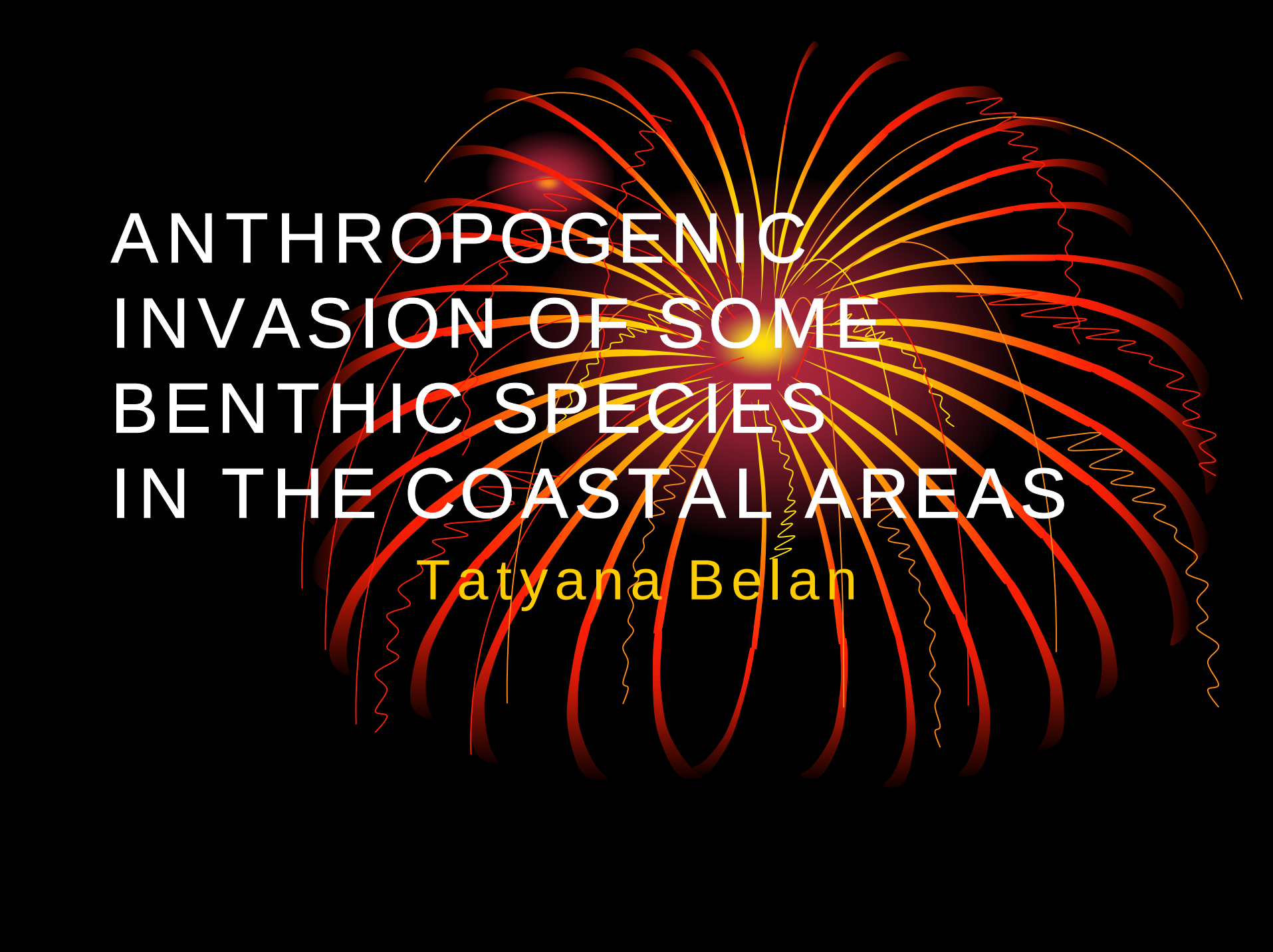
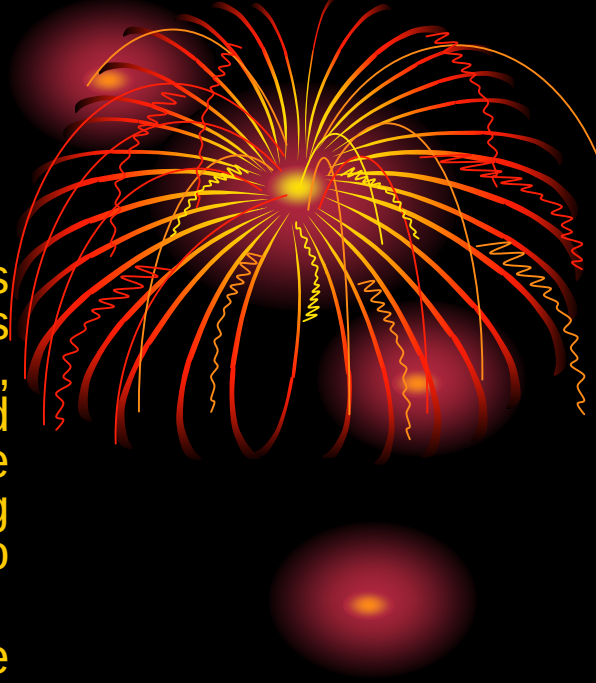


ANTHROPOGENIC INVASION OF SOME BENTHIC SPECIES IN THE COASTAL AREAS

Tatyana Belan

ANTHROPOGENIC INVASION OF SOME BENTHIC SPECIES IN THE COASTAL AREAS



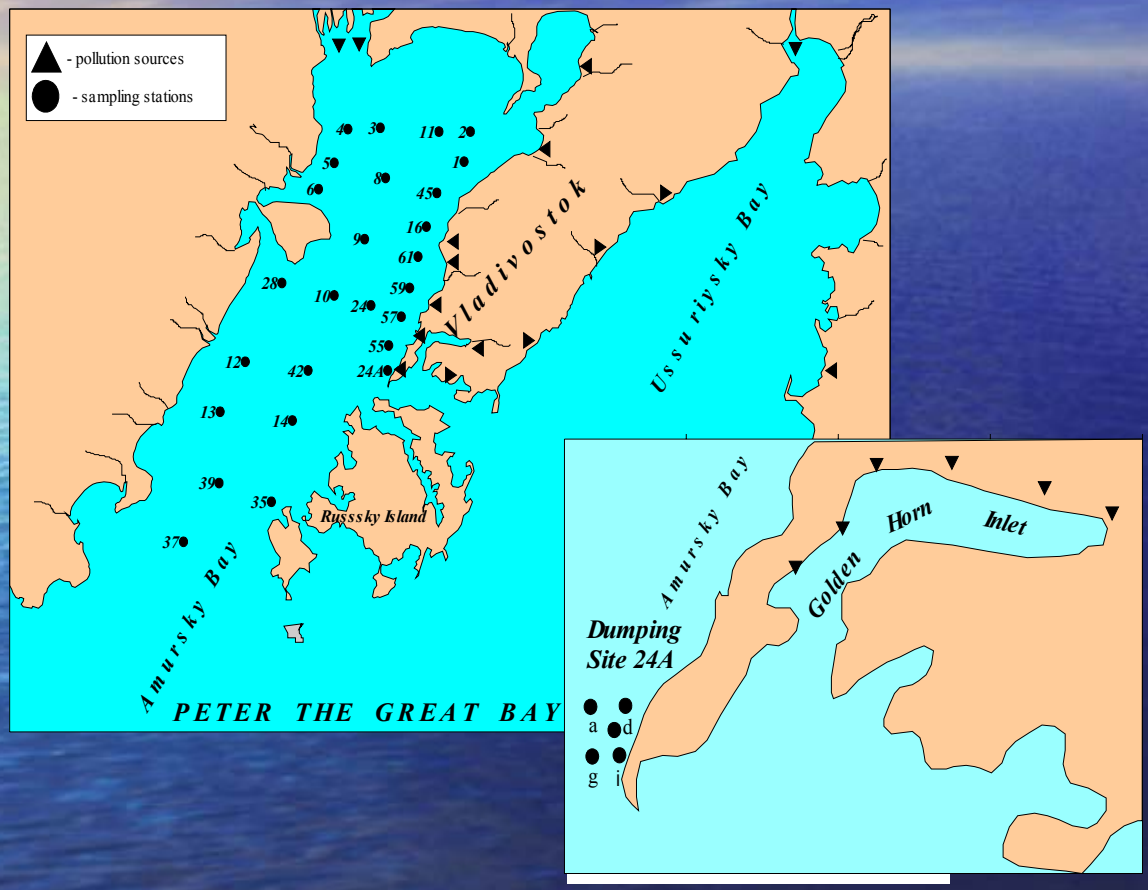
- One of the problems of negative alterations of coastal ecosystems is an exotic species introduction. Indeed, since 1980s, ctenophore *Mnemiopsis leidyi* has invaded the Azov and Black Seas. Common for the Japan Sea species have appeared along southeastern Australia, in San Francisco Bay and in the Atlantic coastal waters.
- Another problem is the invasion of some local species, expansion of their habitat areas and replacement of common benthic organisms.
- Since 1970s-1980s, in the urban and industrial areas of different geographical zones some species (considered to be rare in the middle of last century) were spreading abundantly.
- The main reasons of this phenomena is the alteration of natural conditions due to introduction of a large number of chemicals into the marine environmental.

ANTHROPOGENIC INVASION OF SOME BENTHIC SPECIES IN THE COASTAL AREAS

- The main purpose of this report is to give review of marine environmental quality of coastal zone of Peter the Great Bay (the Sea of Japan), species composition and abundance of benthos, and to compare data obtained in 1980s and in 2001.

- Objectives:
- 1. To study content and distribution pattern of some pollutants in bottom sediments (TM, PHCs, CHCs).
- 2. To study species composition and abundance of benthos.
- 3. To detect possible alterations of benthos species composition, abundance and distribution in 2001 compared with 1980s.

Marine environmental quality assessment in Amursky Bay in 1986-1989. Study area. Methods.



