The value of ecosystem services of Peter the Great Bay (Japan/East Sea)

Olga N. Lukyanova, Ludmila V. Nigmatulina

Pacific Research Fisheries Centre
(TINRO-Centre),
4, Shevchenko Al., 690950, Vladivostok, Russia.
E-mail: onlukyanova@tinro.ru

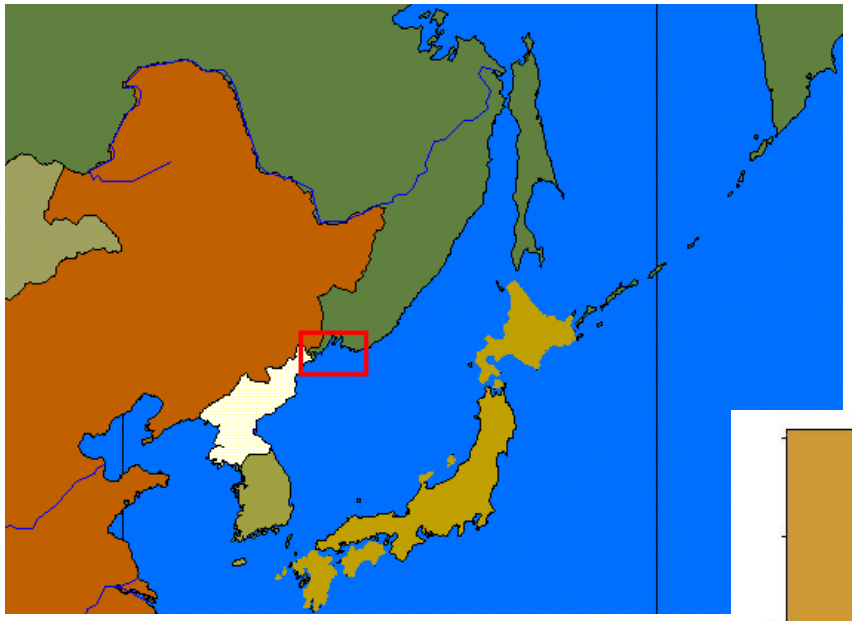
Economic value of natural resources of marine and terrestrial ecosystems is necessary for investment of capital, in industrial planning and assessment of losses from human activity and anthropogenic pollution.

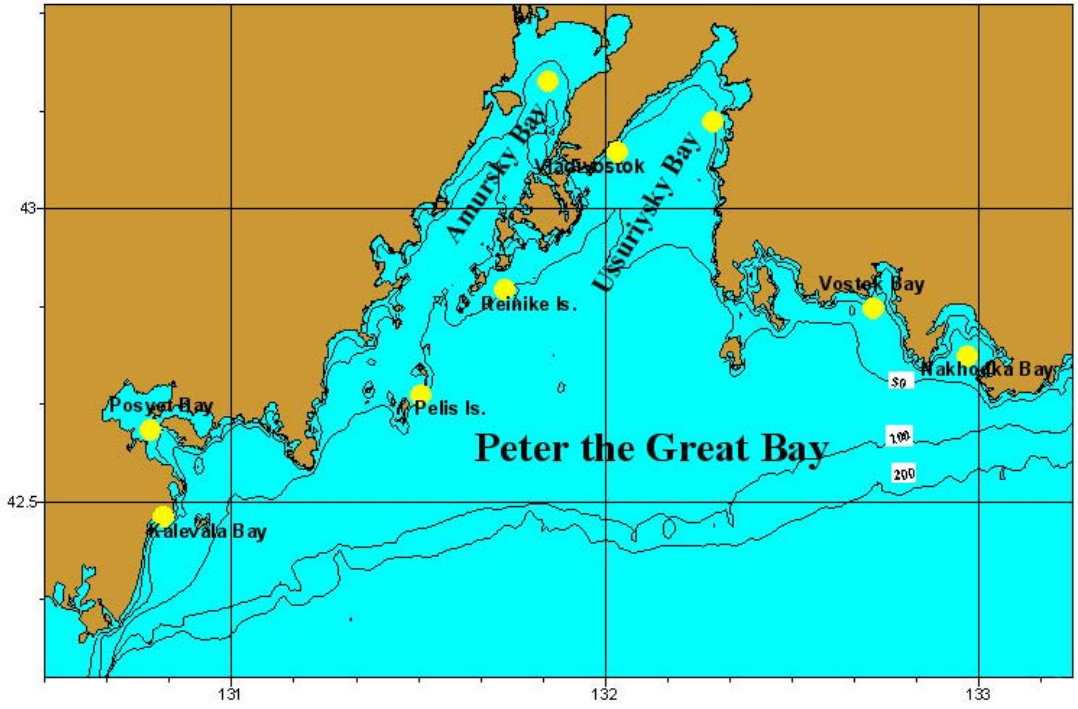
It is therefore necessary to know trends in the number and biomass of main commercial species in study area in order to forecast their changes in future.

