Species composition and abundance of the nekton community in the upper epipelagic layer of the northwest Pacific Ocean during summer 2004-2010

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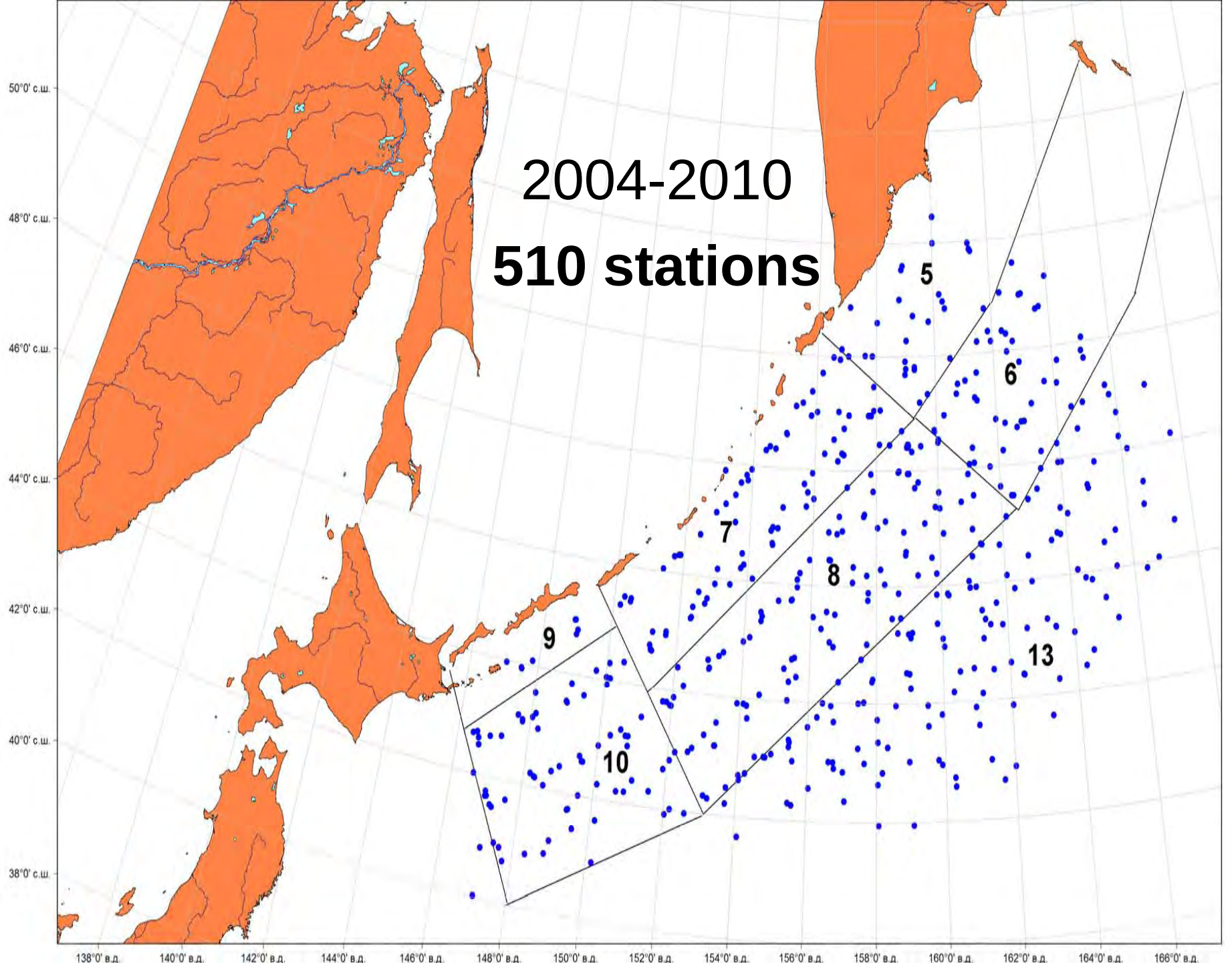
Purpose:

- Describe the alterations in nekton community during early summer period, as well as peculiarities of its species composition and quantitative distribution depending on changes in background conditions

Methods:

- Species names were checked and corrected in accordance with the data FishBase
- Primary data for the quantitative composition were taken from a TINRO database
- In the construction of different species of distribution schemes have been used the relative abundance of nekton (kg / km ^{2}).


2004-2010
510 stations
5
6
7
8
9
10
13
50°0' с.ш.
48°0' с.ш.
46°0' с.ш.
44°0' с.ш.
42°0' с.ш.
40°0' с.ш.
38°0' с.ш.
138°0' в.д.
140°0' в.д.
142°0' в.д.
144°0' в.д.
146°0' в.д.
148°0' в.д.
150°0' в.д.
152°0' в.д.
154°0' в.д.
156°0' в.д.
158°0' в.д.
160°0' в.д.
162°0' в.д.
164°0' в.д.
166°0' в.д.

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

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 ($p \geqslant 1$)

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 (thous. t)

Q – the mean density of species' distribution within the studied area (kg/km^2)

