

# **Monitoring of marine bioresources safety in the Far Eastern Seas**

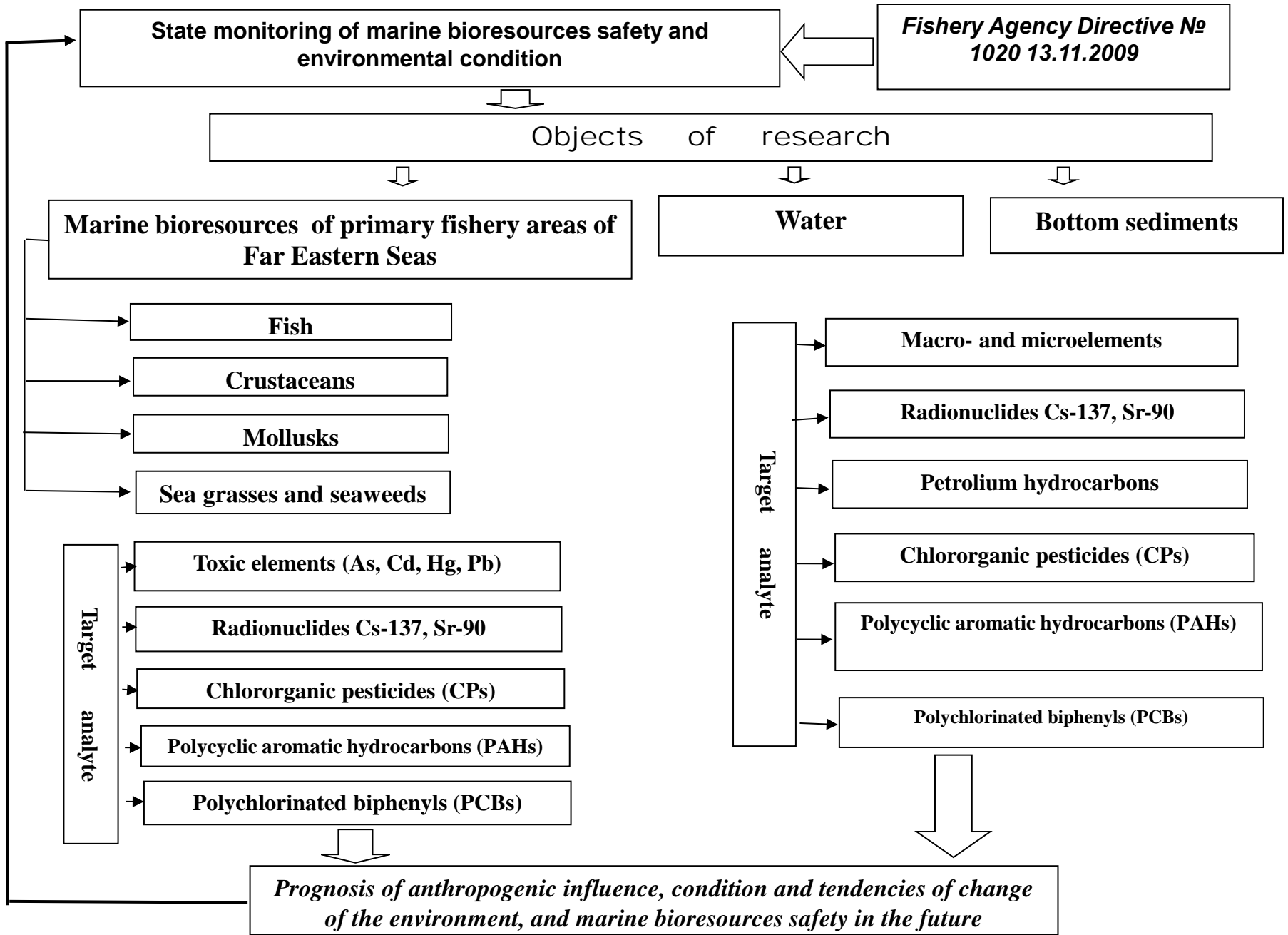
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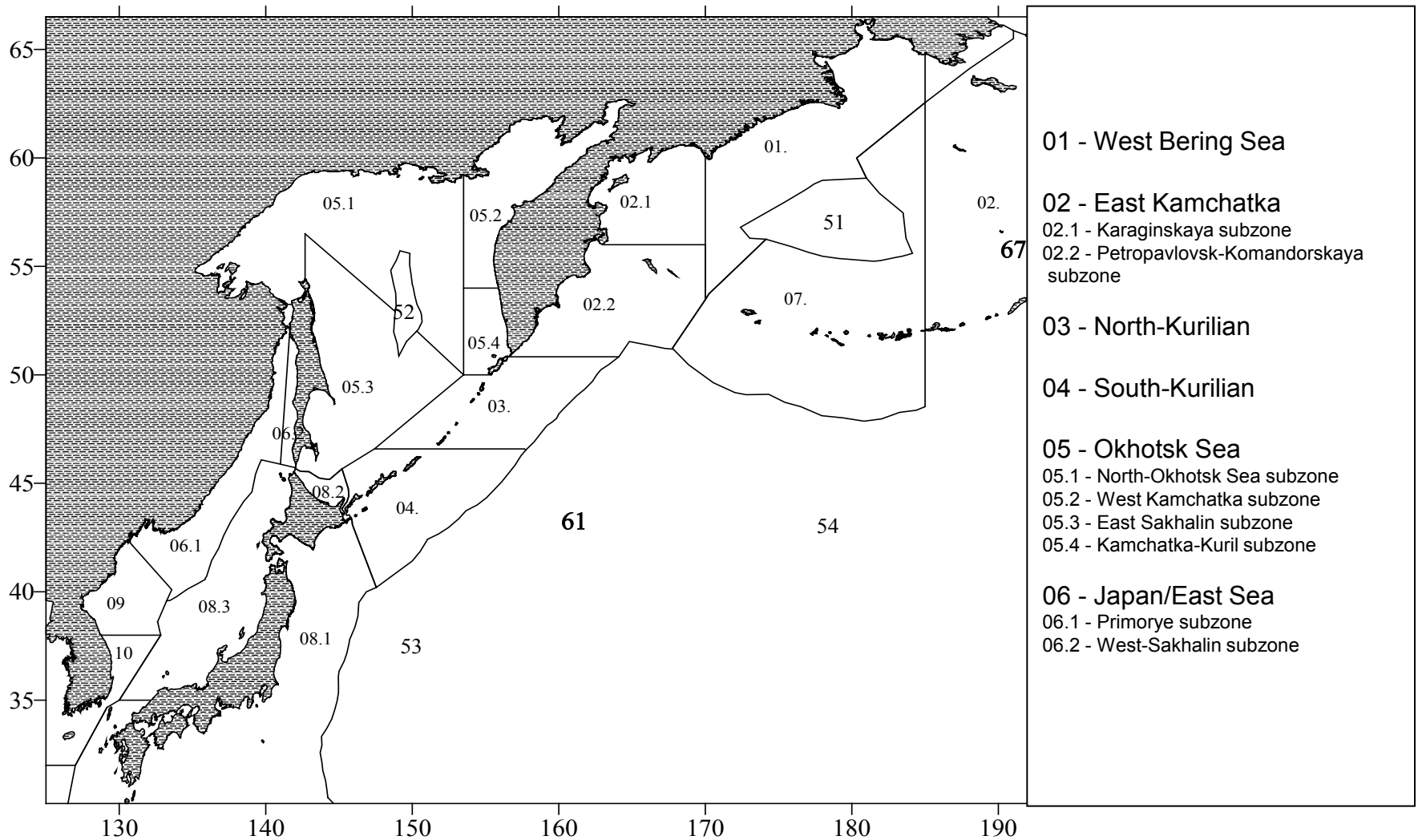
- **Ecological (environmental) monitoring**
  - complex observation of environmental condition, including natural compartments, natural ecological systems, processes and phenomena happened in this systems, assessment and prediction of environmental changes under global and local drivers influence (Izrael, 1979)