The total amount of natural biological resources in the Russian EEZ of the Japan/East Sea varied significantly during last decades.

Nowadays the total biomass of fish, invertebrates and seaweeds is lower than in the 1980s, but the biomasses of main commercial species remained constant during recent years. Data of oceanography and marine biology indicate that such a stable trend will remain till 2015.

Peter the Great Bay, Japan/East sea





The main commercial fish from Peter the Great Bay

Fish	Number of species
Flatfishes	10
Pacific herring	1
Walleye pollock	1
Saffron cod	1
Greenlings	2
Sculpins	8
Far eastern dace	2
Smelts	3
Pacific cod	1
Rockfishes	4
Pacific salmons	3

The main commercial marine invertebrates from Peter the Great Bay

Bivalves	Cephalopods	Echinoderms	Crustaceans
Scallops	Squid	Sea urchins	Crabs
Mussels		Sea cucumber	Shrimps
Anadara			
Spisula			
Corbicula			

The main commercial seaweeds from Peter the Great Bay

Brown algae

- Laminaria japonica

Red algae

- Ahnfeltia tobuchiensis
- Gracillaria verrucosa

Sea grass

- Zostera marina

Methods

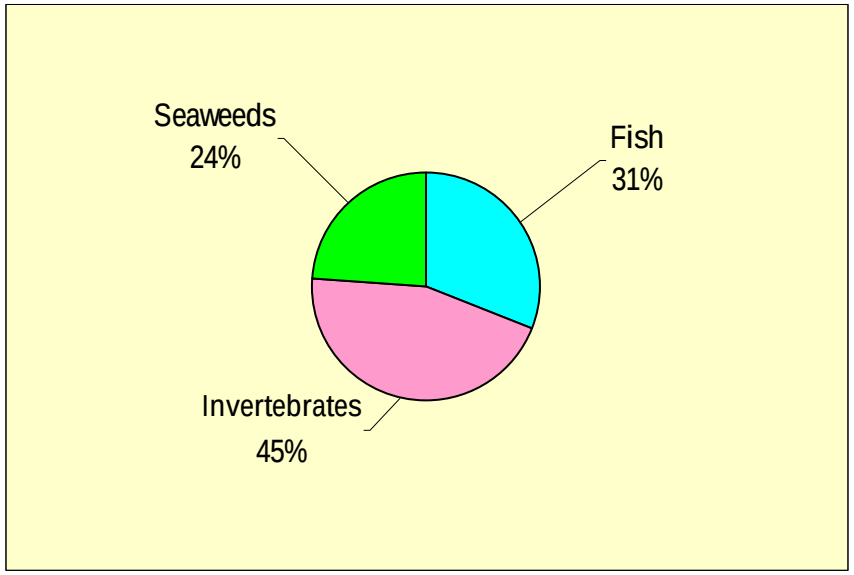
The value of biological resources in Peter the Great Bay based on

- the amount of total biomass of commercial species in the bay and
- the average prices for each relevant unit on the Russian market.