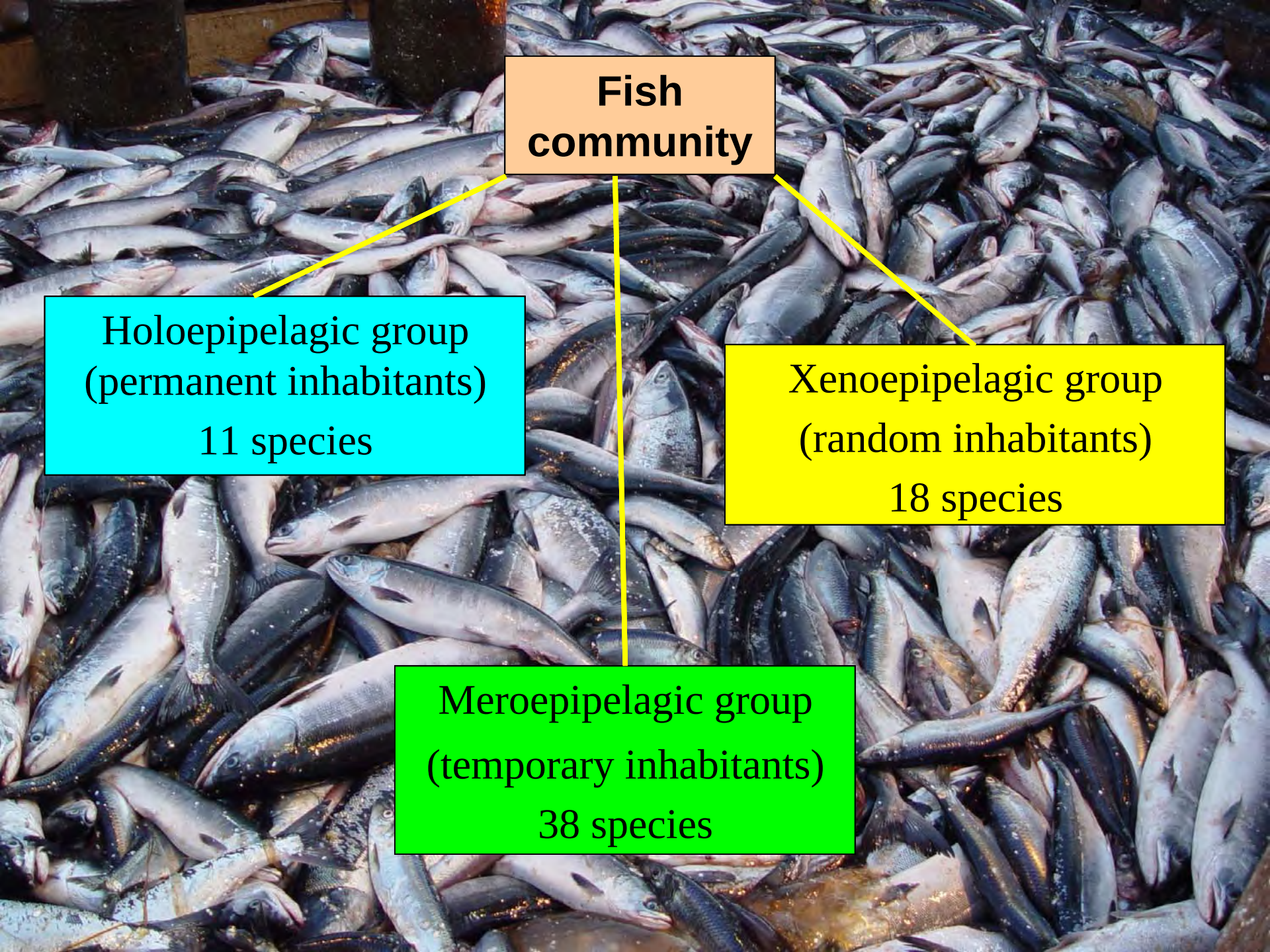
S – area (km^2)

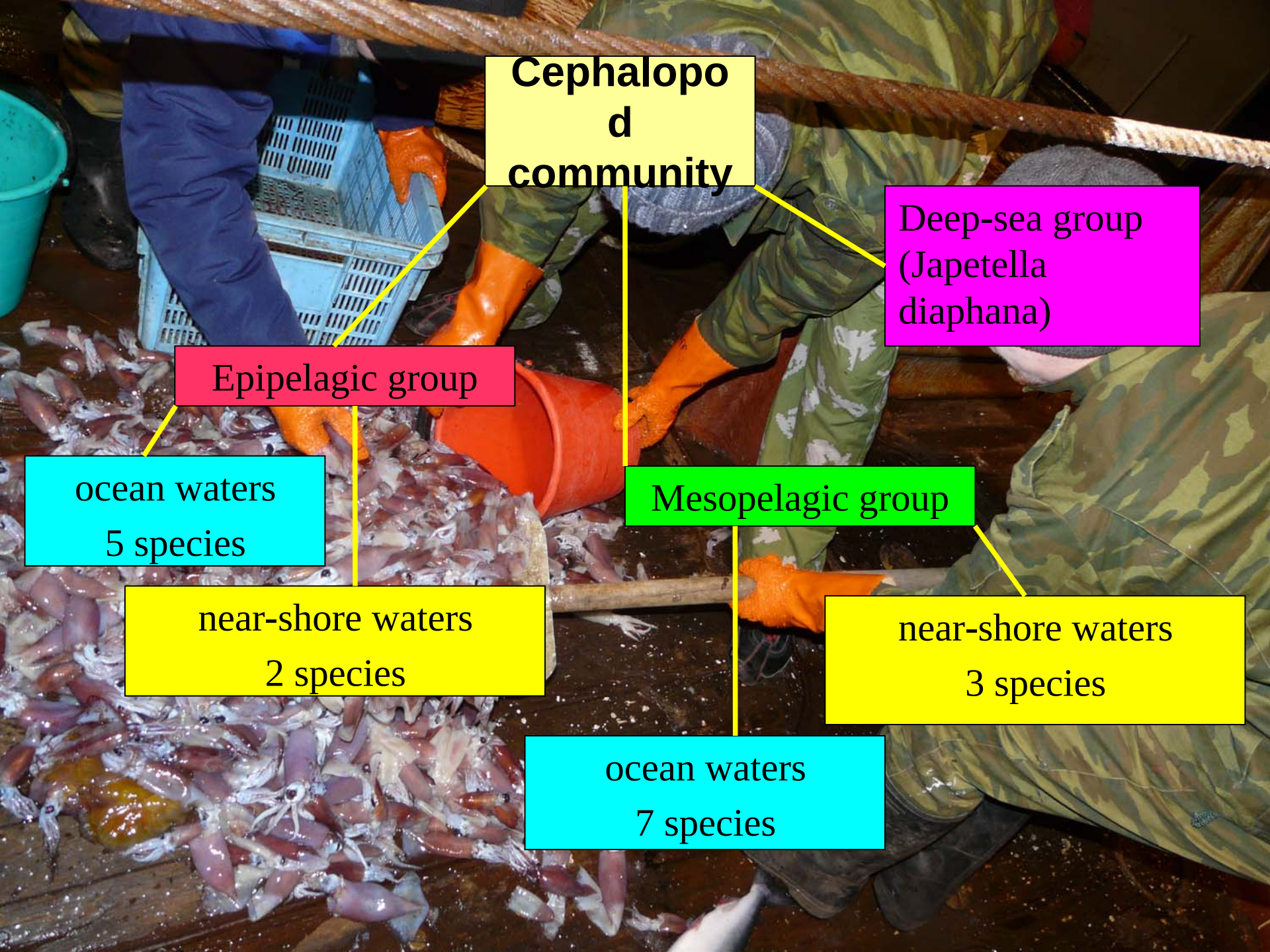
FAMILIES

Fish and Lampreys:	species
Alepisauridae	1
Anotopteridae	1
Bathylagidae	2
Bathymasteridae	1
Bramidae	1
Carangidae	1
Carcharchinidae	1
Caristiidae	1
Centrolophidae	2
Congridae	1
Cottidae	2
Clupeidae	1
Cyclopteridae	2
Engraulidae	1
Gadidae	1
Gonostomatidae	1
Hexagrammidae	3
Icosteidae	1
Lamnidae	1
Liparidae	2
Molidae	1