- **Goal**: Assessment of the marine bioresources safety and state of the marine environment of Far Eastern Seas fishery zones.
- **Tasks**: To determine content of trace metals, organochlorine pesticides, polycyclic aromatic hydrocarbons, polychlorinated biphenyls in the commercial species fished in the Far Eastern Seas/
- To assess quality and safety of water bioresources in relation with sanitary demands.
- To do qualitative estimation of TM, OPs, PAHs, PCBs concentrations in the sea water samples from fishery zones of Far Eastern Seas in relation with Water Quality Standards.

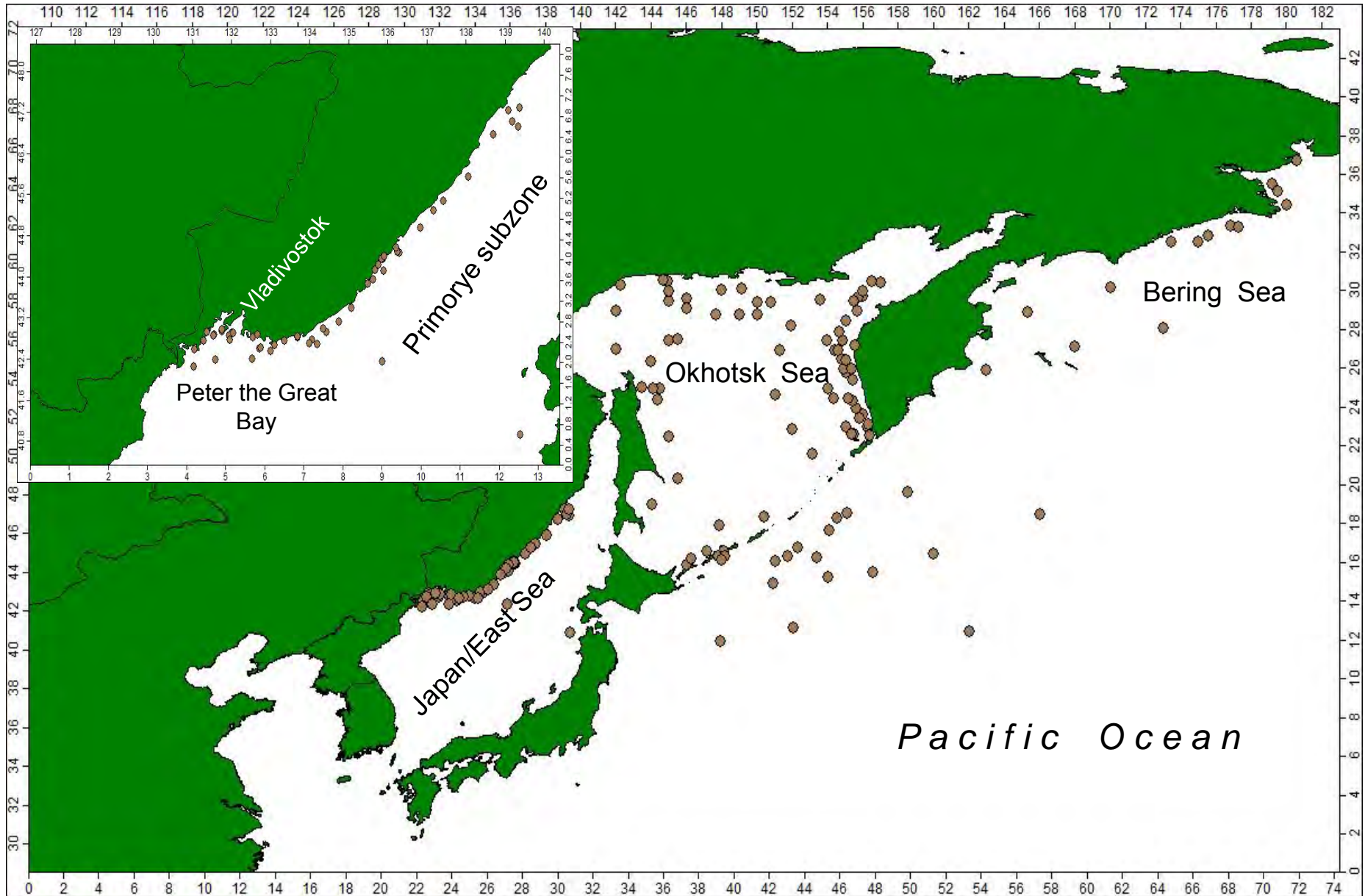


# North-Western part of Pacific Ocean

## Fishery zones of Russia



# Sea water sampling stations map 2011 - 2016



# Commercial species

- Pollock (*Theragra chalcogramma*) (Bering Sea, Japan/East Sea, Okhotsk Sea)
- Pacific herring (*Clupea pallasii*) (Okhotsk Sea)
- Cod (*Gadus macrocephalus*) (Okhotsk Sea)
- Pink salmon (*Oncorhynchus gorbusha*) (Pacific North-Kurilian zone)
- Chum salmon (*Oncorhynchus keta*) (Okhotsk Sea)
- Greenling spotty-bellied (*Hexagrammos agrammus*) (Japan/East Sea)
- Japanese pilchard (*Sardinops melanostictus*) (Pacific South-Kirilian zone)
- Dover sole (*Microstomus pacificus*) (Japan/East Sea)
- Scale-eye plaice (*Acanthopsetta nadezhnyi*) (Japan/East Sea)
- Yellow-striped flounder (*Pseudopleuronectes herzensteini*) (Japan/East Sea)
- Alaska plaice (*Pleuronectes quadrituberculatus*) (Okhotsk Sea)
- Marbled flounder (*Pseudopleuronectes yokohamae*) (Okhotsk Sea)
- Starry flounder (*Platichthys stellatus*) (Okhotsk Sea)
- Northern prawn (*Pandalus borealis*) (Japan/East Sea)
- Hampback shrimp (*Pandalus hypsinotus*) (Japan/East Sea)
- Bering shrimp (*Sclerocrangon salebrosa*) (Japan/East Sea)
- Snow crab (*Chionoecetes opilio*) (Japan-East Sea)
- Red king crab (*Paralithodes camtschaticus*) (Japan/East Sea)
- Hair crab (*Erimacrus isenbeckii*) (Japan/East Sea)

# Methods of investigation

- Atomic absorption spectrophotometry (flame, graphite furnace)
- Mass-spectrometry with inductively coupled plasma (ICP-MS)
- Gas- liquid chromatography with electron-capture detector
- IR-spectrometry



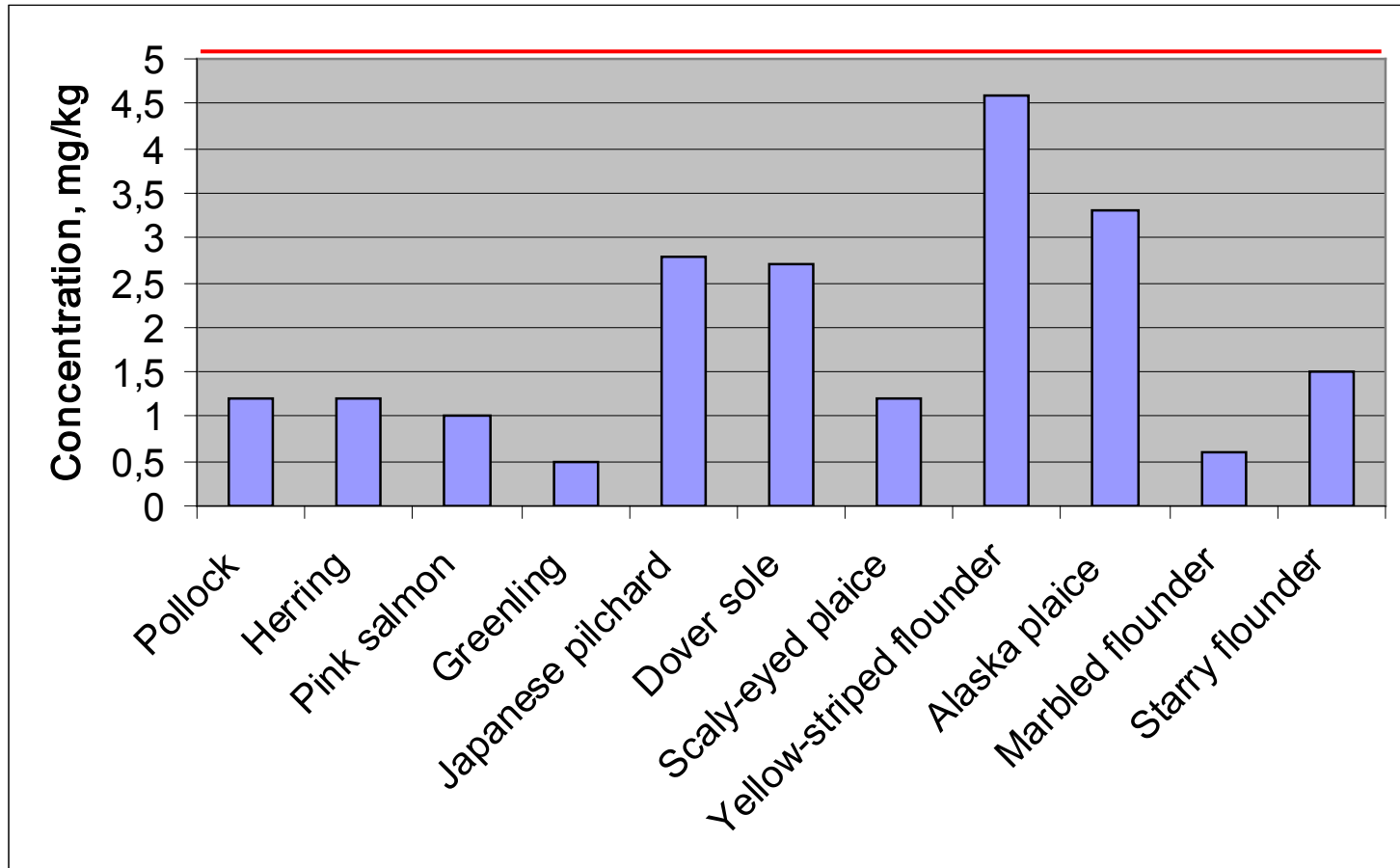
## Hygienic demands of food products safety and nutrition value (SanR&N 2.3.2.1078-01)

Object	As	Cd	Hg	Pb	DDT	HCCH	PCB
Fish products (all kinds)	<b>5,0</b>	<b>0,2</b>	<b>0,5</b>	<b>1,0</b>	<b>0,2</b> <b>(2,0)</b>	<b>0,2</b>	<b>2,0</b>
Mollusks, crustaceans, other invertebrates	<b>5,0</b>	<b>2,0</b>	<b>0,2</b>	<b>10,0</b>	-	-	-
Sea grasses, seaweeds	<b>5,0</b>	<b>1,0</b>	<b>0,1</b>	<b>0,5</b>	-	-	-

