SUMMARY

of the Korea-Russia seminar and discussions held in the East Sea Branch of KORDI, Uljin, on July 5–6, 2012

The seminar was held at the East Sea Branch of KORDI, Uljin on July 5–6, 2012 with participation of the research staff of the East Sea Branch, KORDI, Gyeonbuk Institute for Marine Bioindustry (GIMB), Jeju National University, A.V. Zhirmunsky Institute of Marine Biology (hereafter IMB), Far East Branch of the Russian Academy of Sciences (Vladivostok), represented by the Head of the International Cooperation Dept., Dr. Konstantin A. Lutaenko, and former staff member of the Institute of Marine Geology and Geophysics, FEB RAS (Yuzhno-Sakhalinsk), Dr. Kim Chun Ung. The meeting was chaired by Prof. Park Chan Hong, Director General of the East Sea Branch, KORDI.

Dr. Min Won-Gi of KORDI delivered presentation on the East Sea Project developed by the East Sea Branch. Dr. Konstantin Lutaenko presented an overview of the IMB activities in marine biology and environmental research on East Sea, including IMB structure, research objectives, main laboratories, research achievments, publication activity and proposals for future collaboration. There are a number of scientists in the IMB who has a positive experience of collaboration with Korean researchers and published papers in various fields of marine biology jointly with Korean biologists on genetics of fishes, fish deseases, molluscan biodiversity and biogeography, meiobenthic ecology, fish taxonomy. Among topics outlined by Dr. Park and Dr. Min, the following ones are of main interest from the IMB perspective:

- climate change and its impact on benthic and plankton communities, fishes and overal ecosystem of the East Sea;
- biodiversity and biogeography of the East Sea;
- establishing a database to understand long-term changes of the East Sea ecosystem;
- phytoplankton blooms (red tides) and jellyfish blooms;
- genetics and molecular studies of fish;
- development biology of mollusks and other invertebrates with particular respect to climate and environmental change impact on reproductive cycles, etc;
- deseases of invertebrates and fish, histophysiology biomonitoring.

The parties agreed to work out a roadmap for future cooperation between IMB and East Sea Branch, KORDI. The plan should include following stages:

a, to prepare and sign the MoU between the East Sea Branch of KORDI and the IMB based on discussion **in July 2012**;

b, to collect necessary information and concrete proposals and ideas (topics) for collaborative research and to submit to both sides by the **end of August 2012;**

c, to establish links and contacts between scientists of the East Sea Branch, KORDI and the IMB based on proposals **in September;**

d, to prepare and conduct a workshop on marine biology of the East Sea either in Korea and Russia to share knowledge and ideas and to promote personal contacts of researchers in the **first half of 2013;**

e, to secure necessary funding for joint activities outlined and to seek possibilities of grant submissions for both Korea and Russia foundations.

Among future activities, the exchange by samples and materials (e.g., DNA tissue samples), organization of large-scale field-works (expeditions) and literature exchange are to be considered by parties.

The seminar and discussions have shown high potential of both institutions in the field of marine biology, outlined possible topics of collaboration, and helped to understand joint interests. They were highly successful and further discussions and exchange by comments/suggestions will be continued by e-mail.

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Department of International Cooperation
IMB FEB RAS

Seminar attendees on July 5, 2012 in the East Sea Branch of KORDI, Uljin

View of the East Sea Branch of KORDI, Uljin

I M B

Proposals for Collaboration

Ecophysiology
Reproduction biology

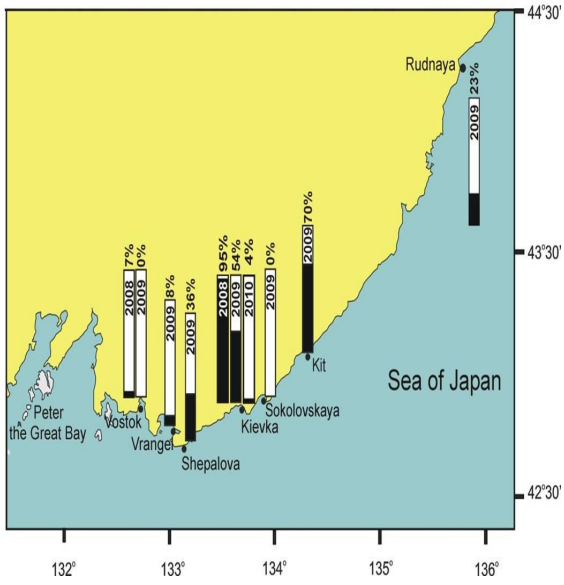
The study of mechanisms of regulation of the reproductive cycle and spawning of marine bottom invertebrates

Laboratory of Cytophysiology, A.V. Zhirmunsky Institute of Marine Biology
Laboratory of Genetics, A.V. Zhirmunsky Institute of Marine Biology
Laboratory of Marine Pollution, V.I. Ilyichev Pacific Oceanological Institute

1. The study of the influence of environmental pollution on the reproductive cycle of bottom invertebrates

The sea urchin *Strongylocentrotus intermedius* (A. Agassiz, 1863) is a commercially important species inhabiting hard substrates in Northern Asian Pacific coastal waters, from the Japanese Islands to the southern Sea of Okhotsk.

Three types of the sea urchin populations that differ in the proportion of individuals with different spawning seasonality (early summer or autumn) have been revealed. The first type of the sea urchin populations is characterized by pronounced late spawning, the second type of the sea urchin populations has pronounced early spawning, and two spawning peaks are characteristic for the third type of the sea urchin populations. The sea urchins exhibiting early spawning prevail (up to 100%) in the populations located near the sources of pollution. Positive correlation between the ecological risk index and the portions of the sea urchin females exhibiting early spawning was revealed. Using 7 allozyme loci as genetic markers, we found no significant genetic differences between sea urchin individuals having different spawning schedules. Thus, the data obtained gives evidence that not only the temperature and photoperiod but also the pollution can influence the timing of the sea urchin reproductive cycle. Elucidation of the mechanisms of such influence could be a subject of further investigations.

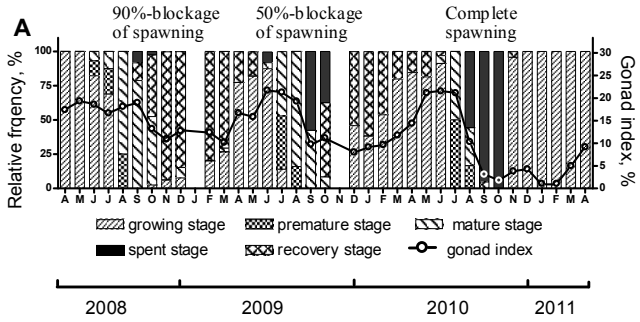


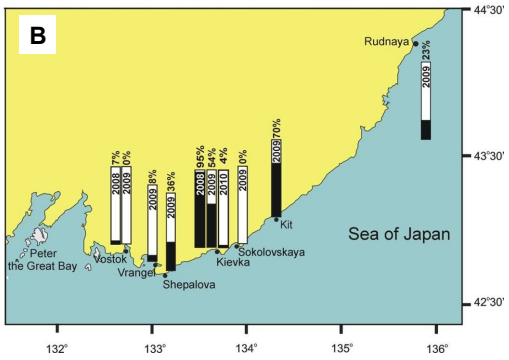
Portions of females of the sea urchin *Strongylocentrotus intermedius* exhibiting early spawning (red columns) and late spawning (green columns) in different ares of the northwestern Sea of Japan.

Graf in the upper left corner demonstrates positive correlation between the ecological risk index and the portions of the sea urchin females exhibiting early spawning.

2. The study of the role of natural environmental factors in regulation of spawning of bottom invertebrates

A phenomenon of spawning blockage was revealed in the course of the study of reproductive cycle of the sea urchin *Strongylocentrotus intermedius* inhabiting the northwestern part of the Japan Sea along the coast of Primorsky Region. In September–November 2008–2010, the portions of unspawned females with disintegrating eggs constituted from 0 to 94% of the total number of females in different settlements of the sea urchin. The process of utilization of unspawned gametes lasted for more than seven months. The presence of the phenomenon of spawning blockage gives evidence that some environmental stimuli are necessary to trigger spawning in the natural populations of the sea urchin *S. intermedius*. Comparison of environmental conditions which impede spawning with those providing normal spawning would allow to reveal the key environmental factors responsible for the spawning achievement by the sea urchin populations.





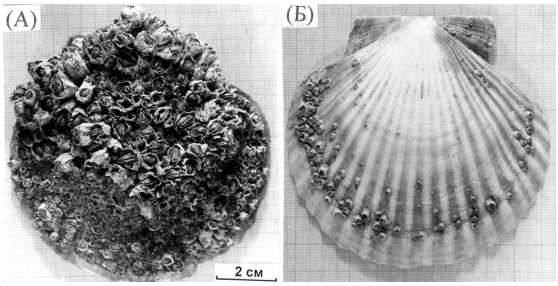
– relative frequency of gonad maturity stages and gonad index values in the females of the sea urchin *S. intermedius* in 2008–2010; B – portions of unspawned females (black parts of the columns) in different *S. intermedius* populations in the northwestern Sea of Japan.

Ecology of commercial bivalves

Benthic ecology

Composition and distribution of the Japanese scallop's epibionts in different parts of East Sea

- The purpose of future work is to determine and to compare the taxonomic composition and distribution of epibionts of the scallop *Mizuhopecten yessoensis* from the different parts of the East Sea
- To estimate the input of the main epibionts in the total biomass of the epibiosis in the coastal zone of Russia and South Korea

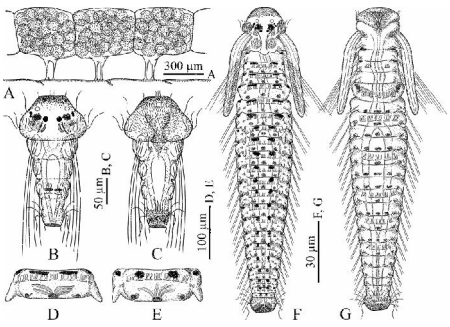


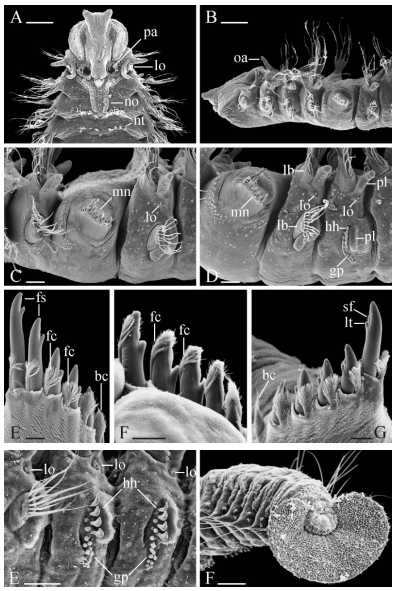
Green algae and cirripedes on the scallop's shell in Peter the Great Bay

Ecology and reproductive biology of polychaetes

Vasily I. Radashevsky
Laboratory of embryology

Research proposal
Morphology, ecology, reproductive biology and phylogeny of one of the most numerous (ca. 1000 species) polychaete families Spionidae (Annelida)

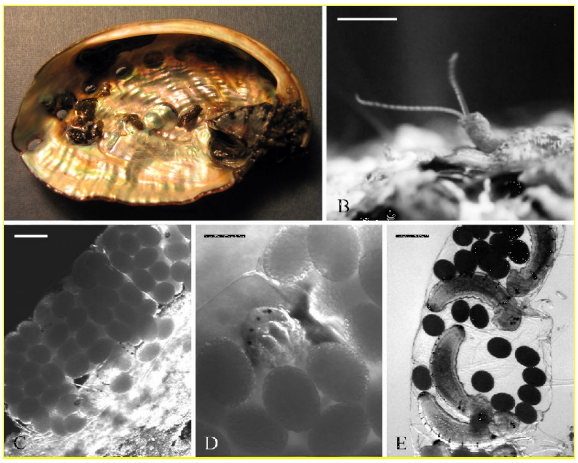




Radashevsky, V.I. 2005. On adult and larval morphology of *Polydora cornuta* Bosc, 1802 (Annelida: Spionidae). *Zootaxa*, 1064: 1-24

Special emphasis on spionids boring into commercial molluscs

Radashevsky, V.I., Lana, P.C. & R.C. Nalesso. 2006. Morphology and biology of *Polydora* species (Polychaeta: Spionidae) boring into oyster shells in South America, with the description of a new species. *Zootaxa*, 1353: 1-37.



Radashevsky V.I. and C. Olivares. 2005. *Polydora uncinata* (Polychaeta: Spionidae) in Chile: an accidental transportation across the Pacific. *Biological Invasions*, 7(3): 489-496.

Genetics/ molecular study

MITOGENOMICS, SPECIATION GENETICS, PHYLOGENETICS, DNA BARCODING ETC.

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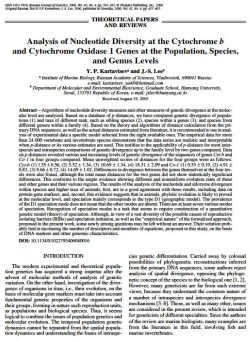
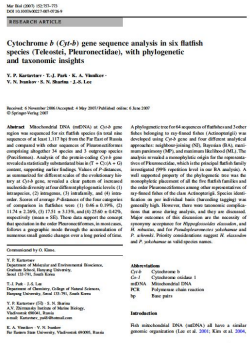


THEORETICAL PAPERS AND REVIEWS

Analysis of Nucleotide Diversity at the Cytochrome *b* and Cytochrome Oxidase 1 Genes at the Population, Species, and Genus Levels



RESEARCH ARTICLE

Cytochrome *b* (*Cyt-b*) gene sequence analysis in six flatfish species (Teleostei, Pleuronectidae), with phylogenetic and taxonomic insights

FULL LENGTH RESEARCH PAPER

The complete mitochondrial genome of the Korean soft-shelled turtle *Pelodiscus sinensis* (Testudines, Trionychidae)

GENETIC COOPERATION SUMMARY

1. COMPARATIVE MITOGENOMICS

1. