Structure of the nekton community of the upper epipelagial in the Northwestern Pacific Ocean in February-April

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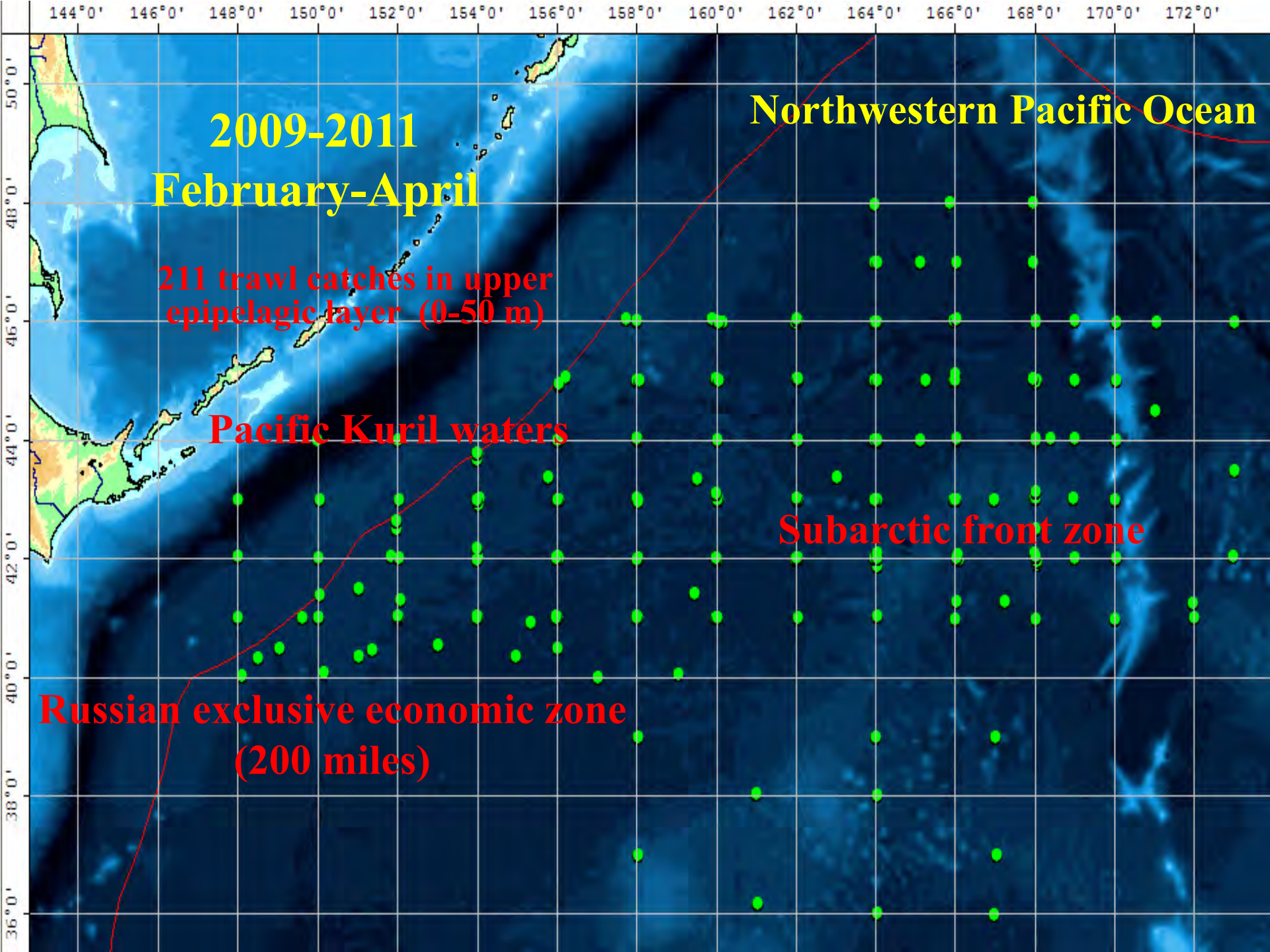
Purpose:

- Describe the features of species composition and quantity distribution in nekton community during early spring period

Methods:

- Primary data for quantity composition and biomass of plankton and nekton, also as nutrition samples were taken from trawl and net catches collected during expeditions TINRO-centre in NWPO in February-April in 2009-2011
- Species names were checked and corrected in accordance with the data FishBase
- In the construction of different species of distribution schemes have been used the relative abundance of nekton (kg / km ^{2}).


144°0'
146°0'
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164°0'
166°0'
168°0'
170°0'
172°0'
50°0'
48°0'
46°0'
44°0'
42°0'
40°0'
38°0'
36°0'
2009-2011
February-April
Northwestern Pacific Ocean
211 trawl catches in upper epipelagic layer (0-50 m)
Pacific Kuril waters
Subarctic front zone
Russian exclusive economic zone (200 miles)

$$\frac{M}{A} \cdot \frac{p}{k} = \frac{M \cdot p}{1.852 \cdot v \cdot t \cdot 0.001 \cdot a \cdot k}$$