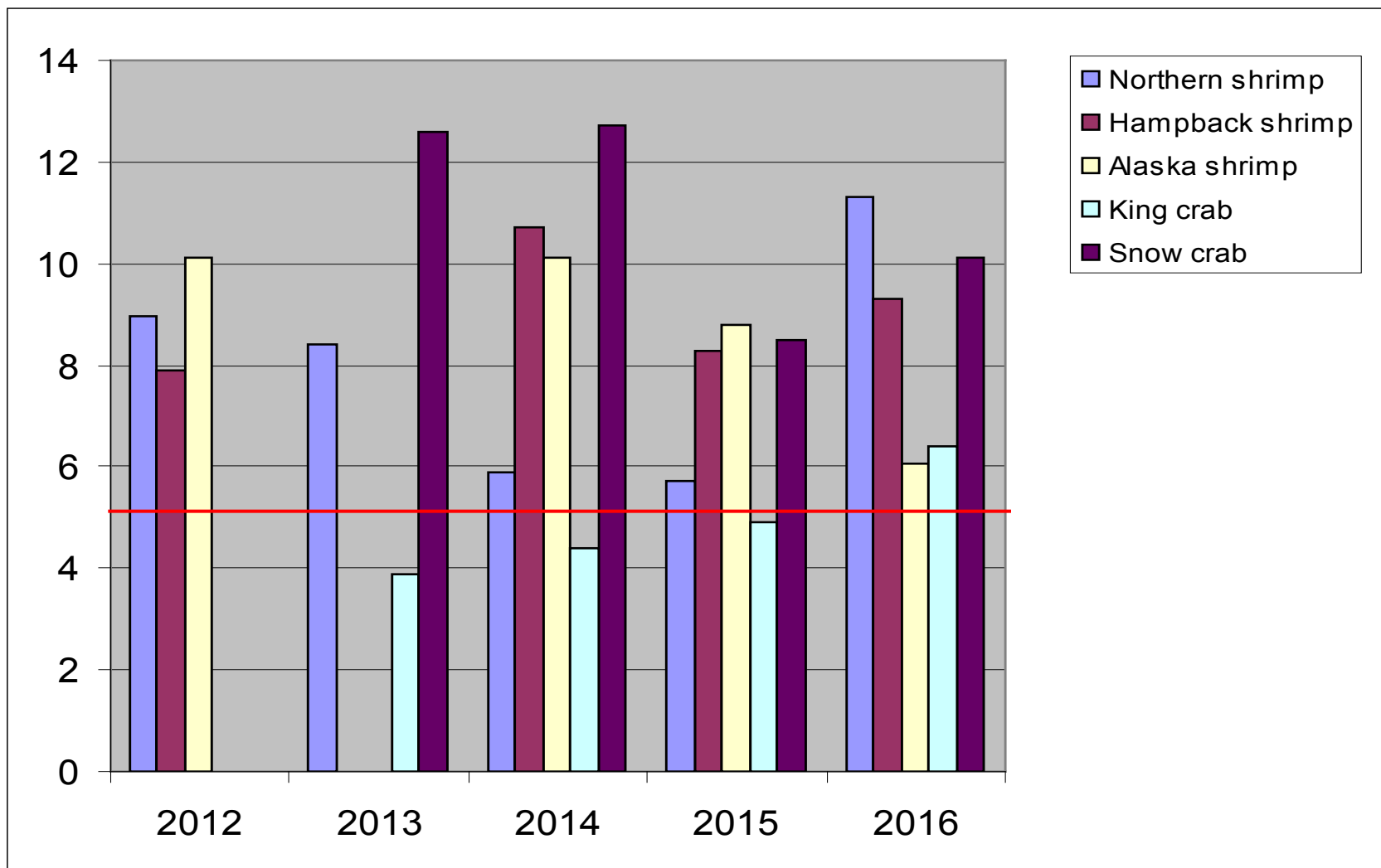
Regulatory standard of water quality of the fishery water bodies (Directive of Fishery Agency № 20, 18.01.2010)

Analyte	MPL, mg/l	Analyte	MPL, mg/l
As	0,01	Mn	0,05
Cd	0,01	Ni	0,01
Co	0,005	Pb	0,01
Cr	0,02	Zn	0,05
Cu	0,005	CPs	0,00001
Fe	0,05	PAHs	0,00001
Hg	0,0001	PCBs	0,00001