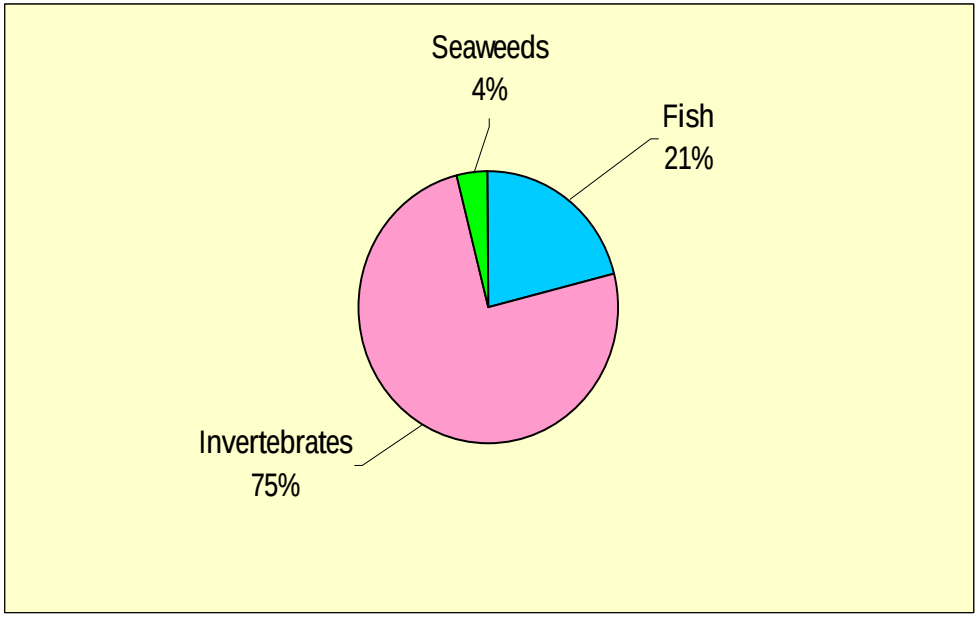
The biomass and value of biological resources of Peter the Great Bay in 2007

Kind of resources	Biomass, t	%	Value, Thousand USD	%
Fish	126,339	31	189,510	21
Invertebrates	187,359	45	659,120	75
Seaweeds	98,500	24	35,970	4
Total	412,198	100	884,600	100
Per unit area	7,4 t /km^2		160 USD/ha	

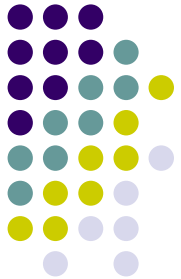
The biomass of main groups of commercial marine organisms from Peter the Great Bay



Value of main groups of commercial marine organisms from Peter the Great Bay



List of major biome of the Earth



- Marine
  - Open ocean
  - Coastal
    - Estuaries
    - Seagrass
    - Coral reffs
    - Shelf
- Terrestrial
  - Forest
    - Tropical
    - Temperate/boreal

  Grass

  Wetland

  Lakes/rives

  Desert

  Tundra

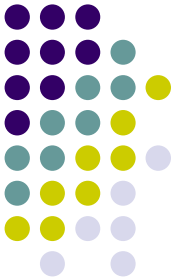
  Ice/rock

  Cropland

  Urban

Summary of average global value of annual marine ecosystem services

(US$ ha^{-1} year^{-1}) (Costanza et al., 1997)



Biome	Area	Gas regu-lation	Distur-bance regu-lation	Nutrient cycling	Waste treat-ment	Biolo-gical control	Habitat	Food produc-tion	Raw mate-rials	Recre ation	Cultu-ral	Total value per ha	Total global flow value $ yr^{-1} x10^{9}
Marine	36,3											577	20,94
Open ocean	33,2	38		118		5		15			76	252	8,381
Coastal	3,01		88	3,67		38	8	93	4	82	62	4,05	12,568
Estuarine	180		567	21,10		78	131	521	25	381	29	22,83	4,110
Seagrass /algae	200			19,00					2			19,00 4	3,801
Coral reefs	62		2,750		58	5	7	220	27	3,008	1	6,075	375
Shelf	2,66			1,43		39		68	2		70	1,610	4,283

Summary of average global value of annual shelf ecosystem services

(US$ ha^{-1} year^{-1})

Biome	Area, ha x 10^6	Nutrient cycling	Biological control	Food production	Raw material	Cultural	Total value per ha	Total global flow value yr^{-1} x 10^9
Shelf	**2,66**	**1,43**	**39**	**68**	**2**	**70**	**1,610**	**4,283**

Total global value of annual ecosystem services of the Earth is about 33 trillion USD.

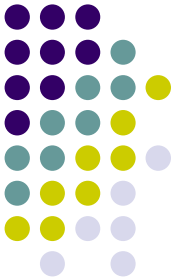
The gross global national product total was 18 trillion USD per year (1990s)

The value of services of marine ecosystems is about 21 trillion USD, and of terrestrial ecosystems is about 12 trillion..

