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 / km²).
2004-2010
510 stations
\[ \frac{M \cdot p}{A \cdot k} = \frac{M \cdot p}{1.852 \cdot v \cdot t \cdot 0.001 \cdot a \cdot k} \]

\( M \) - mass of fish in the catch (ind., kg)
\( A \) - the area, covered with trawl catches (km²)
\( v \) – 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
\[ q = \frac{b}{k_y s} \]

\( q \) - 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 \( k_y \)

\[ B = \frac{Q S}{10^6} \]

\( B \) – biomass of the species (thous. t)
\( Q \) – the mean density of species’ distribution within the studied area (kg/km²)
\( S \) – area (km²)
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Fish community

Holoepipelagic group (permanent inhabitants)
11 species

Xenoepipelagic group (random inhabitants)
18 species

Meroepipelagic group (temporary inhabitants)
38 species
Cephalopod community

Epipelagic group
- Ocean waters: 5 species
- Near-shore waters: 2 species

Mesopelagic group

Deep-sea group
(Japetella diaphana)
- Ocean waters: 7 species
- Near-shore waters: 3 species
### Number of species in the nekton community

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Share of species (%) in the nekton community

2004
3591 th. tons
- salmon: 16%
- pink salmon: 11%
- mesopelagic fishes: 45%
- squids: 17%
- other fishes: 22%

2006
1938 th. tons
- salmon: 24%
- pink salmon: 14%
- mesopelagic fishes: 55%
- other fishes: 7%

2007
3178 th. tons
- salmon: 19%
- pink salmon: 11%
- mesopelagic fishes: 64%
- squids: 11%

2008
1717 th. tons
- salmon: 27%
- pink salmon: 12%
- mesopelagic fishes: 54%
- squids: 9%
- other fishes: 11%

2009
2551 th. tons
- salmon: 34%
- pink salmon: 27%
- mesopelagic fishes: 38%
- other fishes: 11%

2010
1243 th. tons
- salmon: 50%
- pink salmon: 29%
- mesopelagic fishes: 13%
- other fishes: 9%
Distribution of density (kg/km²) of northern smoothtongue (●), fluorescent lampfish (+), and bigfin lanternfish (◊)

- **2004**
- **2006**
- **2007**
- **2008**
- **2009**
- **2010**

Legend:

- 1: < 10 kg/sq. km
- 2: 10.1-100 kg/sq. km
- 3: > 100 kg/sq. km
- *: 100.1-1000 kg/sq. km
- ◊: > 1000 kg/sq. km
Distribution of density (kg/km²) of Pacific promfet (○), Japanese anchovy (+), and Pacific saury (Δ)

- 2004
- 2006
- 2007
- 2008
- 2009
- 2010

Legend:

1. < 10 kg/sq. km
2. 10.1-100 kg/sq. km
3. 100.1-1000 kg/sq. km
4. > 1000 kg/sq. km
Biomass dynamics (th. tons) of nekton community

Biomass dynamics (th. tons) of squids

Biomass dynamics (th. tons) of salmon

Biomass dynamics (th. tons) of mesopelagic fishes
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 ± 368 thousand tons, in the last year (2010) it was much lower.
Thanks for your attention