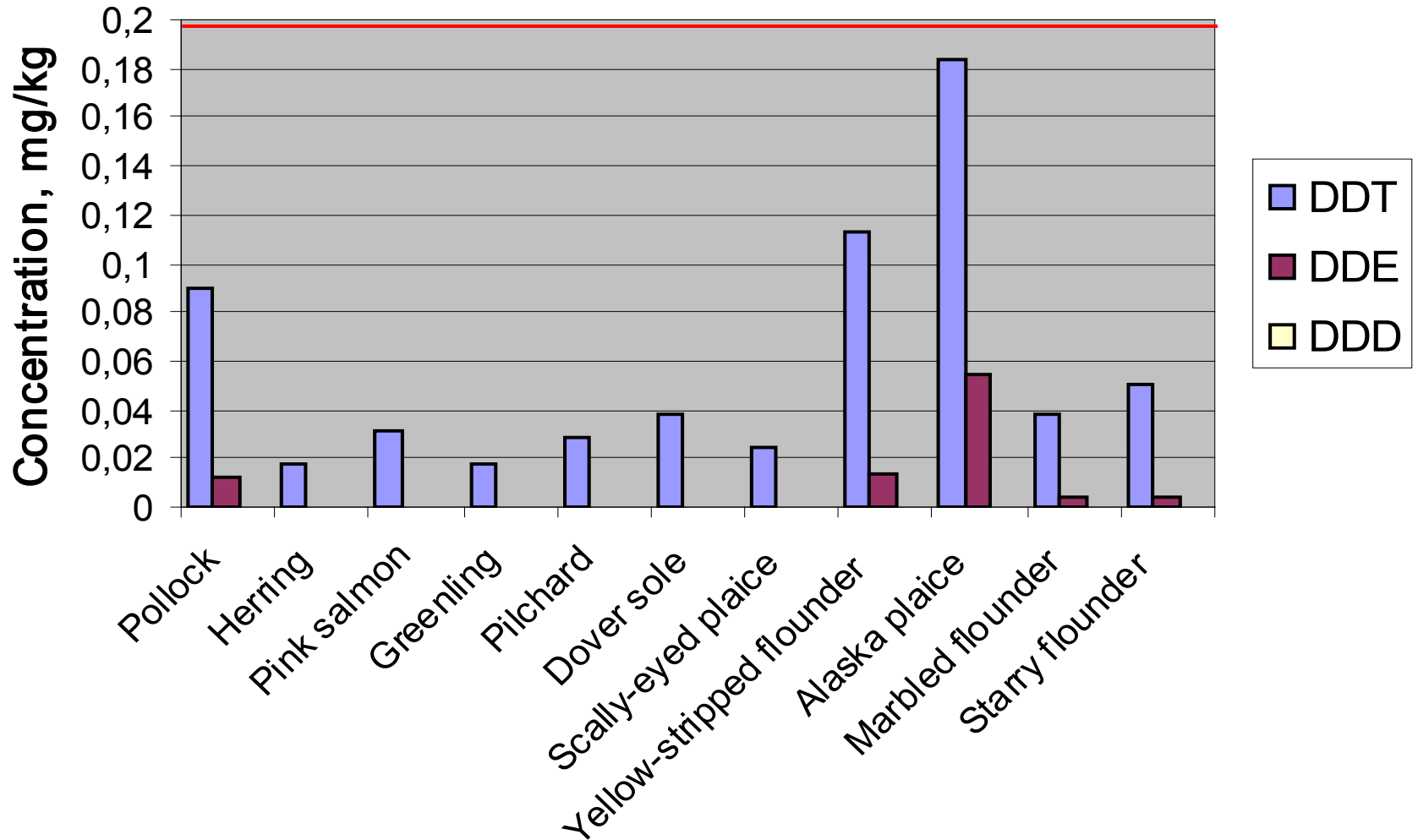
# Arsenic concentrations in the commercial fish from Far-Eastern Seas, mg/kg



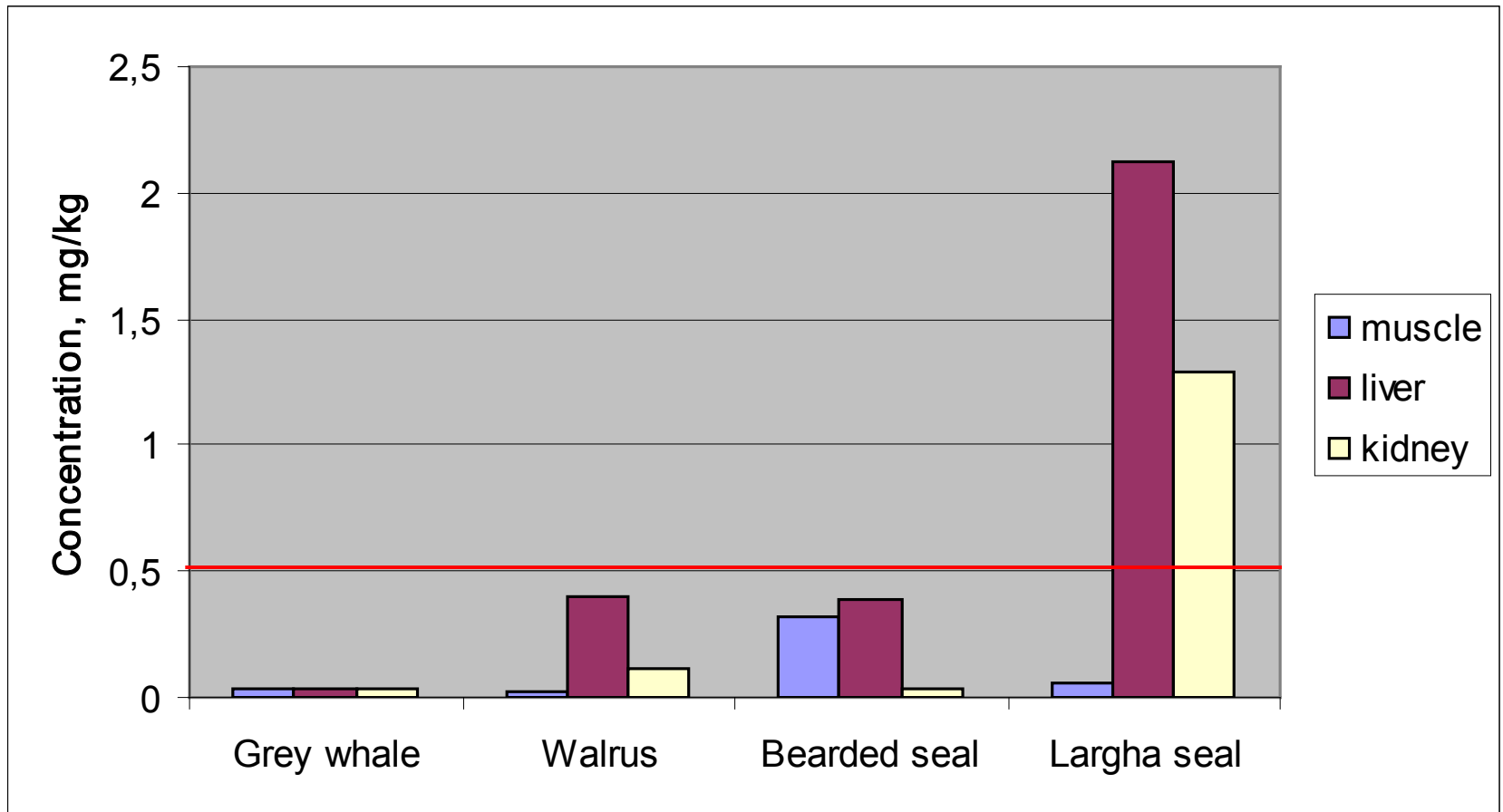
# Arsenic concentrations in the commercial crustaceans from Far Eastern Seas in relation to year of sampling, mg/kg



