THE STRUCTURE OF ZOOPLANKTON COMMUNITIES IN THE RUSSIAN FAR EASTERN REGIONS (Okhotsk and Bering seas, Pacific waters of the south Kuril Islands).

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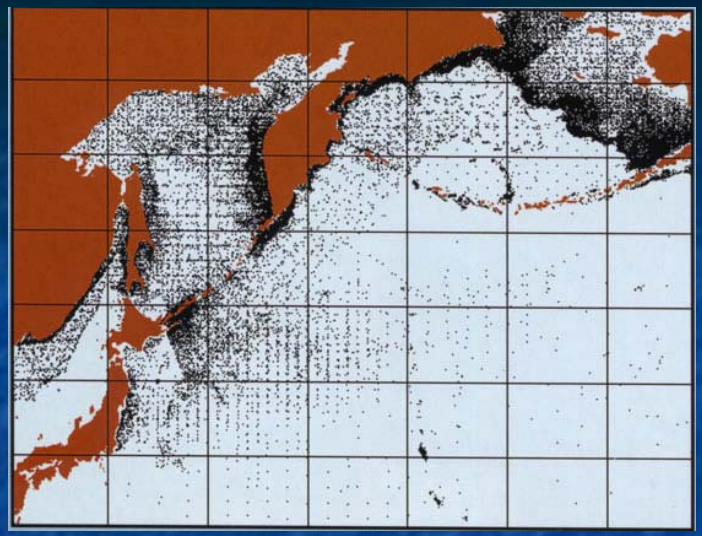
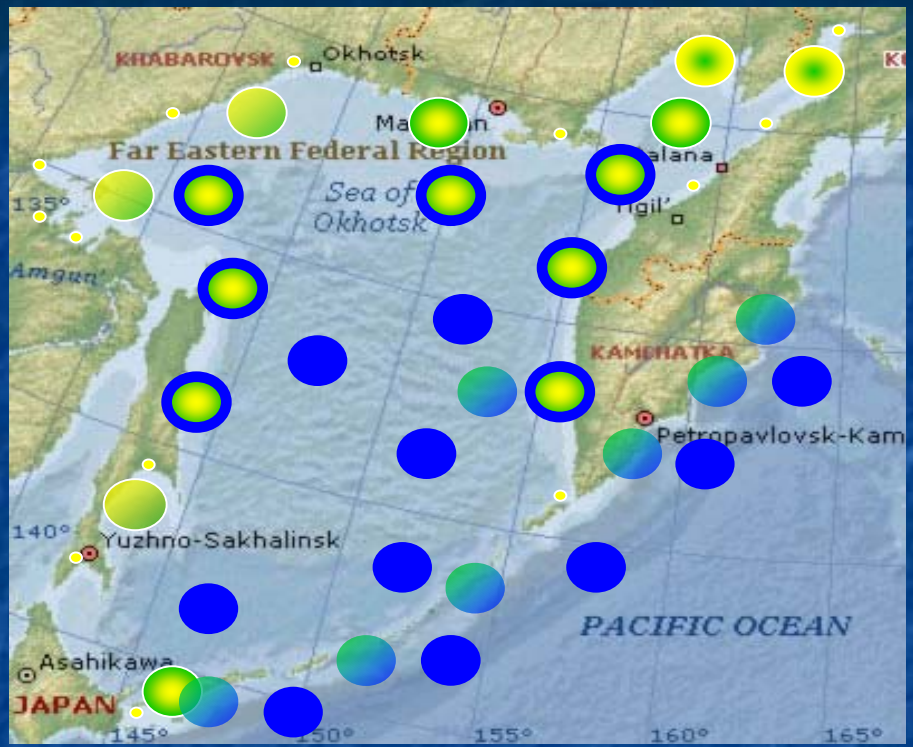
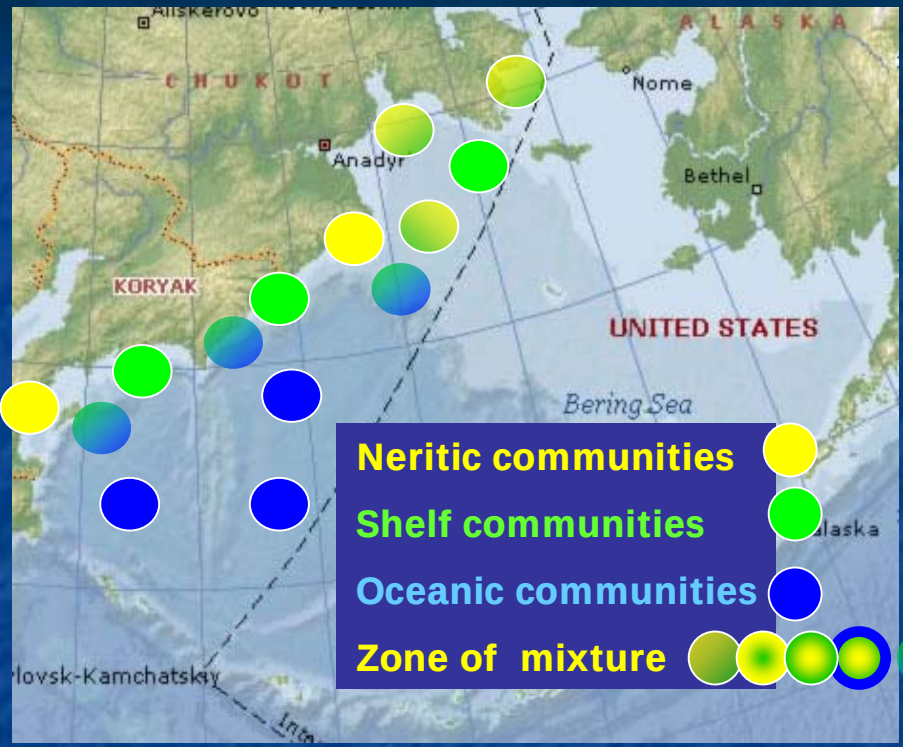


Large amount of data on the of zooplankton communities had been collected during complex TINRO-Centre surveys into the Russian Far Earstern seas and adjacent areas.