- M - mass of fish in the catch (ind., kg)
- A - the area, covered with trawl catches (km^2)
- v – the trawling velocity (kn)
- t - the time of trawl catches (h)
- a – the horizontal opening of the trawl (m)
- p, k – the correction coefficients
- p – the capacity coefficient, applied to compensate graded trawling ($p \geq 1$)
- k – the catchability coefficient of the trawl
- 1,852 - the number of kilometers in one nautical mile, 0.001 – the number of kilometers in one meter

$$q = b / k_y * s$$

q - the arithmetic mean of species distribution densities at each station

b - mass of the species in the catch

S – the size of the area trawled for 1 hour, which is calculated from the horizontal opening of the trawl and the average vessel speed, taking into account the catchability of the species k_y

$$B = Q * S / 10^6$$

- B – biomass of the species (thousand t)
- Q – the mean density of species distribution within the studied area (kg/km^2)
- S – area (km^2)

Classification by Parin N.V. (1968)

Fish community 54 species

Lamna ditropis

Holoepipelagic group (permanent inhabitants) 7 species

Brama japonica

Desmodema lorum

Xenoepipelagic group (accidental inhabitants) 12 species

Caristius macropus

Benthalbella dentata

Meroepipelagic group (temporary inhabitants) 35 species

Genera Oncorhynchus

Family Myctophidae

Cephalopod community 19 species

Classification by Nesis K.N. (1985)

Epipelagic group 5 species

Boreoteuthis borealis

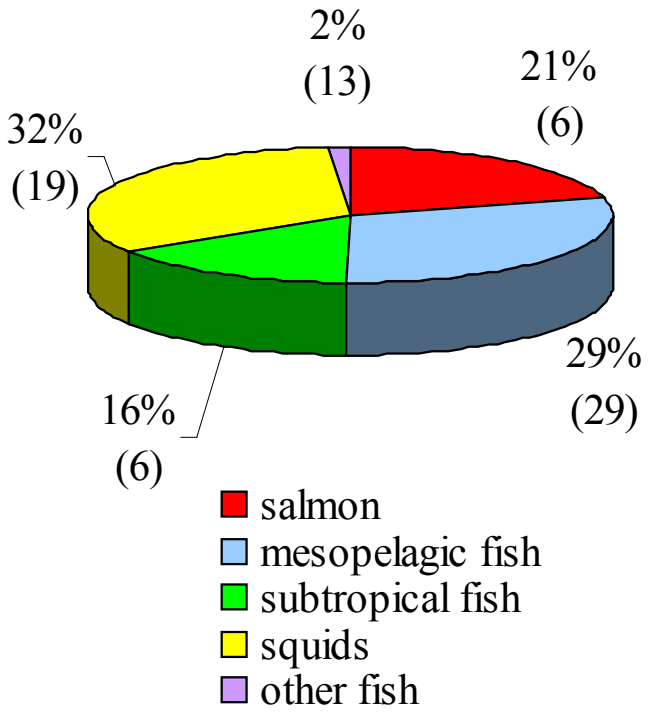
Onychoteuthis borealijaponicus

Mesopelagic group 14 species

Genera Gonatus

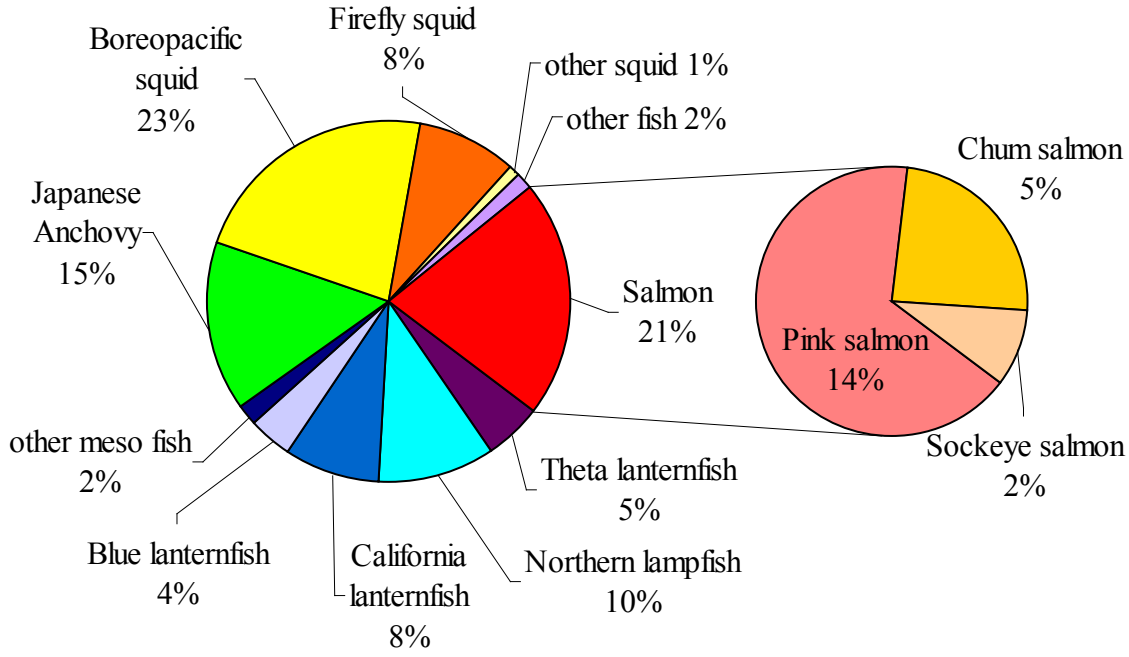
Watasenia scintillans

The share (%) of certain groups of species in nekton community in 2009-2011
(**N** - number of species)

