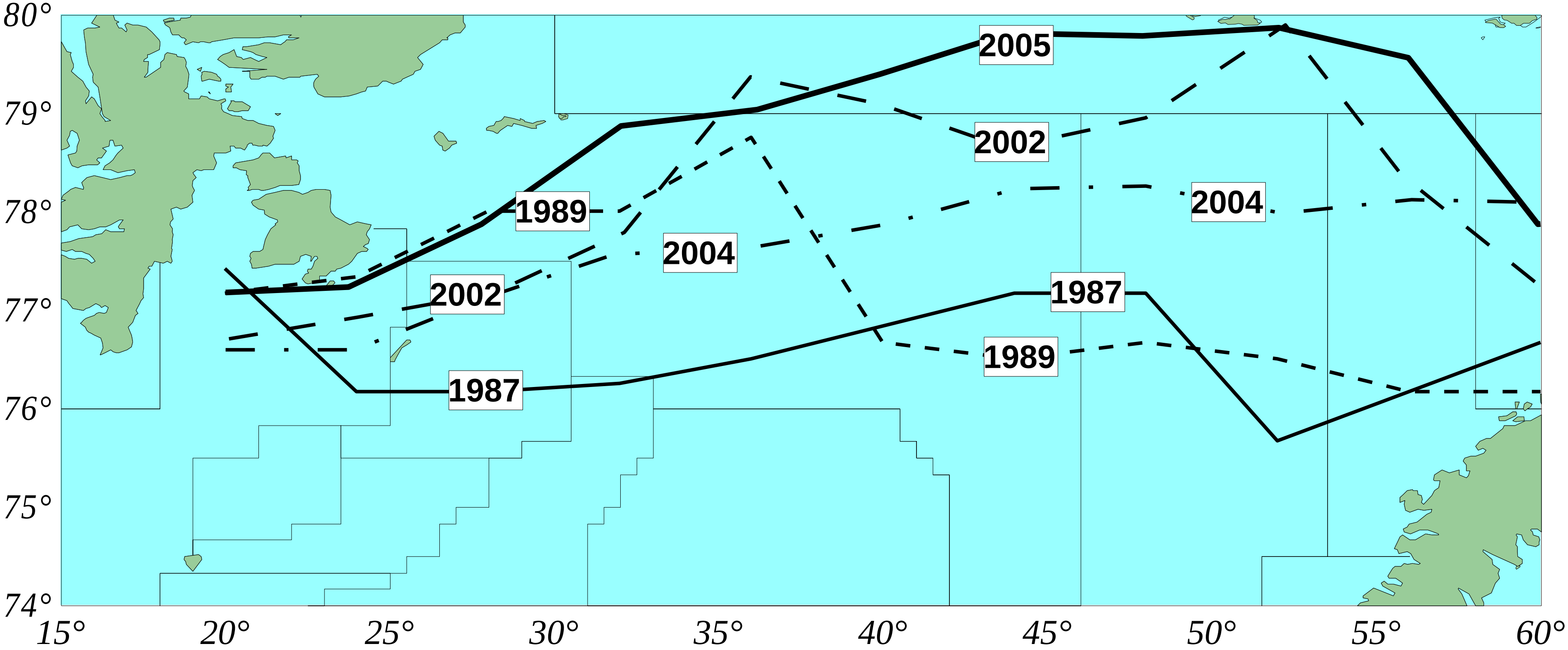
Object

This study analyzes the year-by-year changes in the plankton community structure and the ways of formation of biomass parameters in the years with different water temperatures in connection with the sea ice dynamics in summer period.