Results from these expeditions are presented in a lot of publications scientist from TINRO-Centre: V. Shyntov; A. Volkov; E. Dulepova; A. Efimkin; K. Gorbatenko and et al.
Some of the data was used in this research together with our own data.

Distribution of the large-scale types of zooplankton communities

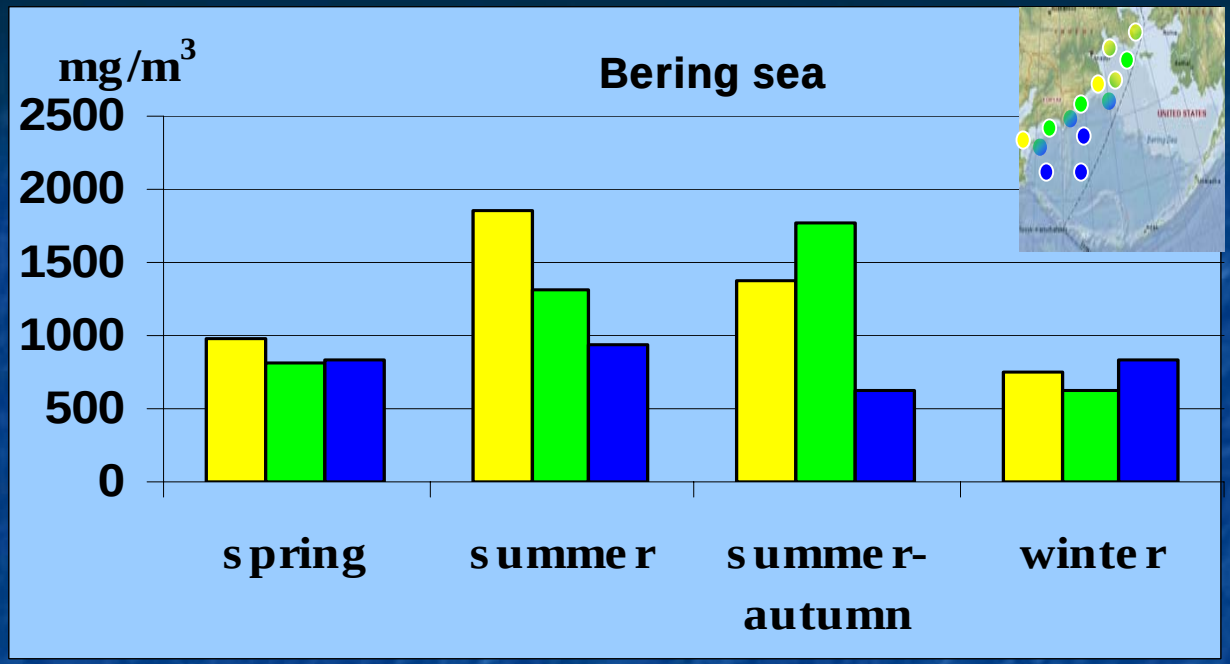


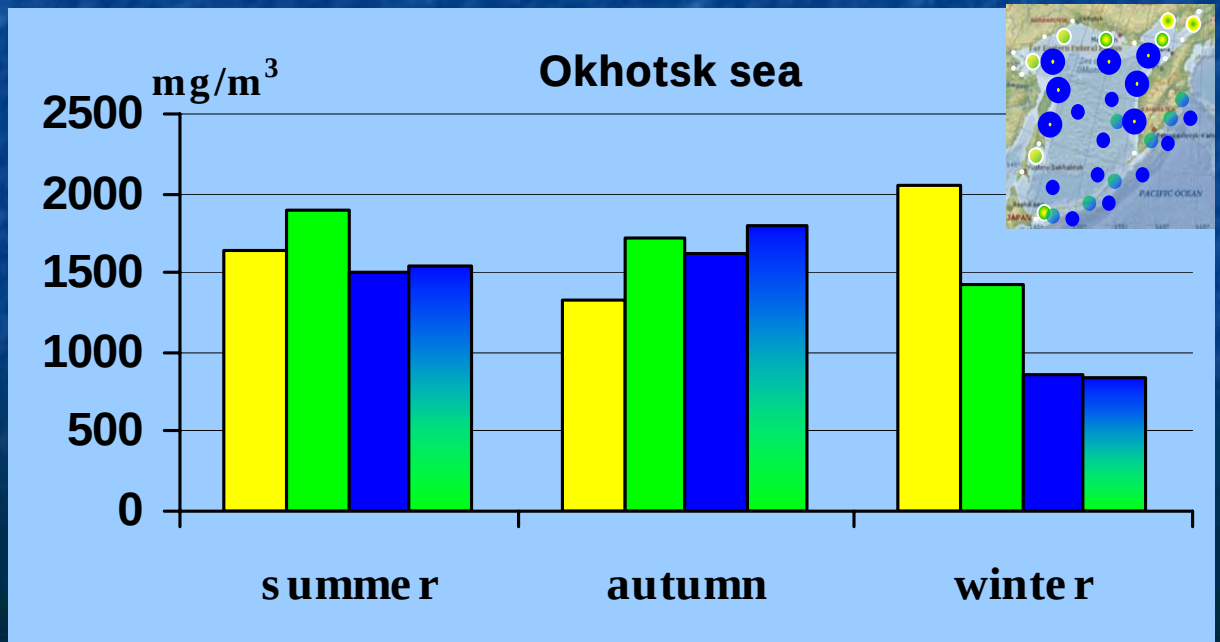


The large-scale types of zooplankton communities were revealed: near-shore (neritic and shelf) and off-shore (oceanic or deep-water). Species can penetrate from one community to another. The zone of mixture between neritic and shelf communities was formed in the area where shelf is fairly large (for example - north Okhotsk sea shelf). The zone of mixture between shelf and off-shore communities was formed where shelf is narrow. The neritic and shelf communities in the Bering sea are better outlined, then in Okhotsk sea.

In the Pacific waters off the south Kuril Island, where shelf zone is small, near-shore communities extend along the coastline in a narrow belt, and is the largest near Kunashir Island. As a result , oceanic species frequntly occur in the shelf community. Besides, this area is influenced by transformed Pacific waters, which also affect the structure of zooplankton community.

Biomass of zooplankton in different communities





The position of boundaries between communities depends om the development of currents and water mass, and is a subject to seasonal and annual fluctuations. Off-shore communities extend towards the shelf in winter, while neritic communities are more abundant in summer.

Neritic communities

Shelf communities

Oceanic communities

Zone of mixture

EVERY COMMUNITY CHARACTERIZED DETERMINATE

- **SIZE STRUCTURE**

SMALL-SIXED FRACTION - LESS THAN 1.5 MM
MEDIUM-SIZED FRACTION - 1.5 TO 3.5 MM
LARGE-SIZED FRACTION - 3.5 MM AND MORE

- **SPECIES COMPOSITION**

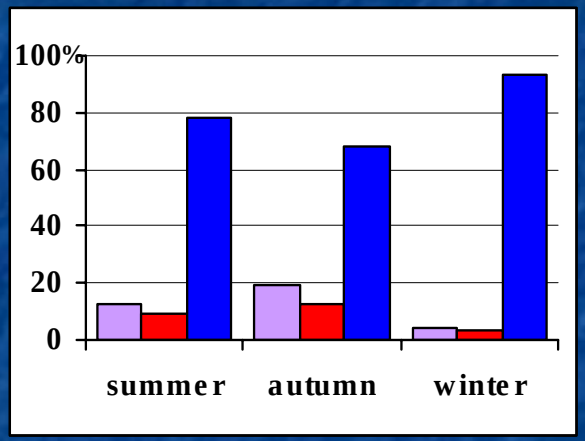
- **TROPHIC STRUCTURE**

NON-PREDATORY ZOOPLANKTON:
HPYTOPHAGOS AND EURYPHAGOS
PREDATORY ZOOPLANKTON: ZOOPHAGOS

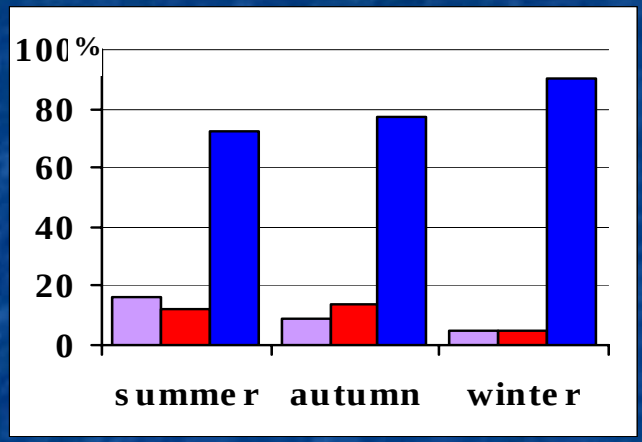
- **DYNAMICS OF ZOOPLANKTON BIOMASS**

Zoopkankton size composition (%) in 200-0 m layer in different communities of the Okhotsk sea

