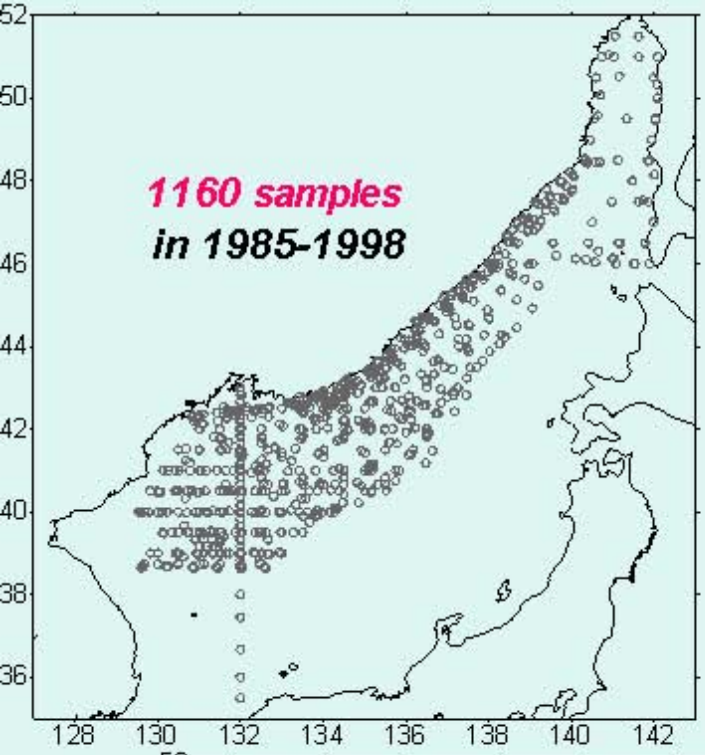
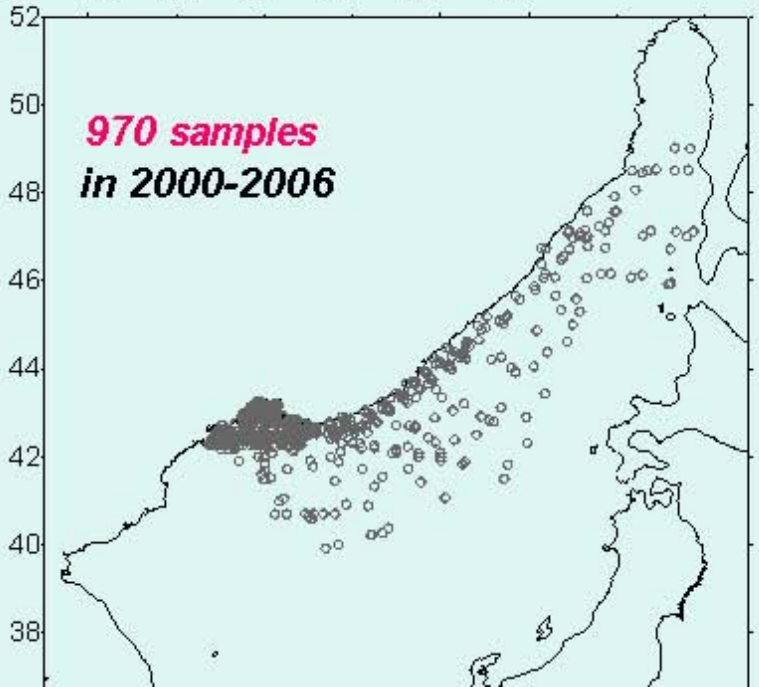
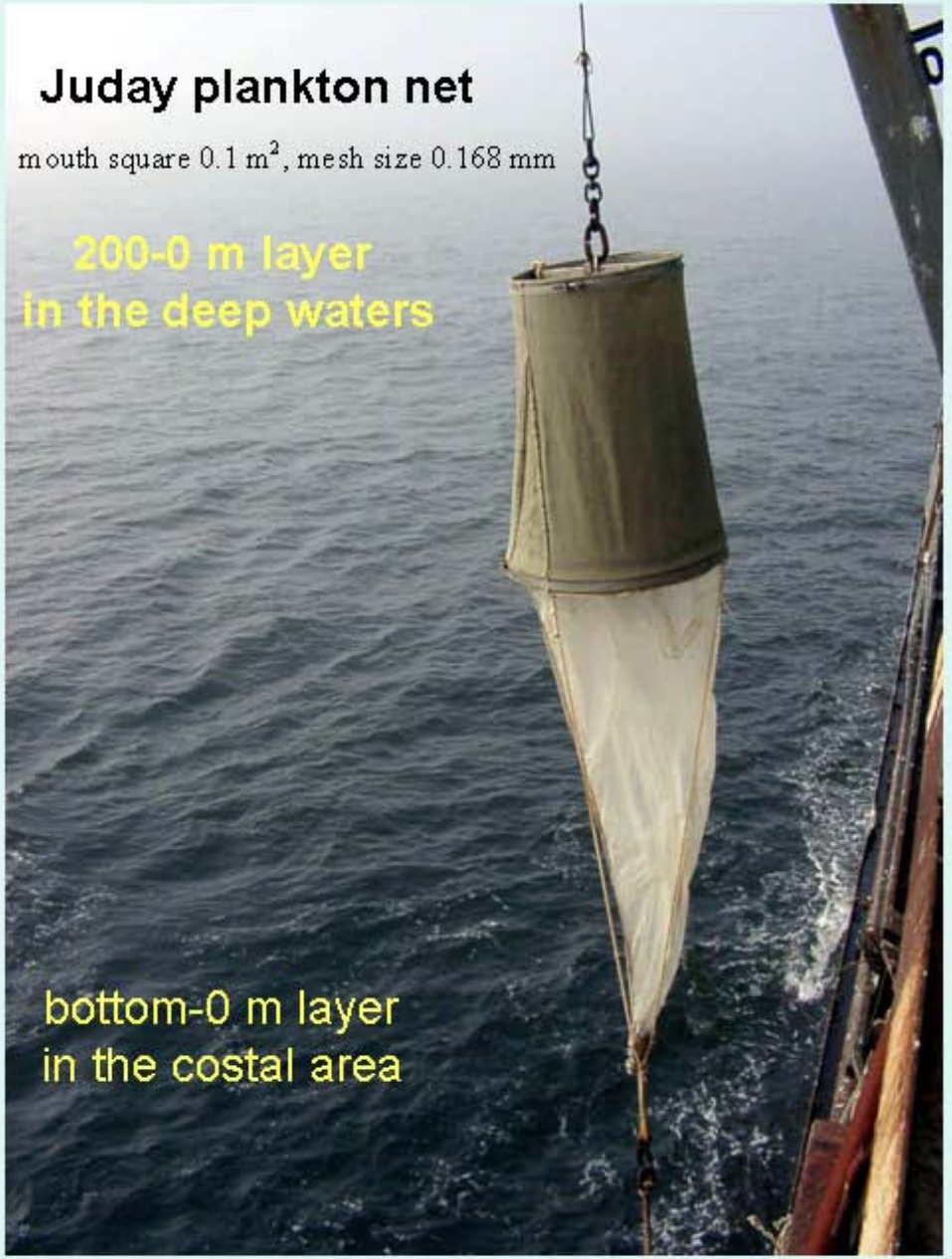
Modern state of zooplankton in the north-western Japan Sea

Pacific Fisheries Research Centre (TINRO-centre), 4 Shevchenko Alley, Vladivostok, Russia, 690950,
dolganova@tinro.ru

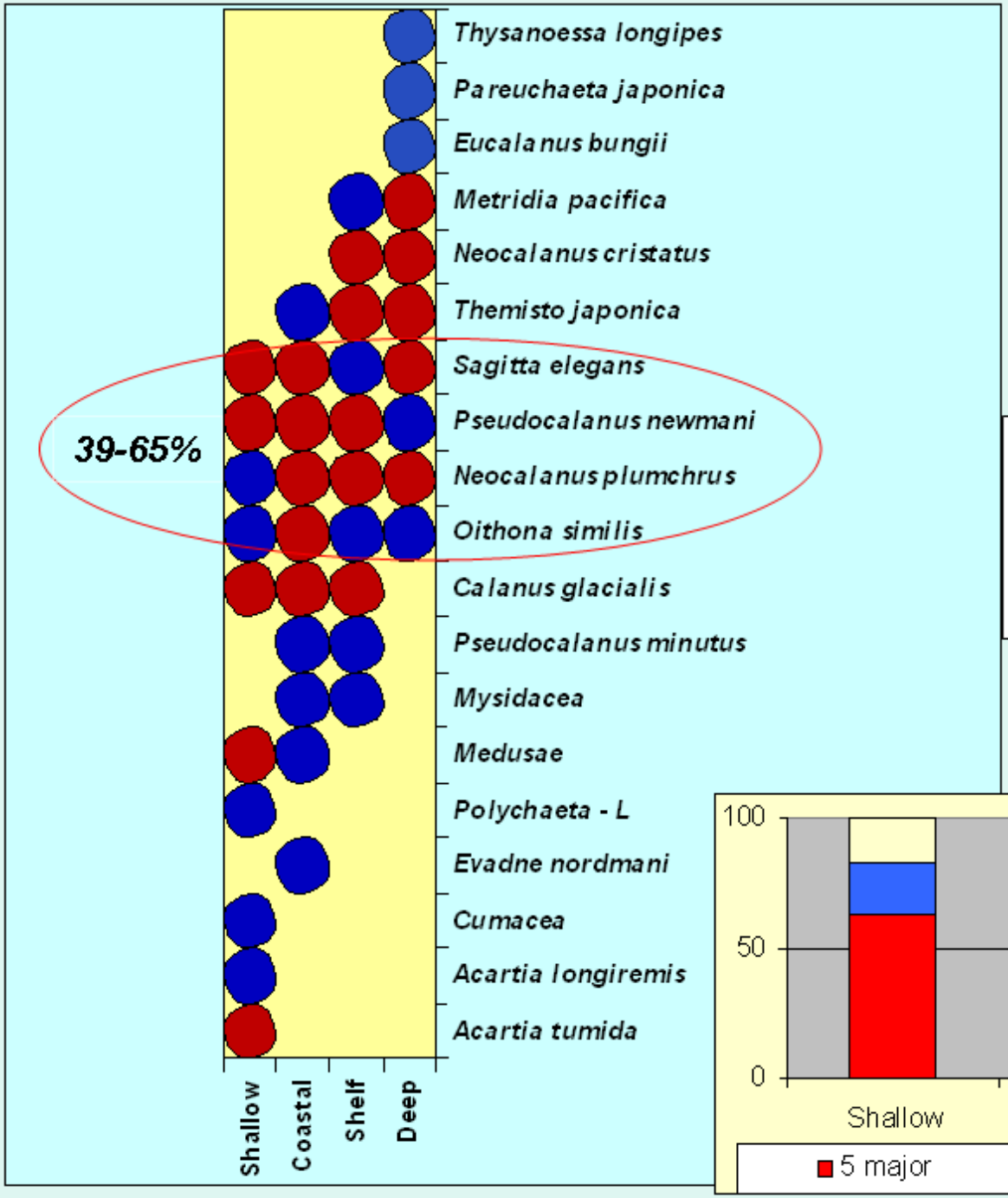
Natalia Dolganova
2007


1160 samples
in 1985-1998
52
50
48
46
44
42
40
38
36
128
130
132
134
136
138
140
142


970 samples
in 2000-2006
52
50
48
46
44
42
40
38


Juday plankton net
mouth square 0.1 m², mesh size 0.168 mm
200-0 m layer
in the deep waters
bottom-0 m layer
in the costal area

