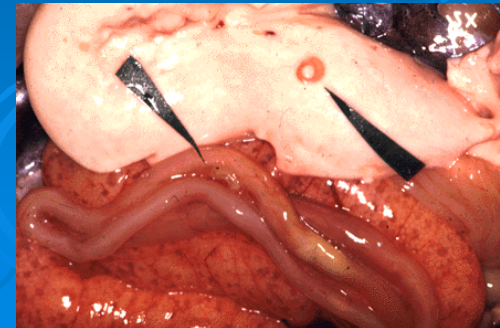
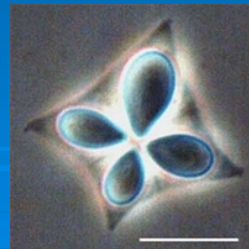


# *Parasitology of pacific cod*

Nadezhda L. Aseeva

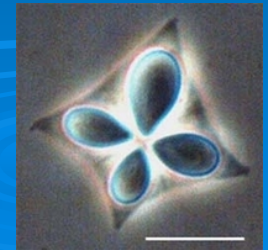
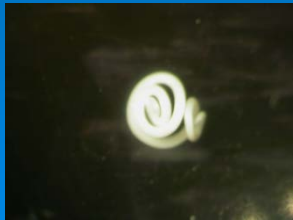
Pacific Fisheries Research Center Vladivostok Russia  
e-mail: [aseeva\\_n@hotmail.com](mailto:aseeva_n@hotmail.com)





## Goal:

- to overview parasitic fauna of pacific cod



# Materials and methods

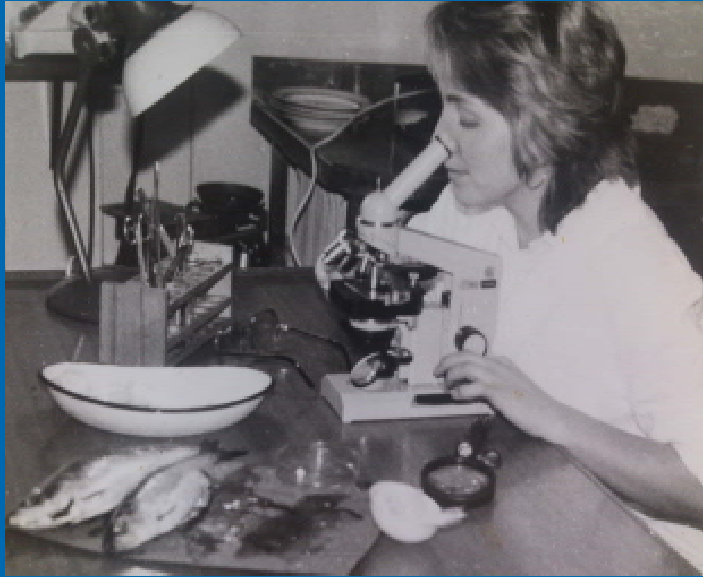


*Scheme of the sampling (green areas)*

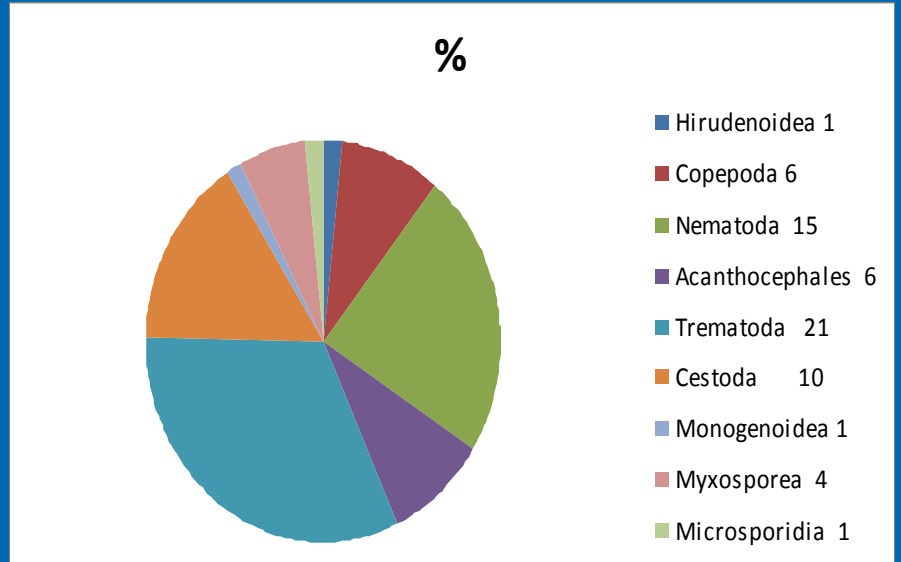
- data from all available scientific literature
- data of my own observations in the Japan, Okhotsk and Bering Seas and North-West Pacific in the period from 1987 to 2012

Standard methods of parasitological investigation

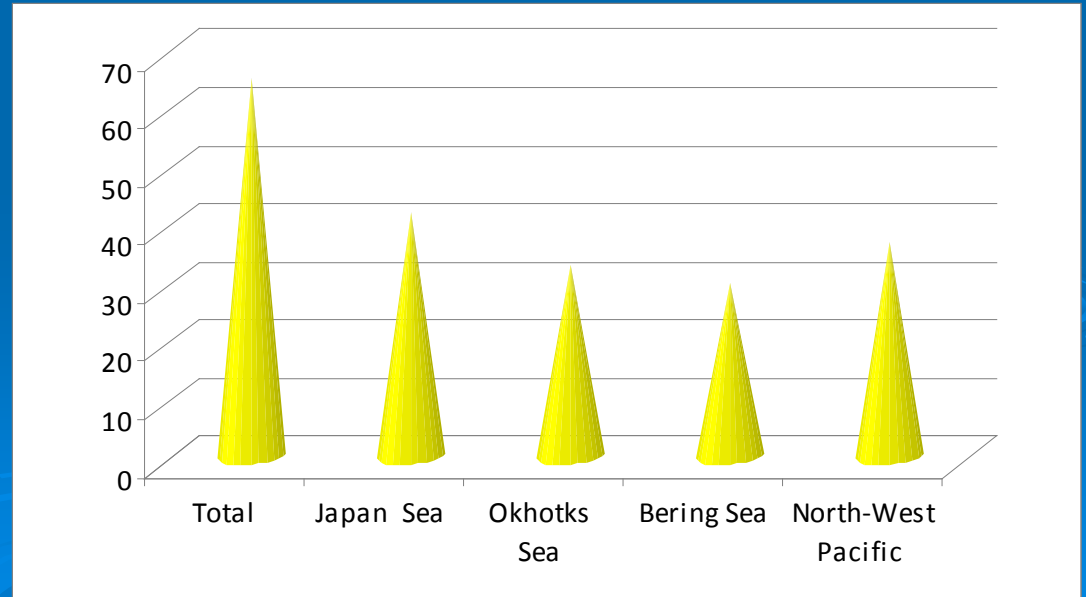
# Number of parasitic species



*In Lab. of Parasitology, TINRO*



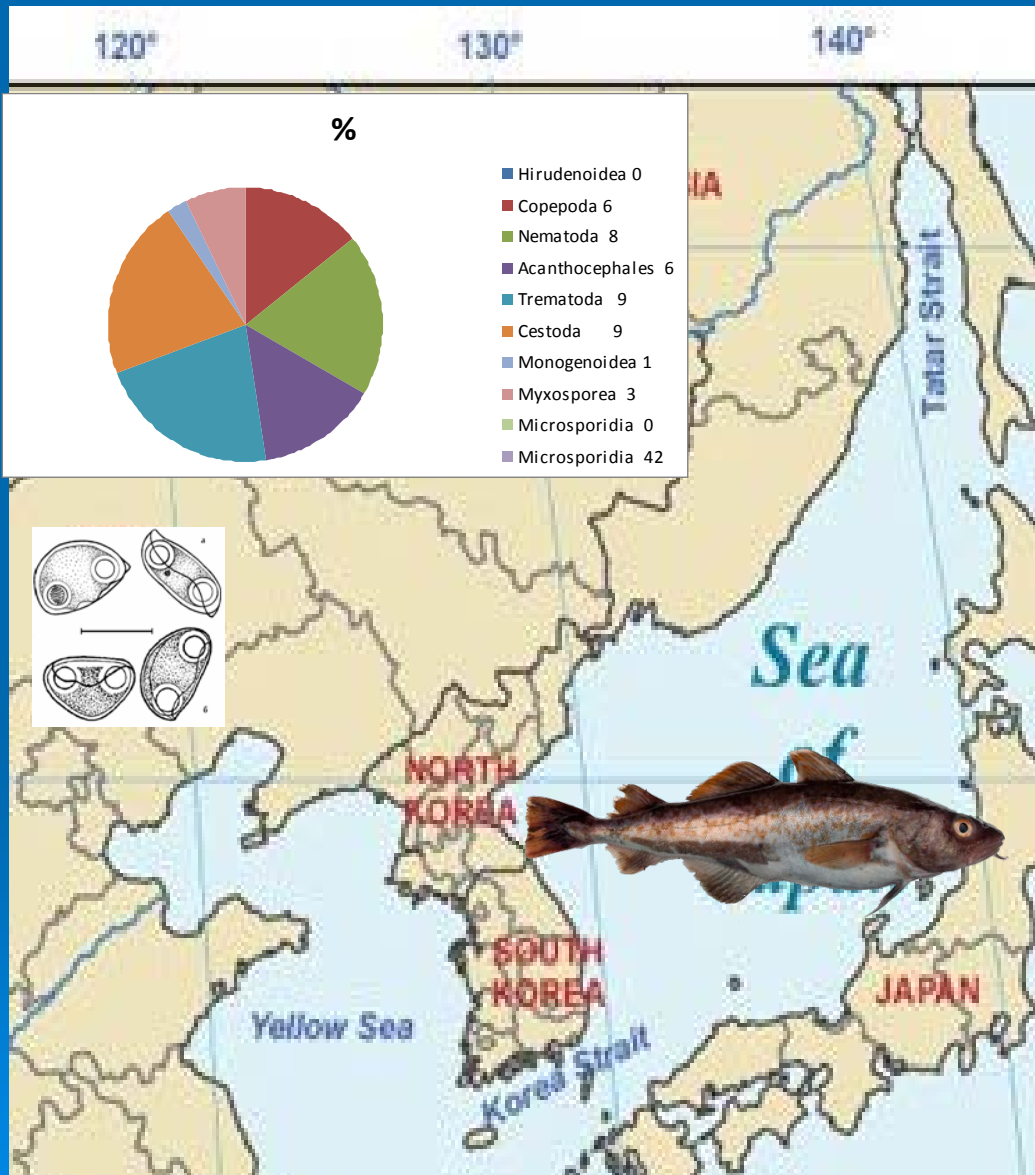
*Species structure of pacific cod parasites in the Far-Eastern Seas and North-West Pacific*