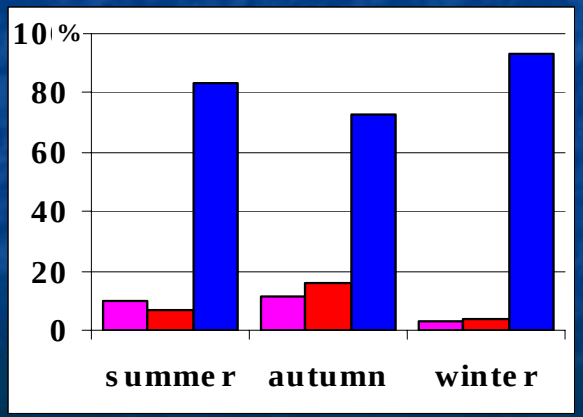
Neritic communities



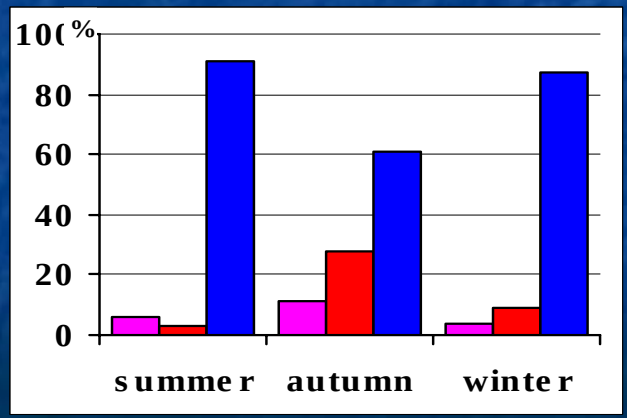
Shelf communities



Oceanic communities



Zone of mixture

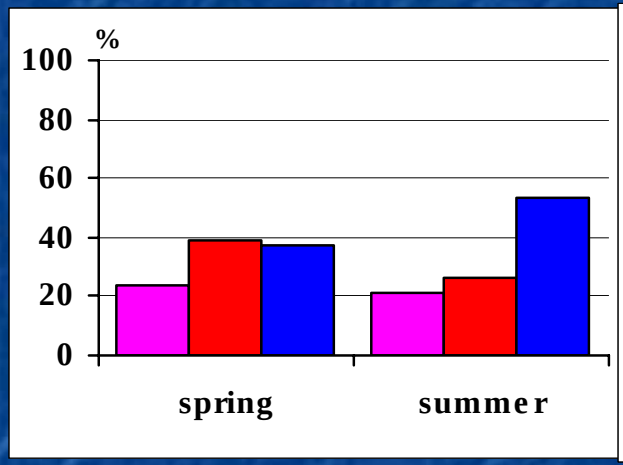


Large-sized fraction | Medium-sized | Small-sized

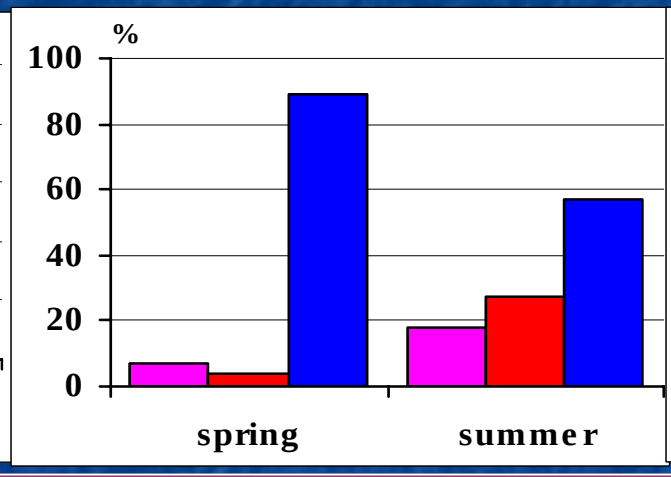
Large-sized zooplankton fraction forms the basis of zooplankton biomass in the Far Eastern seas irrespective of season. The share of small- and midium-sized planktonic animals is highly variable, and rarely exceeds 20 % of the total zooplankton biomass. On the whole, the share of small and medium-sized zooplankton in near-shore communities is higher than in the off-shore.

Zoopkankton size composition (%) in 200-0 m layer in different communities of the western Bering sea

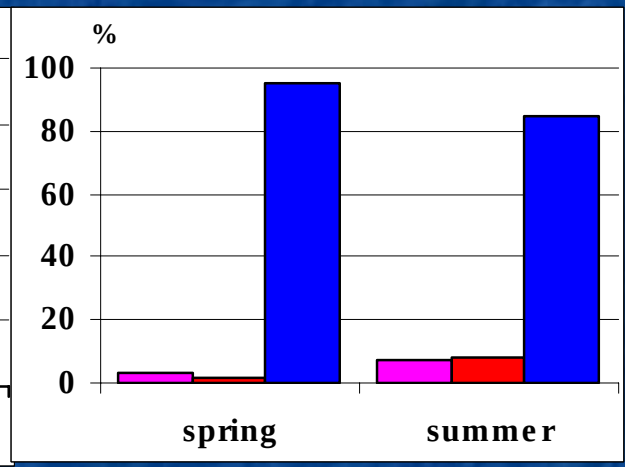
Neritic communities



Shelf communities



Oceanic communities



Large-sized fraction **Medium-sized** **Small-sized**

In the western Bering sea, where communities are better outline, the share of small- and medium-sized zooplankton in the near-shore communities is higher than in the Okhotsk sea. In the oceanic waters off the south Kuril region (summer 1991-1996) the biomass of small-sized zooplankton groups was 65-200 mg/m^3, while in the shelf waters - 135-362 mg/m^3.

Though species composition within every type is greatly variable, 10 species or so generally account for most of the community biomass, and the share of the first two-three dominant species can be as mush 50 %.

Moreover, basic species are the same across the whole area, including Bering and Okhotsk seas and Pacific waters. These areas differ only in dominant species abundance and ratio, including their seasonal and annual variability pattern.

Different species composition resulted in different functional traits of trophic structure of zooplankton communities.

The following trophic groups of zooplankton distinguished: **predatory zooplankton** (zoophagous) and **non-predatory** (phytophagous and euryphagous).