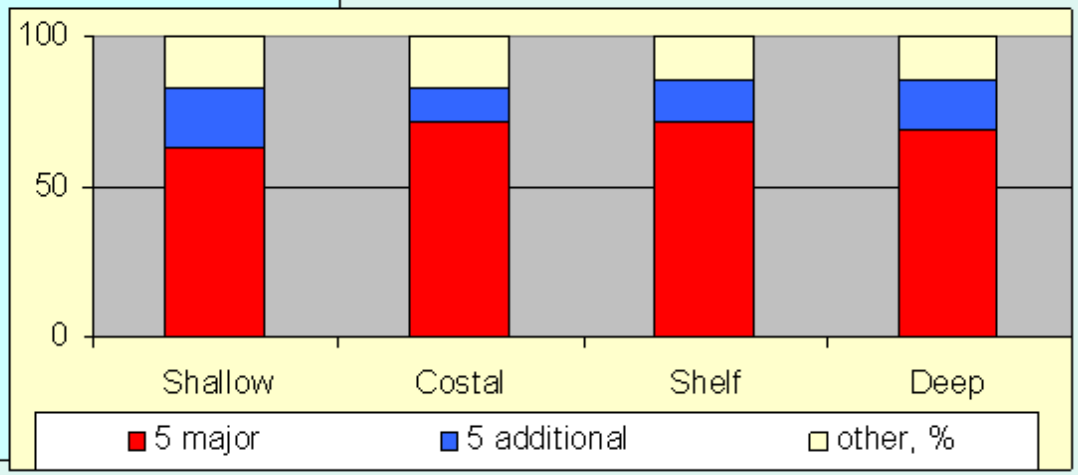
small (SF) middle (MF)	animals with body size less 1.2 mm 1.2-3.5 mm
large (LF)	more than 3.5 mm

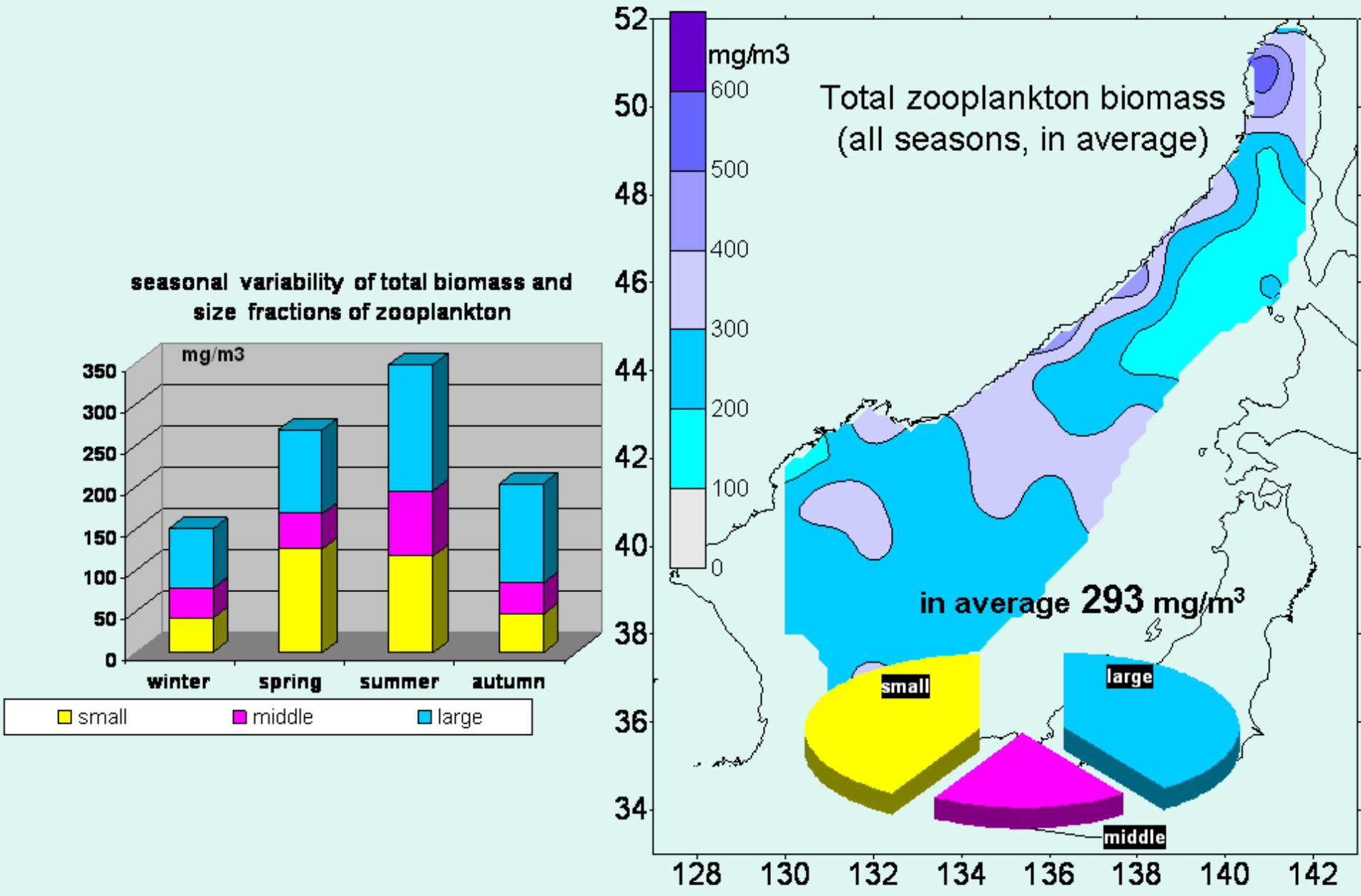


Dominating species of zooplankton

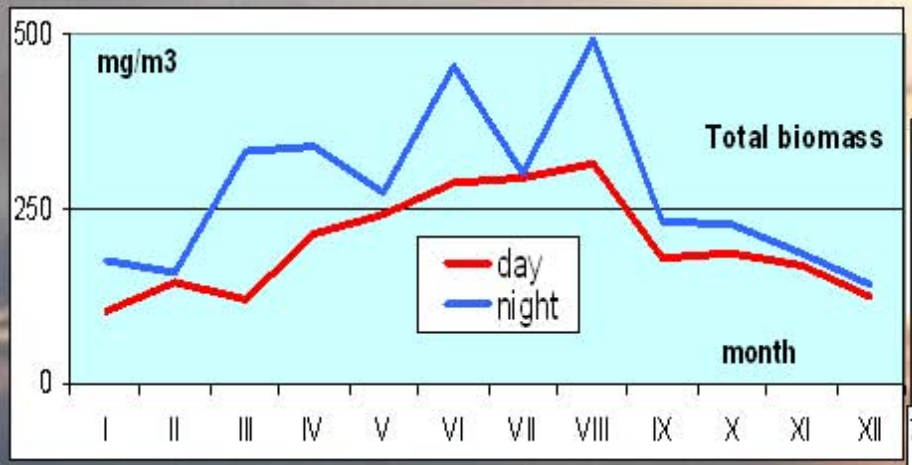
2000-2006

5 major species – 63-72%
5 additional species – 11-20%
Other species – 14-17%
of total biomass

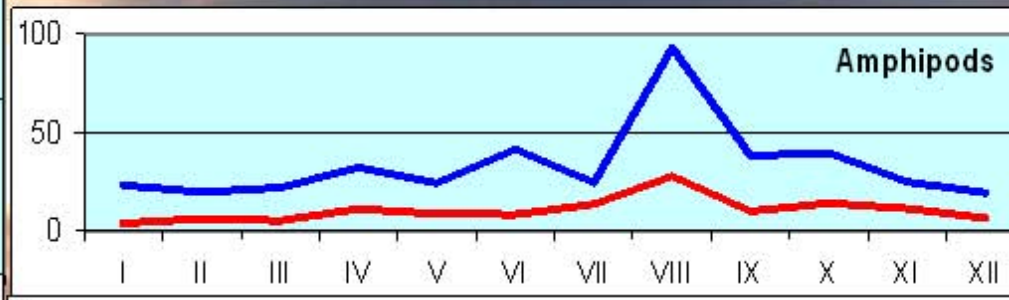


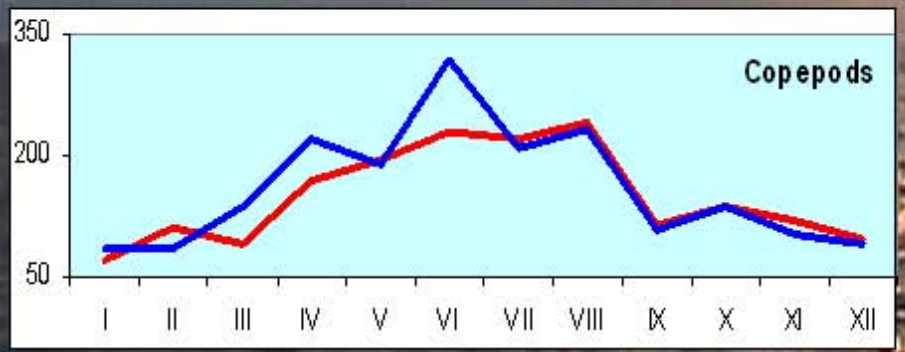

seasonal variability of total biomass and size fractions of zooplankton
mg/m3
350
300
250
200
150
100
50
0
winter
spring
summer
autumn
small
middle
large
mg/m3
600
500
400
300
200
100
0
Total zooplankton biomass
(all seasons, in average)
in average 293 mg/m3
small
large
middle
52
50
48
46
44
42
40
38
36
34
128
130
132
134
136
138
140
142

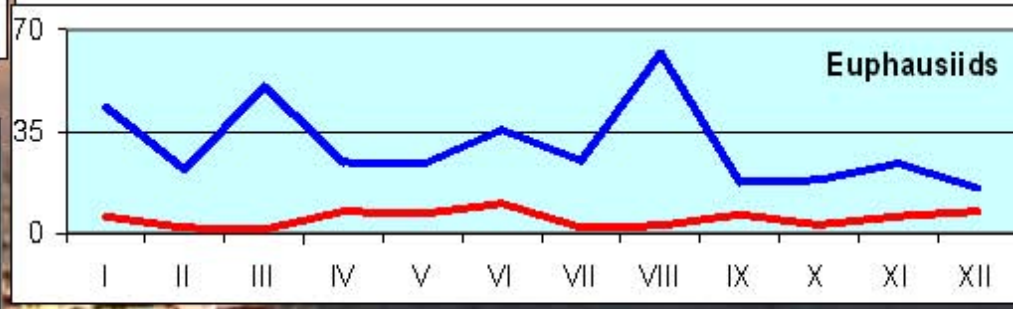
Seasonal variability of daily vertical migrations of zooplankton