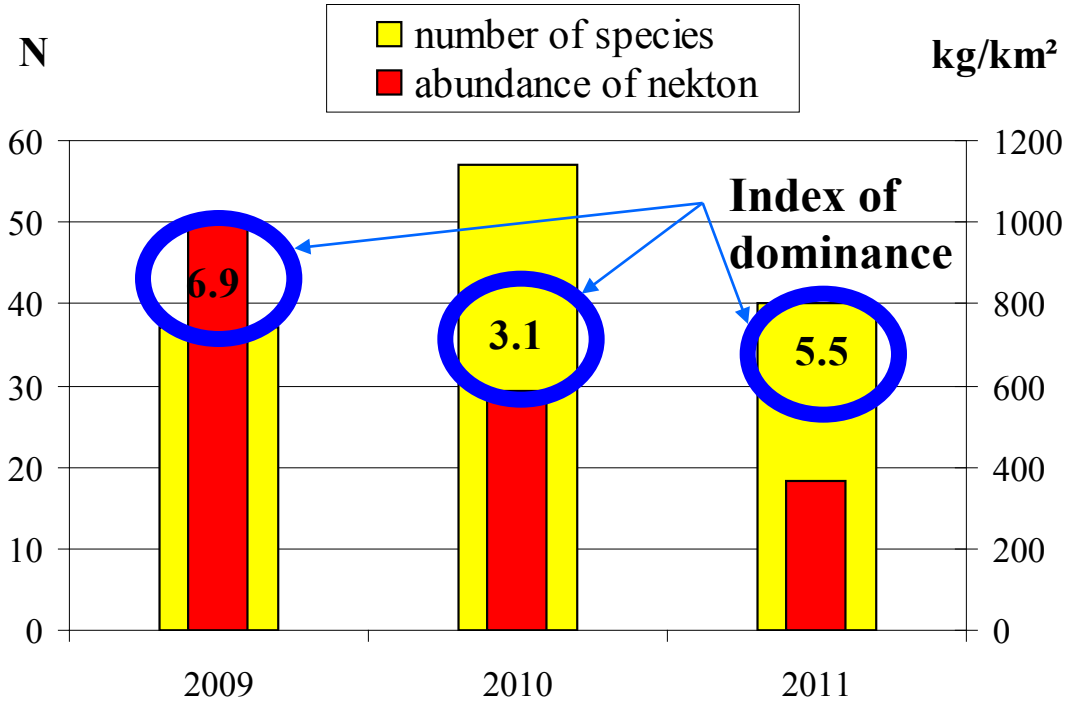


The share (%) of dominant species in nekton community in 2009-2011

Average nekton biomass - 634 000 t



Year-to-year dynamic of species composition and abundance of nekton community



Index of dominance = 1/Simpson's diversity index (Simpson, 1949)

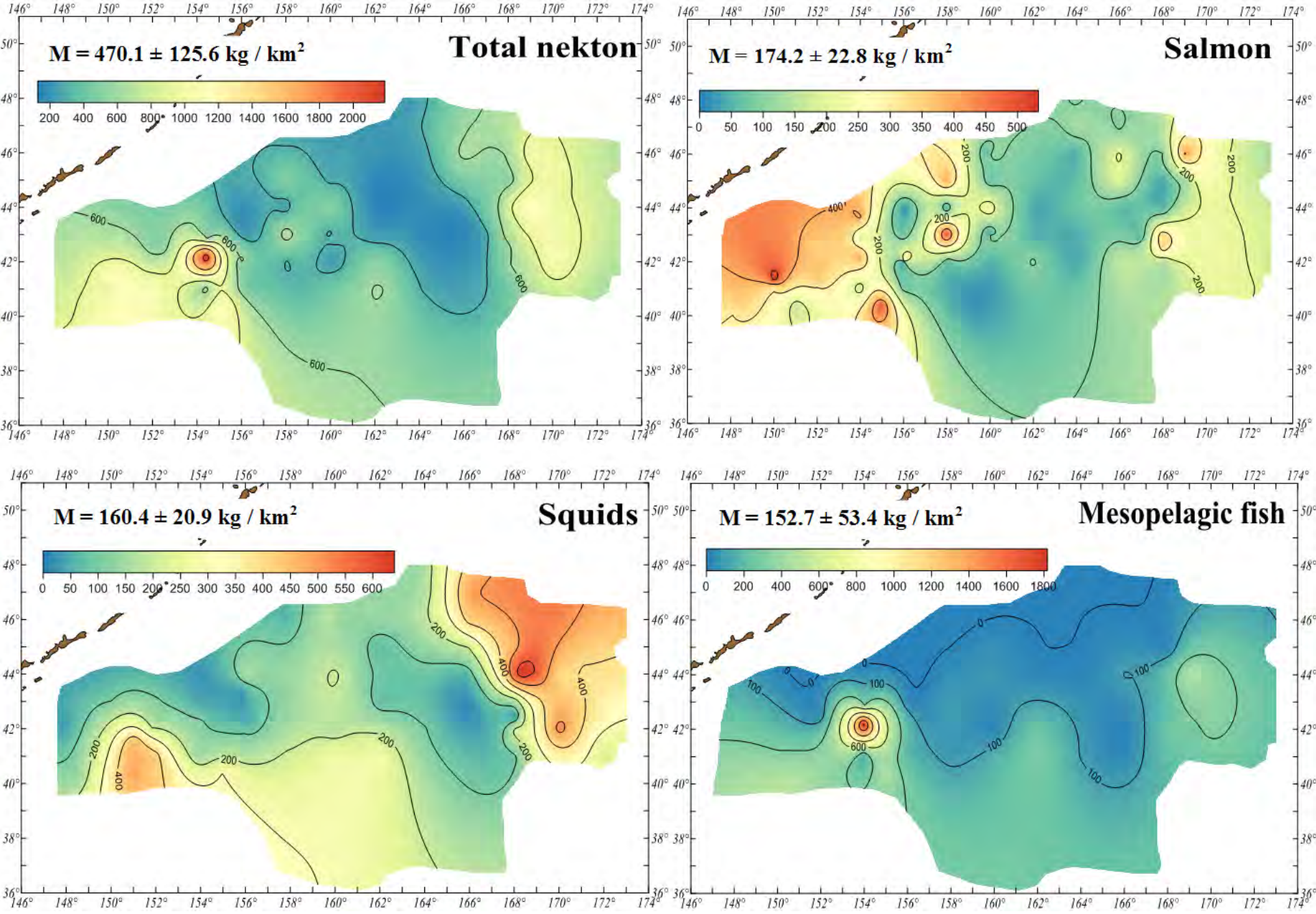
Simpson's diversity index (D) = Σ pi^2
pi - share of i-species in sample