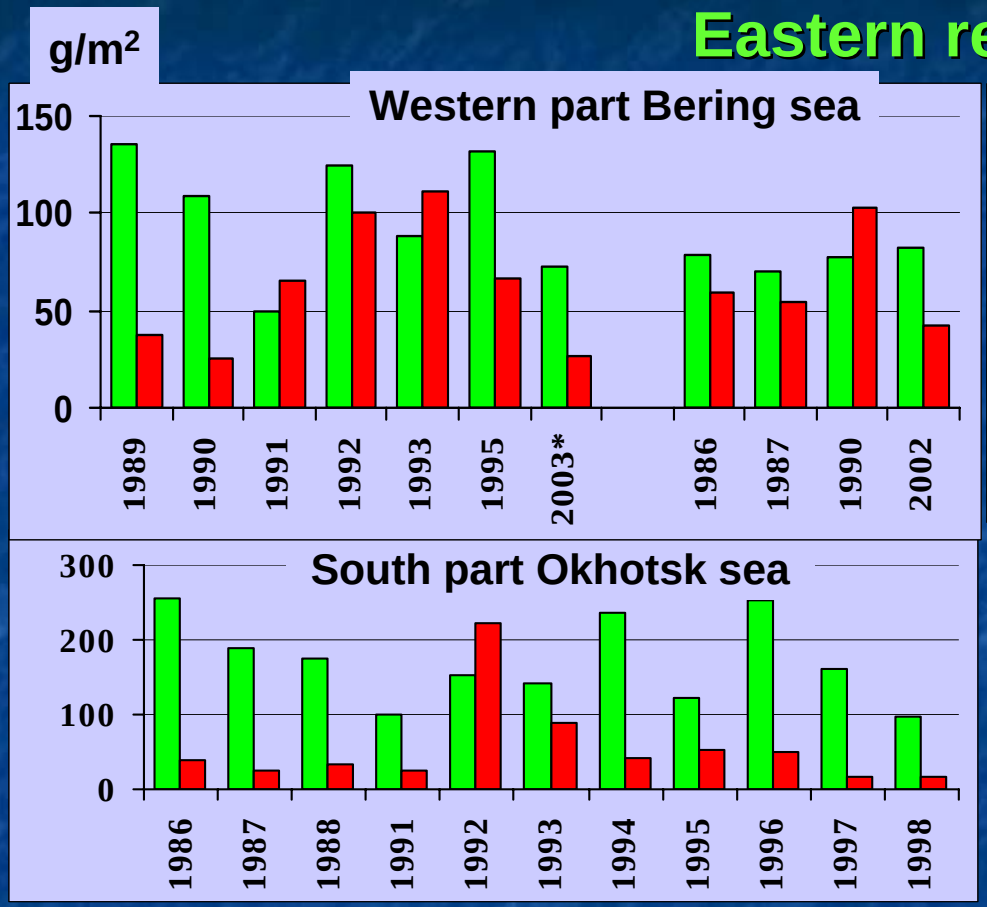
Considerable regional, seasonal and annual variability was observed in the trophic structure of zooplankton communities.

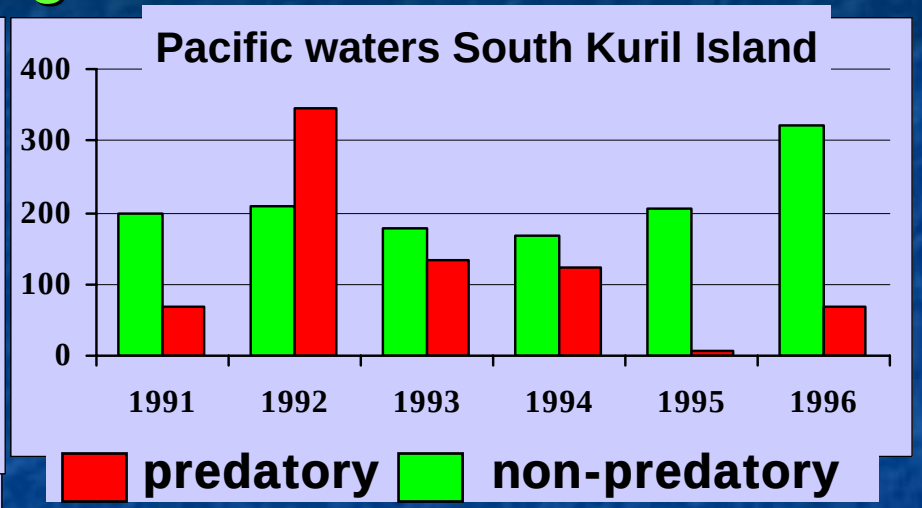
On the whole, the phyto- and euryphagous species dominated mostly in near-shore communities. The share of predatory zooplankton was high in off-shore communities.

Communities	SUMMER-AUTUMN	WINTER
	Bering sea, water east Kamchatka Peninsula	
Neritic, shelf	dominated phytophagous and euryphagous	share of phytophagous decreased share of euryphagous increased
Deep-water and Anadyr bay	dominated zoophagous, but share of euryphagous is the big	dominated zoophagous, but share of euryphagous decreased
Okhosk sea		
Neritic, shelf	dominated euryphagous	dominated euryphagous
Deep-water	dominated euryphagous, but share of zoophagous is the big	dominated euryphagous, but share of zoophagous is the big
Okhosk water south Kuril Island		
Neritic, shelf	dominated euryphagous	dominated euryphagous
Pacific water south Kuril Island		
Neritic, shelf	dominated phytophagous and euryphagous	share of phytophagous decreased share of euryphagous increased
Deep-water (oceanic)	dominated zoophagous	no data

Every region was characterized by its own pattern of dynamics in biomass of different trophic groups.

Data analysis reveals that share of predatory zooplankton increased in 1990s in the different areas of the Far Eastern regions.