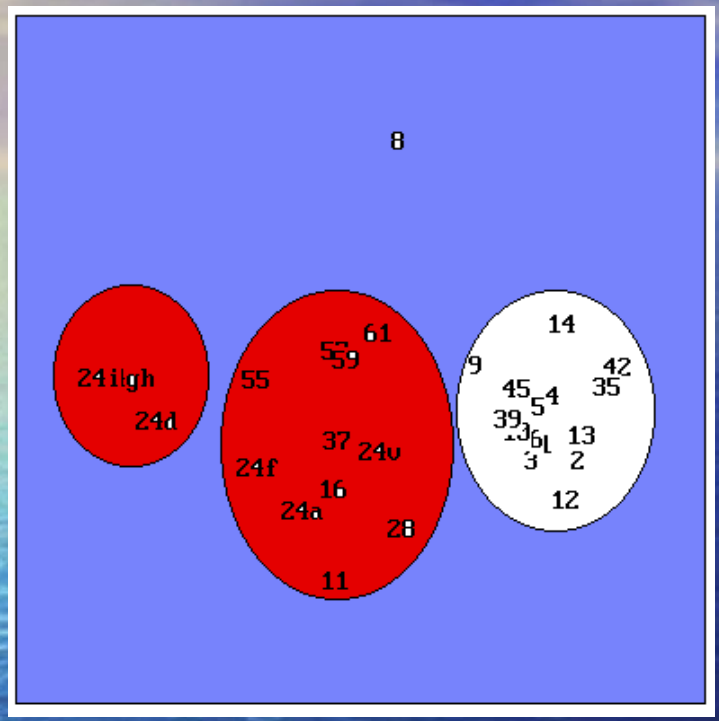
30 stations were investigated in Amursky Bay. Two or three replicate sediments samples were collected at each station with a van Veen grab for benthos study and chemical analysis.

The most polluted zones were detected by PCA of sediment chemistry data (content of PHC, Cu, Cd, Pb, Zn, Fe).

Benthic communities were detected by hierarchical agglomerative cluster analysis.

Species having the greatest contribution to the division of sites into clusters were determined using the similarity percentages program (SIMPER).

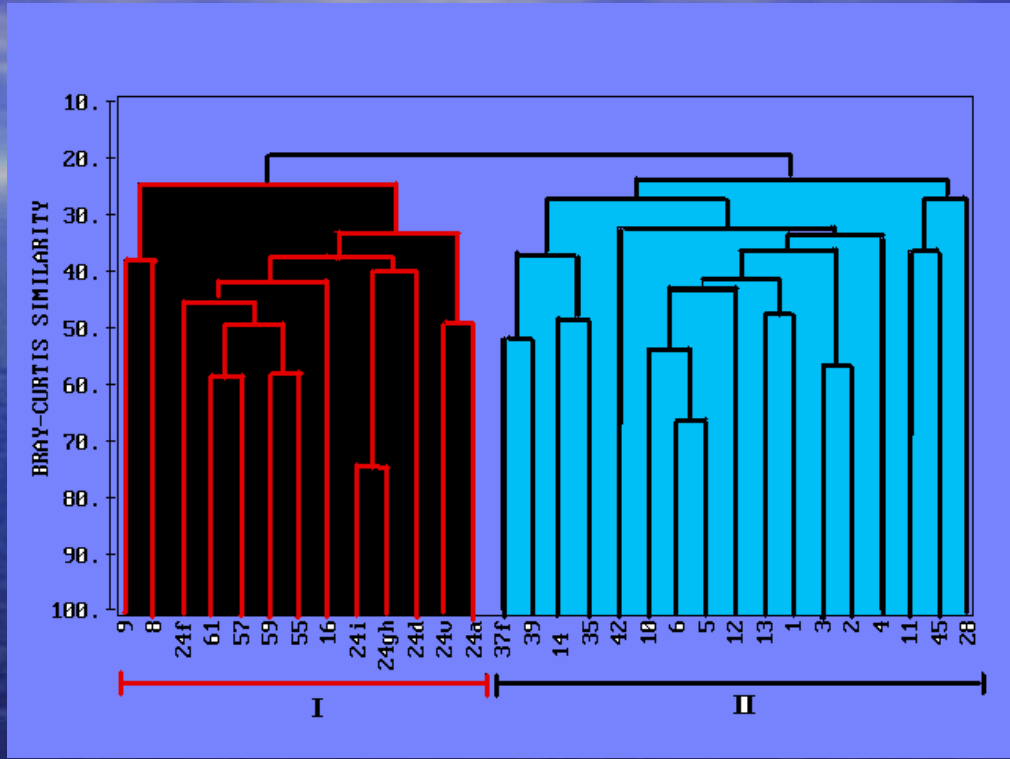
Amursky Bay, 1986-1989. Results.



PCA ordination of sediment chemistry data. Concentrations of PHC and TM (Cu, Cd, Pb, Zn, Fe) in bottom sediments after transformation (√) and normalization for 30 sites (% variance explained = 87%).

I – gross pollution; II – severe pollution;

III – moderate pollution.