*Number of parasitic species from pacific cod, by regions*

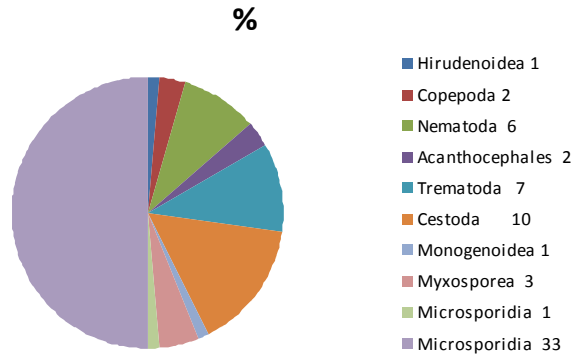


# List of parasitic species for pacific cod in the Japan/East Sea



- 40 parasitic species: 3 myxosporeans, 3 trematodes, 8 nematodes, 9 cestods, 6 acanthocephales, 6 copepods.
- The most expanded parasitic species are:
  - cestodes *Abothrium gadi* and *Nybelinia* sp.;
  - trematode *Hemiurus levinseni*,
  - acanthocephale *Echinorhynchus gadi*;
  - nematode *Pseudoterranova decipiens*
- Species diversity of cestodes and nematodes increases but number of Trematoda species decreases
- Muscles are contaminated by parasites for 38 % of cod, mainly by nematode *Pseudoterranova decipiens*, liver is contaminated for 30 % of cod.

# List of the parasitic species for pacific cod in the Okhotsk Sea

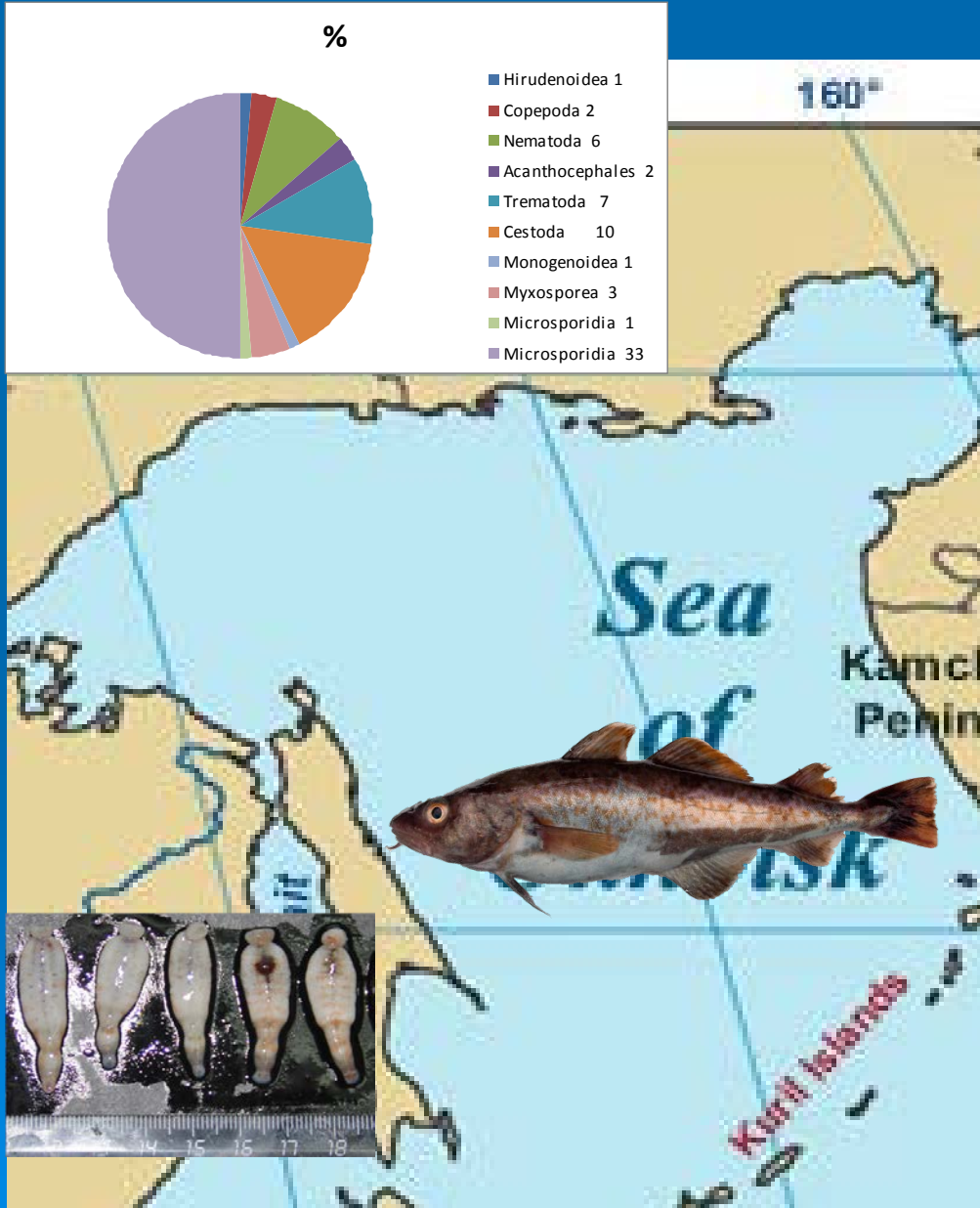


32 parasitic species: 1 microsporidea, 3 myxosporeans, 10 cestodes, 7 trematodes, 6 nematodes, 2 acanthocephales, 2 copepods, and 1 leech.