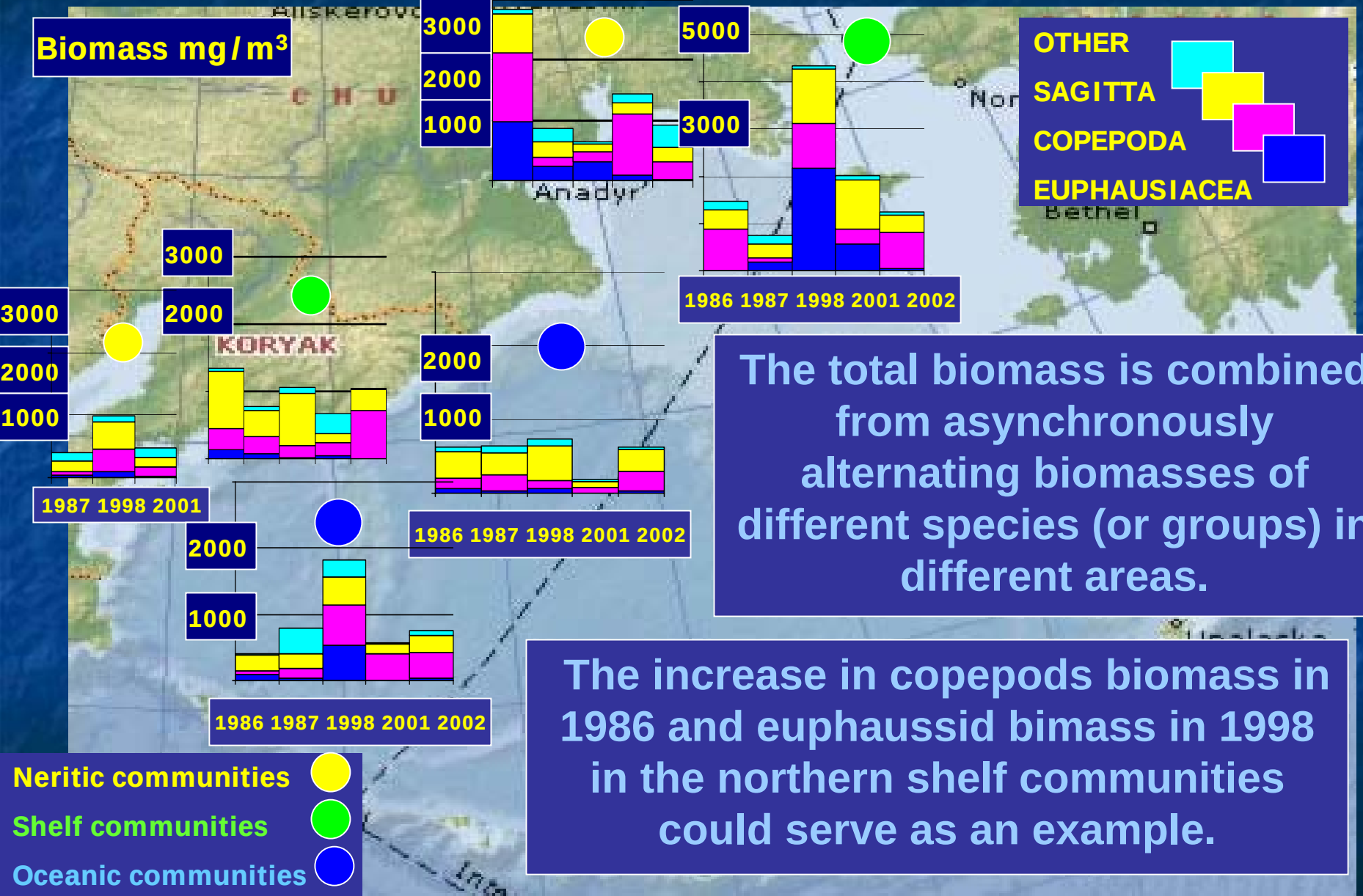
THESE CHANGES IN PLANKTONIC COMMUNITIES WERE CAUSED BY SEVERAL FACTORS, THE DECREASE OF NUMBER AND BIOMASS OF PLANKTIVOROUS FISH BEING ONE OF THEM (Dylepova, 1996, 2002; Shyntov, 1997, 2002; and et al).

The drop in biomass of highly abundant species in the early 1990s resulted in decrease of plankton consumption. This led to redistribution in the predatory to non-predatory zooplankton ratio, and was one of the causes for rise in biomass of alternative nektonic species (saury, anchovy, mictophids, salmon and squid). Nonetheless, consumption rate of food organisms by necton in the mid 1990-s appeared lower than in 1980-1990s, and the increase of the alternative species biomass was not able to make up for the decrease highly abundant species.

This resulted in stabilization of nektonic production in pelagic communities at a lower then in 1980s.

Thereby, multiple factors, including community-related are responsible for the biomass variability.

BIOMASS OF SAME GROUPS ZOOPLANKTON IN AUTUMN 1986-2002 IN DIFFERENT AREAS OF THE BERING SEA.