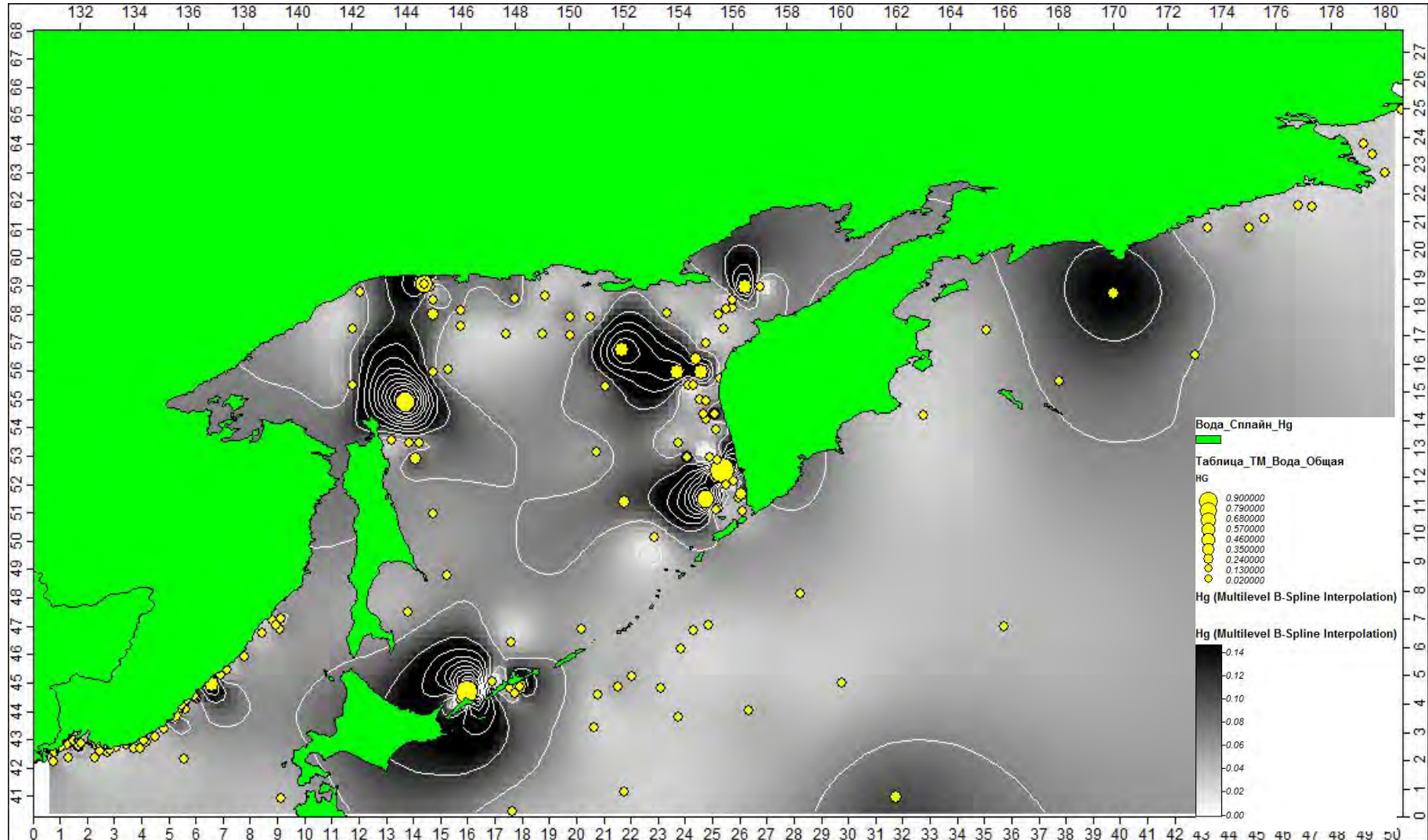
# OP concentrations in fishes from main fishery zones of Far Eastern Seas, mg/kg