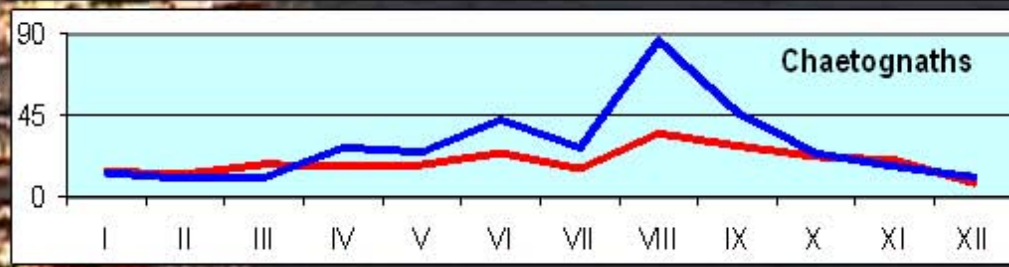


Layer 200-0 m

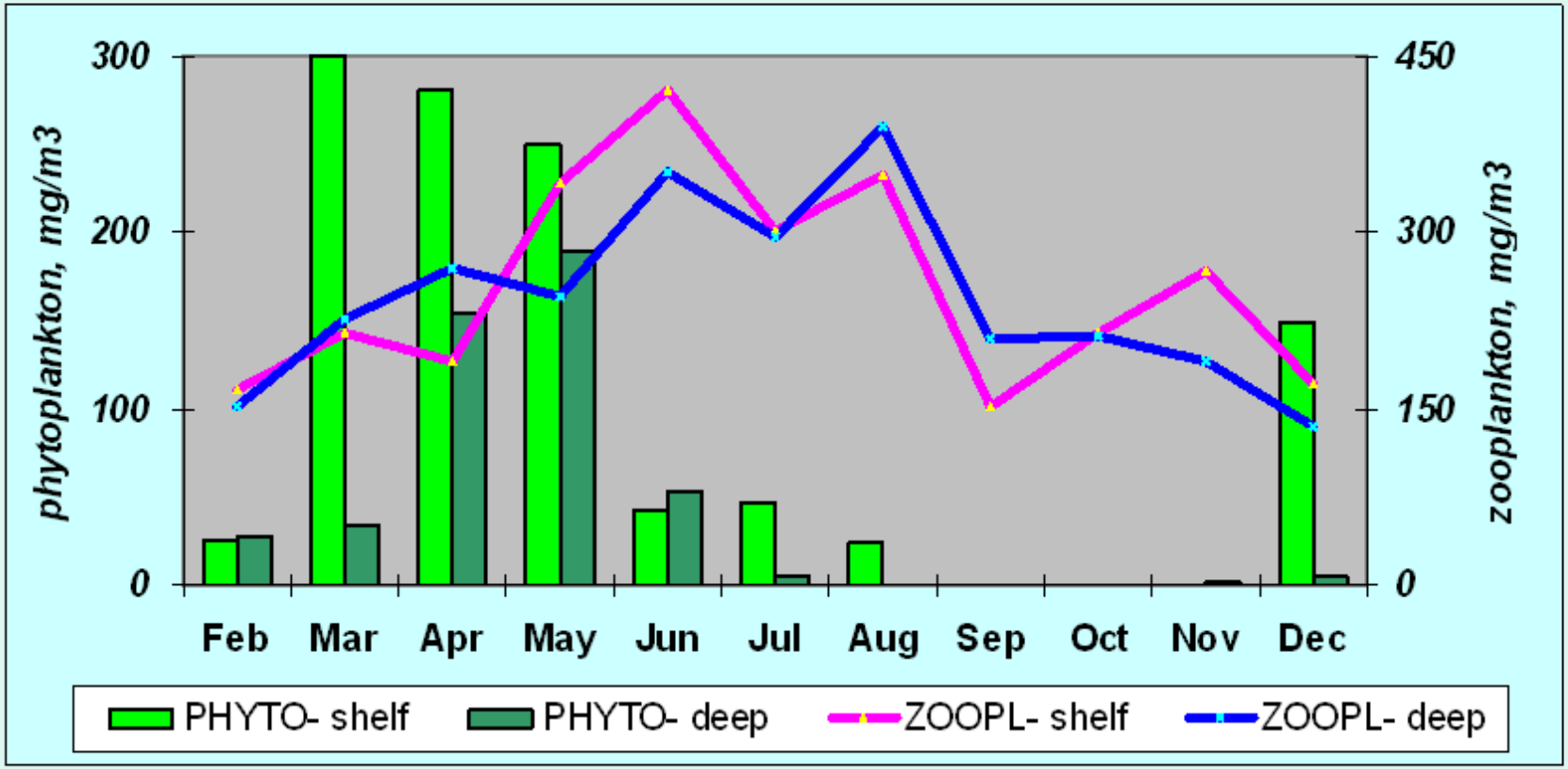








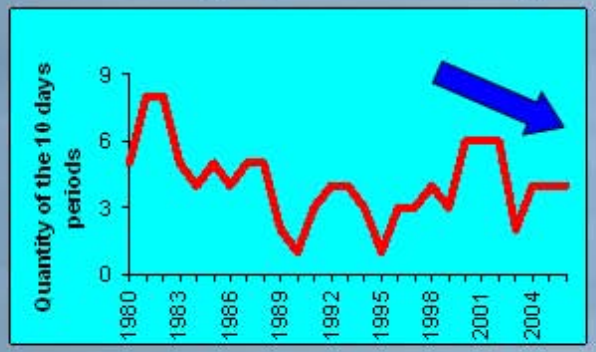
Seasonal variability of phyto- and zooplankton concentration in the northwestern part of Japan Sea



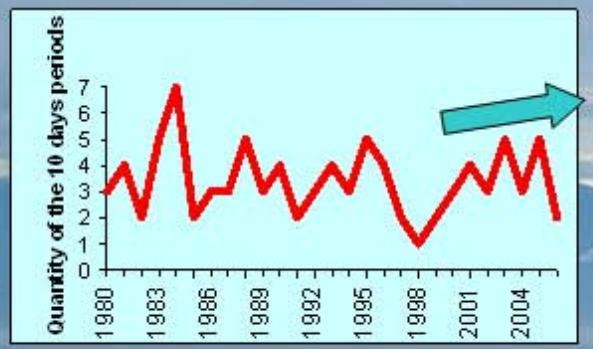
1985-2006, in average

Duration of typical atmospheric processes over the Japan Sea (Glebova, 2006)

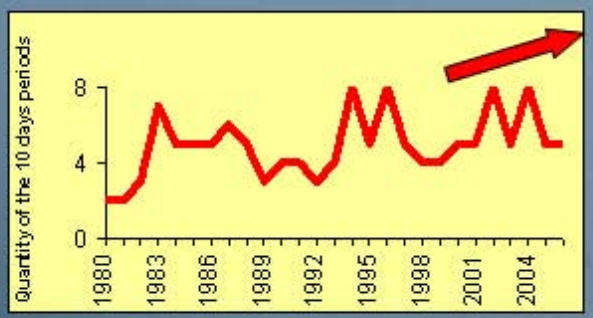
Winter "cold" type (northen monsoon)



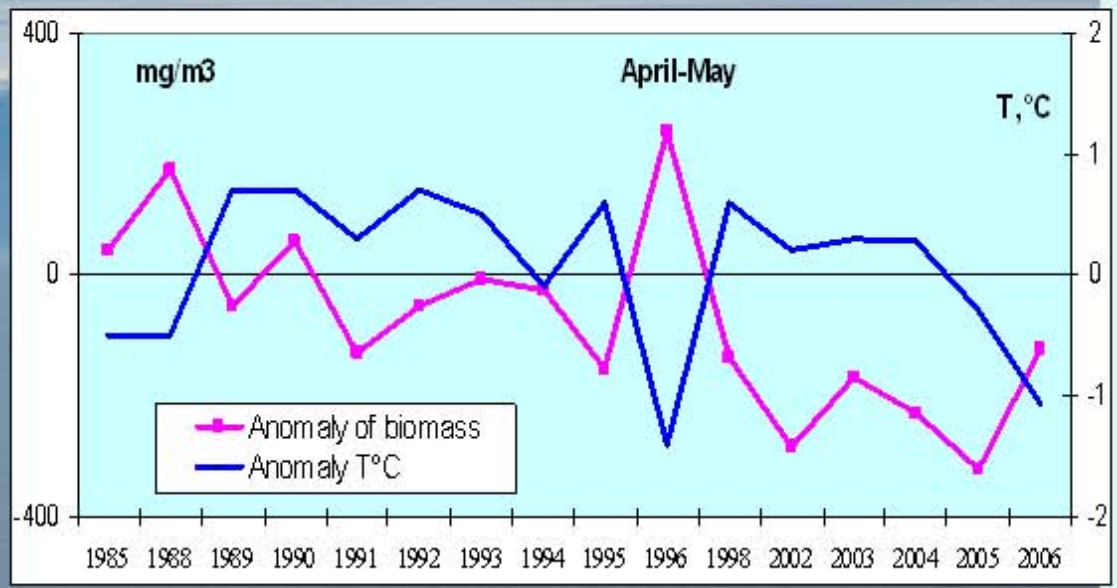
Winter "warm" type (easing northen monsoon)

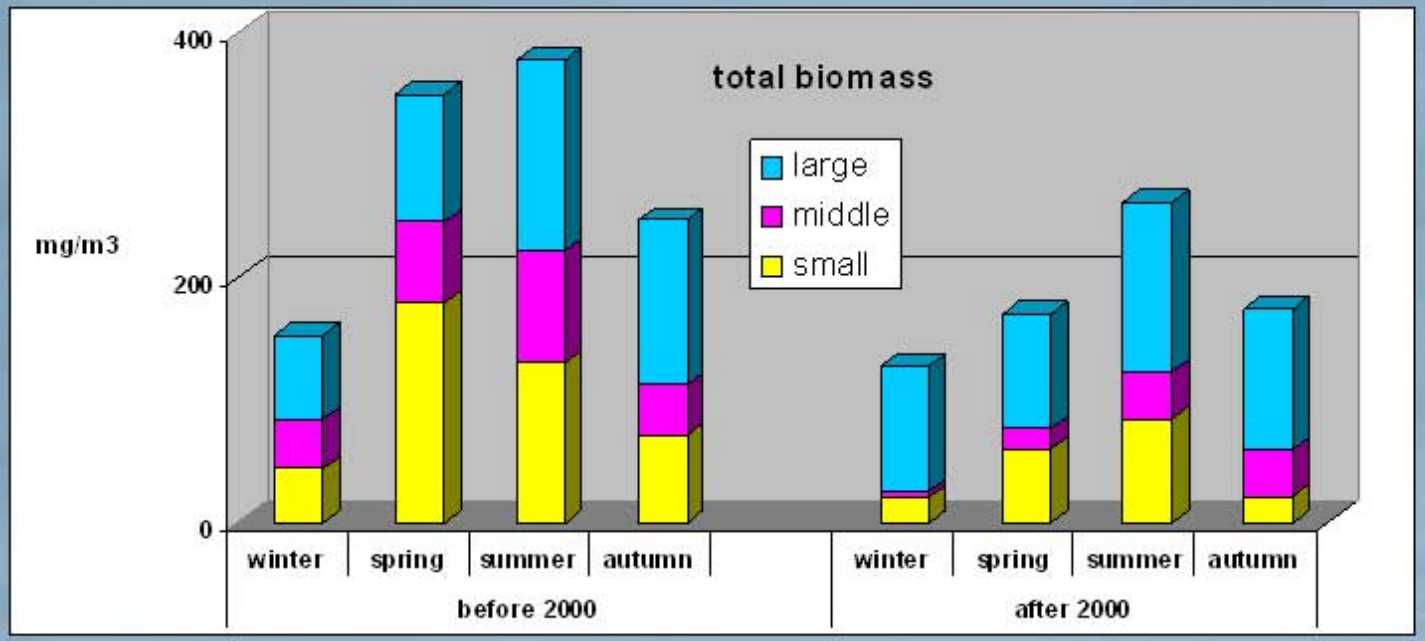


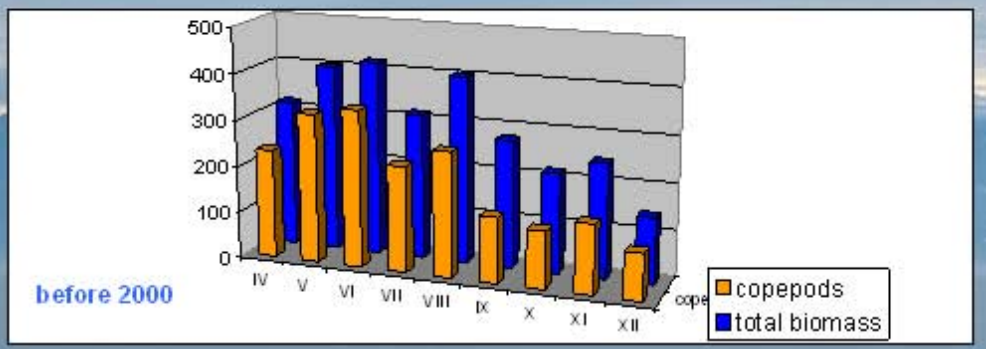
summer type (sourthen monsoon)