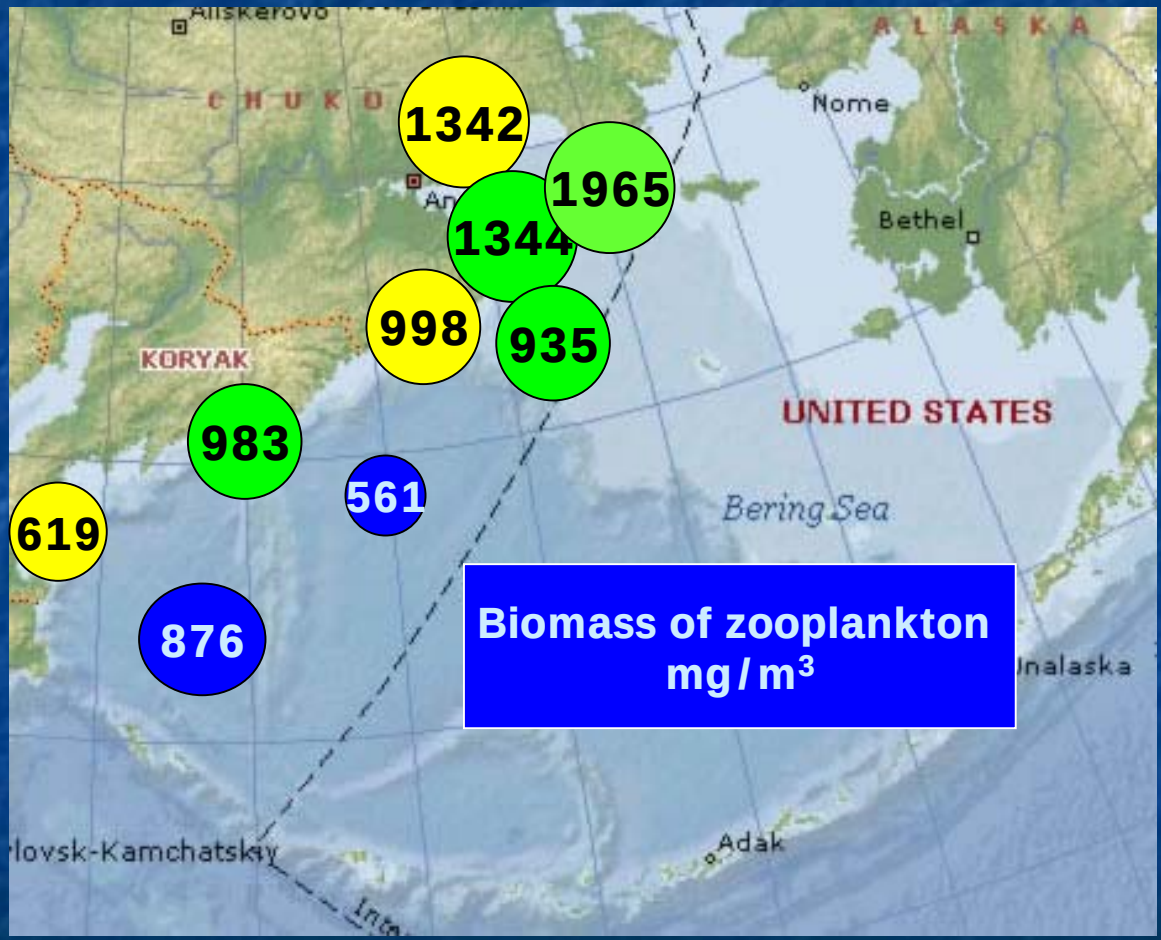


The total biomass is combined from asynchronously alternating biomasses of different species (or groups) in different areas.

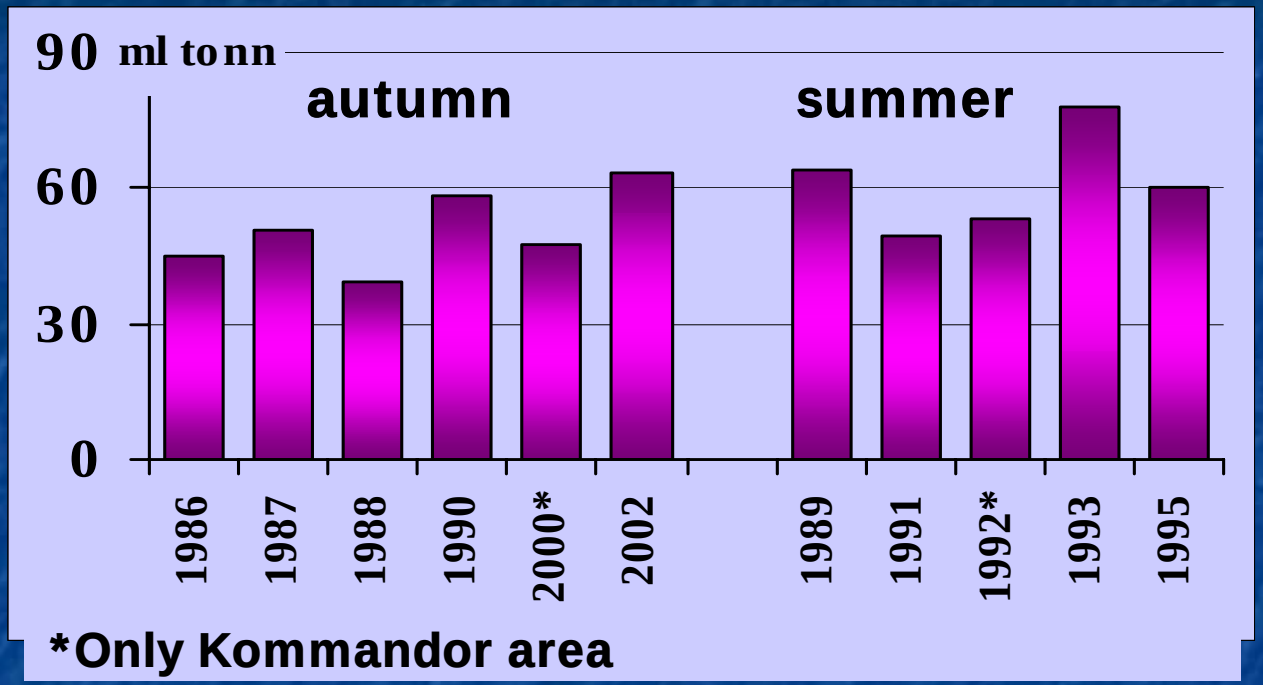
The increase in copepods biomass in 1986 and euphaussid bimass in 1998 in the northern shelf communities could serve as an example.