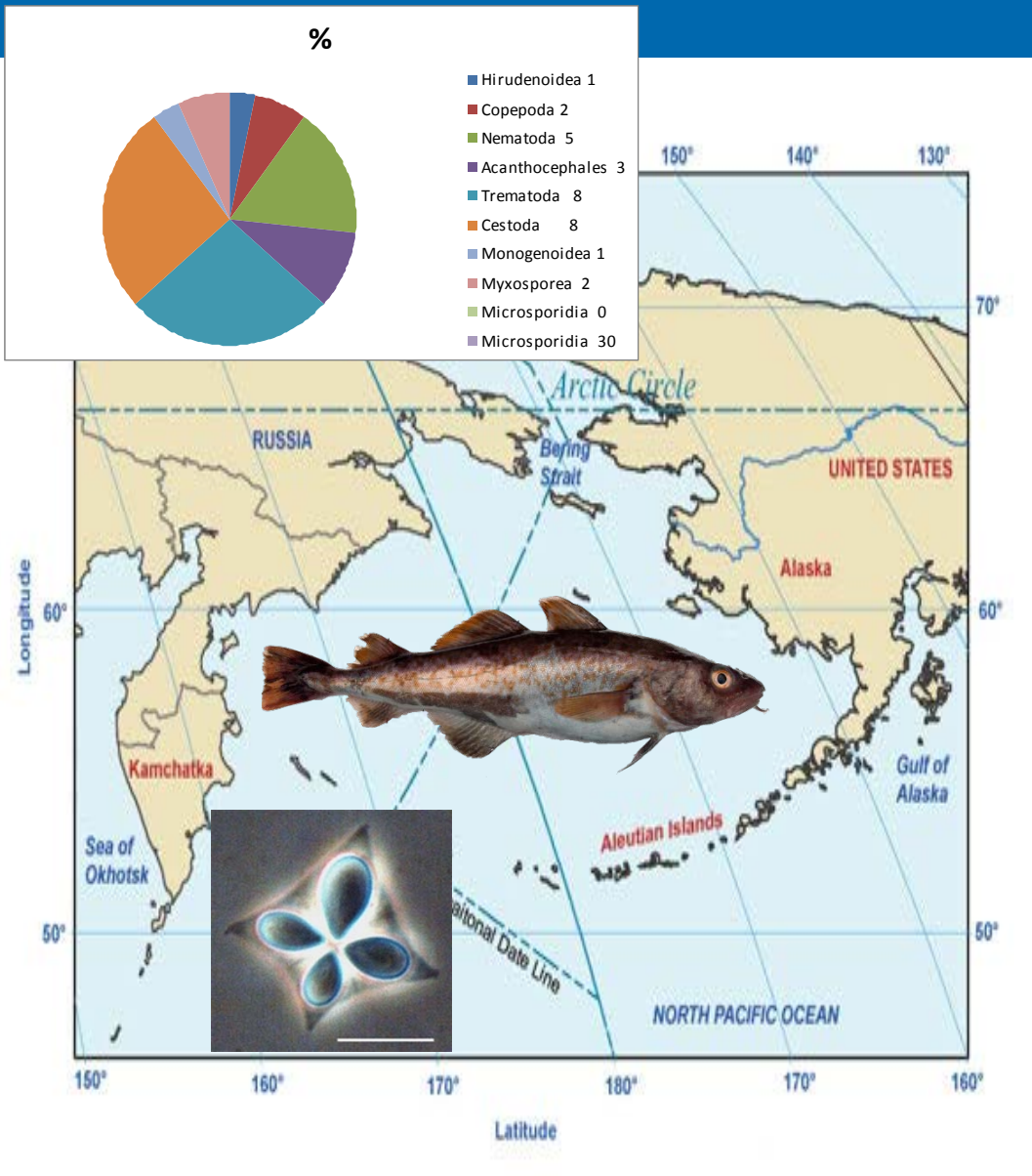
The most expanded species are:

- cestode *Pyramicocephalus phocarum*
- trematode *Hemiurus levinseni*
- acanthocephale *Echinorhynchus gadi*
- nematodes *Pseudoterranova decipiens* and *Anisakis simplex* 72 % .

Muscles are contaminated for 33 % of cod, mostly by nematode *Pseudoterranova decipiens*, and this contamination decreases from south to north. In opposite to the Japan Sea, liver is contaminated for 18 % of cod, usually by cestode *Floriceps saccatus*.



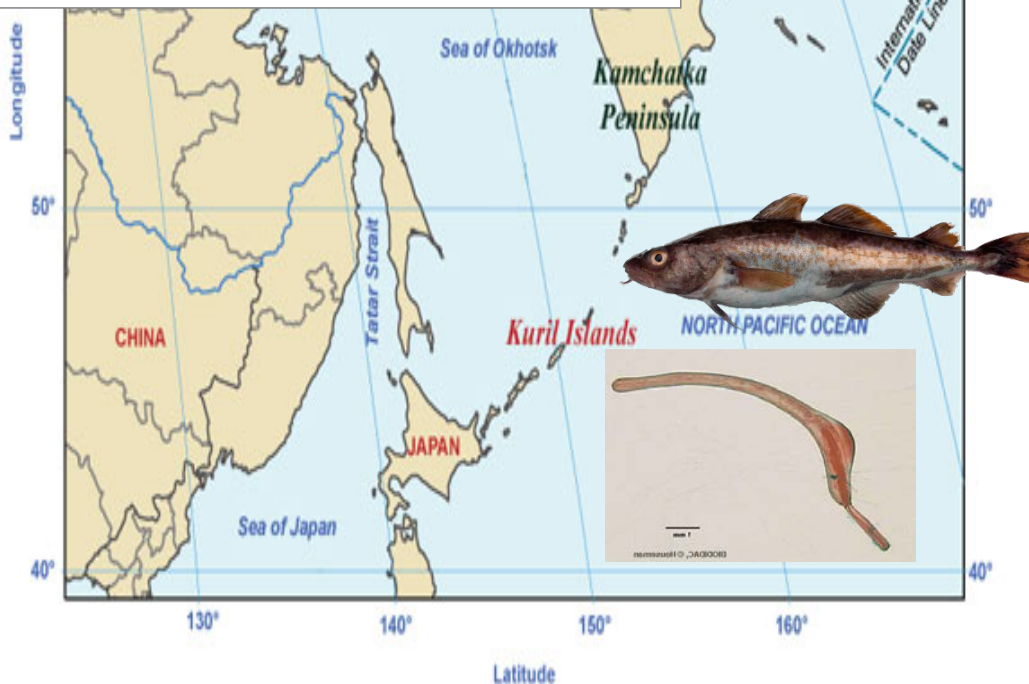
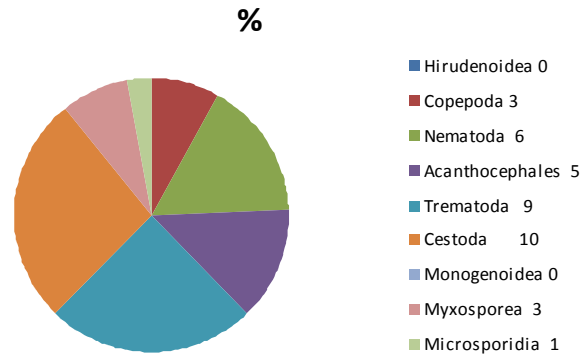
# List of the parasitic species for pacific cod in the Bering Sea