Total value of annual ecosystems services of costal area of the World Ocean is $ 12,6 trillion.

Total area of the shelf is 26,6 million km^{2}.

Summary of average global value of annual shelf ecosystem services (Peter the Great Bay) (US$ ha^{-1} $year^{-1}$)



Biome	Nutrient cycling	Biological control	Food produc-tion	Raw material	Cultural	Total value per ha
Shelf	**1,43**	**39**	**68**	**2**	**70**	**1,610**

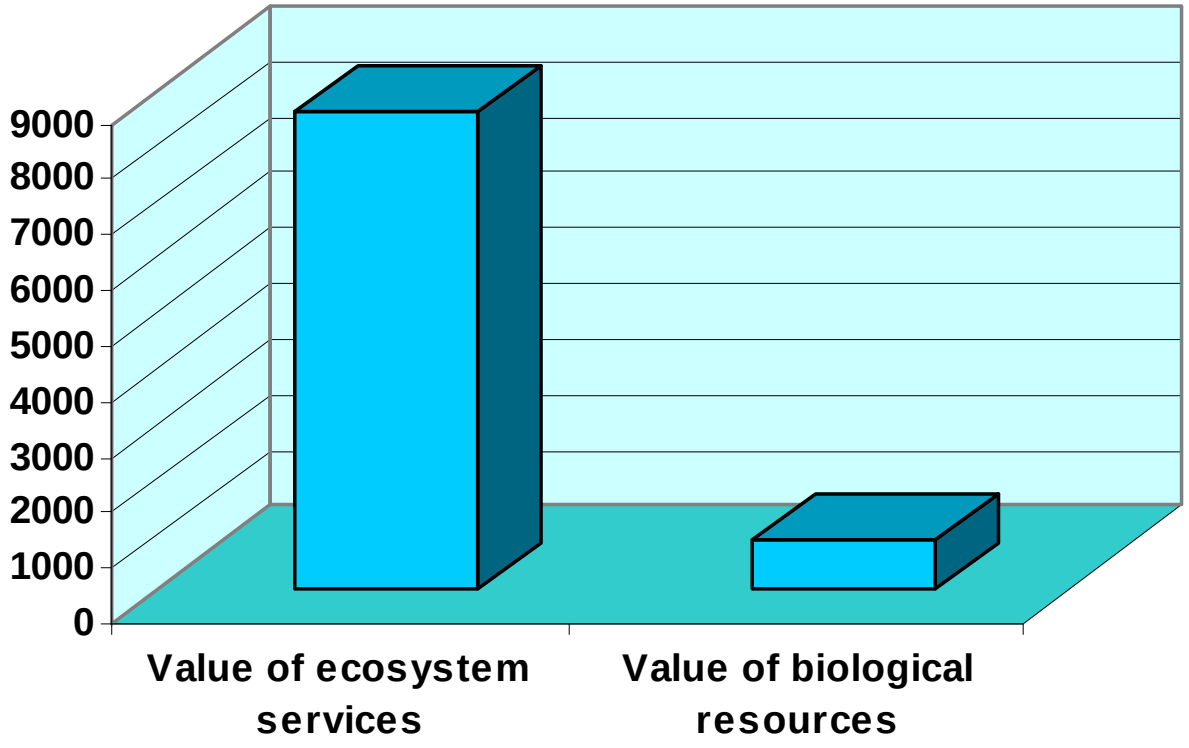
Average value of annual ecosystem services for Peter the Great Bay was estimated as $1610 ha^{-1} yr^{-1}.

The total square of the Bay is 55600 km^2 .

The total value of ecosystem services of Peter the Great Bay is $ 8,573 x 10^6 yr^{-1} .

The value of biological resources of the Bay is $ 885x 10^6 yr^{-1}

Value of ecosystem services and biological resources of Peter the Great Bay



CONCLUSION

The evaluation of ecosystem services make the range of potential values of these services more apparent.

Such an estimation could be considered only provisional.

Next step is to establish specific coefficients for ecosystems of different climatic zones in relation with their biodiversity and other features.

We are planning to evaluate ecosystem services for other main fisheries regions of the Russian Far-Eastern seas.

THANK YOU VERY MUCH

FOR YOUR ATTENTION.