Index of dominance show a **number of dominant species** in nekton community

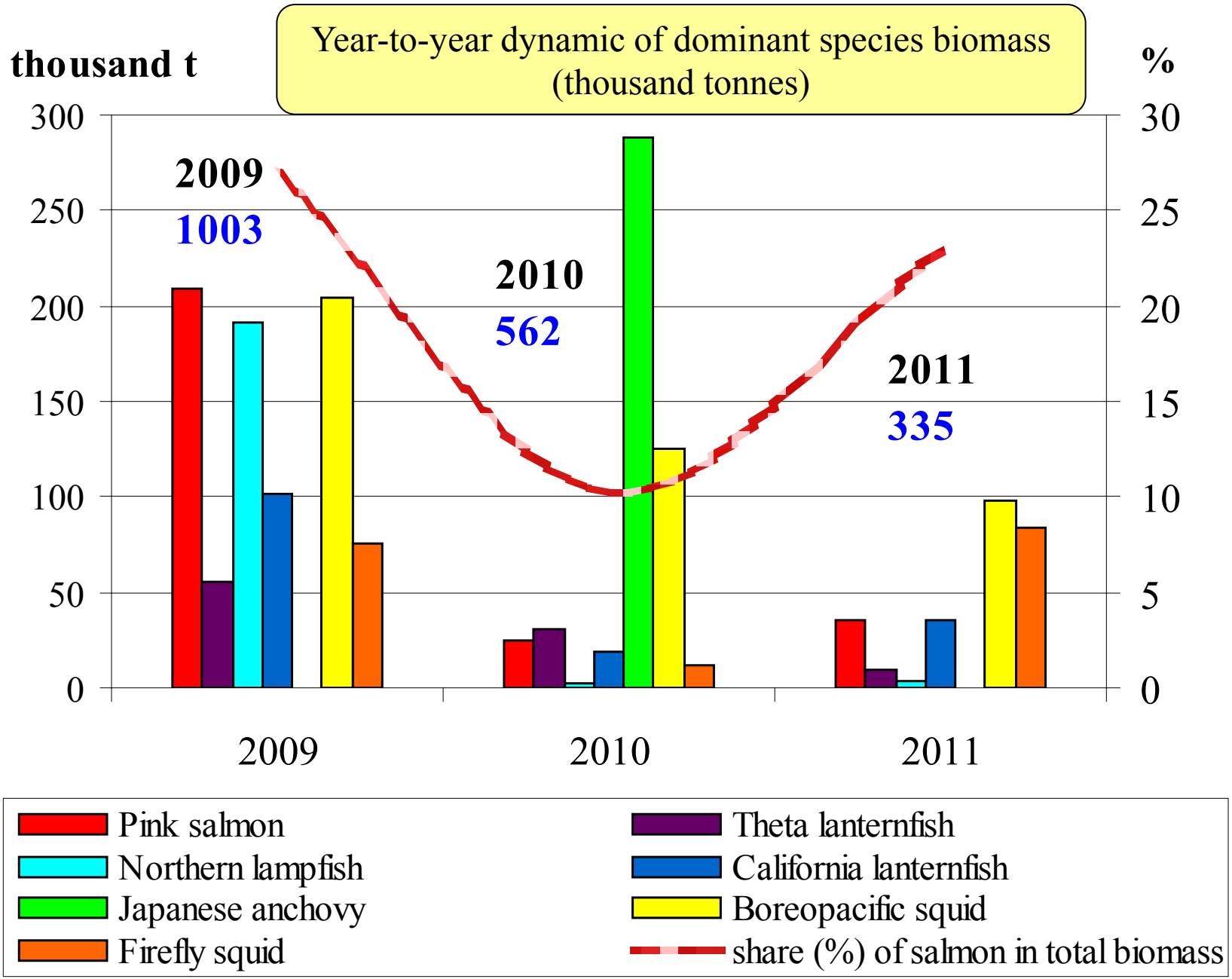
species	2009
Pink salmon	20.8
Boreopacific squid	20.4
Northern lampfish	19.0
California lanternfish	10.1
Firefly squid	7.5
Theta lanternfish	5.6
Blue lanternfish	4.6
Total share (%)	88.0