	species
Microstomatidae	1
Myctophidae	12
Nemichthyidae	2
Notosudidae	1
Paralepididae	5
Petromyzontidae	1
Pterothrissidae	1
Salmonidae	6
Scomberesocidae	1
Scombridae	1
Scopelarchidae	1
Sebastidae	1
Squalidae	1
Stichaeidae	2
Stomiidae	1
Tetragonuridae	1
Trachipteridae	2
Zaproridae	1
Pisces gen. sp.	2
total	71

Cephalopods:	species
Alloposidae	1
Bolitaenidae	1
Chiroteuthidae	1
Cranchiidae	2
Enoploteuthidae	1
Gonatidae	12
Octopodidae	1
Ommastrephida	2
Onychoteuthida	2
Sepiolidae	1
total	24

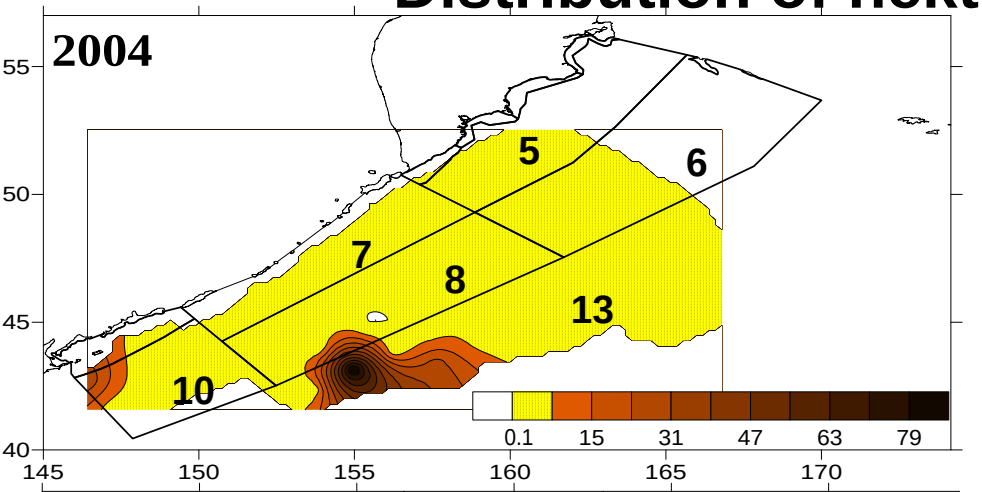

Fish community
Holoepipelagic group (permanent inhabitants) 11 species
Xenoepipelagic group (random inhabitants) 18 species
Meroepipelagic group (temporary inhabitants) 38 species

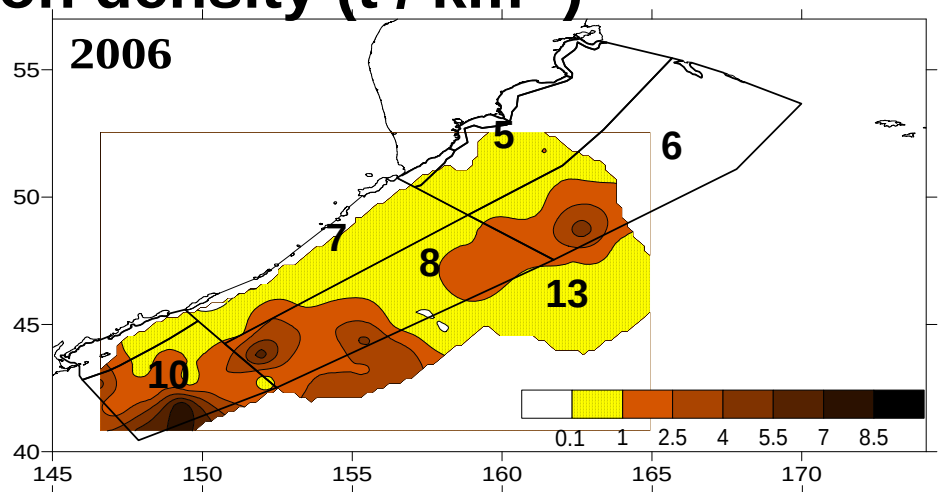

Cephalopod community
Deep-sea group (Japetella diaphana)
Epipelagic group
ocean waters
5 species
near-shore waters
2 species
Mesopelagic group
near-shore waters
3 species
ocean waters
7 species

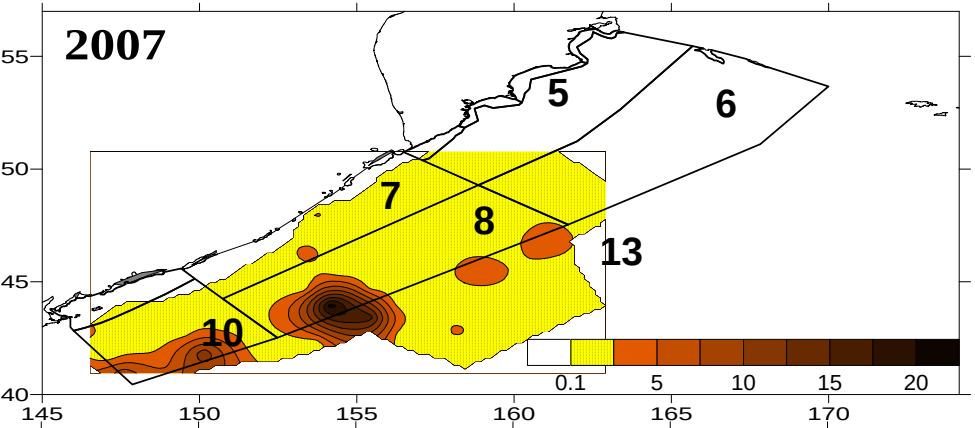
Number of species in the nekton community

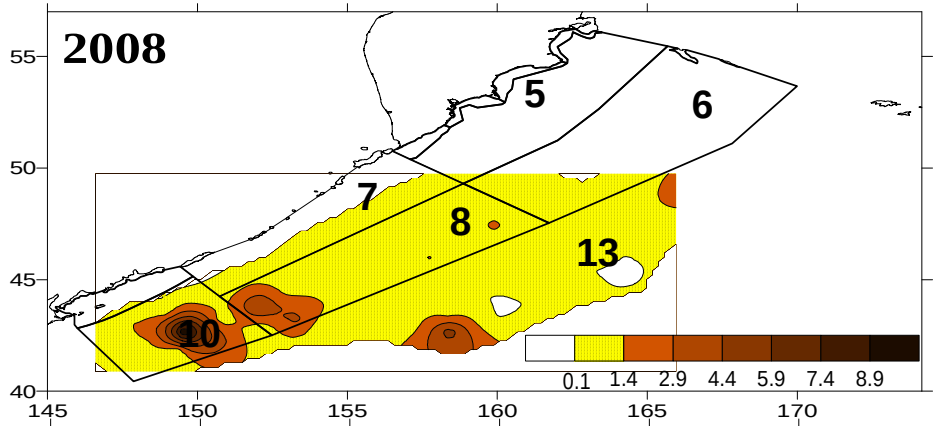
Groups		Biostatistical areas							
		5	***6***	***7***	***8***	***9***	***10***	***13***	***Total***
2004	Fish and Lampreys	15	25	16	25	5	18	28	**47**
	Cephalopoda	7	10	5	12	3	11	16	**21**
	Entire nekton	22	35	21	37	8	29	44	**68**
2006	Fish and Lampreys	11	19	17	29	5	24	26	**41**
	Cephalopoda	7	7	8	14	0	11	10	**16**
	Entire nekton	18	23	25	43	5	35	36	**57**
2007	Fish and Lampreys	12	5	15	16	-	22	24	**39**
	Cephalopoda	4	3	5	7	-	7	10	**13**
	Entire nekton	16	8	20	23	-	29	34	**52**
2008	Fish and Lampreys	5	14	13	20	-	23	37	**42**
	Cephalopoda	2	5	7	8	-	10	10	**13**
	Entire nekton	7	19	20	28	-	33	47	**55**
2009	Fish and Lampreys	9	16	14	23	5	27	37	**47**
	Cephalopoda	4	4	5	10	1	10	7	**12**
	Entire nekton	13	20	19	33	6	37	44	**59**
2010	Fish and Lampreys	12	13	18	16	3	21	*27*	**39**
	Cephalopoda	4	5	2	6	0	6	*9*	**13**
	Entire nekton	16	18	20	22	3	27	*36*	**52**

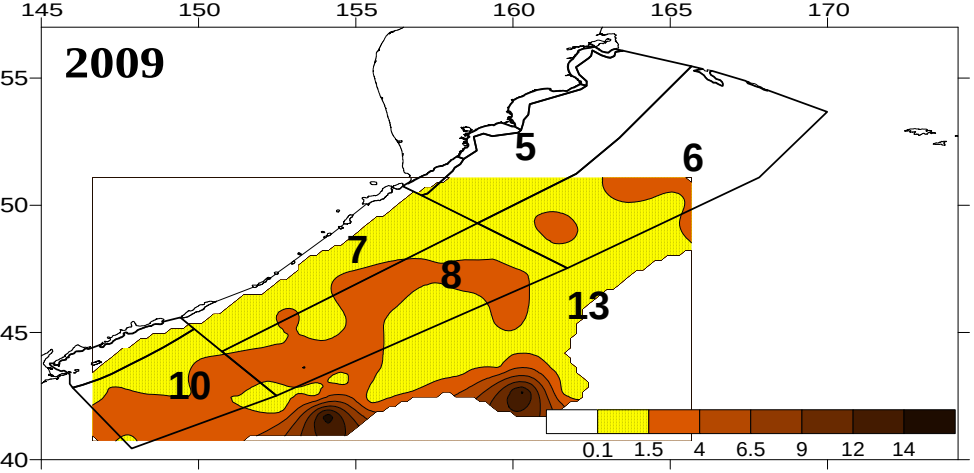
Distribution of nekton density (t / km ²)

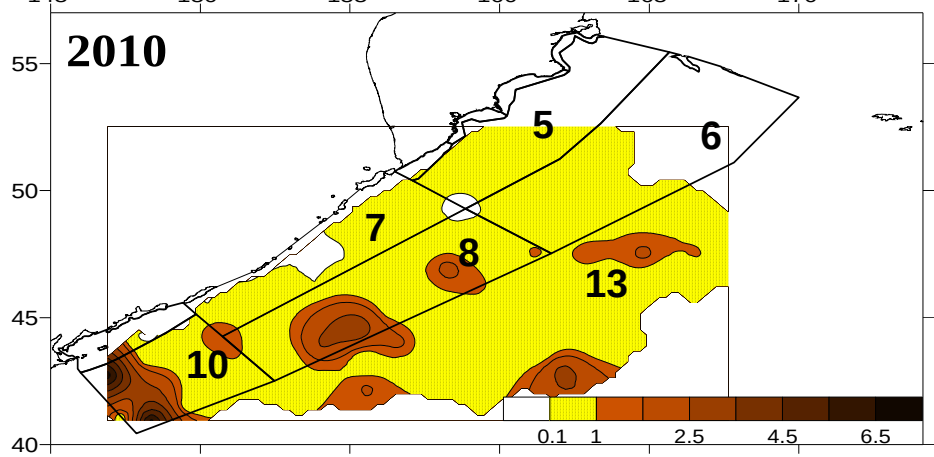




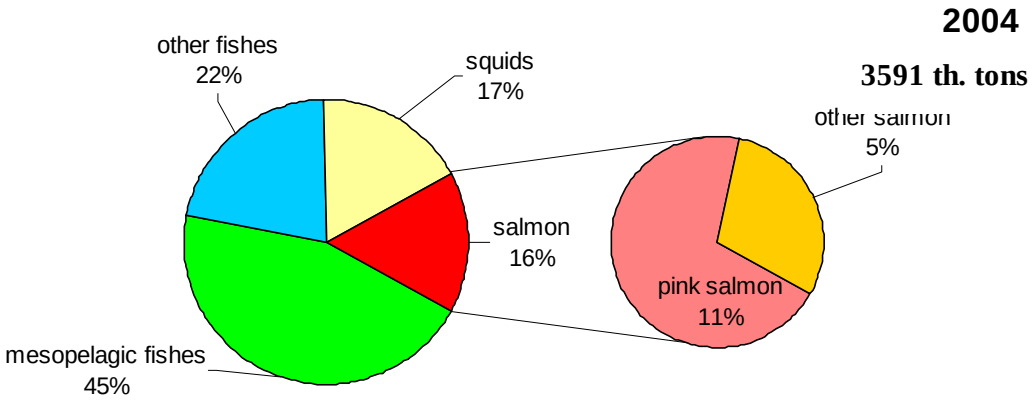


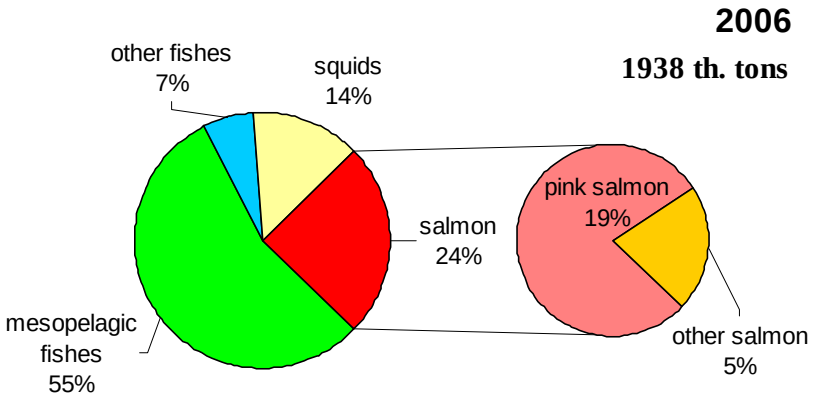


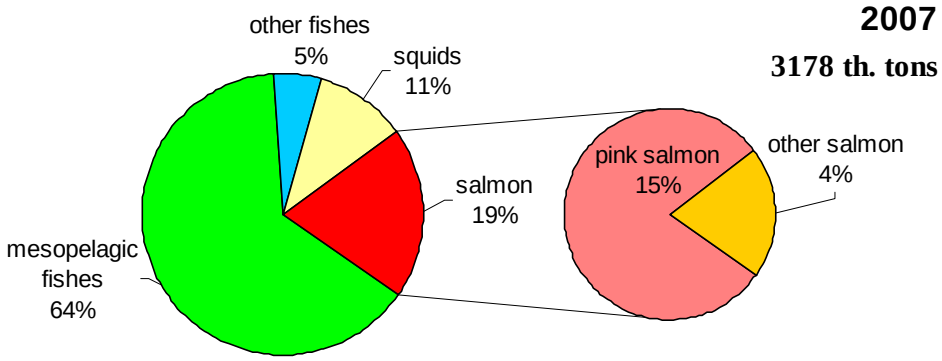


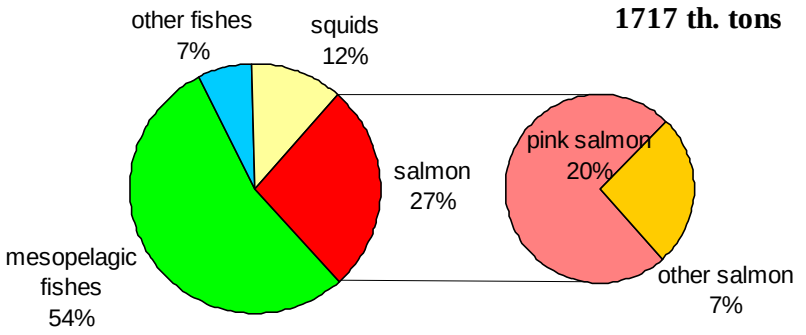


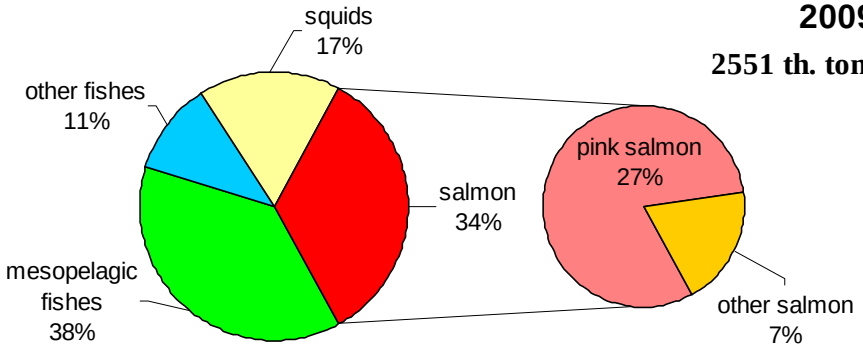
Share of species (%) in the nekton community

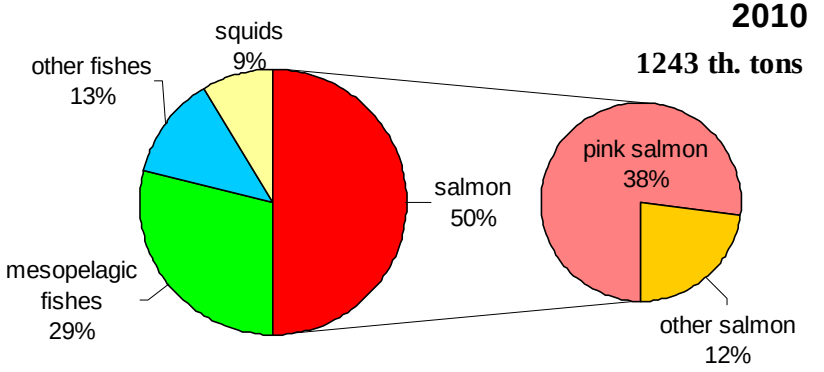




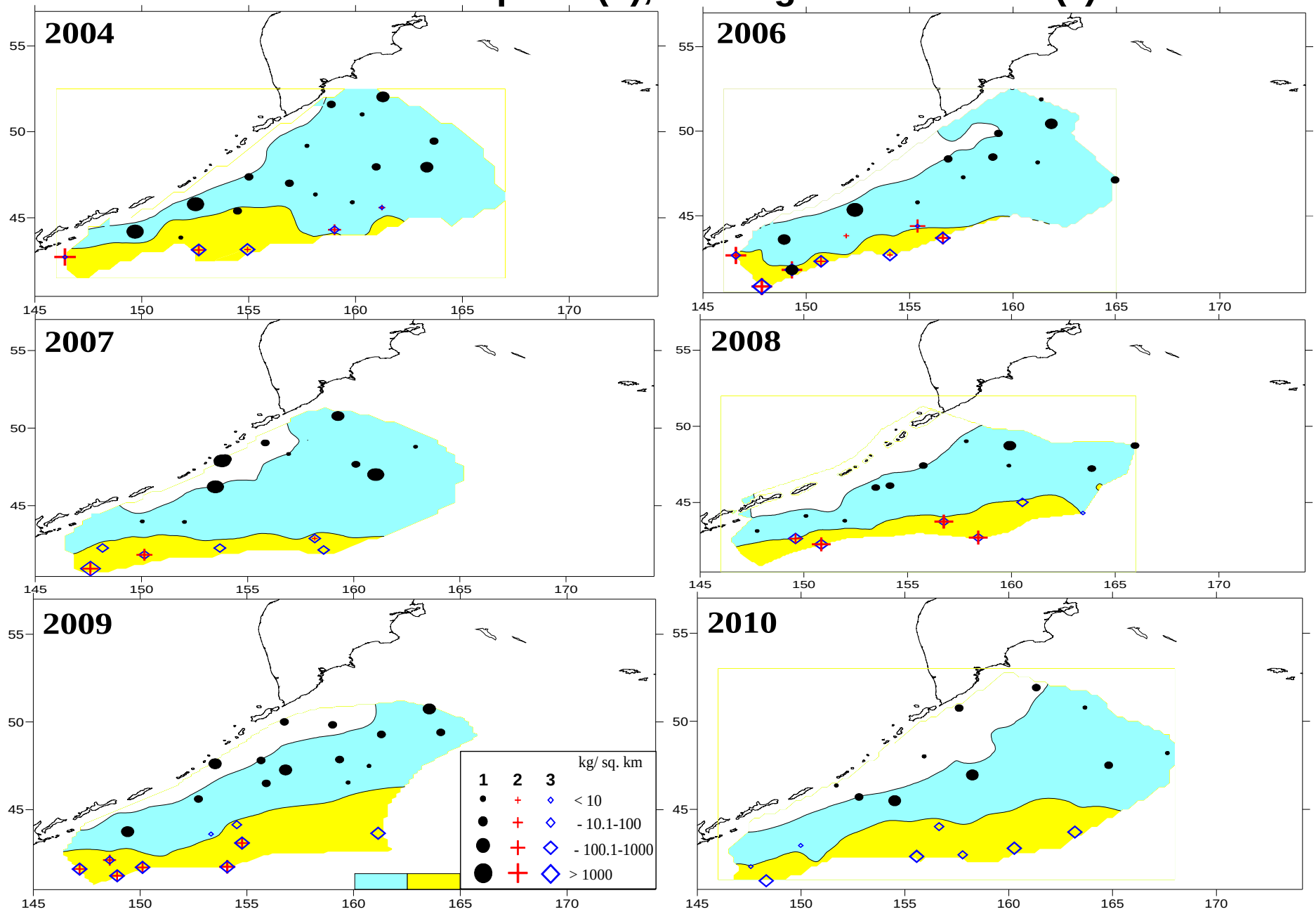




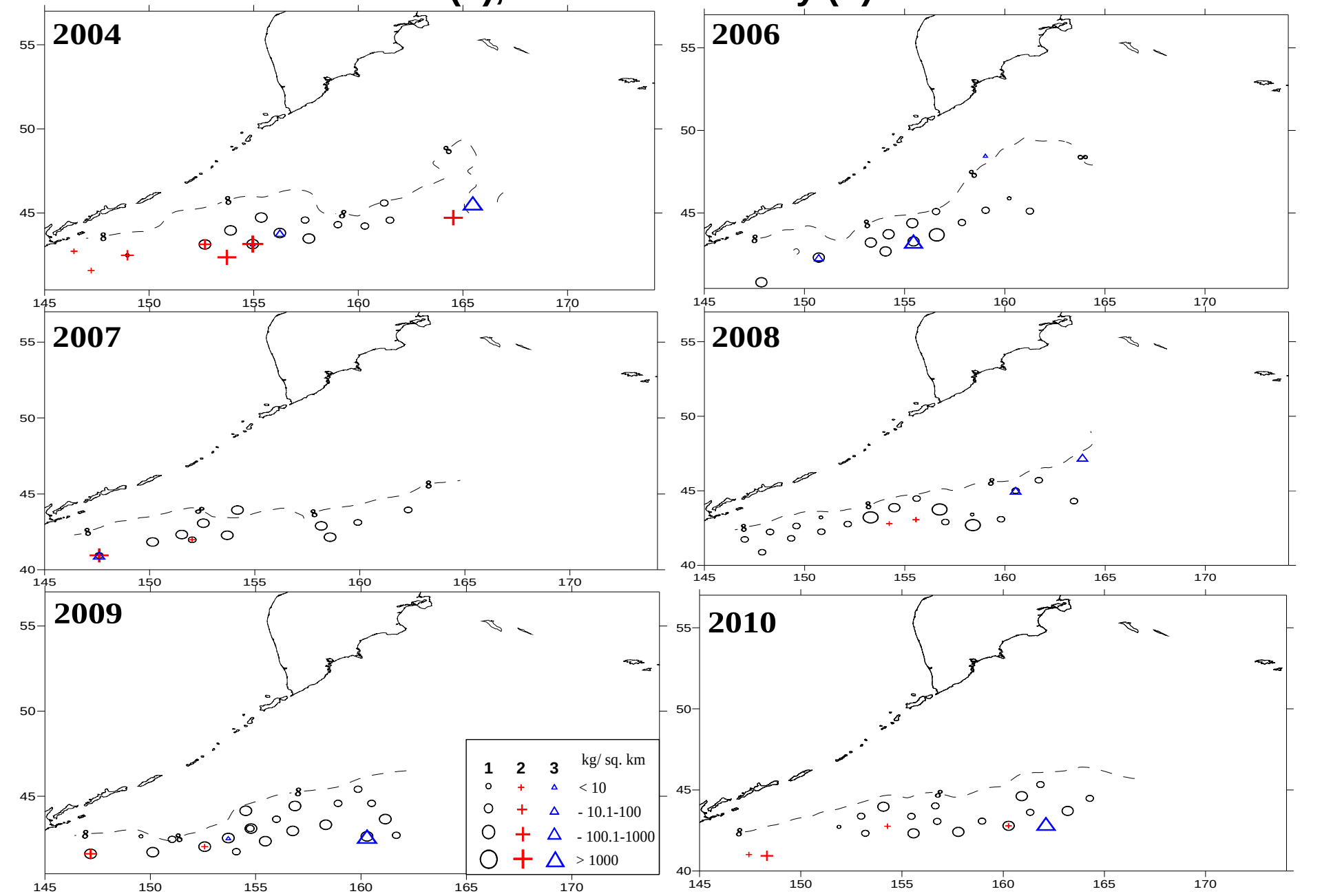


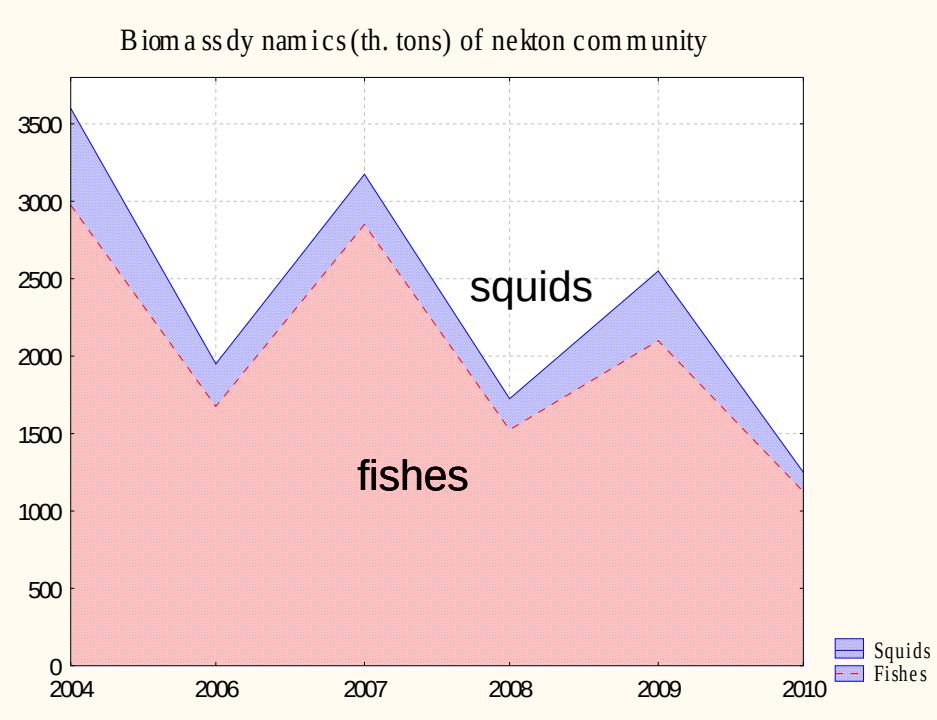


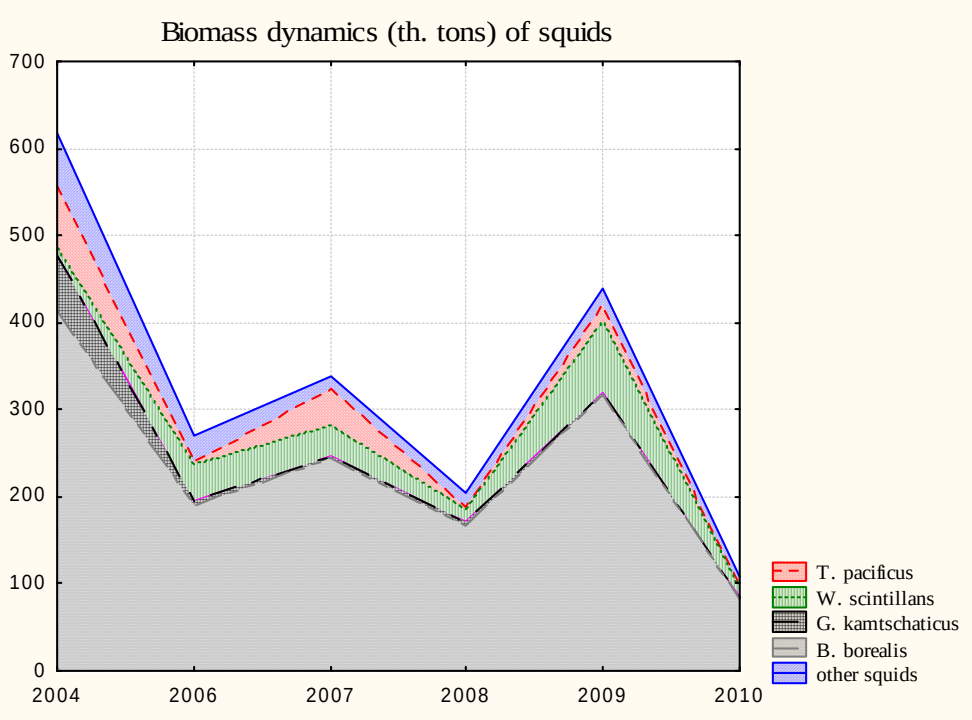
Distribution of density (kg/km²) of northern smoothtongue (●), fluorescent lampfish (+), and bigfin lanternfish (◊)