Biomass of zooplankton (mg/m3) in different communities in the Bering sea.

In the western Bering sea, the zooplankton biomass in the shelf communities in autumn is higher than in the deep-water communities, while the biomass in the souhern deep-water communities is higher than in the northern.

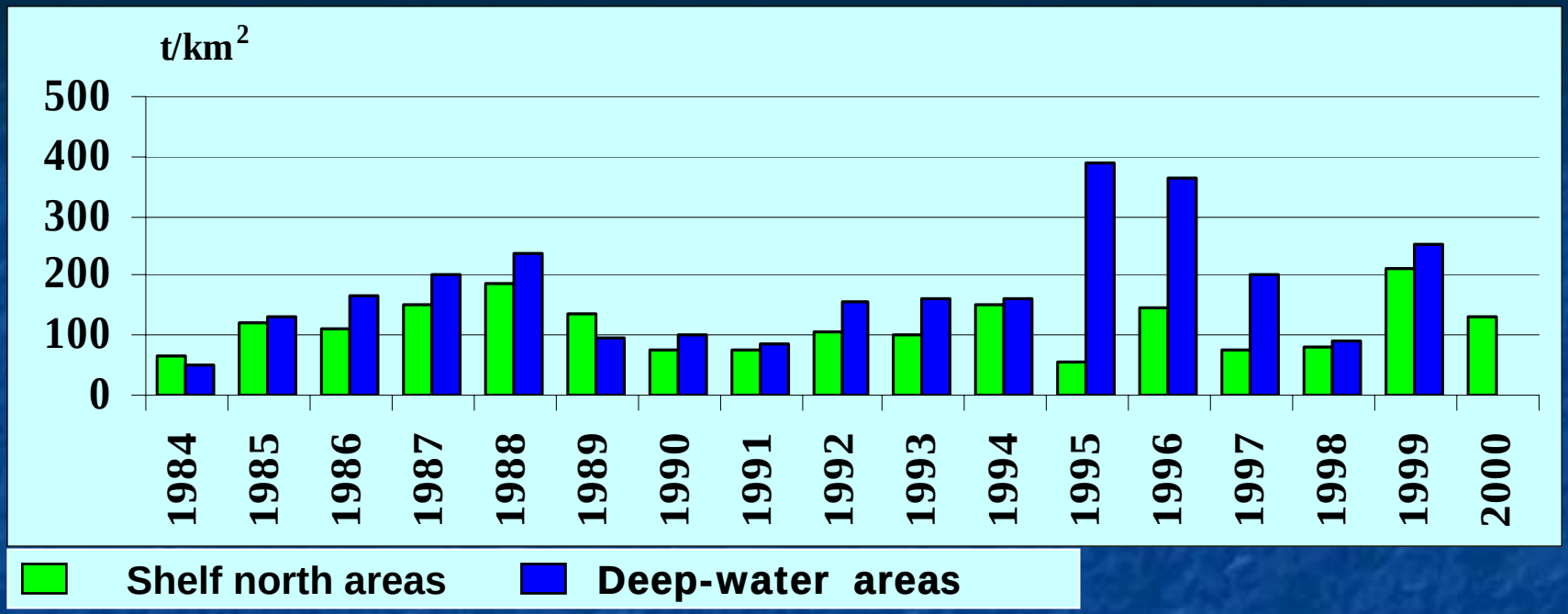


Biomass of macrozooplankton in epipelagic Kommandor and Aleutian areas (deep-water areas of the Bering sea)



We were unable to reveal a strong trend towards long-term variability in the zooplankton biomass in the western Bering sea basing on data collected during the 1980-1990s and from the literature (Efimkin, 1998; Shyntov, 2002; Dylepova, 2002).

Biomass of zooplankton in the different areas of Okhotsk sea



Judging from large-scale surveys conducted by TINRO-Centre, and from the literature (Volkov, 1985, 1996; Shyntov, 2002; Dylepova, 1990, 2002; and et al) half of the total zooplankton stock in the Okhotsk Sea is found over the deep-water area (except for the Derjigin and TINRO basins). In autumn, the highest zooplankton biomass also was observed in north areas. The zooplankton biomass in off-shore areas was higher in the 1990s than in the 1980s. On the contrary, in the northern shelf areas jf the sea the plankton biomass was higher, on the average, than in 1980s. In the south Kuril waters, the plankton biomass in the 1990s was higher tnan in early 1990s.

Thereby, organic material produced by zooplankton has its own pattern in different communities and depends on a variety of factors.

In general, the organic matter is underutilized at the modern rate of production in the Far Eastern region.

THANK YOU FOR ATTENTION!