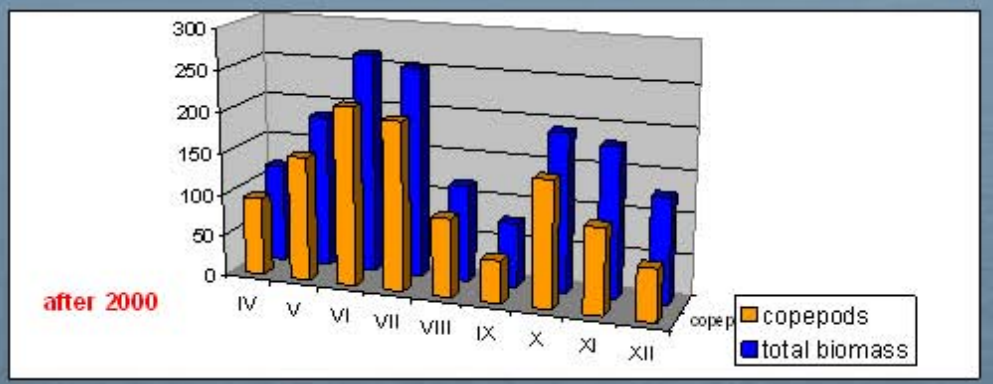


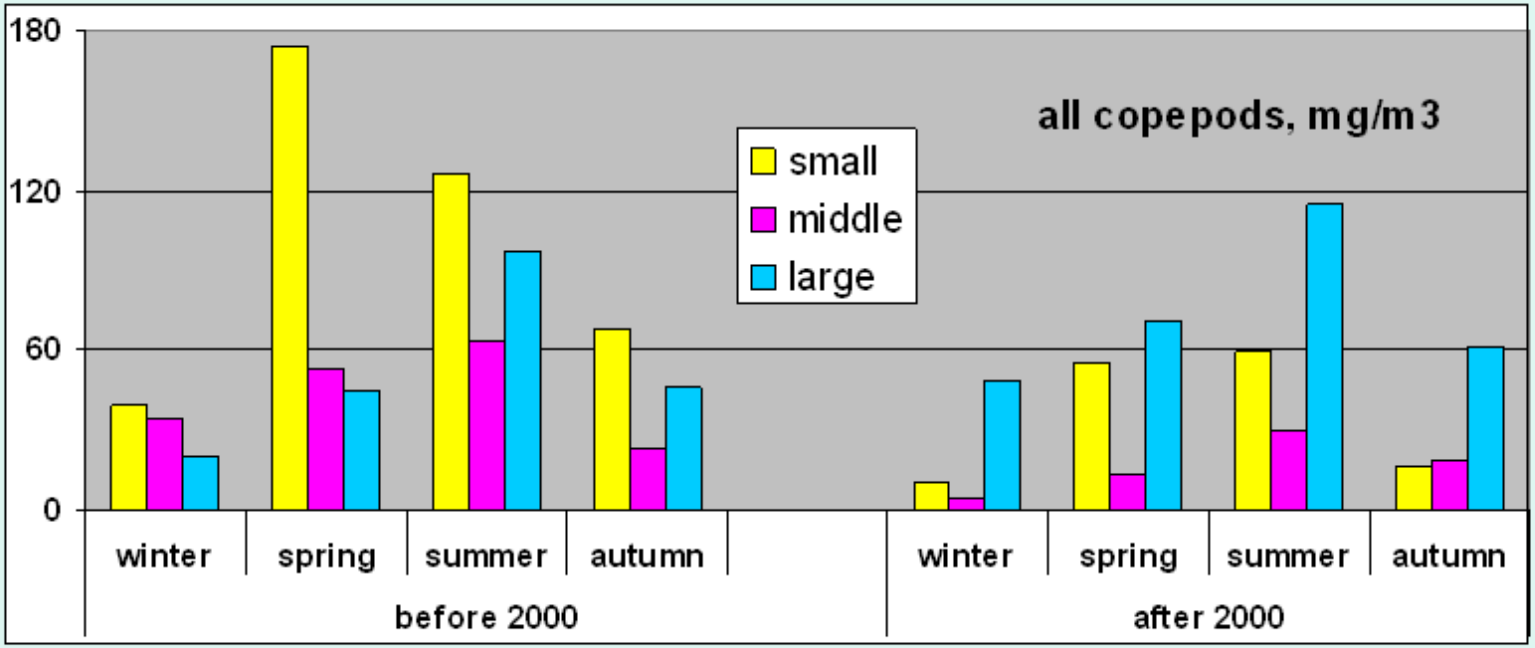
Correlation between water temperature and zooplankton biomass (Dolganova, Zuenko, 2004)

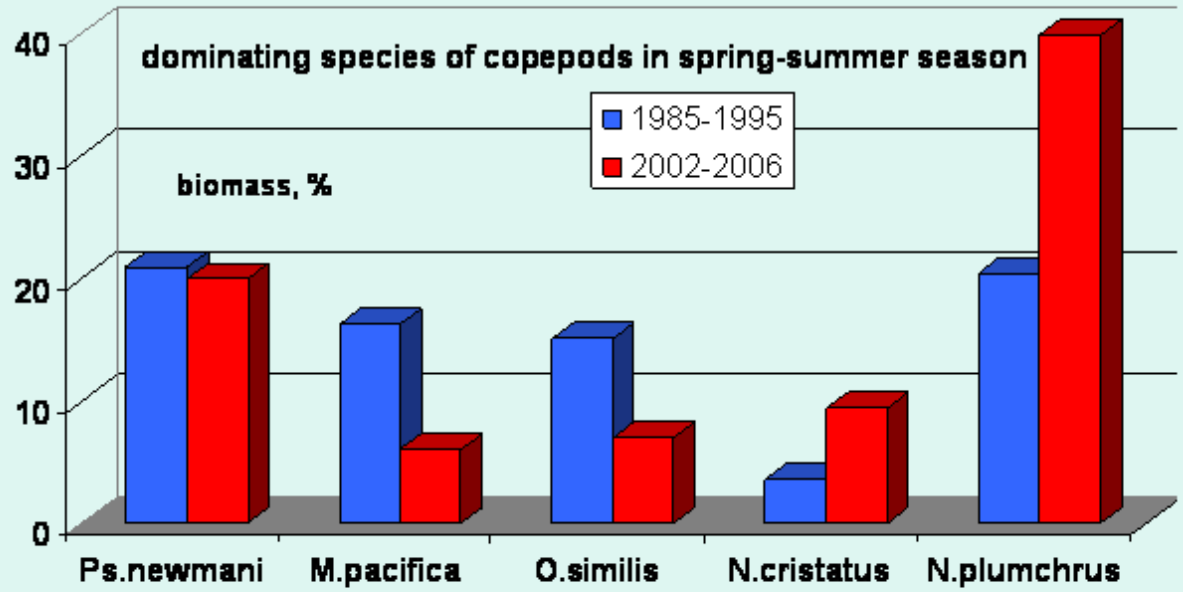



total biomass
mg/m3
400
200
0
large
middle
small
winter
spring
summer
autumn
winter
spring
summer
autumn
before 2000
after 2000

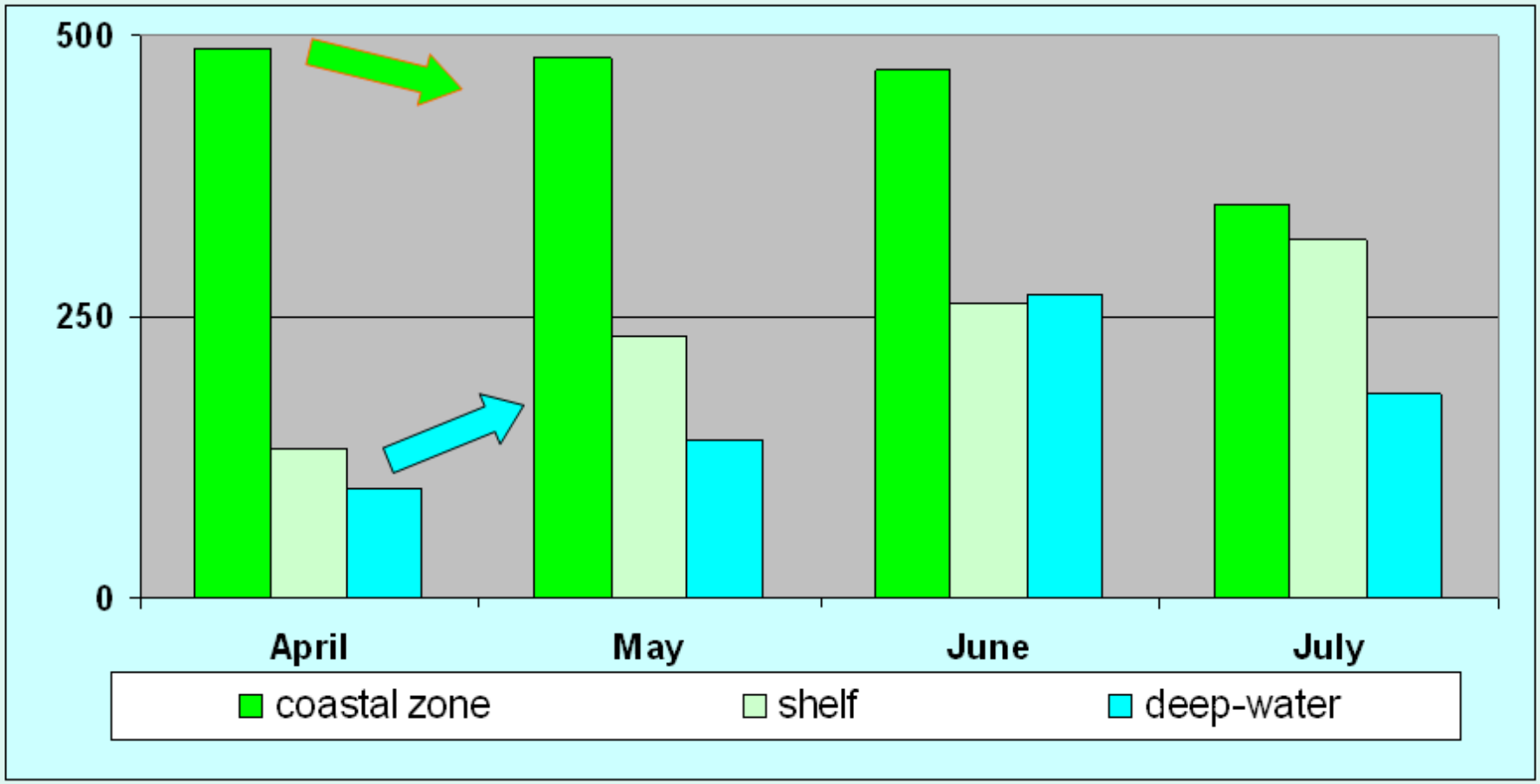

500
400
300
200
100
0
IV
V
VI
VII
VIII
IX
X
XI
XII
before 2000
copepods
total biomass