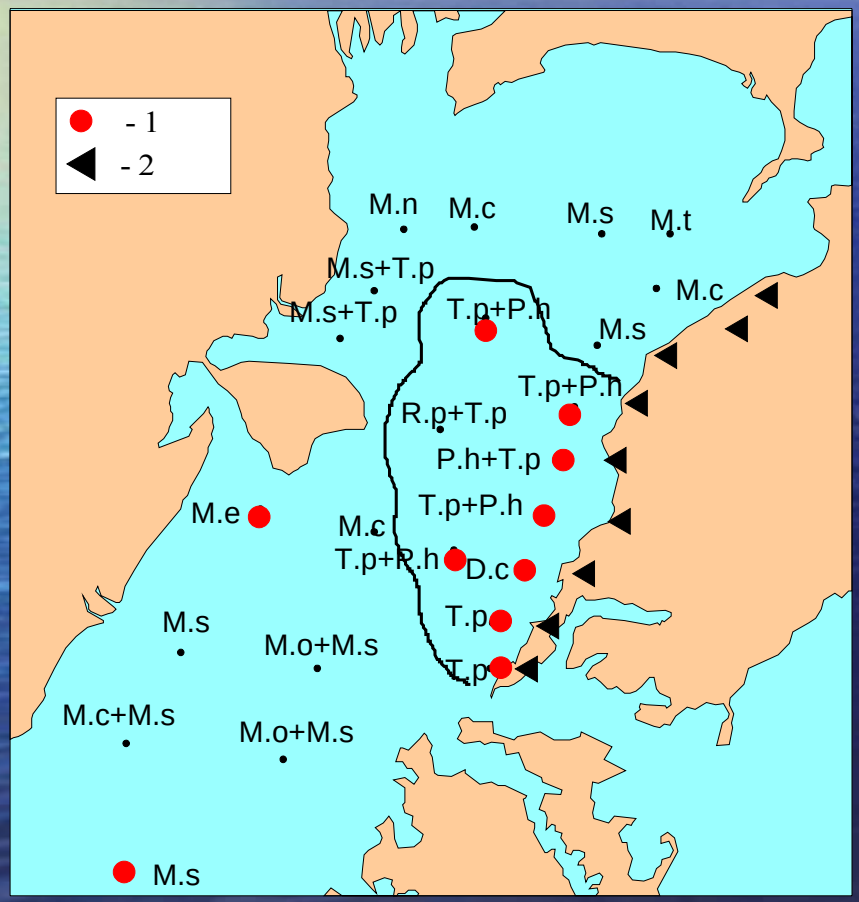


Macrozoobenthos fauna. Dendrogram for hierarchical clustering for 30 sites, using group-average linking of Bray-Curtis similarities calculated on √√-transformed and standartization biomass data.

Bottom sediment pollution and distribution of benthic communities in Amursky Bay in 1986-1989

1 – the most polluted areas; 2 - main pollution sources

Dominant of biomass species: T.p – *Tharyx pacifica;* P.h – *Phoronopsis harmeri*; D.c – *Dipolydora cardalia*; M.s – *Maldane sarsi*; M.o – *Macoma orientalis*; M.c – *Macoma calcarea*; M.n – *Macoma nipponica*; M.t – *Macoma tokoyensis*; M.e – *Melinna elisabethae; O.s-Ophiura sarsi; C.c – Cirratulus cirratus; S.i – Scalibregma inflatum; C.m – Cerebratulus marginatus; D.p. – Dosinia penicillata*