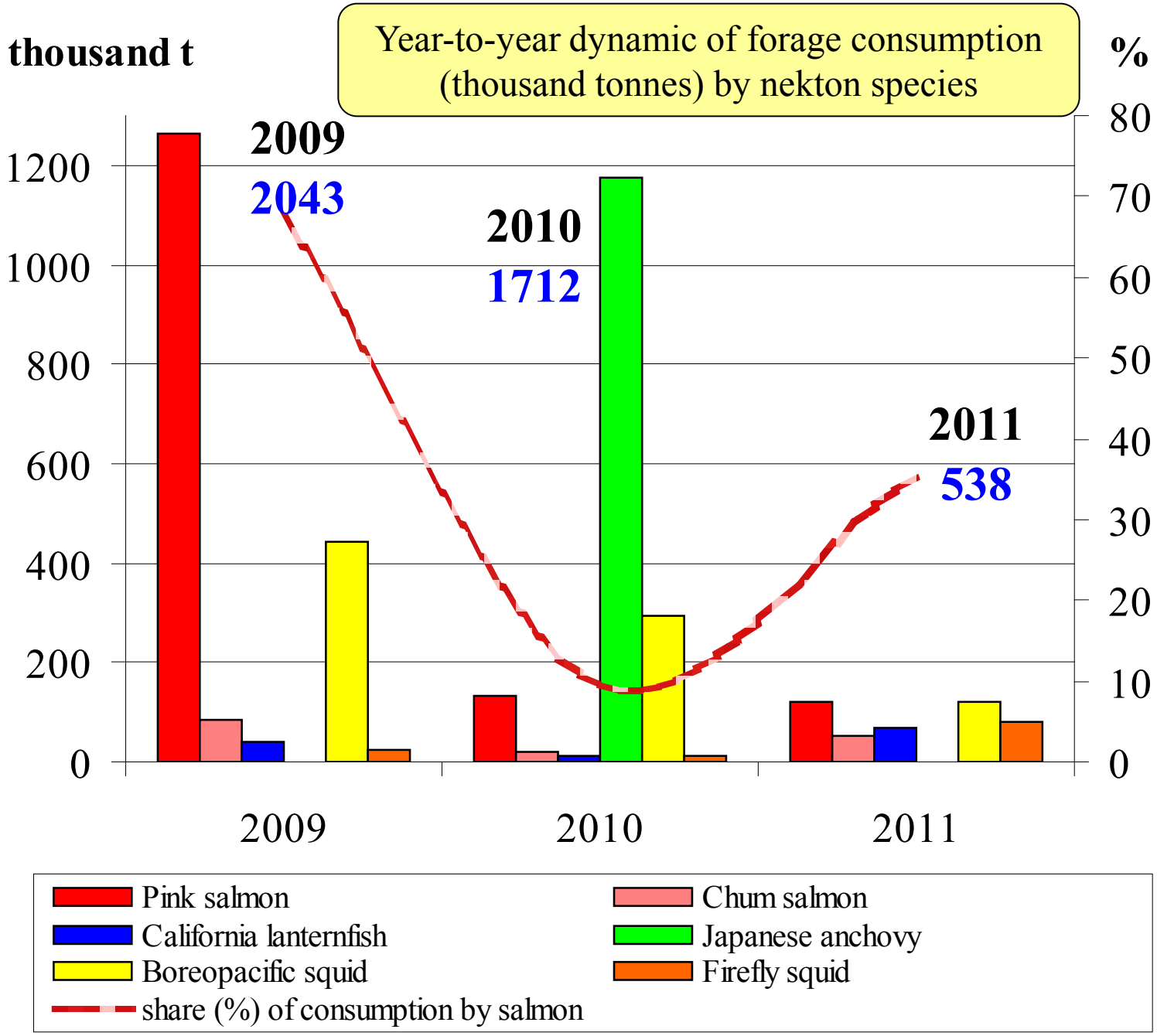
species	2010
Japanese anchovy	51.3
Boreopacific squid	22.2
Theta lanternfish	5.4
Total share (%)	78.9

species	2011
Boreopacific squid	29.2
Pink salmon	10.5
California lanternfish	10.5
Chum salmon	9.4
Blue lanternfish	4.5
Total share (%)	64.1