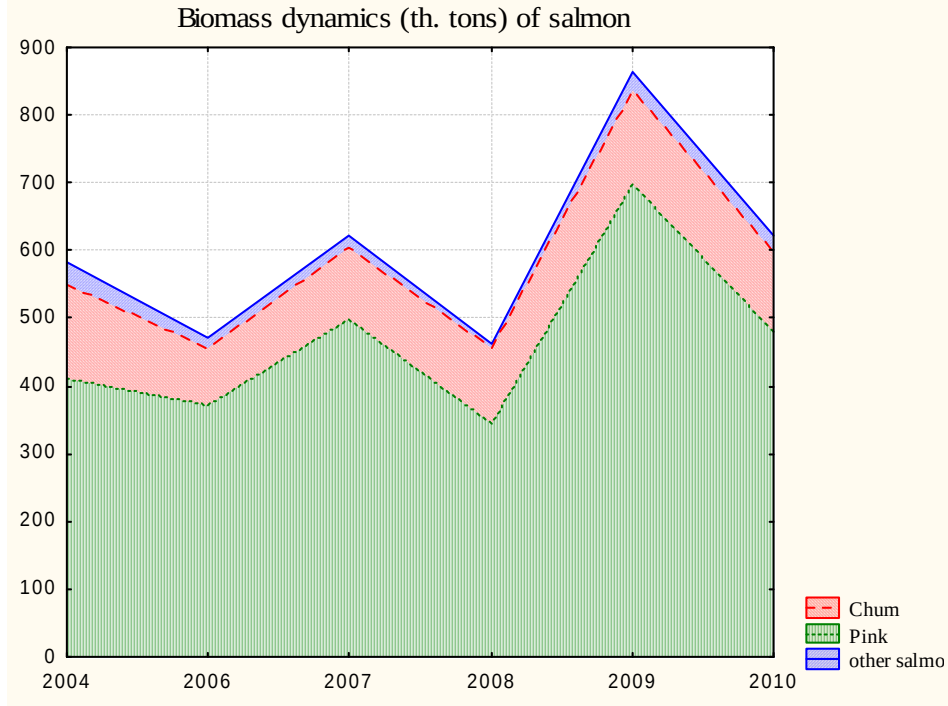


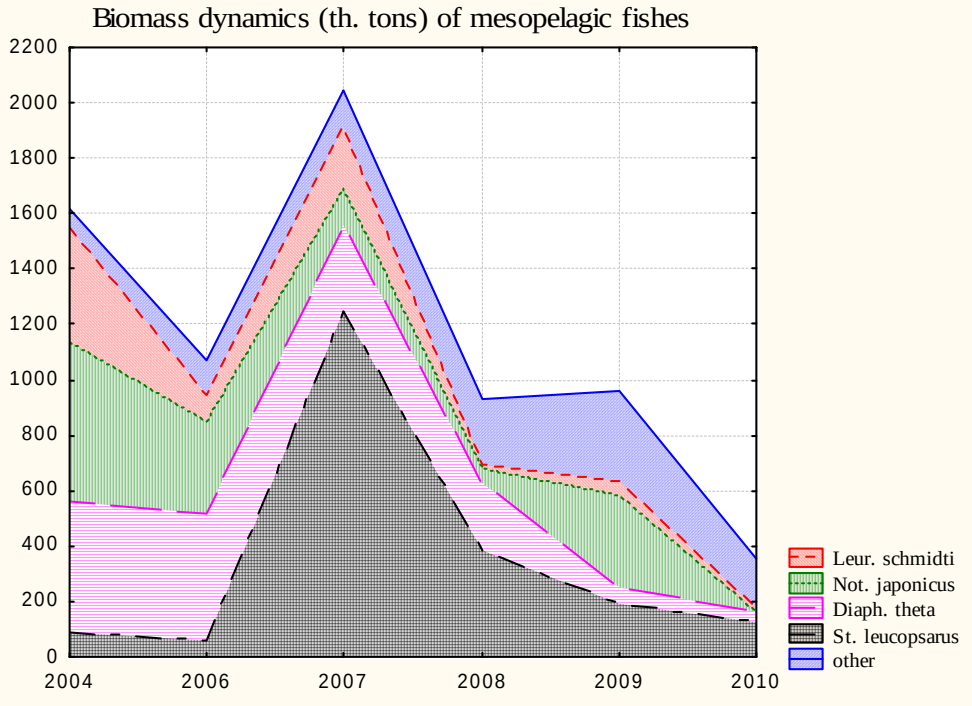
Distribution of density (kg/km²) of Pacific promfet (○), Japanese anchovy (+), and Pacific saury (△)




Biomassdynamics(th. tons) of nekton community
3500
3000
2500
2000
1500
1000
500
0
2004
2006
2007
2008
2009
2010
squids
fishes
Squids
Fishes


Biomass dynamics (th. tons) of squids
700
600
500
400
300
200
100
0
2004
2006
2007
2008
2009
2010
T. pacificus
W. scintillans
G. kamtschaticus
B. borealis
other squids


Biomass dynamics (th. tons) of salmon
900
800
700
600
500
400
300
200
100
0
2004
2006
2007
2008
2009
2010
Chum
Pink
other salmo


Biomass dynamics (th. tons) of mesopelagic fishes
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
2004
2006
2007
2008
2009
2010
Leur. schmidti
Not. japonicus
Diaph. theta
St. leucopsarus
other

CONCLUSIONS

The composition of nekton community in ocean waters off the Kuril Islands is generally predetermined by the abrupt transition between neritic and oceanic biotopes and also the presence of species of the low-boreal and subtropical complexes, which arrive in this area during summer to forage

Number of species regularly grows starting from near-shore areas towards ocean waters. Within this region, density of nekton species drops, and number of species, on the contrary, increases southward and eastward—from the periphery to the center of the ocean

Against the background of the recorded high salmon biomass, main alterations in nekton community of the upper epipelagic zone occurred as a result of the decline in biomass of fishes and squids of low-boreal and subtropical species complexes. Mean biomass of nekton in the epipelagic layer within the study area was 2370 $\pm$ 368 thousand tons, in the last year (2010) it was much lower


Thanks for your attention
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