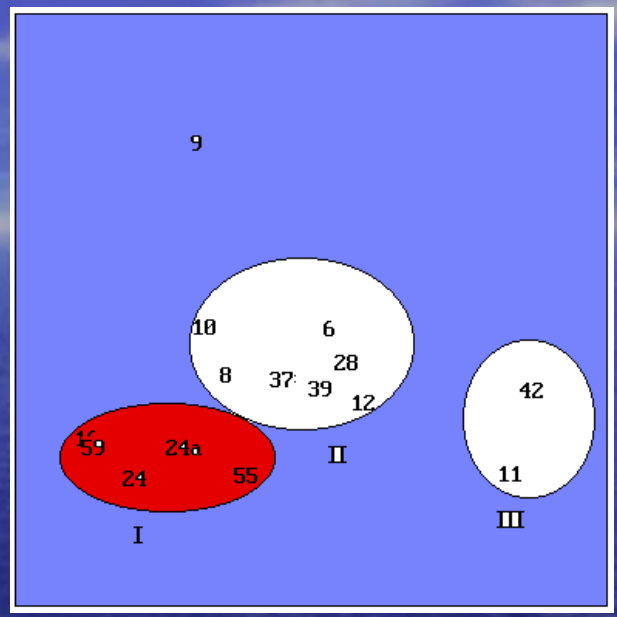


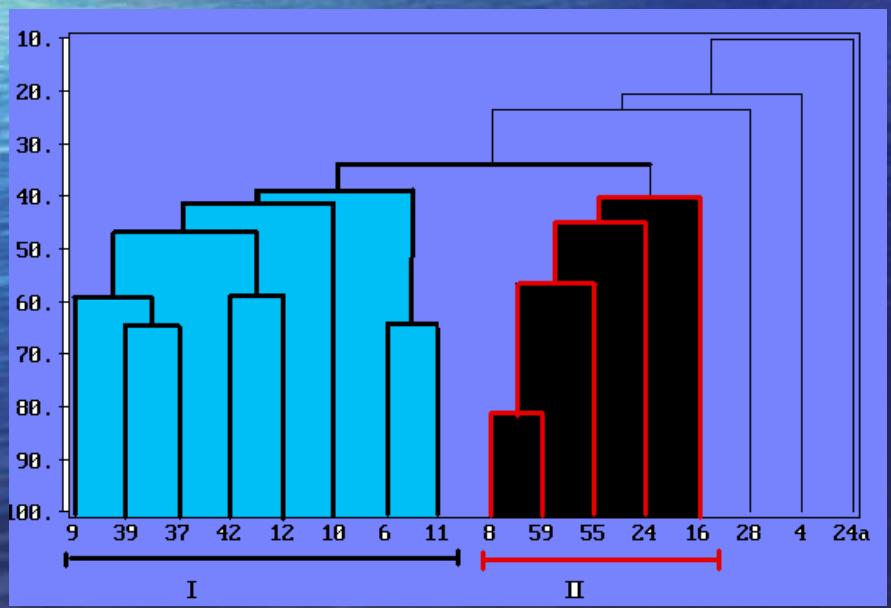
Our results showed that the zones with the highest pollutant concentrations consisted with the boundary community I, and inhabited by small opportunistic species of polychaetes and phoronids, having anomalously high density.

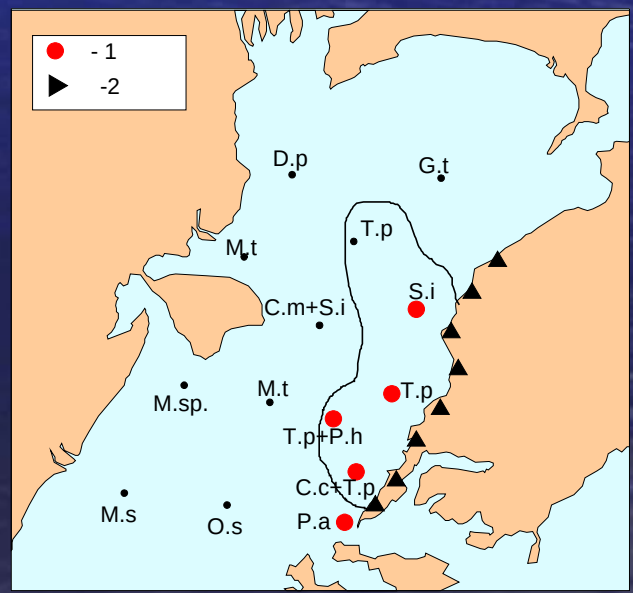
SIMPER data analysis indicated that following species were determined the community structure and dominated in term of density and biomass: polychaetes *Th. pacifica, Schistomeringos japonica, D. cardalia, Capitella capitata,* phoronid *Ph. harmeri.* Subdominant species was *Cirrartulus cirratus.*

Marine environmental quality assessment in Amursky Bay in 2001. Results.

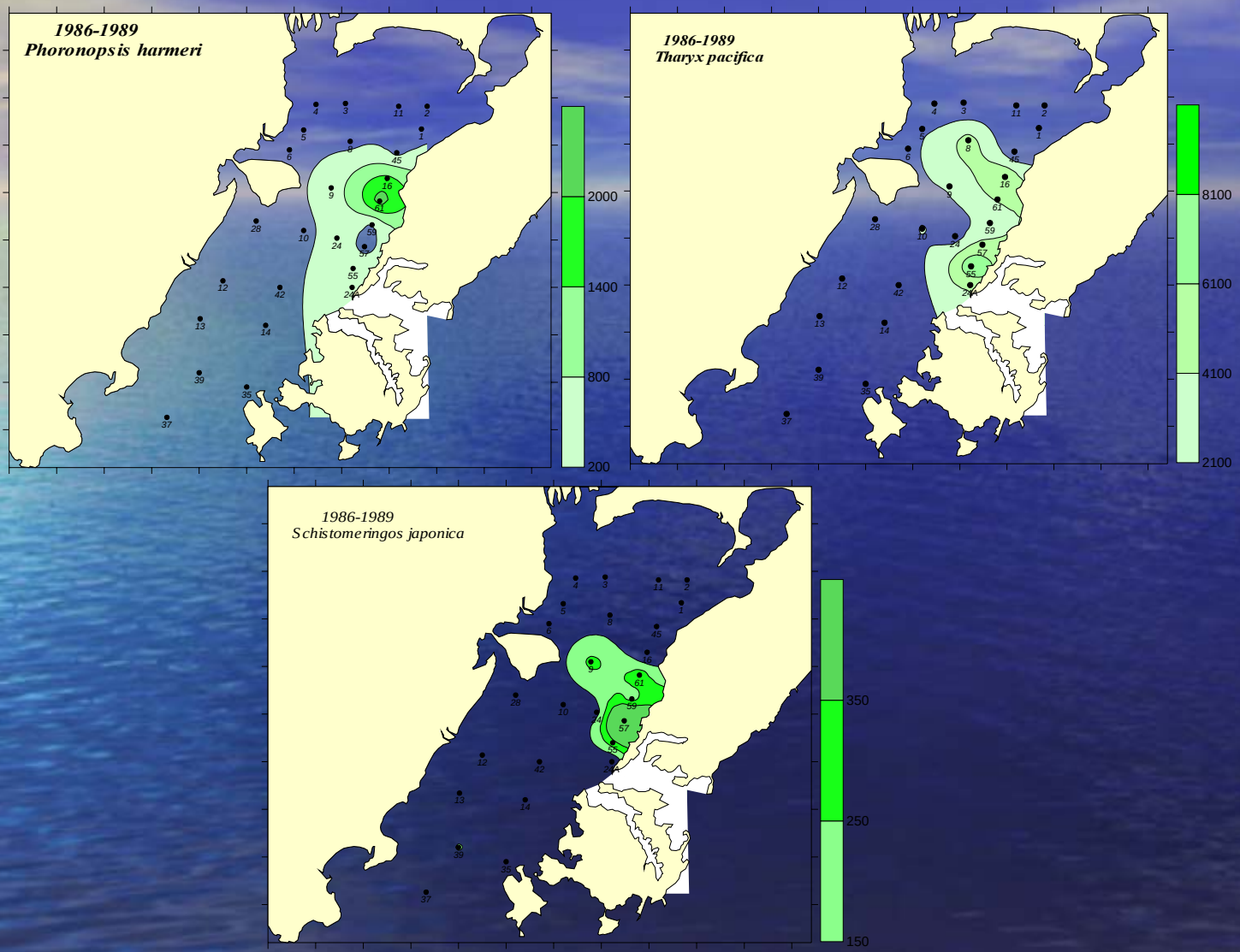
- Investigation in 2001 was implemented according to program of 1986-1989 in 16 sites. Despite on decreasing of contaminant content in bottom sediments, the most polluted zone was located in the same area of the Bay. The boundary of this zone consisted with the area of community, where opportunistic species were dominated again: *Th. pacifica, Ph. harmeri, Cirratulus cirratus*.