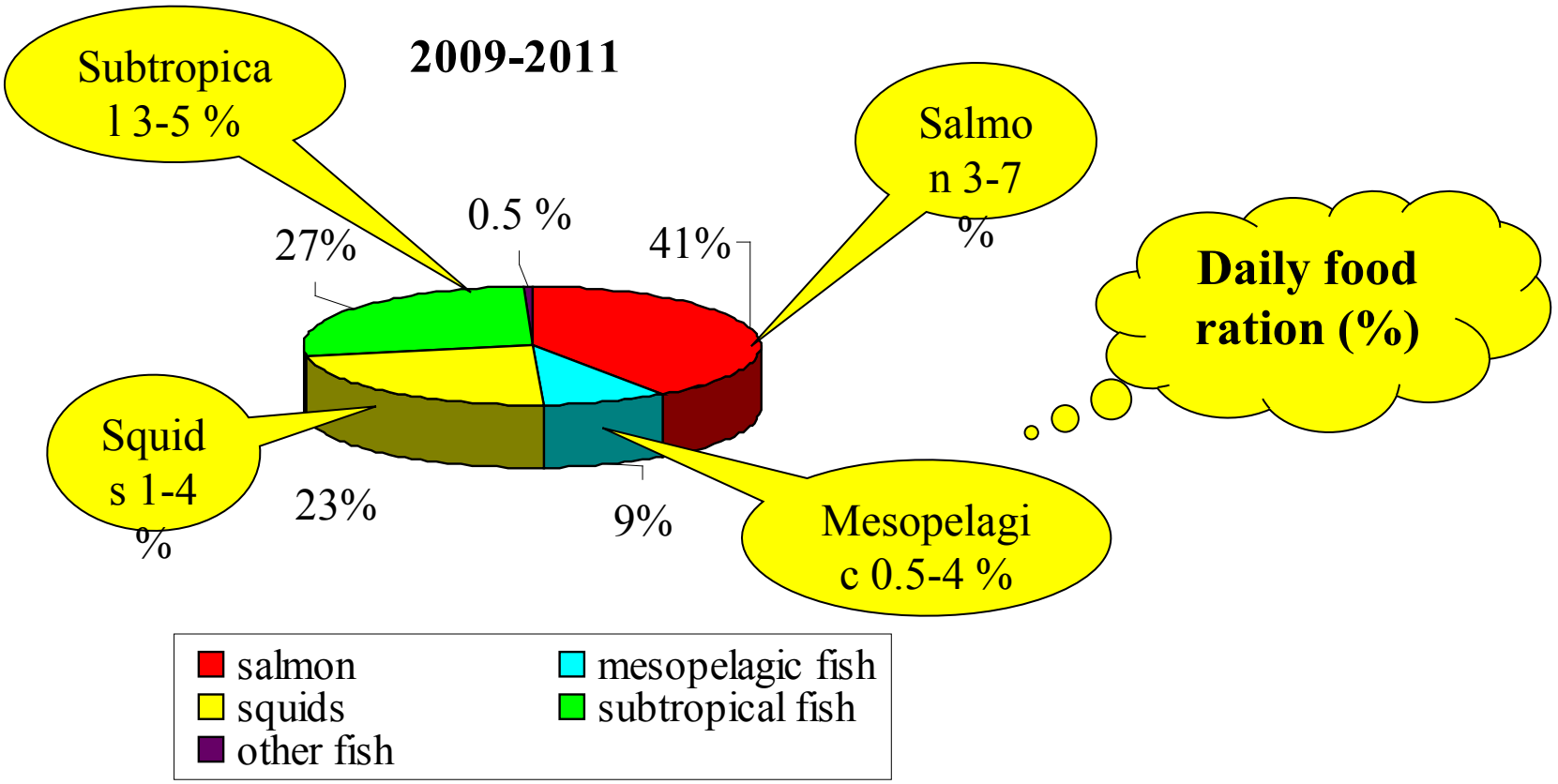


The density distribution of nekton groups (kg/km²) in February-April in 2009–2011