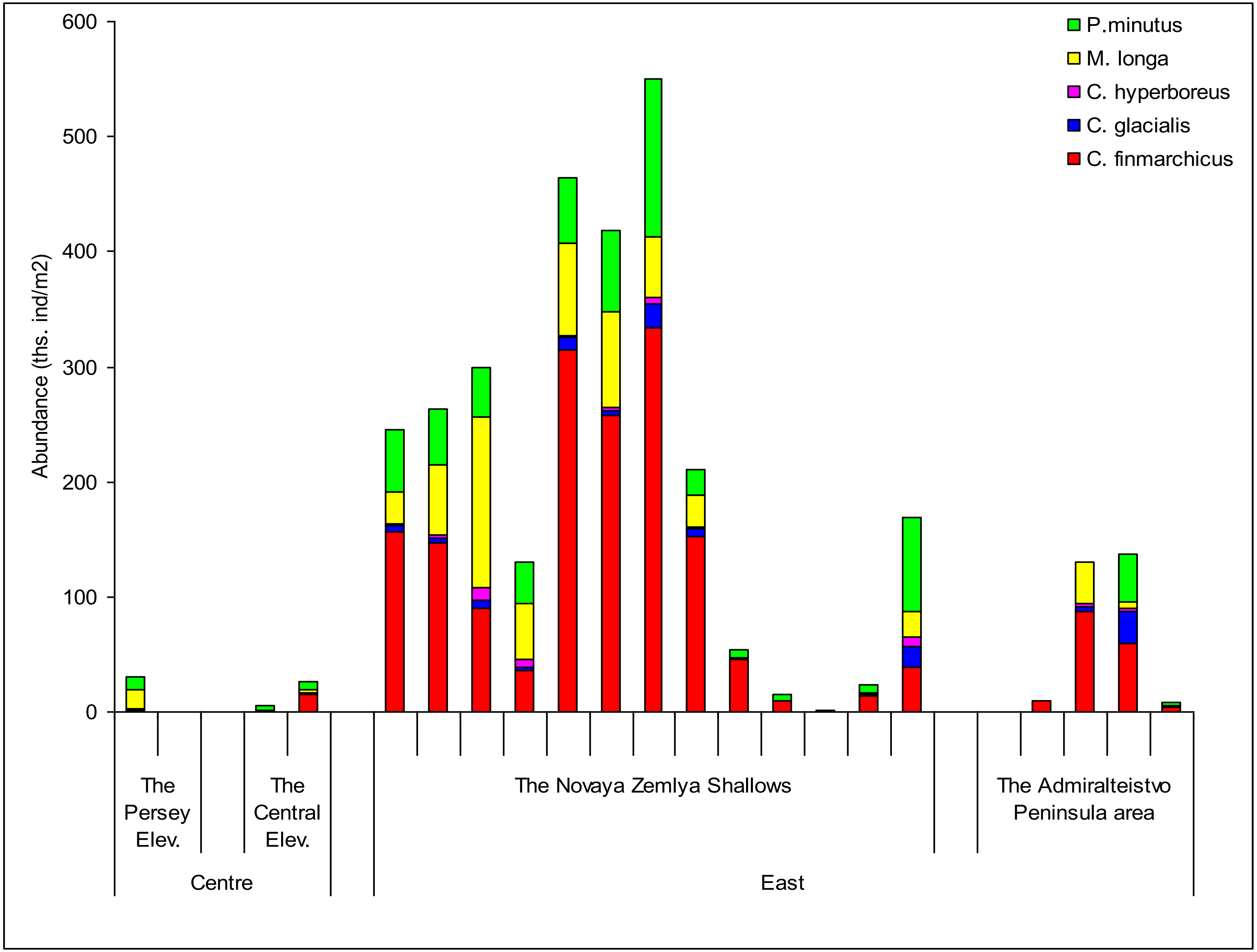
Materials

- **The data for a cold year (1987), moderate (1989) and abnormally warm years (2002, 2004, and 2005) are analyzed.**
- **Totally for the above period 437 samples of zooplankton were fully processed by PINRO.**
- **The greatest attention was paid to the two "biomass-forming" species: the North Atlantic C. *finmarchicus* and the Arctic *C. glacialis*. The data for the other Arctic species *P. minutus* and *M. longa* are given as background.**

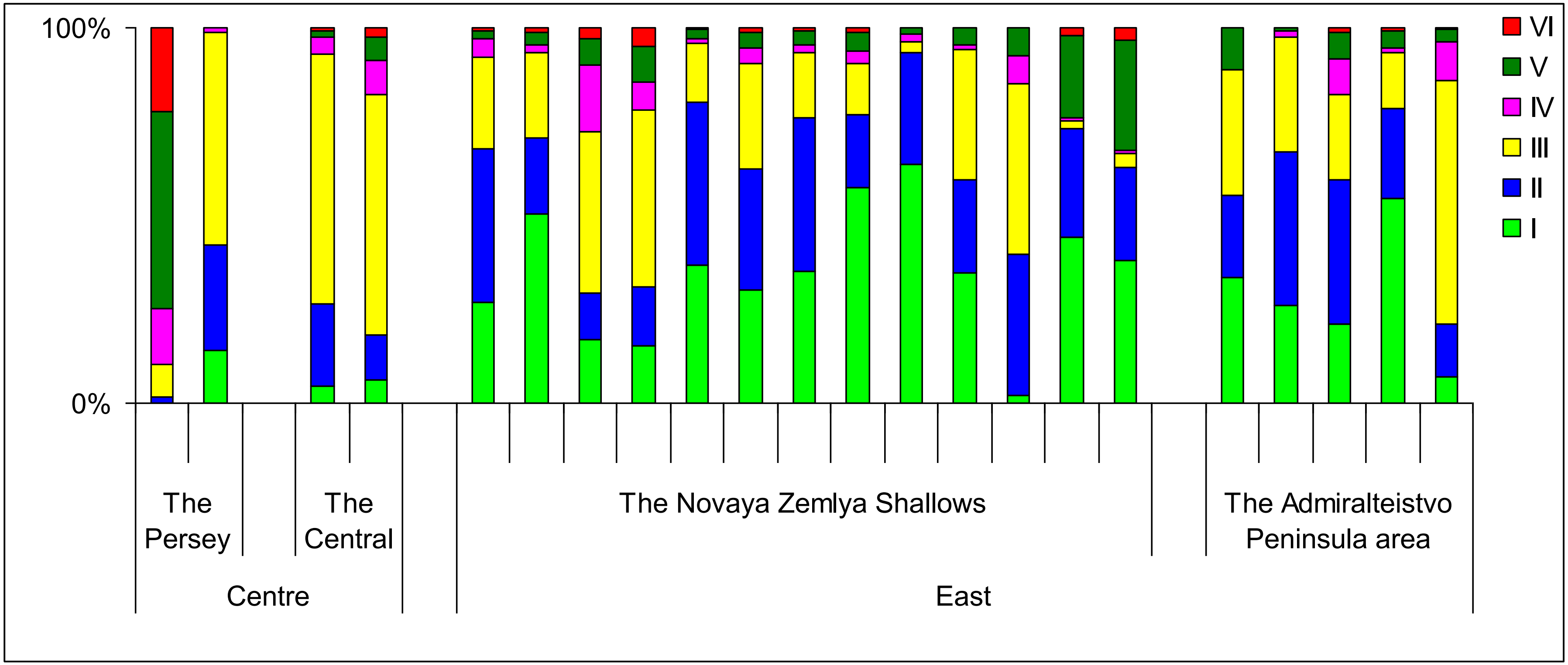
Ice edge location in July 1987, 1989, 2002, 2004, 2005



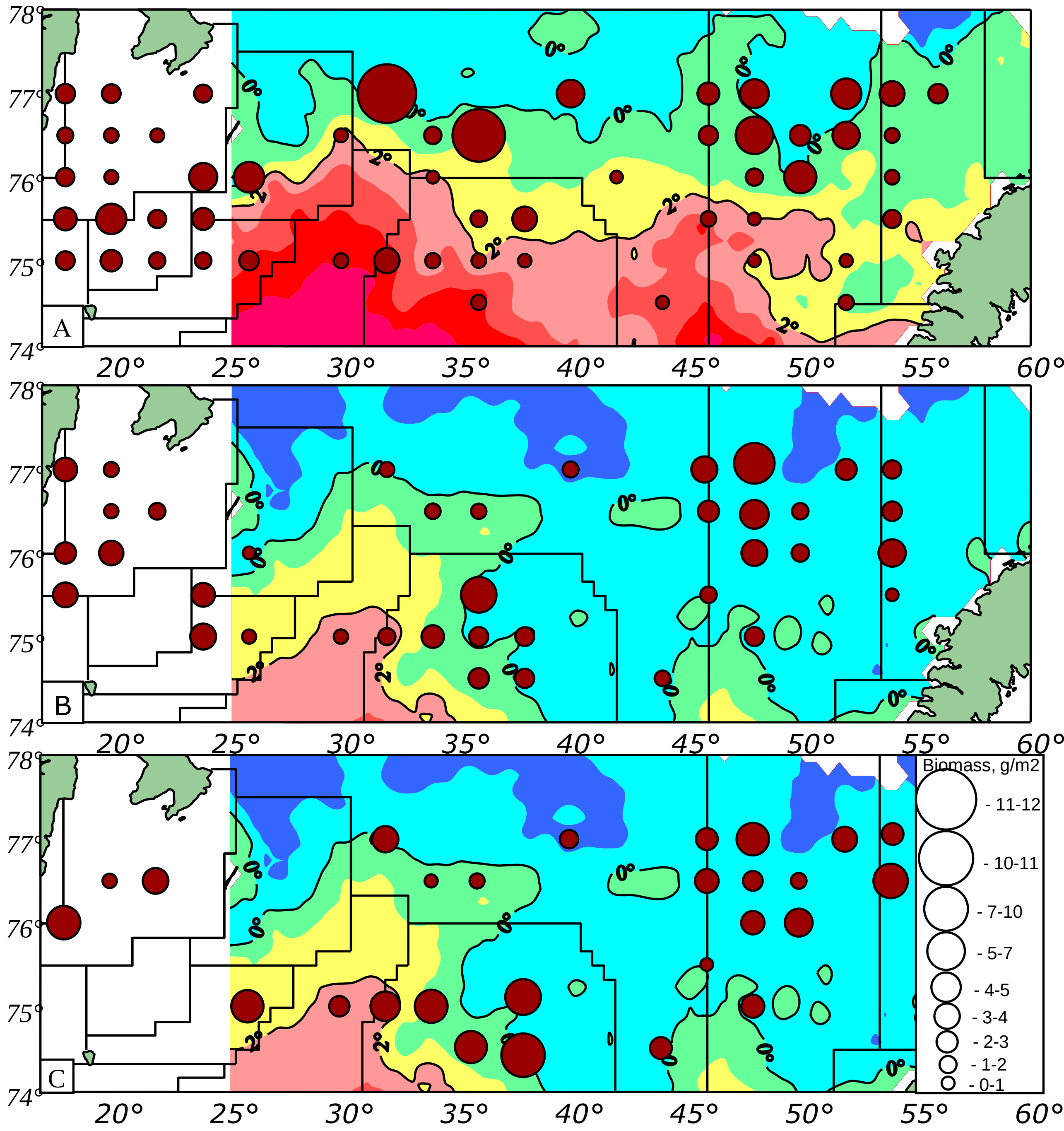
Abundance of zooplankton in Arctic waters in August 1987



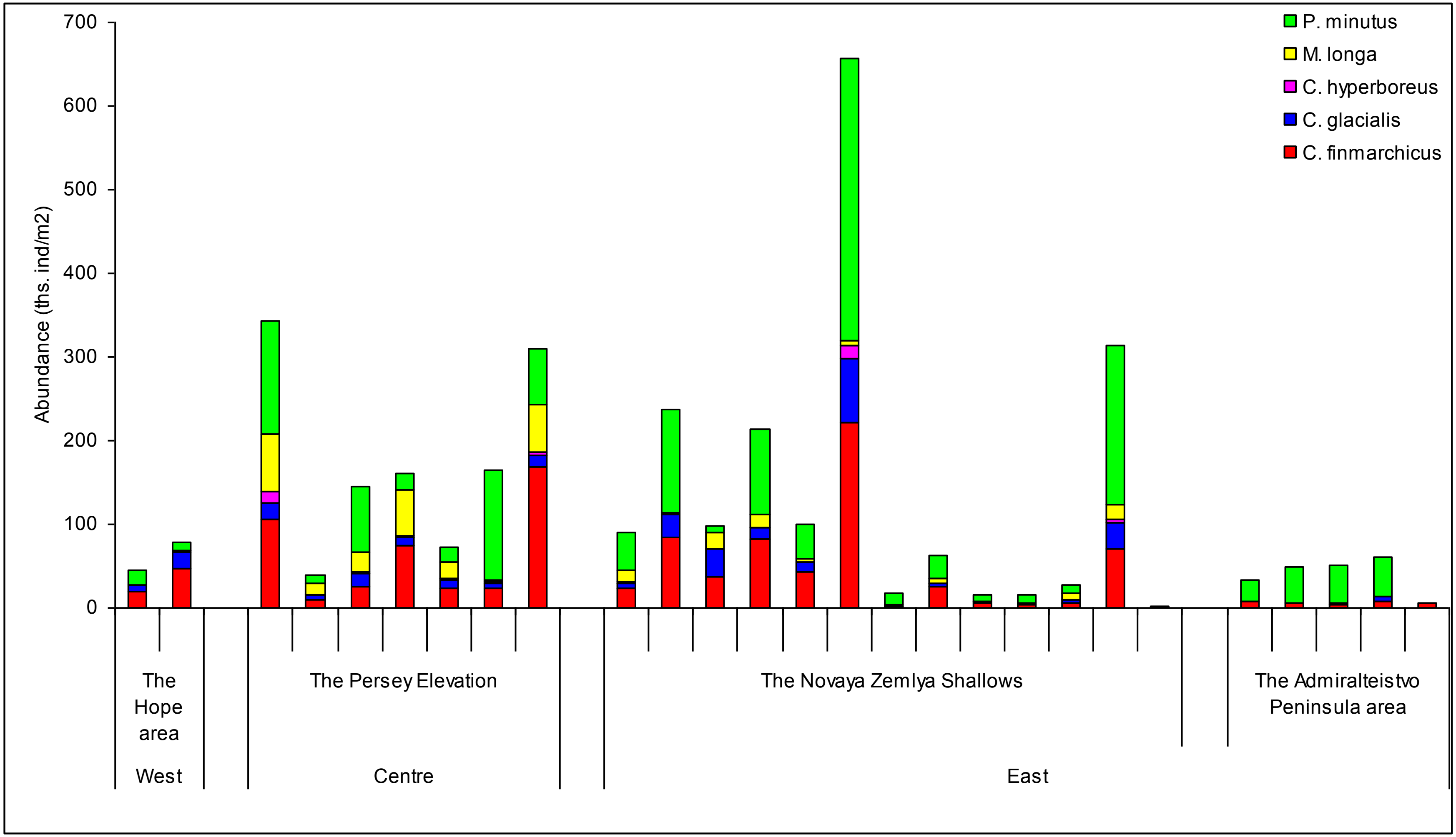
Stage composition of *Calanus finmarchicus* in Artic waters in August 1987