300
250
200
150
100
50
0
IV
V
VI
VII
VIII
IX
X
XI
XII
after 2000
copepods
total biomass

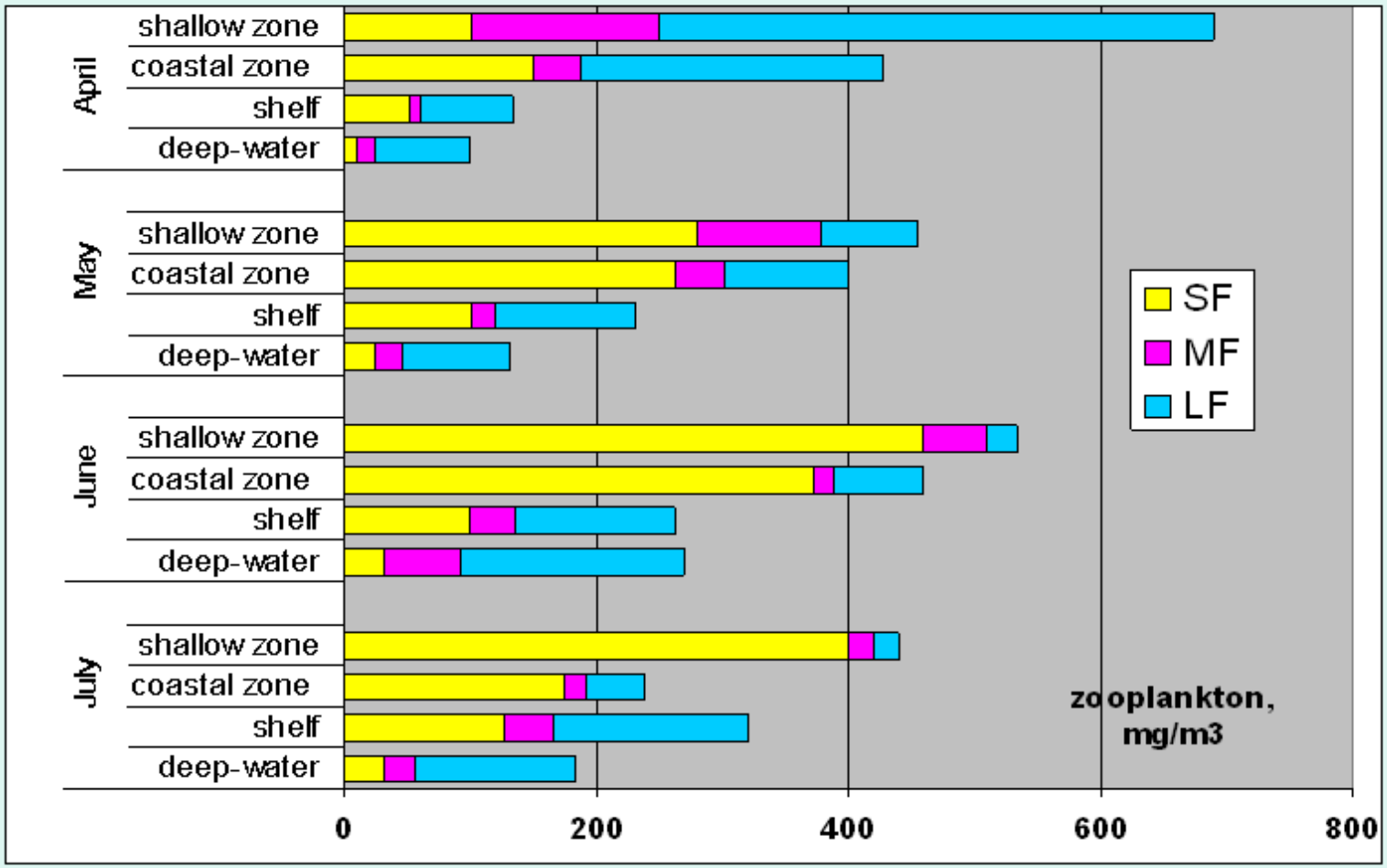

all copepods, mg/m3
small
middle
large
180
120
60
0
winter
spring
summer
autumn
winter
spring
summer
autumn
before 2000
after 2000


dominating species of copepods in spring-summer season
1985-1995
2002-2006
biomass, %
40
30
20
10
0
Ps.newmani
M.pacifica
O.similis
N.cristatus
N.plumchrus

Total biomass (mg/m^3) of zooplankton in 2002-2006

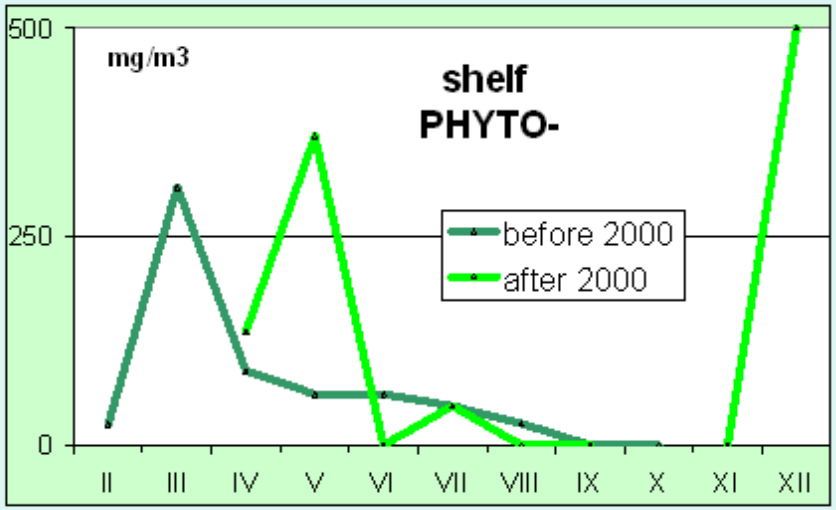


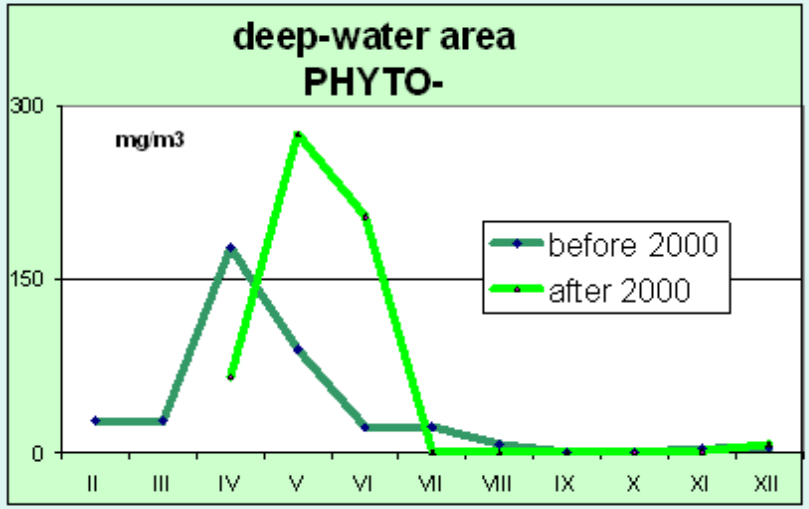
Seasonal variability of zooplankton size-structure in certain zones

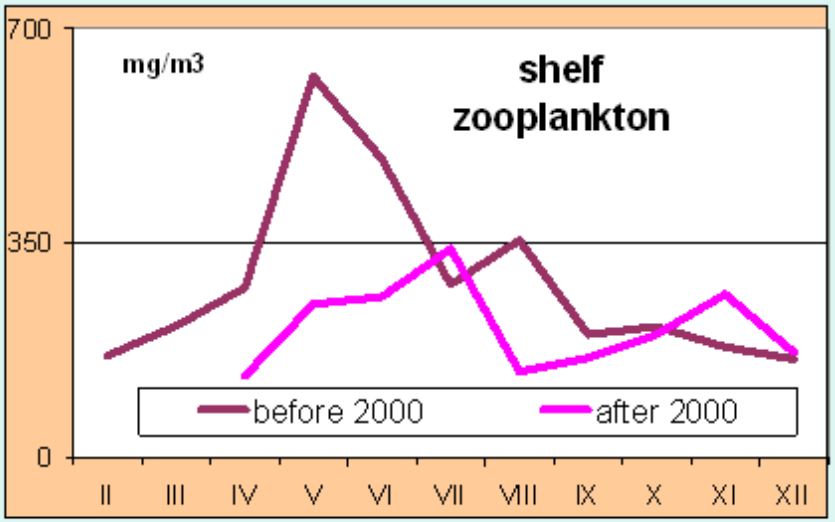


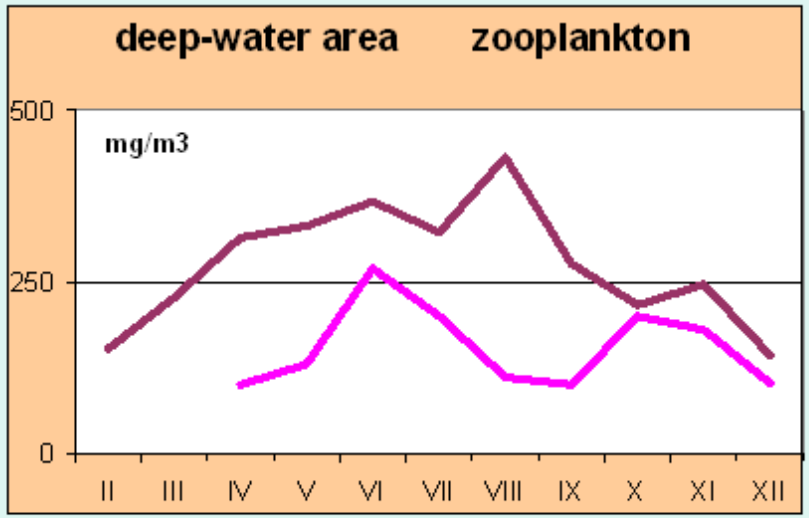
Spring-summer period of 2002-2006

Seasonal dynamics and interunnual variability of Phyto- and Zooplankton in the north-western Japan Sea