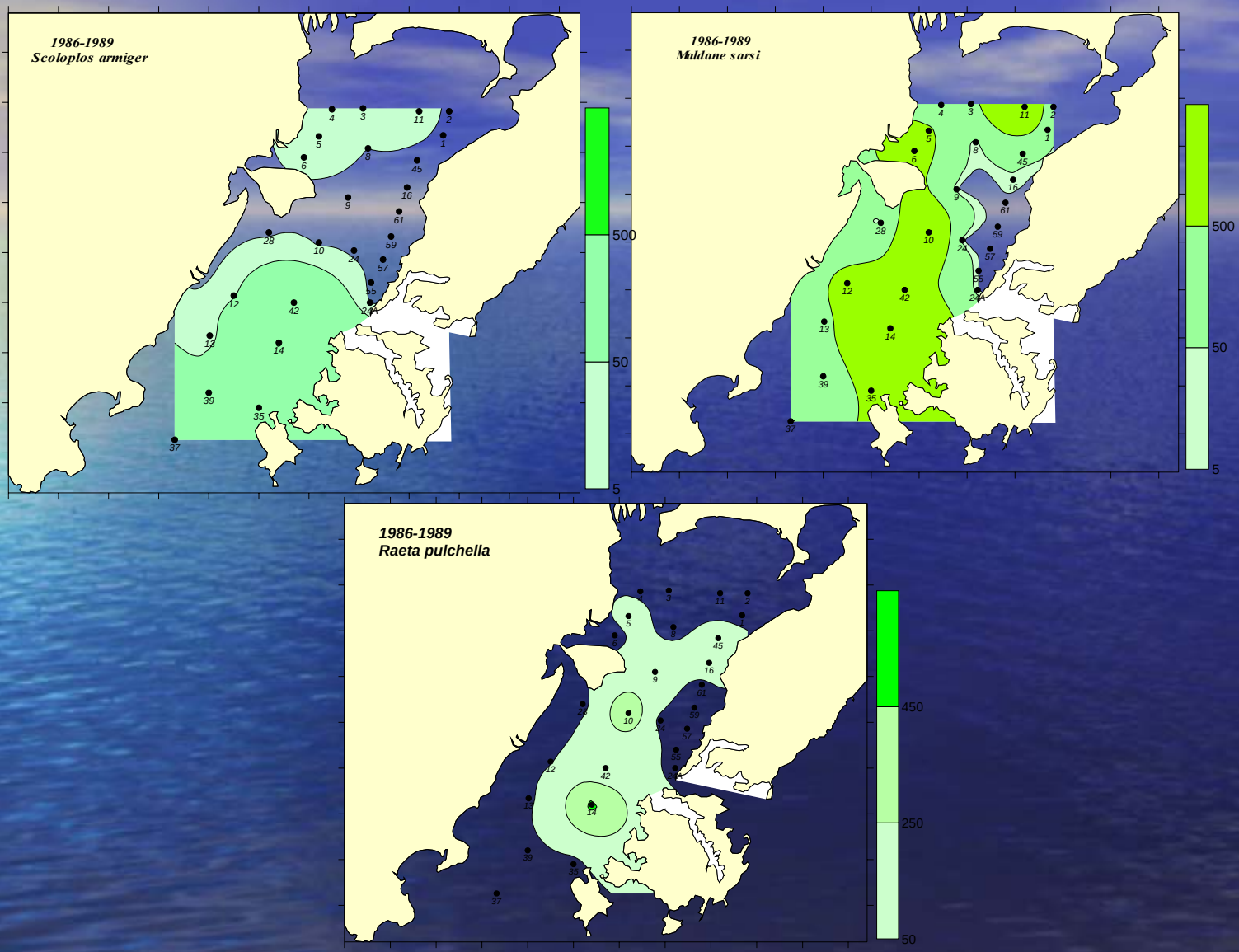




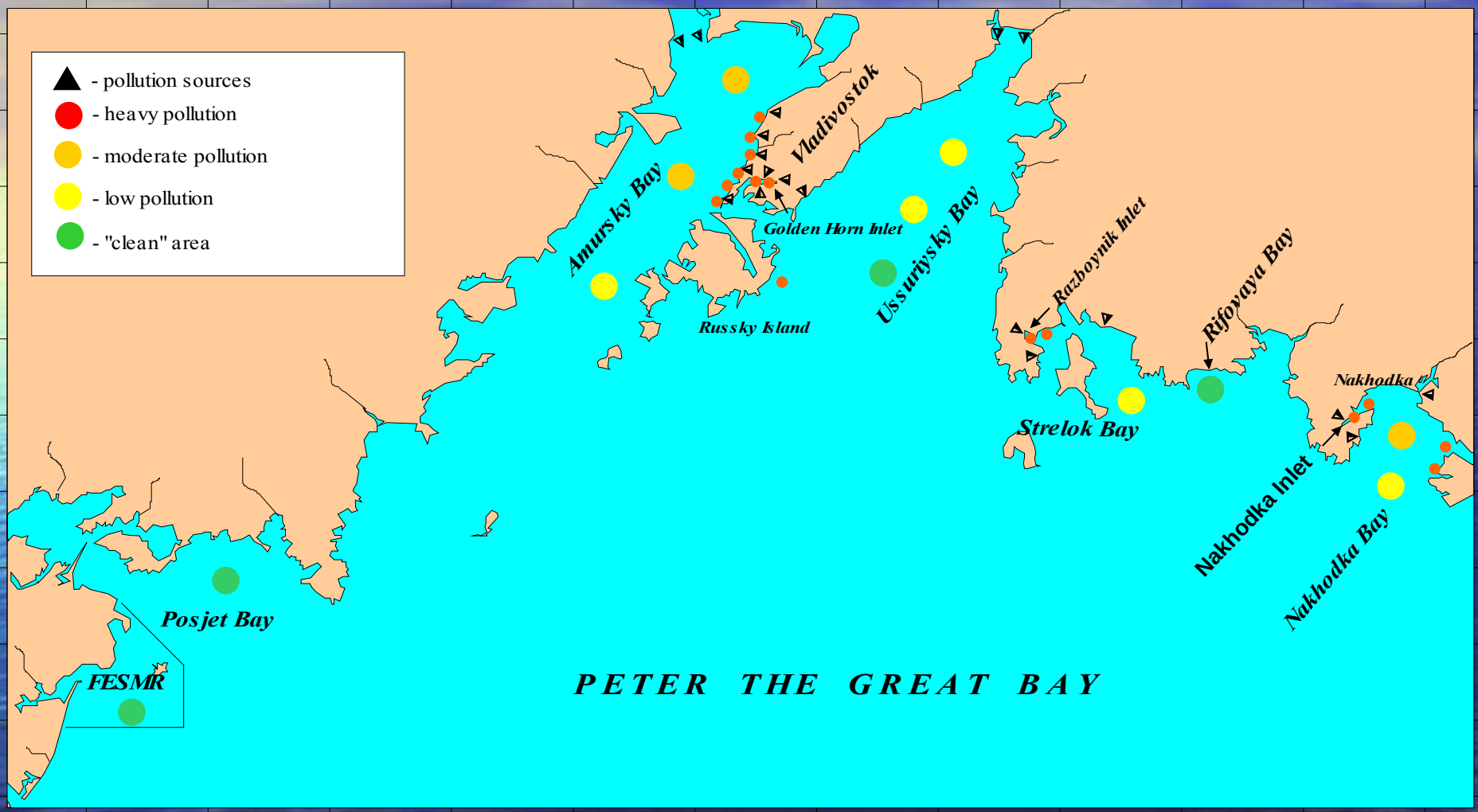
Distribution pattern of tolerant to pollution species in 1986-1989