- 30 species of parasites: 2 myxosporeans, 8 cestodes, 9 trematodes, 3 acanthocephales 2 copepods and 1 leech.
- The most expanded species is acanthocephales *Echinorhynchus gadi*
- Muscles are contaminated for 24 % of fish, mainly by nematode *Pseudoterranova decipiens*. Small-sized cod with the length below 40 cm is usually free of parasites Liver is contaminated for 30 % of cod, mainly by nematode *P. decipiens* (as in other seas)



# List of the parasitic species for pacific cod in the North-West Pacific



36 species: 1 microsporidia, 3 myxosporeans, 10 cestodes, 9 trematodes, 6 nematodes, 5 acanthocephales, 2 copepods.

The most expanded species are:

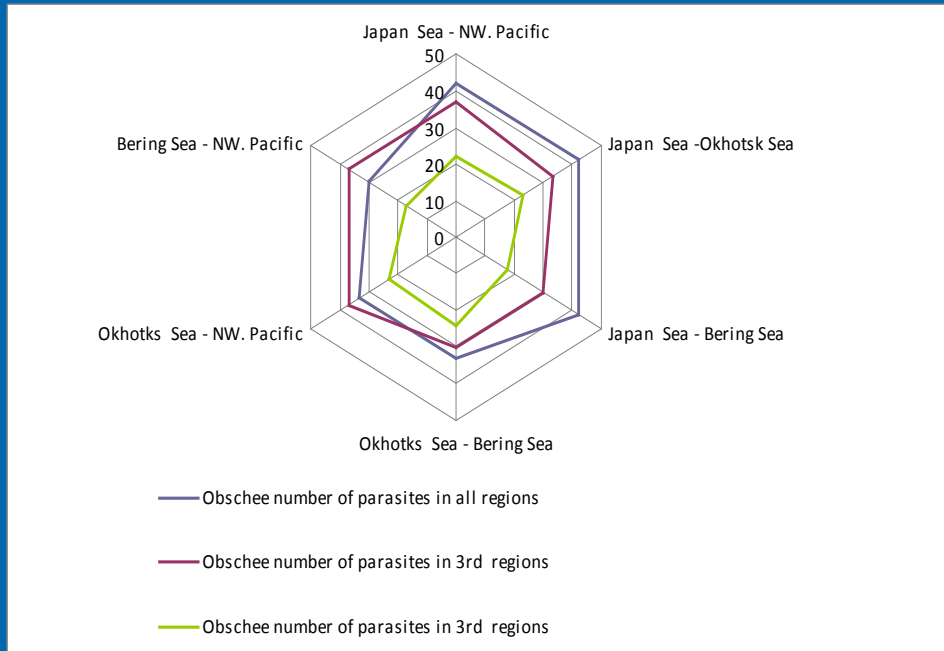
- cestodes *Abothrium gadi*, *Pyramicocephalus phocarum* and *Nybelinia sp.*
- trematode *Hemiurus levinseni*

Tendency to enrichment of species diversity could be traced, in particular for cestodes.

Muscles are contaminated for 60 % of fish, mostly by *P. decipiens*, liver is contaminated for 38 % of cod, mostly by nematode *P. decipiens*.