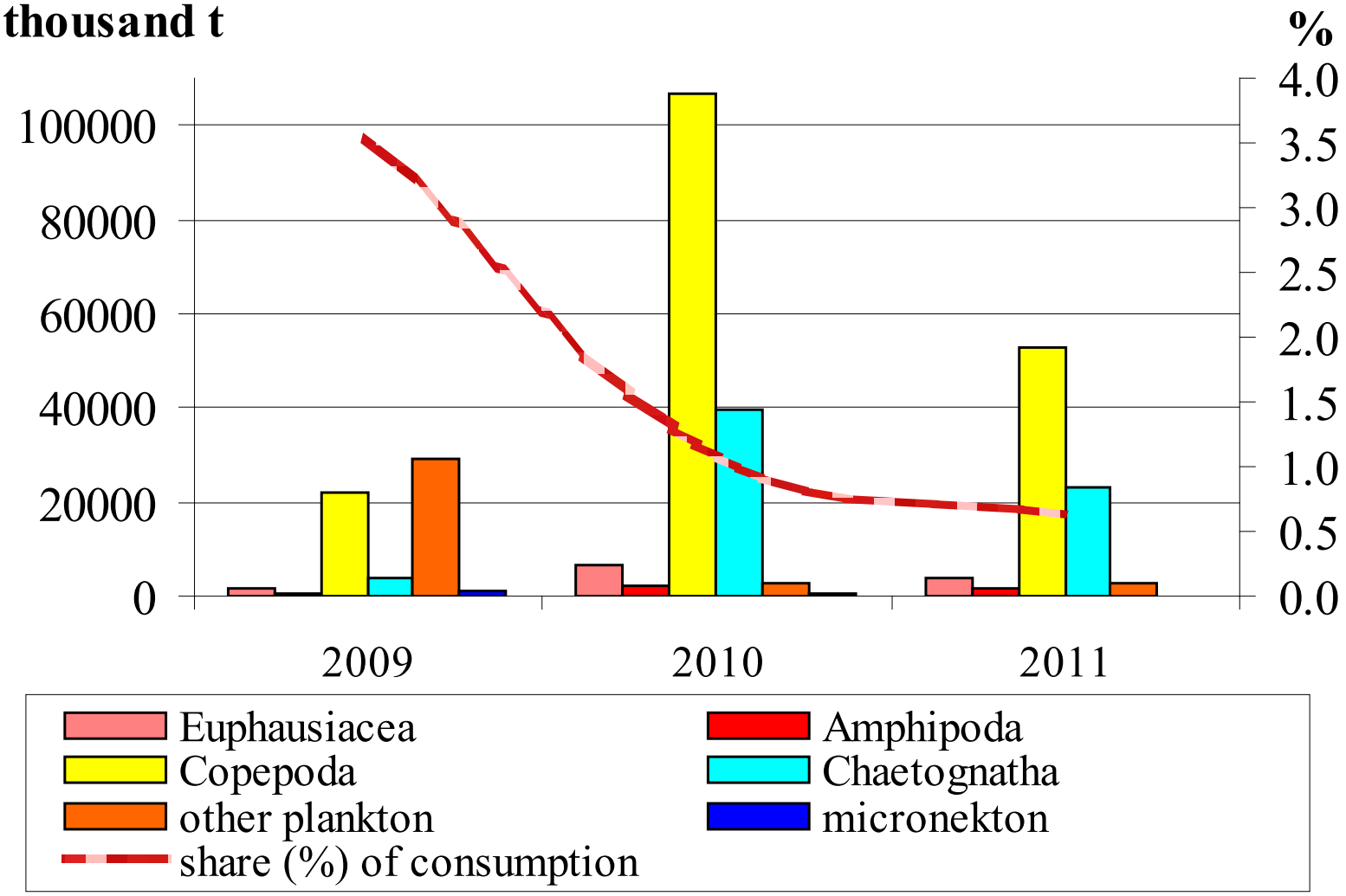

Year-to-year dynamic of dominant species biomass (thousand tonnes)
thousand t
%
300
250
200
150
100
50
0
30
25
20
15
10
5
0
2009
1003
2010
562
2011
335
2009
2010
2011
Pink salmon
Theta lanternfish
Northern lampfish
California lanternfish
Japanese anchovy
Boreopacific squid
Firefly squid
share (%) of salmon in total biomass


thousand t
Year-to-year dynamic of forage consumption (thousand tonnes) by nekton species
%
2009
2043
2010
1712
2011
538
1200
1000
800
600
400
200
0
80
70
60
50
40
30
20
10
0
2009
2010
2011
Pink salmon
Chum salmon
California lanternfish
Japanese anchovy
Boreopacific squid
Firefly squid
share (%) of consumption by salmon

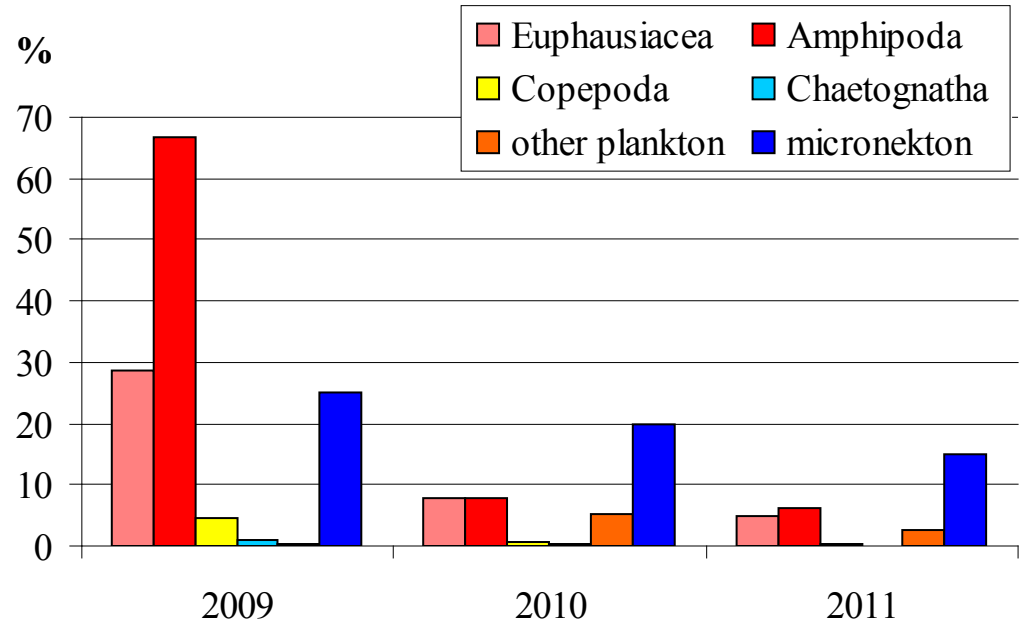
The share (%) of consumption of forage resources by certain nekton groups



The stock of forage resources (thousand tonnes) and share (%) of their consumption



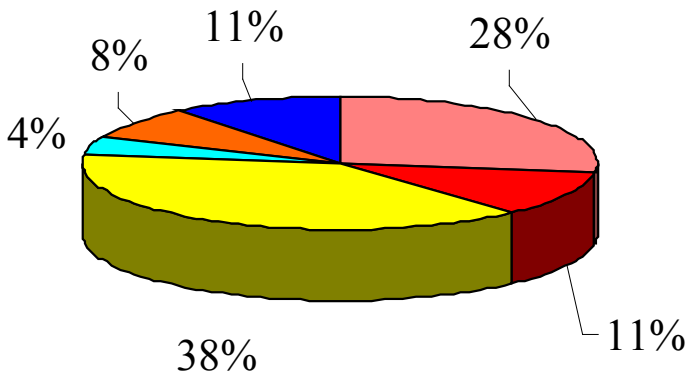
The dynamic of share (%) of consumption of forage resources by nekton species