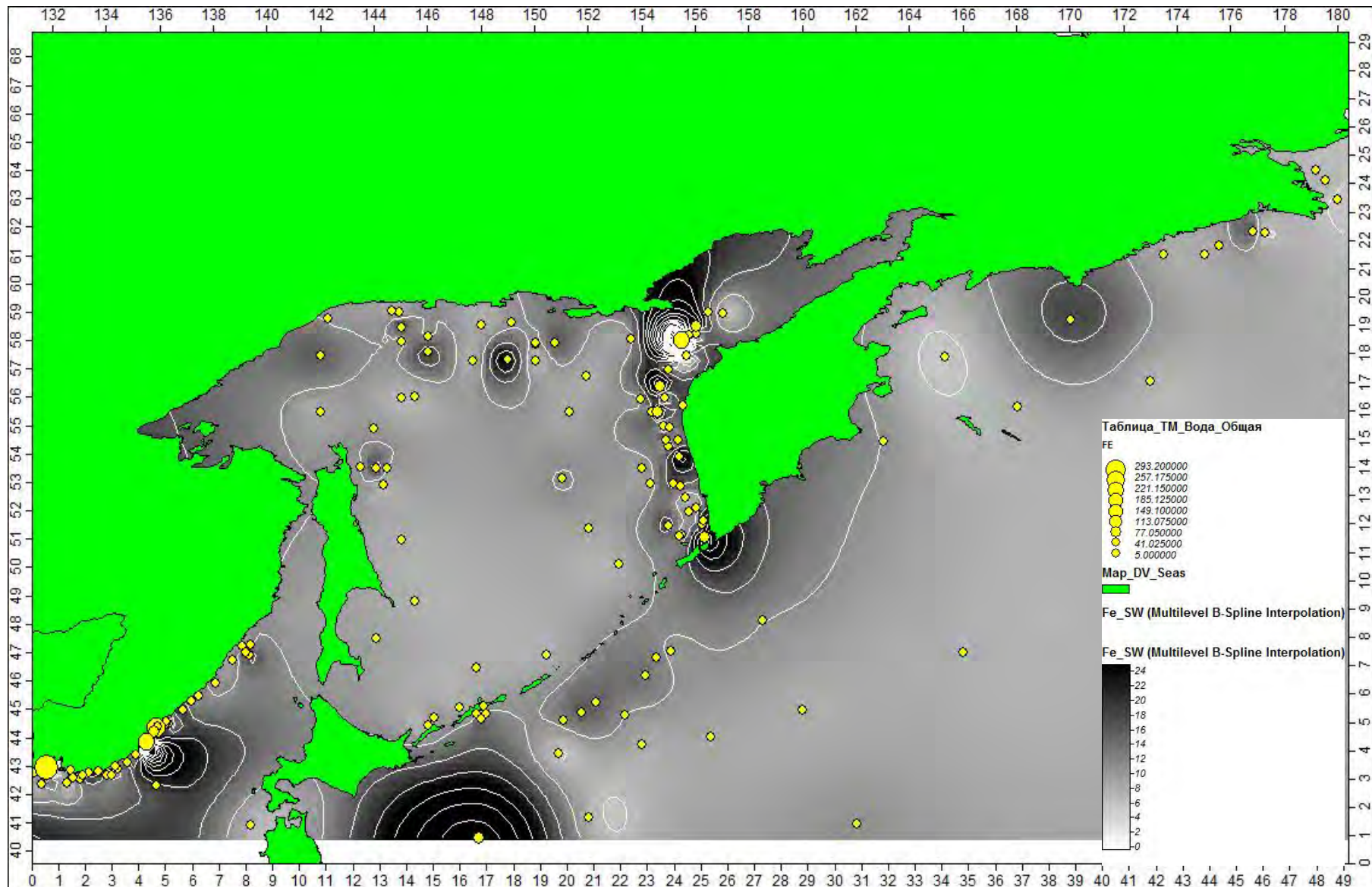
# Mercury concentrations in marine mammal tissues from different areas of Far Eastern Seas, mg/kg



# Spatial distribution of mercury in the surficial sea water layer of Far Eastern Seas in 2011-2016, $\mu\text{g/l}$



# Spatial distribution of iron in the surficial sea water layer of Far Eastern Seas in 2011-2016, $\mu\text{g/l}$





# Summary:

- 1. The content of trace elements, organochlorine pesticides, polychlorinated biphenils, polycyclic aromatic hydrocarbons in marine bioresources from the base fishery areas of Far Eastern Seas were determined.
- 2. It was demonstrated, that quality of commercial fishes captured in Japan/East, Okhotsk and Bering Seas was in the good agreement with the safety demands of Sanitary Rules.
- 3. It was found, that total arsenic concentrations in the commercial crustaceans exceeded threshold level 5 mg/kg. It is necessary to establish threshold level of inorganic arsenic in marine bioresources in the Exclusive Economic Zone of Russian Federation.

- 4. Trace metal concentrations in sea water of fishery zones of Far Eastern Seas did not exceed threshold levels, excluding elevated concentrations of Hg and Fe in the samples from some sampling stations of Okhotsk and Japan/East Seas.
- 5. Persistent organic pollutants (OPs, PAHs, PCBs) in marine media of Far Eastern basin were not determined.



Thank you for attention