# Number of common parasitic species for pacific cod from different regions, by pairs of regions

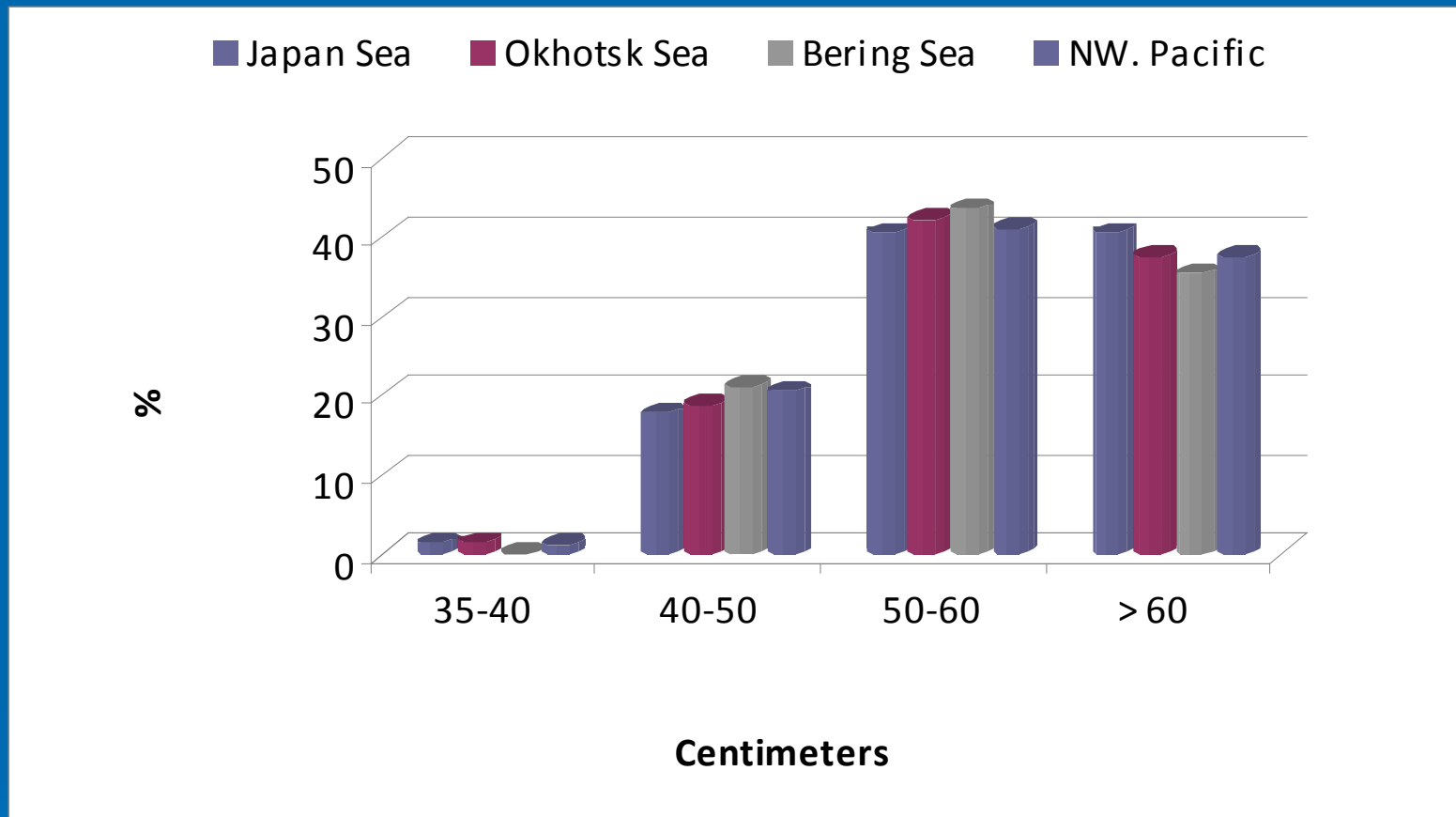


Southern warm-water regions, as the Japan/East Sea and the southern areas of the North-West Pacific, are distinguished by higher species diversity of the cod parasites, and the northernmost region – Bering Sea has the poorest parasitic fauna with only 30 species.

However, the most expanded species are almost the same in all investigated regions – they are the trematode *Hemiurus levinseni*, acanthocephale *Echinorhynchus gadi*, and nematode *Pseudoterranova decipiens*.