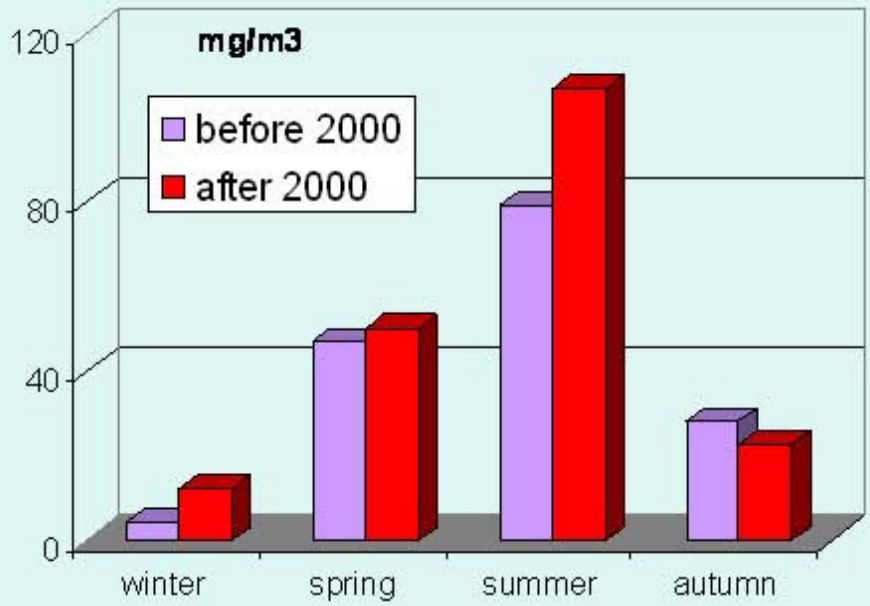


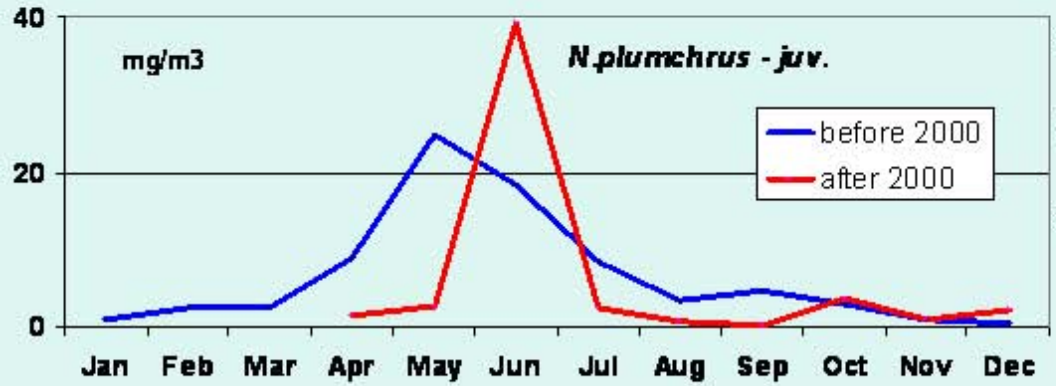


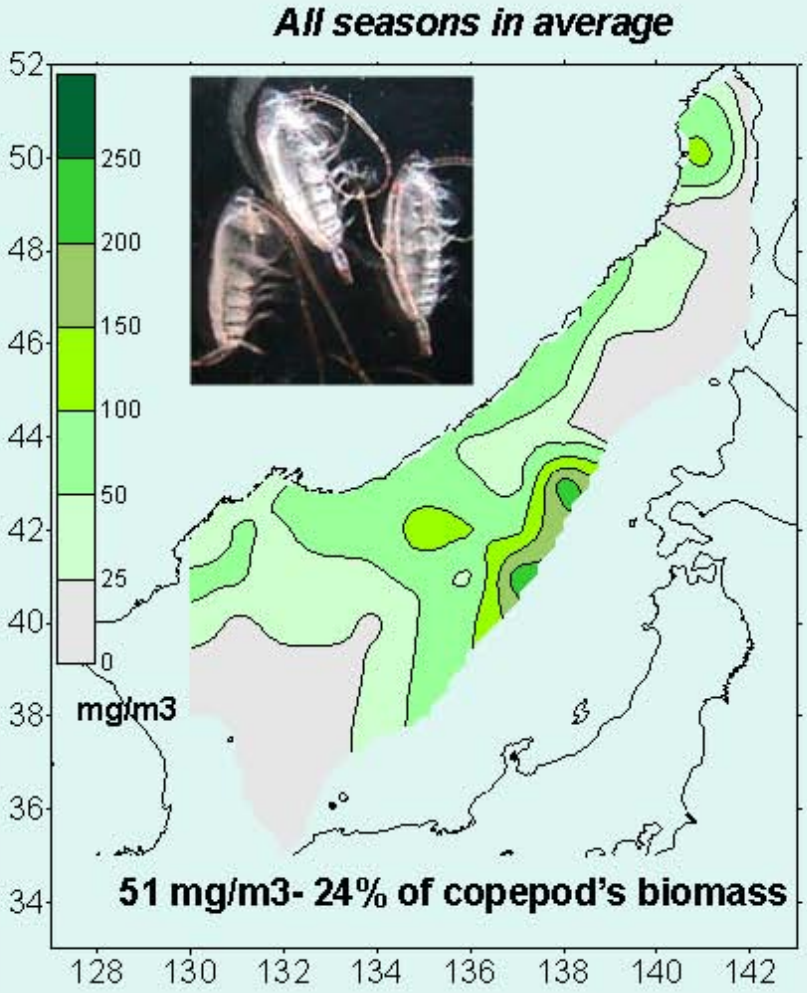




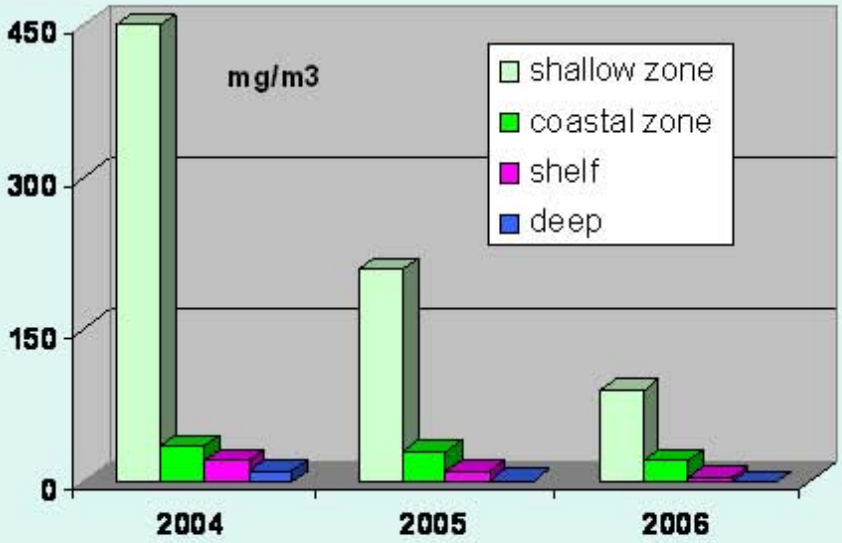
Neocalanus plumchrus s.l. becomes more abundant