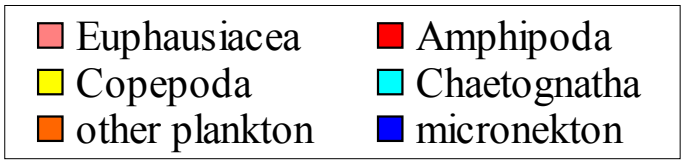


Nekton species are consume of amphipods (27 %), euphausiids (14 %) and copepods (2 %) of their forage stock

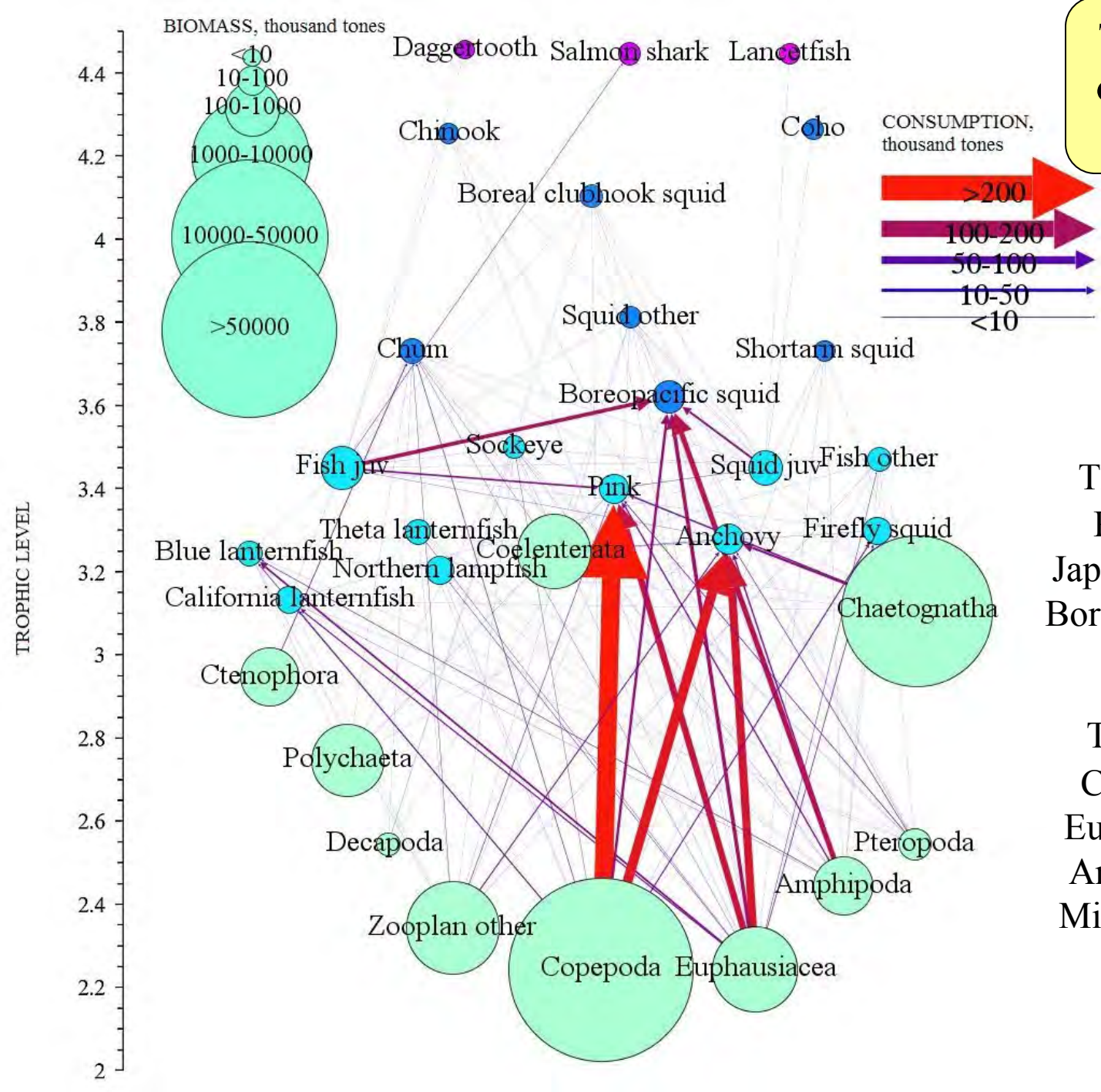
The share (%) of diet of nekton species

2009-2011





Trophic relationships of nekton community in 2009-2011



The main consumers :
Pink salmon – 34 %
Japanese anchovy – 27 %
Boreopacific squid – 19 %

The main preys :
Copepods – 38 %
Euphausiids – 28 %
Amphipods – 11 %
Micronekton – 10 %

Conclusion

- The key species and main consumers of forage resources were – Pink salmon (34%), Japanese anchovy (27%) and Boreopacific squid (19%)
- The diet of consumers mainly include copepods (38%), euphausiids (28%) and amphipods (11%)
- However, nekton species mostly consumed amphipods (27 %), euphausiids (14 %) and copepods (2 %) of their forage stock
- Total consumption of forage resources for all time did not exceed 4 % of their stock, so forage resources is quite enough for normal functioning of the nekton community in NWPO in early spring


Thank you for attention