Distribution pattern of sensitive to pollution species in 1986-1989



Pollution level of bottom sediments in 1986-2001

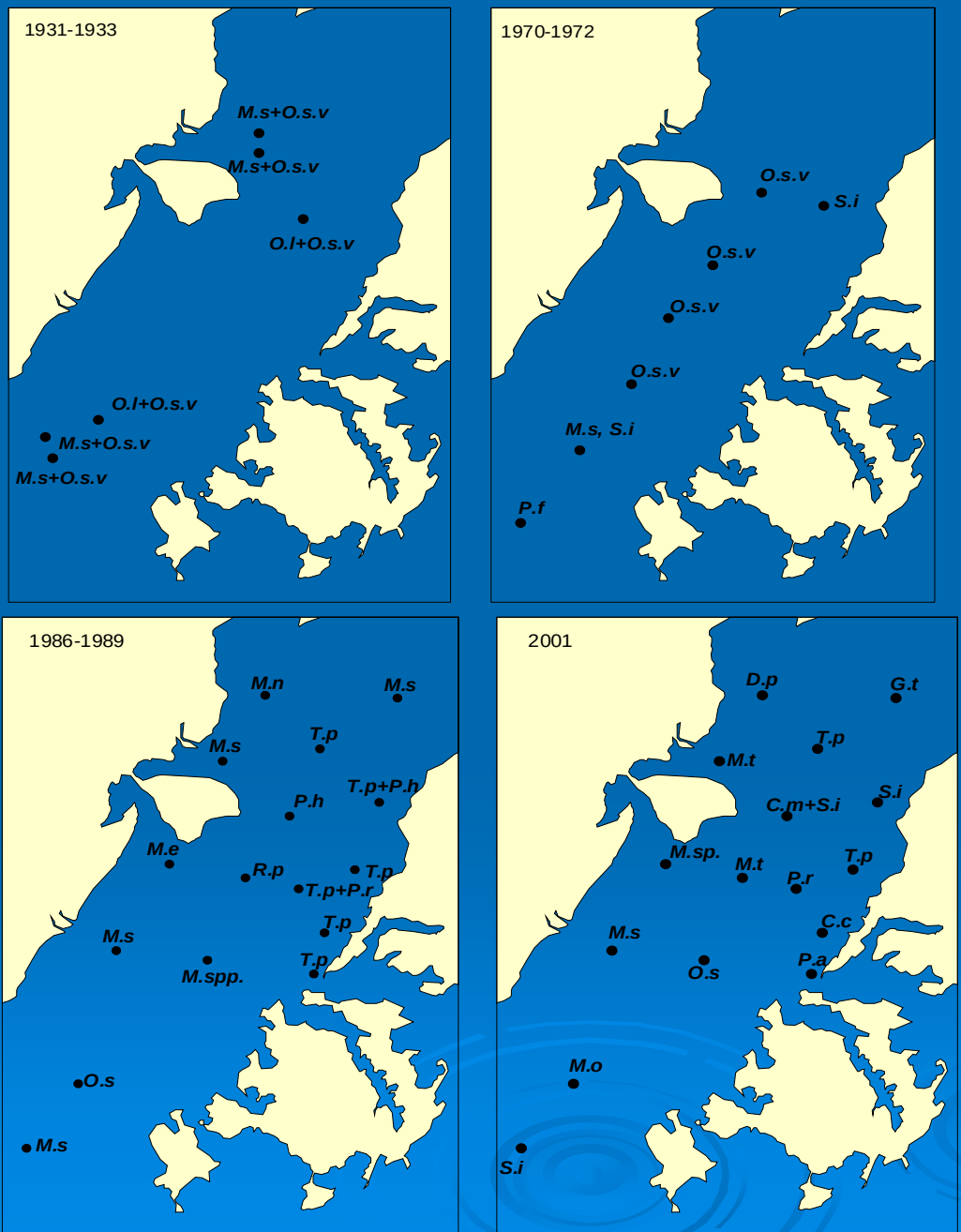


- Investigation carried out in Peter the Great Bay in 1986-2001 confirmed that the most polluted areas were inhabited by small opportunistic species, mainly by polychaetes, having very high abundance.
- Thus in Nakhodka Inlet the highest density of *Th. pacifica* was about 20,000 ind/m^2 (in Amursky Bay >8000, in Golden Horn Inlet >4000 ind/m^2). This species was not reported of occurrence in study areas in 1930s, while at the beginning of the 1970s it occurred sporadically, and became wide spread in the middle of 1970s and at the beginning of 1980s (Deryigin & Somova, 1944; Klimova, 1988; Belan, 1992, 2001, 2003).
- The greatest abundance of *Sch. japonica* (800-1700 ind/m2) was recorded at the east part of Amursky Bay and Golden Horn Inlet. Individuals of this genus became dominant in the urban and industrial areas of Black Sea and Pacific coast of Canada in the middle of 1970s – at the beginning of 1980s (Levings, 1985; Burd et al, 1990). In the period of 1940s-1960s, species of this genus were not observed or occurred at very low density in Black Sea Kiseleva et al., 1984; Losovskaya, 1977).
- The highest abundance of *D. cardalia* (2600-4500 ind/m^2) was recorded in the east part of Amursky bay. Species of Dipolydora genus became wide spread in Black Sea since 1970s.

Conclusions:

- Investigations carried out in Peter the Great Bay in 1986-2001 showed that some coastal areas were inhabited by small opportunistic species, mainly by polychaetes, having very high abundance.
- These areas were characterized by ecologically stress conditions due to high contaminants concentrations, low oxygen content and other anthropogenic disturbances.
- According to available data, expansion of opportunistic species had been registered since 1970s-1980s.
- One of the reasons for wide distribution of opportunistic species is their ecological flexibility and persistence under different kinds of environmental disturbances.

Long-term changes of distribution of dominant benthic species in Amursky Bay



Temporal trends of PHCs, DDTs and Cd in Amursky Bay