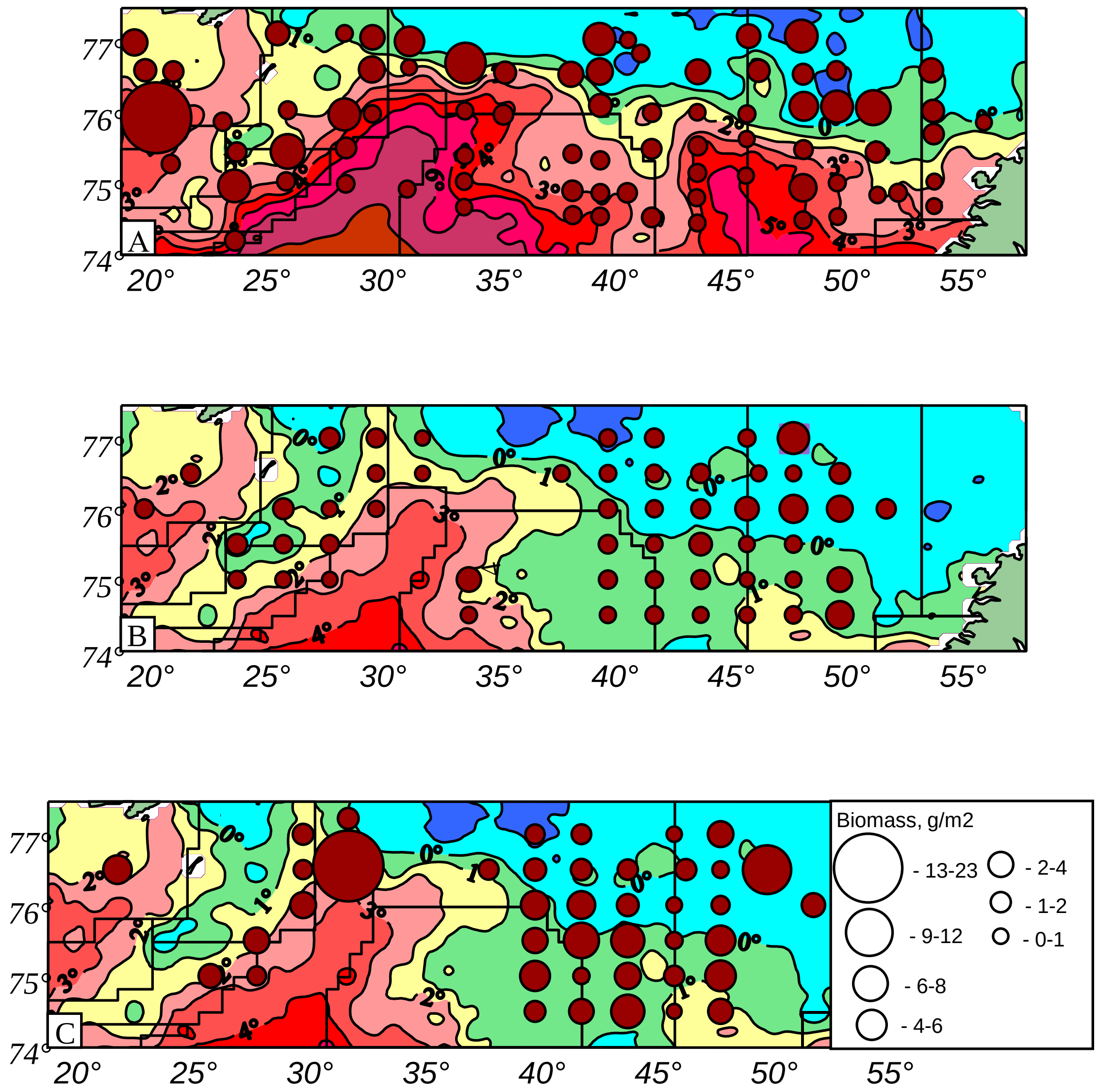
Zooplankton biomass distribution in the 0-50 m layer (A), 50-100 m layer (B) and 100-bottom m layer (C) in August 1987



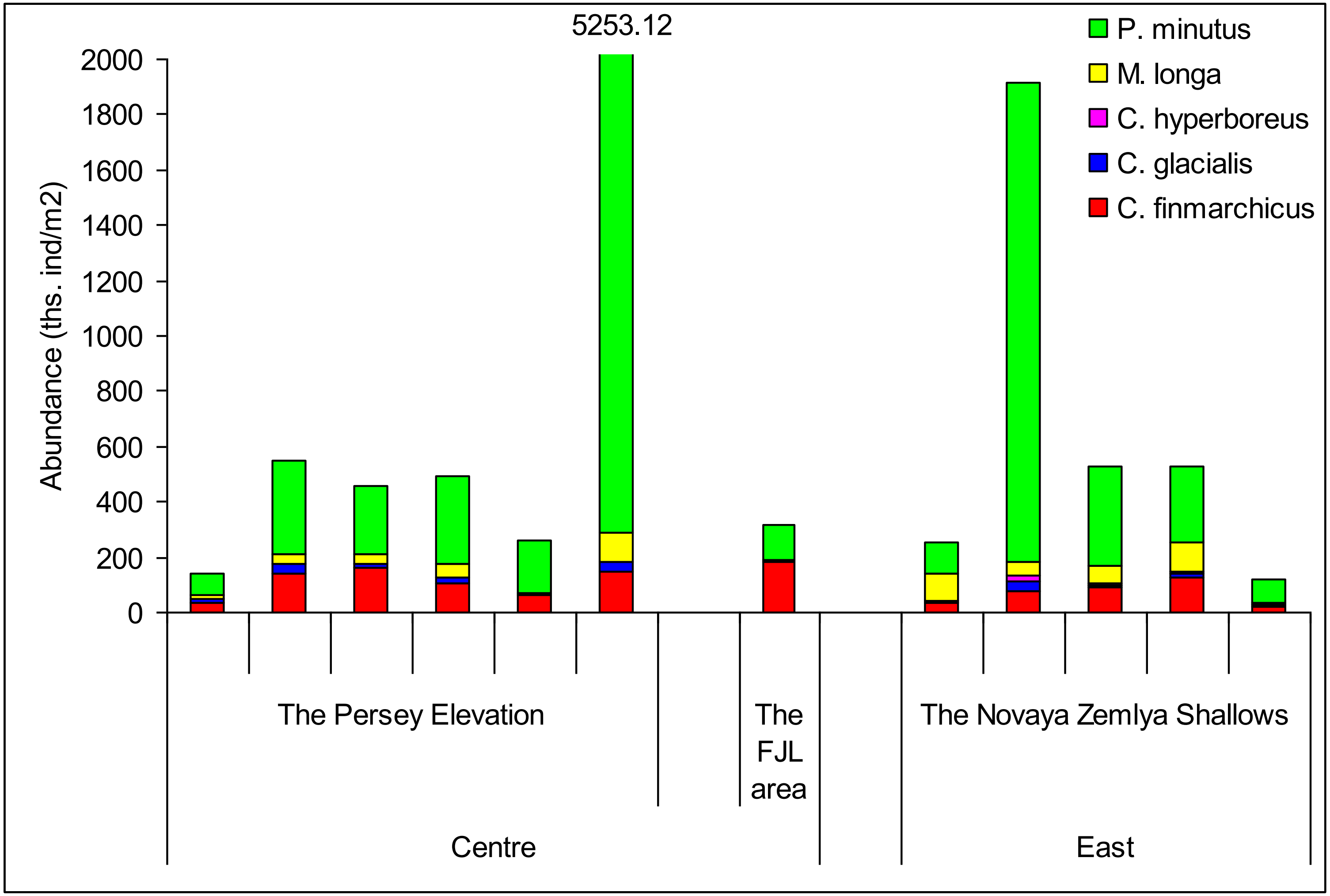
Abundance of zooplankton in Arctic waters in August 1989



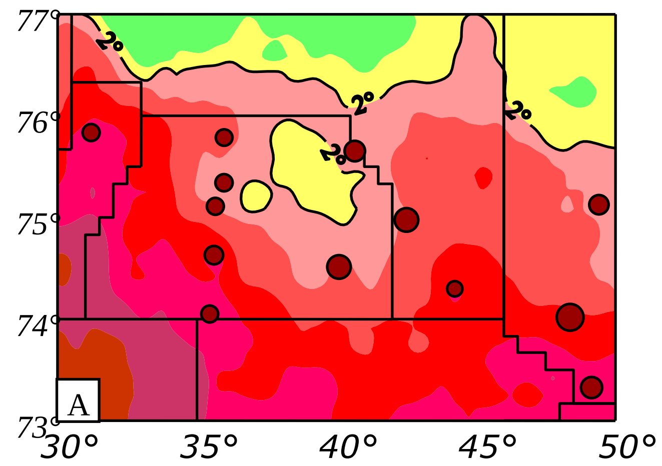
Zooplankton biomass distribution in the 0-50 m layer (A), 50-100 m layer (B) and 100-bottom m layer (C) in August 1989