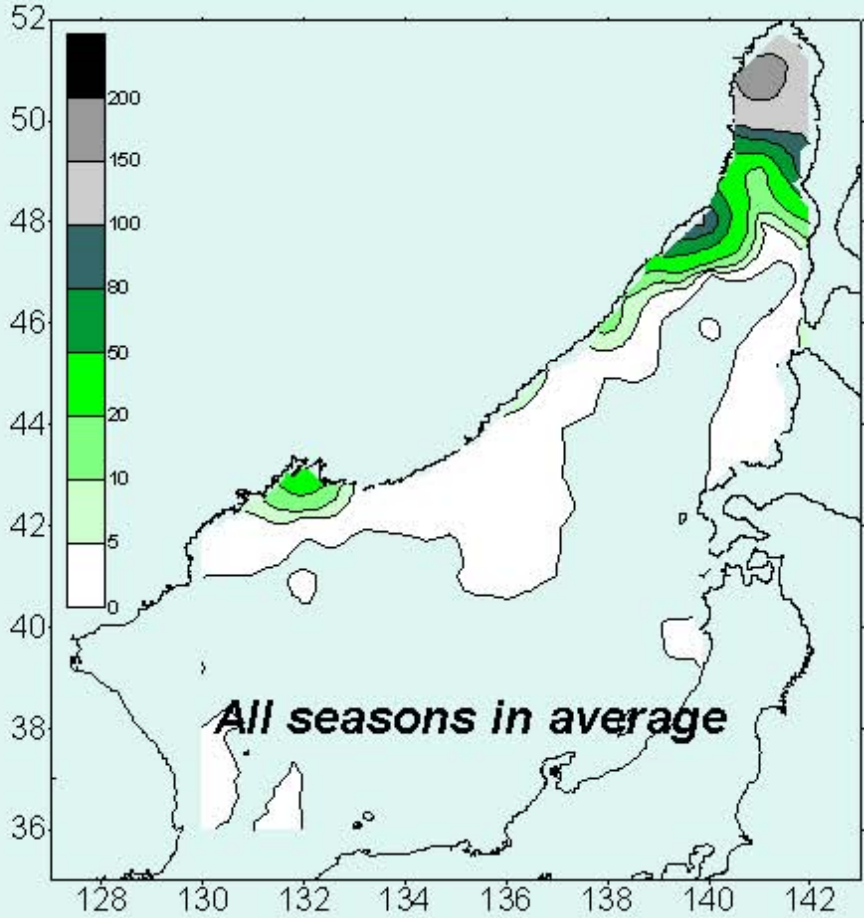


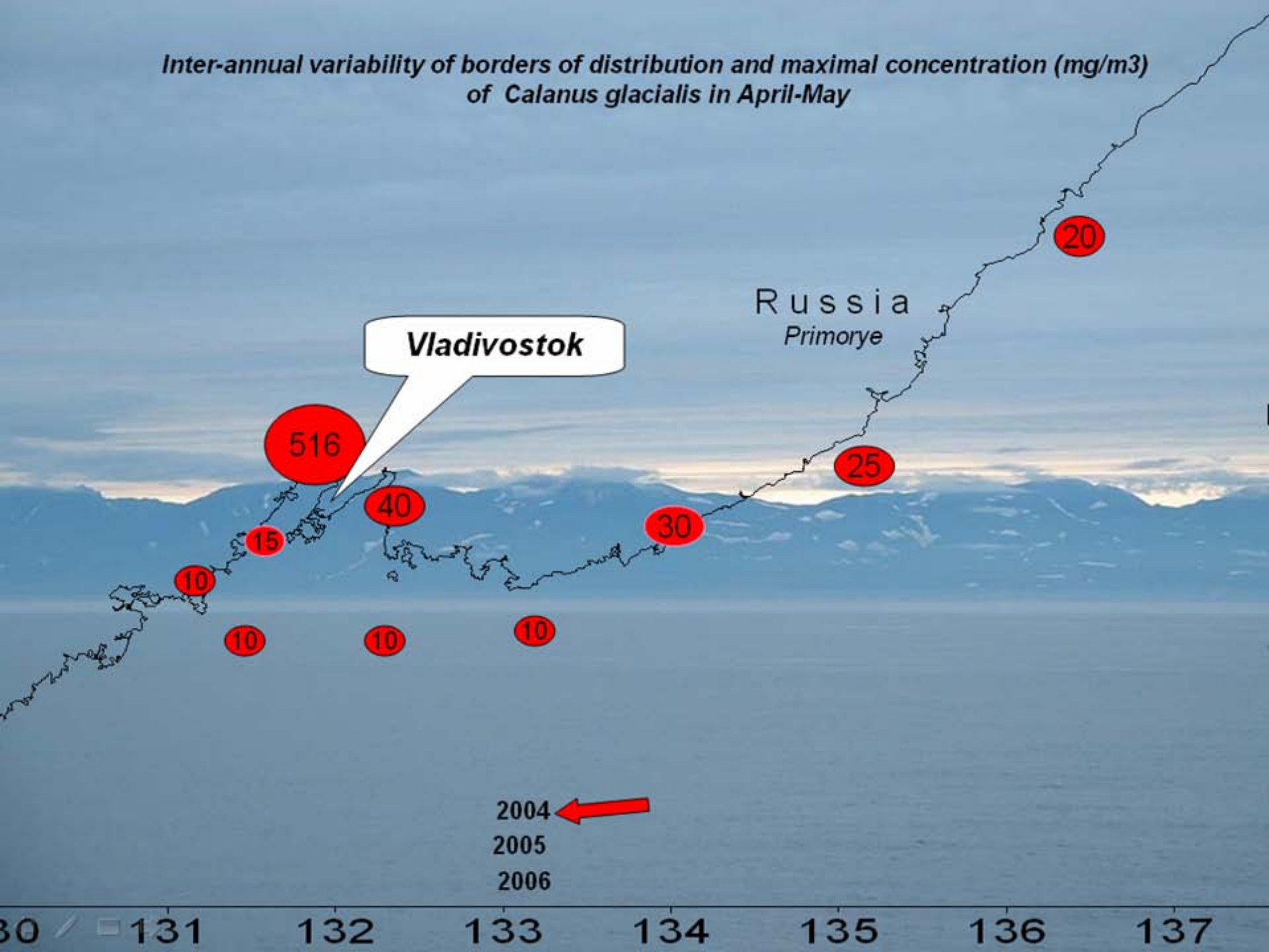


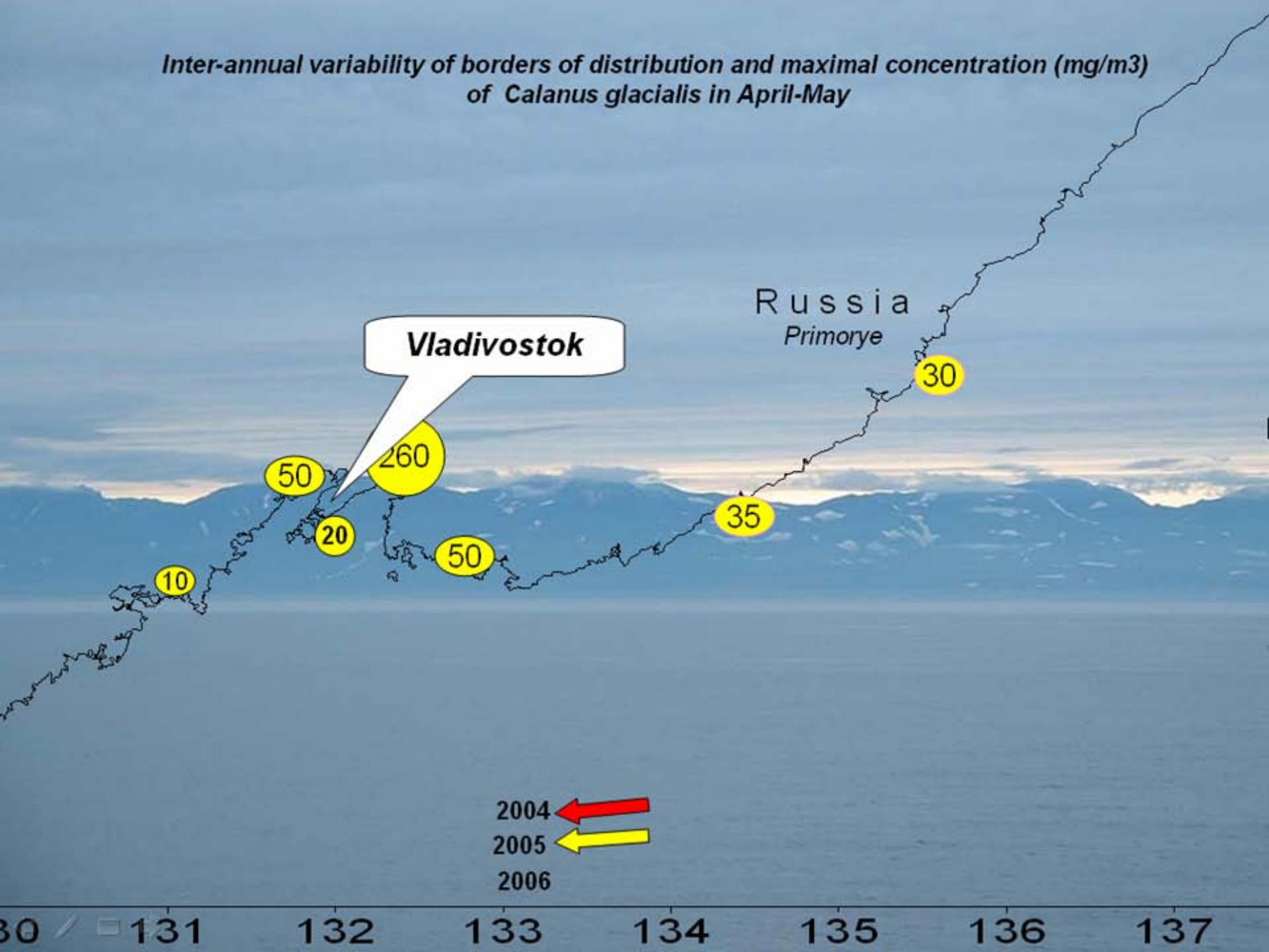


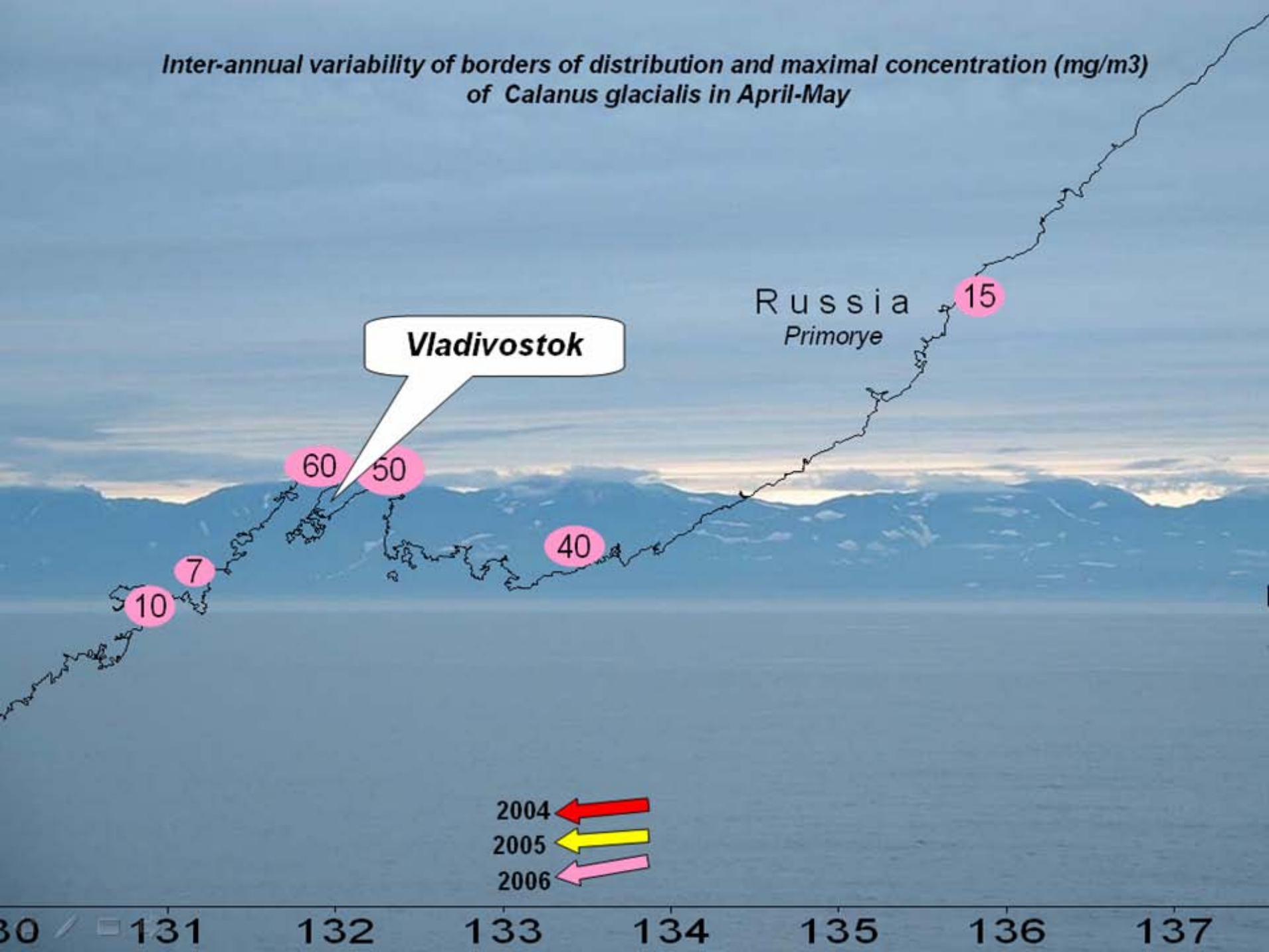
Calanus glacialis is limited by shelf zone



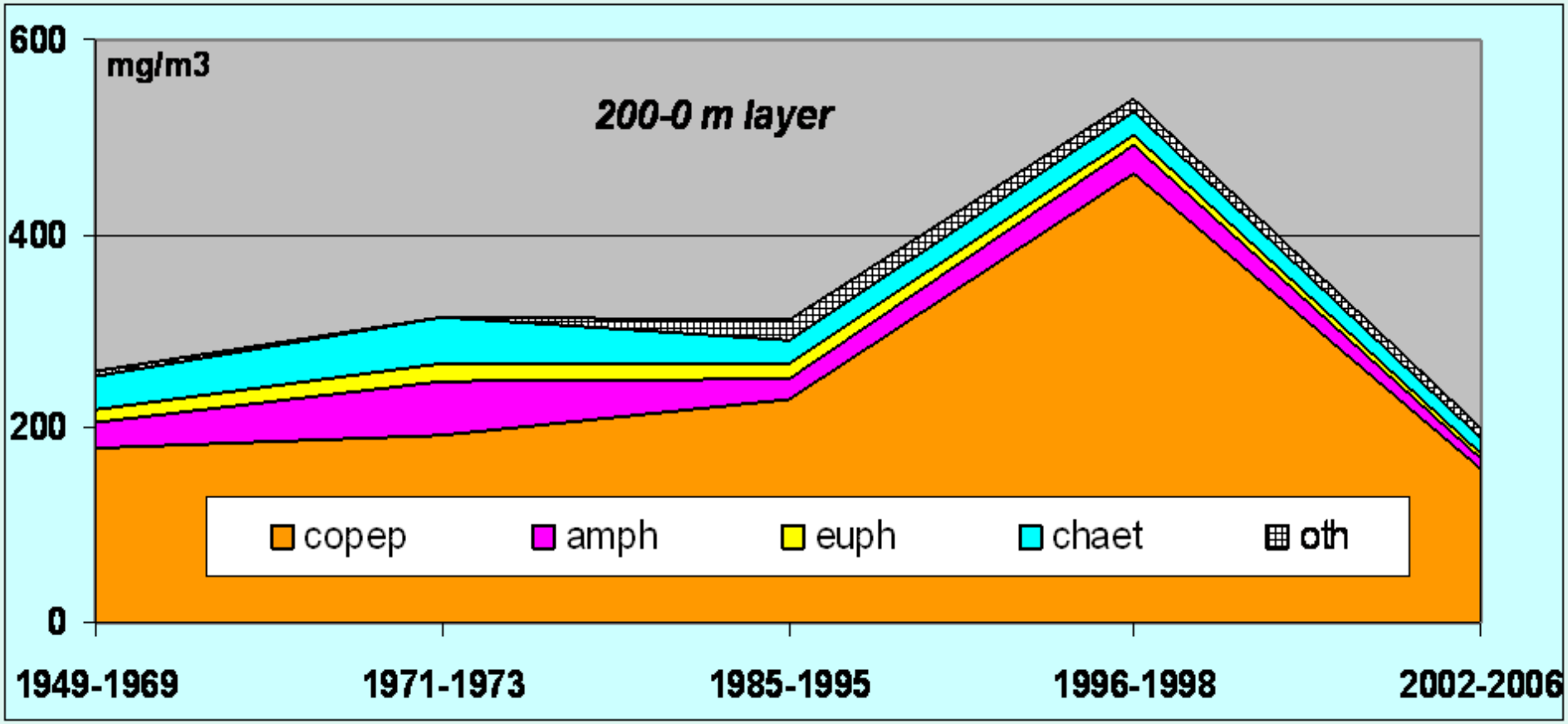



Inter-annual variability of borders of distribution and maximal concentration (mg/m3)
of Calanus glacialis in April-May
Russia
Primorye
Vladivostok
516
40
15
10
10
10
30
25
20
2004
2005
2006
131
132
133
134
135
136
137

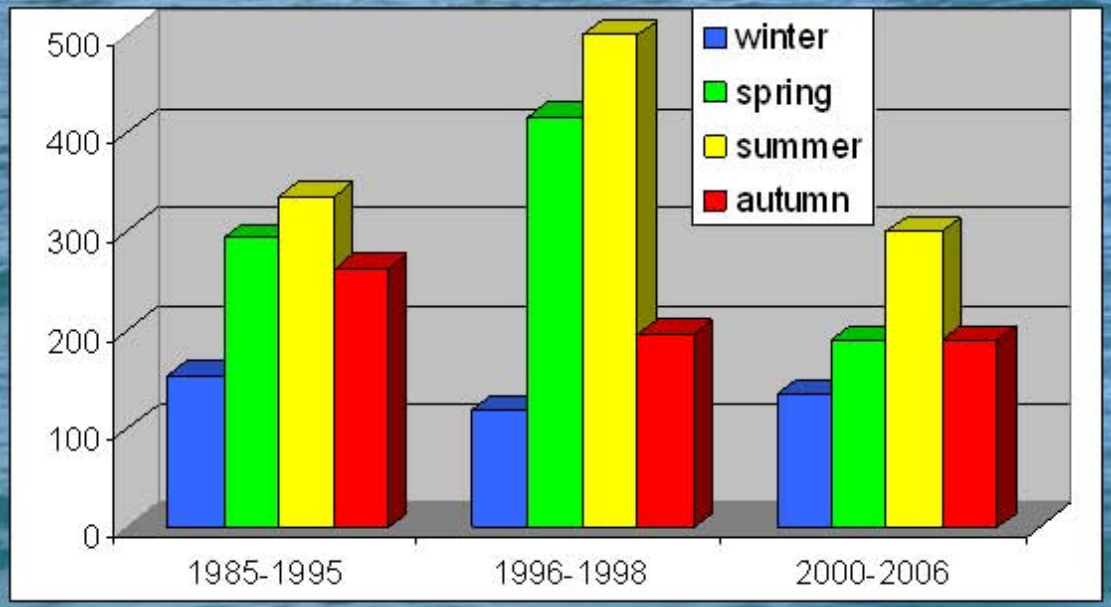

Inter-annual variability of borders of distribution and maximal concentration (mg/m3)
of Calanus glacialis in April-May
Russia
Primorye
Vladivostok
260
50
20
50
10
35
30
2004
2005
2006
131
132
133
134
135
136
137


Inter-annual variability of borders of distribution and maximal concentration (mg/m3)
of Calanus glacialis in April-May
Russia
Primorye
Vladivostok
60
50
40
15
7
10
2004
2005
2006
131
132
133
134
135
136
137

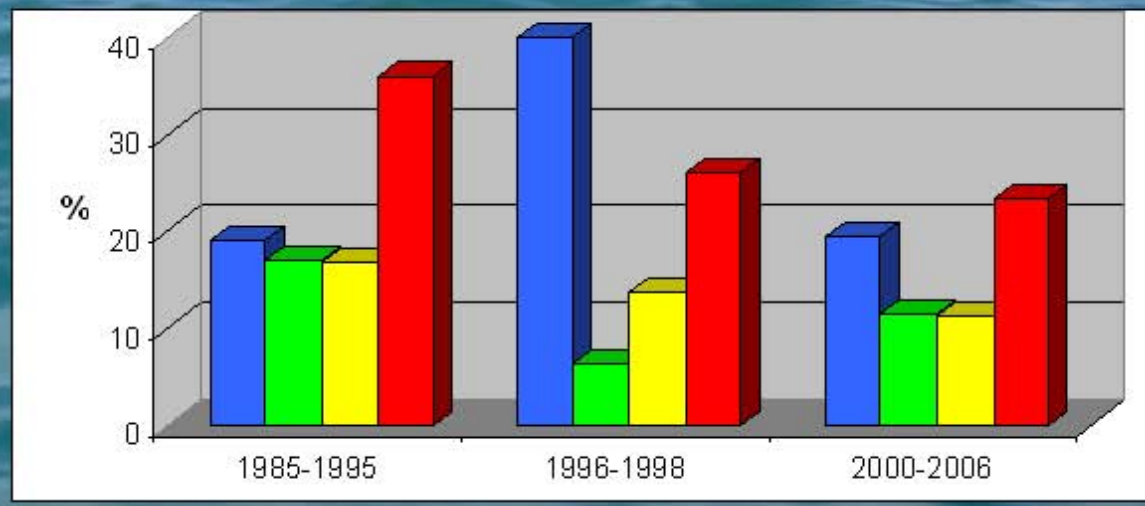
Inter-annual variability of zooplankton in the Japan Sea (Russian EEZ)
in spring-summer period

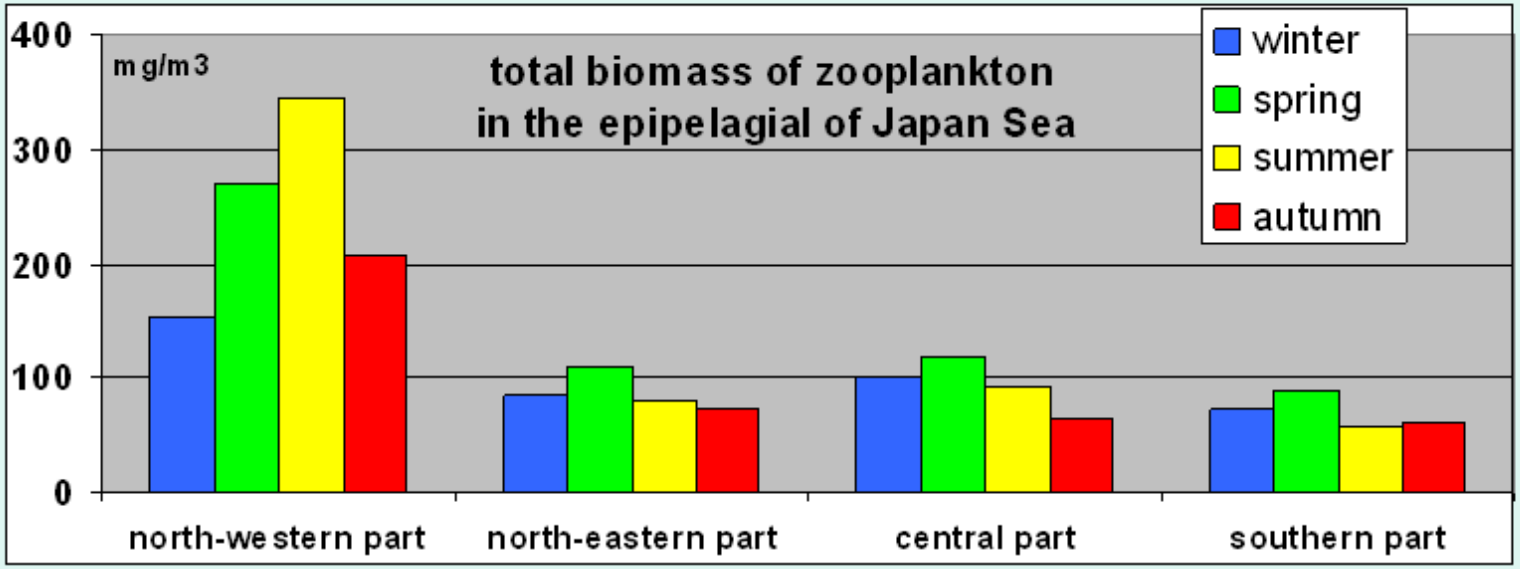


Inter-annual variability of zooplankton biomass (mg/m3) in the Russian EEZ of Japan Sea in different seasons

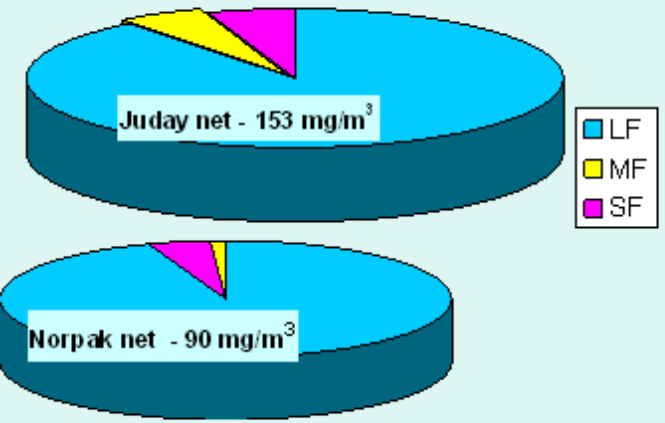


Share (%) of carnivorous plankton in total biomass





North-western North-eastern	Dolganova, 2001; 2002; Dolganova, Zuenko, 2004 Hirota, Hasegawa, 1999; Kotori, Hirano, 2000
Central part Southern	Nishihawa et al., 1995; Terazaki, 1999; Hirakawa et al., 1999 Hirakawa et al., 1995; Minami et al., 1999; Kim et al., 1999; 2001; Kang et al., 2002; Chiba, Saino, 2002; 2003; Iguchi, 2004; Song, Kang, 2006



Dolganova N.T., Kidokoro H., 2003. (Juday, Norpak)	Compared catch efficiency of different plankton nets in the Japan sea // PICES.- XII Annual Meeting. Abstr.- Seoul, Republic of Korea..
Gorbatenko K.M., Dolganova N.T., 2007. (Juday, JuOM, Norpak, WP-2, Bongo).	Comparing the catch efficiency with different types of plankton nets in the high production zones of the Pacific ocean.- Okeanologiya, V.47, № 2.

Conclusion

A north-western Japan Sea has twice higher biomass of zooplankton in the epipelagic layer, than the central and southern parts.

In the shallow and coastal zones of the northwest Japan Sea zooplankton abundance is the highest in spring, but in the shelf and deep-water zones – in summer.

After the highest abundance in 1990s, total biomass of zooplankton has essential decrease in the last 5 years, but structure of plankton community (ratio of major groups) has no changes. However, there are some changes among copepods community: small-size species were decreased, and large-size species – increased.

There are noticeable changes in the time and duration of biological seasons in the last 5 years. Phytoplankton "blooming" delayed, and an annual maximum of zooplankton abundance began later. The time of spawning of mass species also became more than 1 month later.

Interunnual variability of zooplankton abundance depends on the temperature in surface layer: the lower the temperature, the higher the biomass.

Thank you for your attention