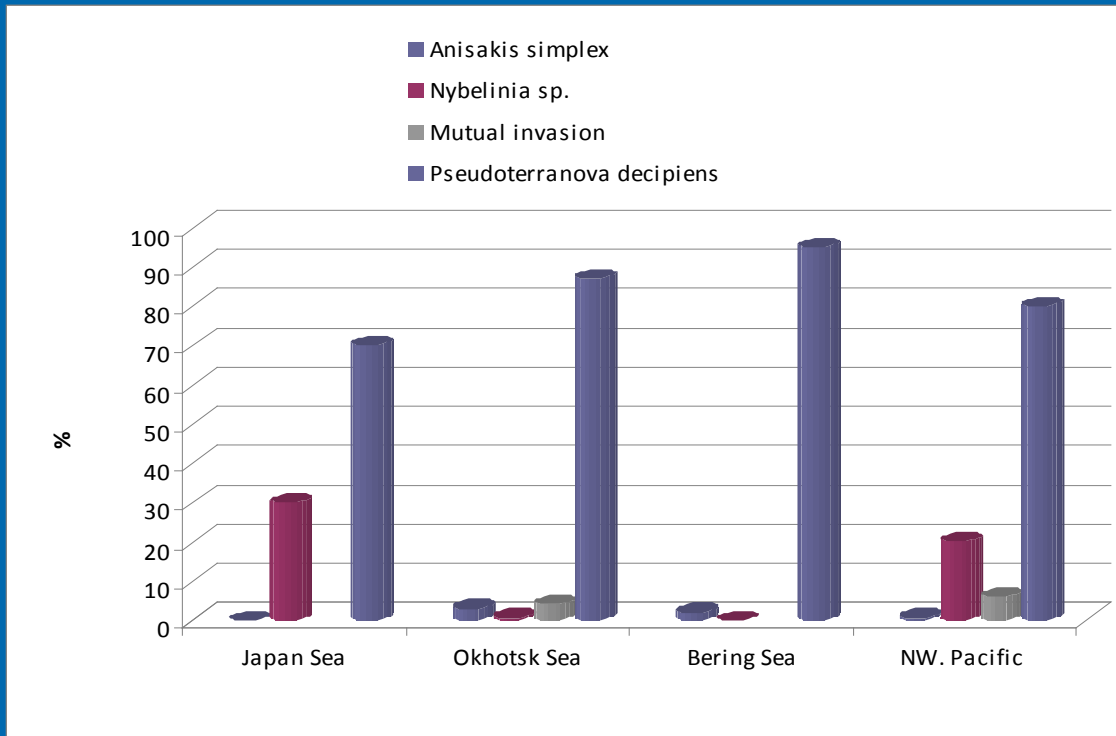
<i>pairs of regions</i>	<i>number of common species</i>
Japan Sea - NW Pacific	20
Japan Sea - Okhotsk Sea	18
Okhotsk Sea - NW Pacific	17
Bering Sea - NW Pacific	14

# Contamination of cod muscles, by size (age) groups



- Contamination of cod by parasites increases with its age, so small-sized fish is less contaminated, down to absence of parasites in the fish < 40 cm in the Bering Sea.
- Usually the increasing continues until the length 60 cm, where the contamination becomes stable or even slightly lower. This threshold is conditioned by change of the cod food spectrum: it includes zooplankton until the fish length 50-60 cm, but the cod larger than 60 cm preys on fish exclusively (feeding by zooplankton is more risky from the point of parasites infestation)

# Contamination of cod muscles by parasites dangerous for human health and worsening the fish appearance



*Anisakis simplex*



*Nybelinia sp*



*Pseudoterranova decipiens*



# Conclusions

- List of parasites from the pacific cod includes 65 species of microsporidians, myxosporeas, cestodes, trematodes, acanthocephales, nematodes, copepods, and leeches. The parasites species diversity is the highest in the Japan Sea 40 species and the lowest in the Bering Sea 30 species.
- All specimens of the pacific cod are contaminated by parasites. However, the most of its parasites are not dangerous for human health and even do not worsen the fish appearance. Besides, the contamination of the muscles and liver is considerably lower – in the range 20-60 %.
- The most common species of the cod parasites are the cestodes *Abothrium gadi* and *Nybelinia surmenicola*, trematodes *Podocotyle reflexa*, *Hemiurus levinseni*, acanthocephale *Echinorhynchus gadi*, and nematodes *Pseudoterranova decipiens* and *Anisakis simplex*
- Muscles of pacific cod are usually contaminated by larvae of the nematode *Pseudoterranova decipiens* and cestode *Nybelinia sp.*, the infestation by dangerous nematode *Anisakis simplex* is rare. Liver of pacific cod is generally lower contaminated by parasites than the muscles,



***Thanks for yours attention***