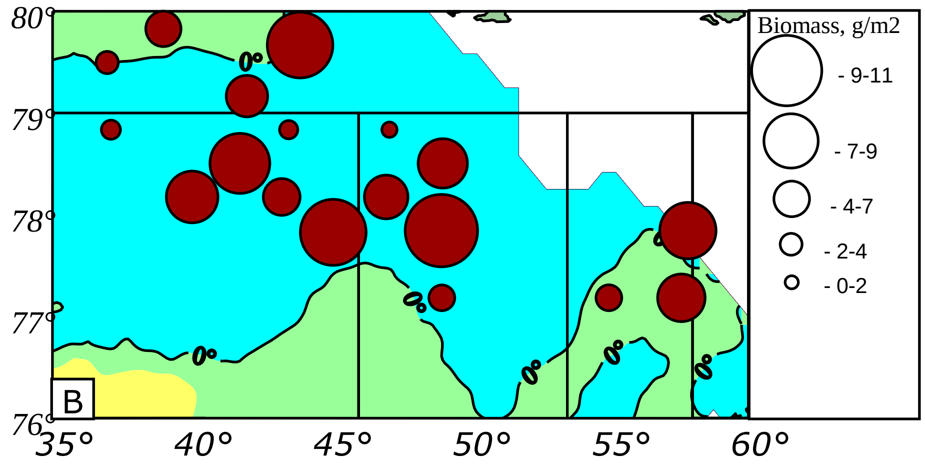


Abundance of zooplankton in Arctic waters in August-September 2002

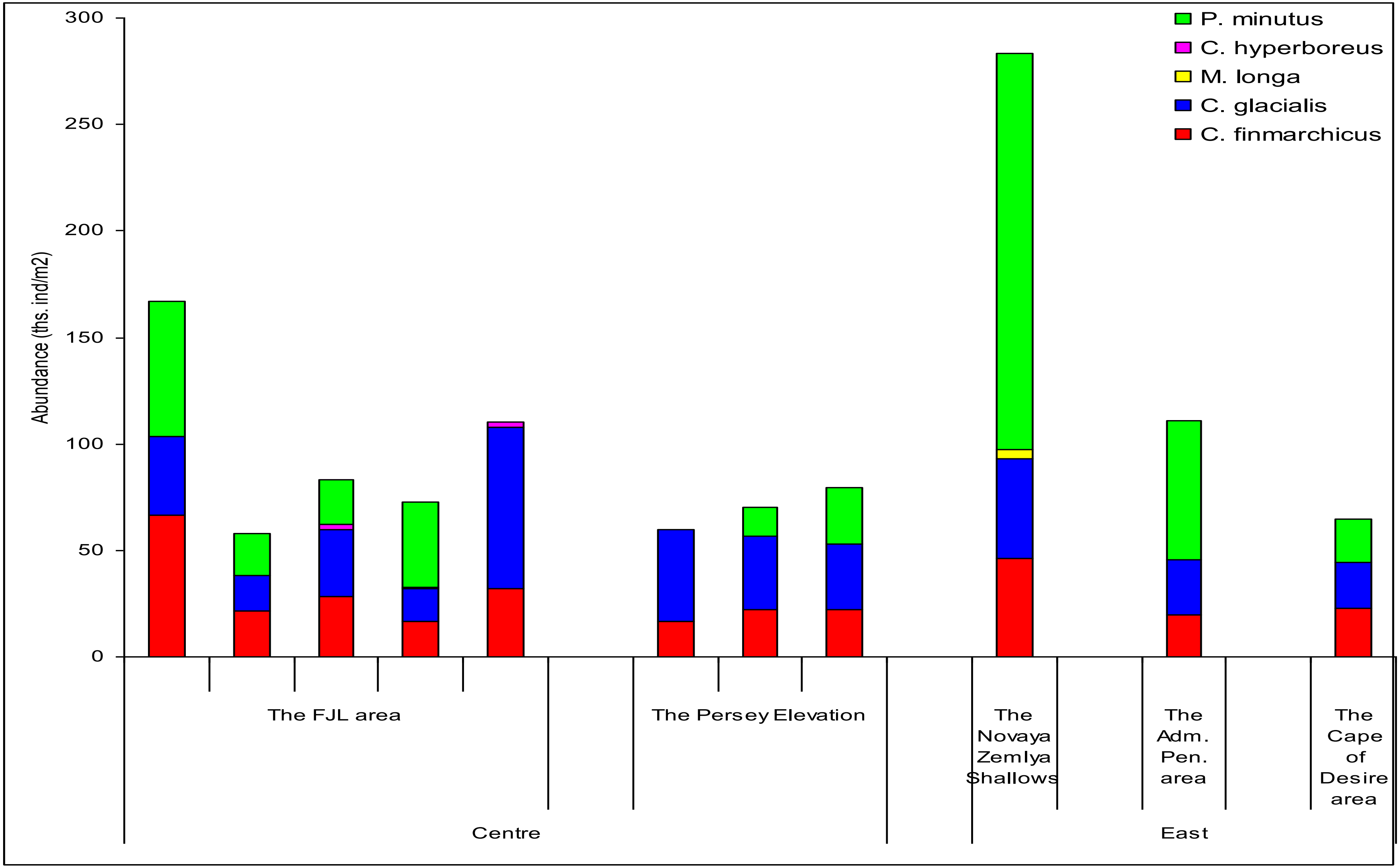


Zooplankton biomass distribution in the 0-50 m layer (A) and 0-bottom m layer (B) in August-September 2002

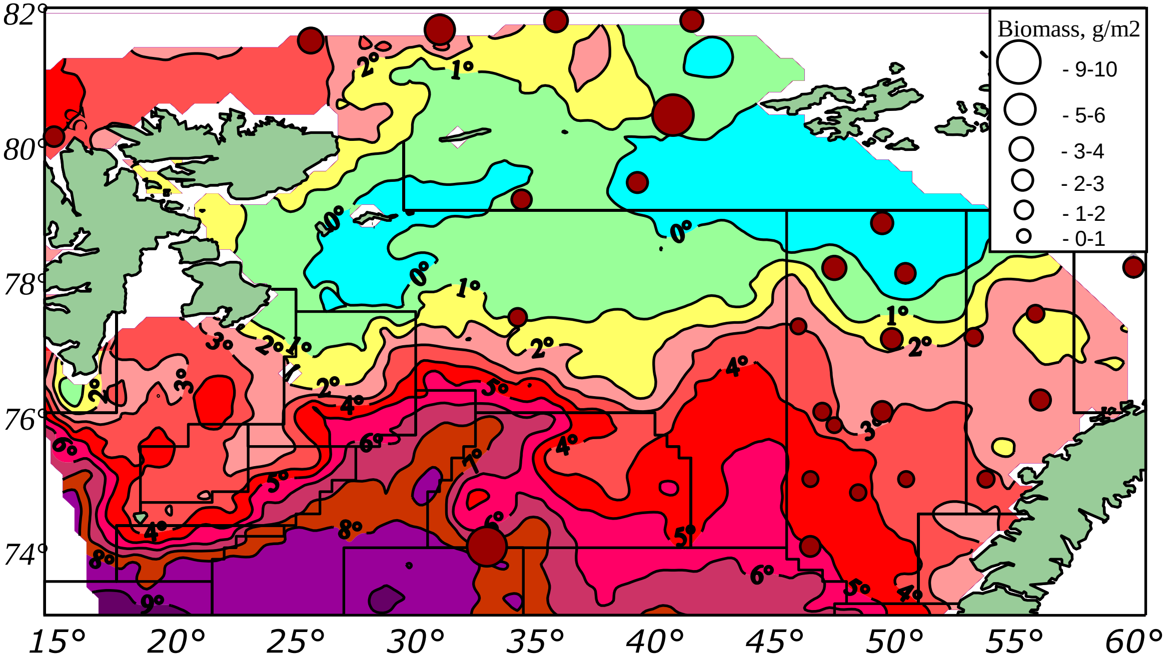




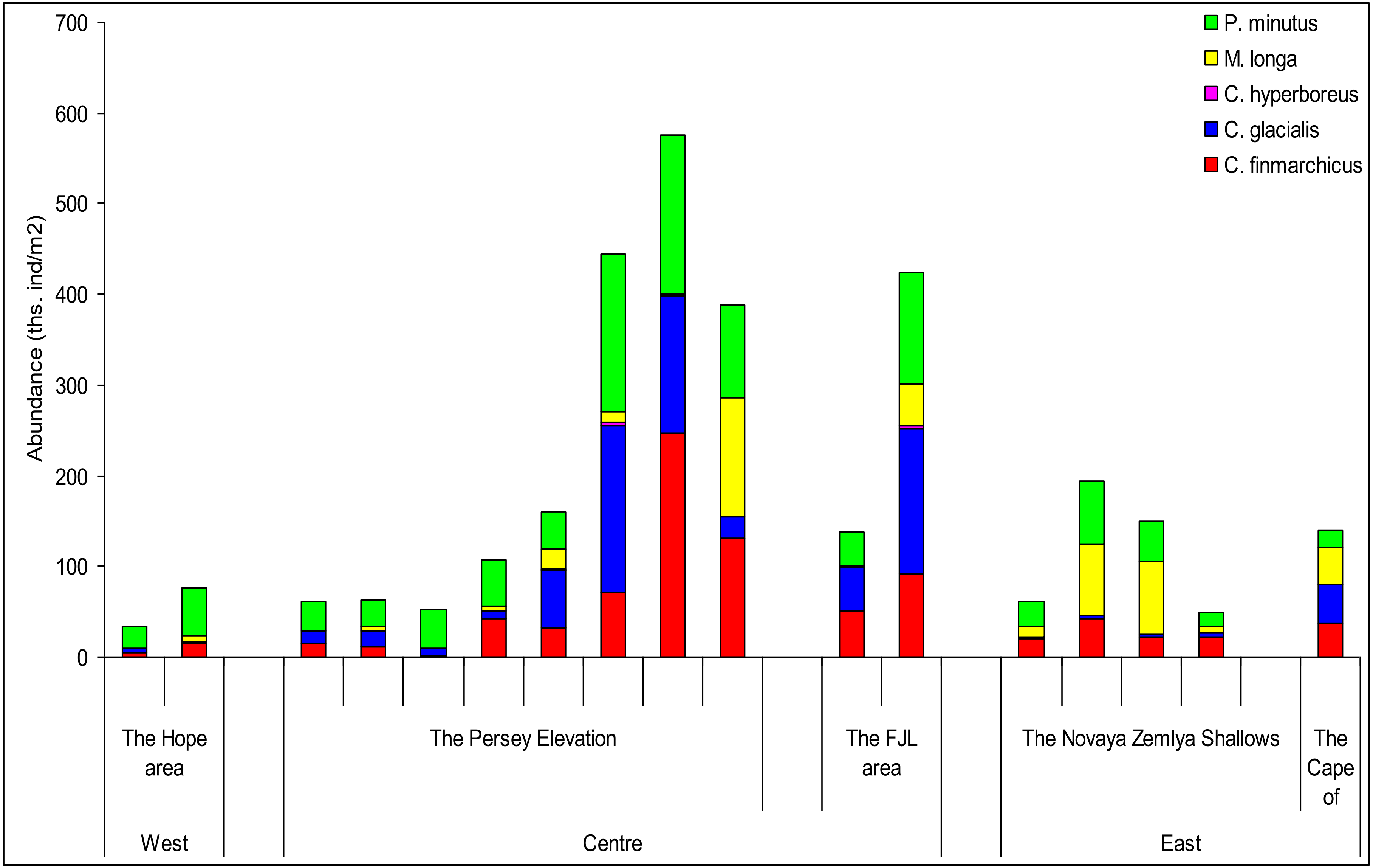
Abundance of zooplankton in the mixed waters in August-September 2004



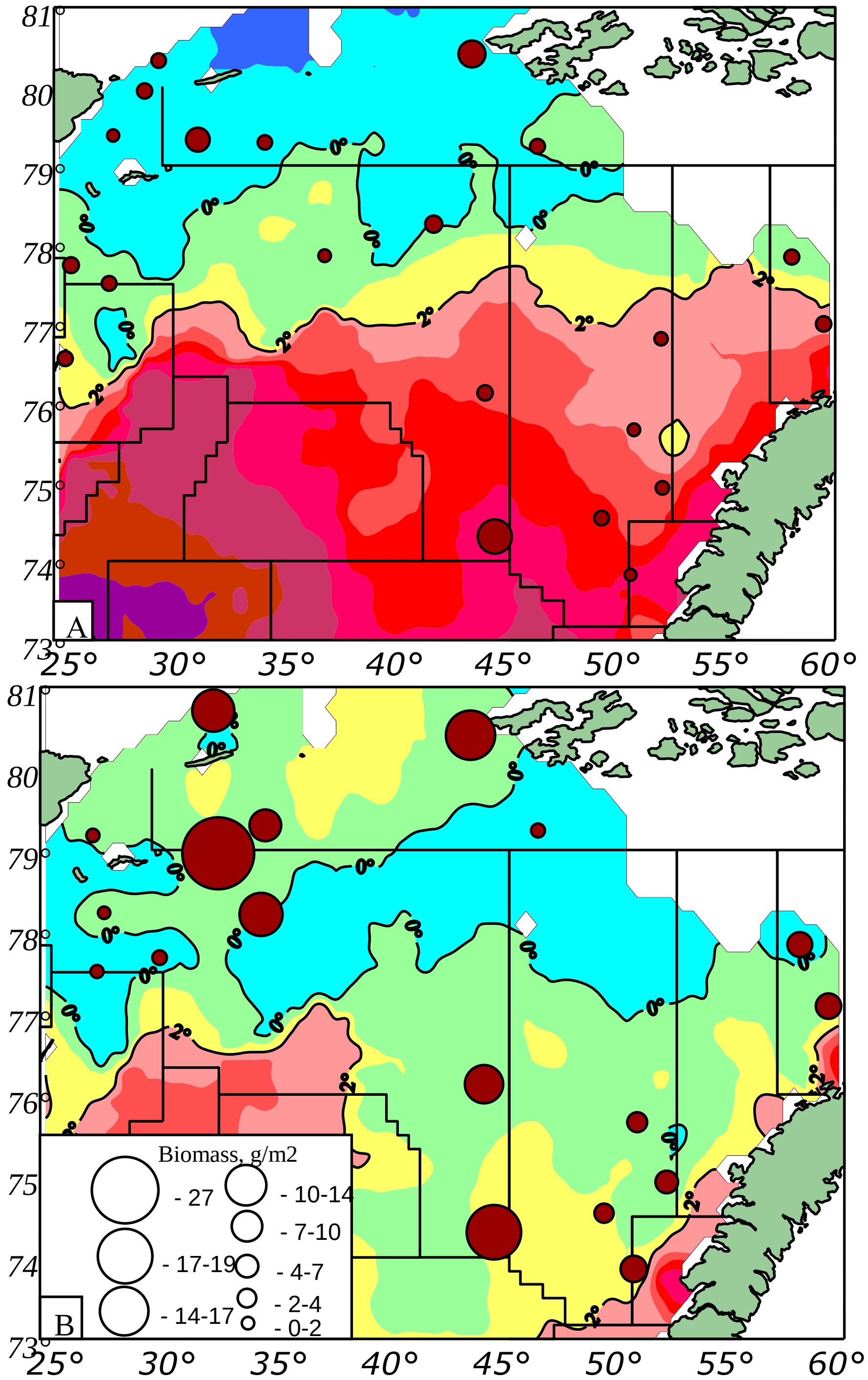
Zooplankton biomass distribution in the 0-50 m layer in August-September 2004



Abundance of zooplankton in the mixed waters in August-September 2005



Zooplankton biomass distribution in the 0-50 m layer (A) and 0-bottom m layer (B) in August-September 2005



CONCLUSION

The average zooplankton biomass (WP2 +MOCNESS) measured in August-September 2006 (9.3 g dry weight m-2) was above the long-term mean (1990-2006) (7.9 g dry weight m-2), and has increased since 2001 (7.3 g dry weight m-2).

Atlantic water masses contain the highest biomass, stressing the importance of advective transport of zooplankton from the Norwegian Sea, and the favourable higher temperatures in these waters that significantly influences the central and western part of the Barents Sea.

The rates of ice melt in the sea have a considerable impact on the numbers, reproduction time and development rates of the "biomass-forming" species – C. *finmarchicus* and C. *glacialis*.

In cold years due to late ice retreat the aggregation density of C. *finmarchicus* in the Arctic waters in August is low and only increases in the area with fast retreat of ice edge. Aggregations of C. *glacialis* are formed faster because of hibernates of older stages as well as fry transport from the north.

In warm years the ice dynamics has different impact. The northern position of the ice edge and increased advection by the system of warm currents in summer (2002) facilitate enlargement of the local groupings due to the plankton transport from the south; in September when its composition is mixed, the numbers of copepods are high. When heat advection is weak and ice melt in the eastern areas is later (2005) the number of C. *Finmarchicus* is low. When the ice edge is in its southern position in July (2004) and ice erosion is faster in August C. *glacialis* dominates in the plankton biomass.

In cold years in August in the north (76-77ºN) intensive reproduction of *C. finmarchicus* takes place and reproduction of C. *glacialis* begins. In warm years the center of reproduction of these species shifts north of 77ºN and takes place in September in a large area in the Arctic and mixed water.

The maximum values of the biomasses (over 10 g/m2) in most cases were observed in the northern areas with domination of older copepodits and mature individuals of C. *glacialis* и *C. finmarchicus*.


Questions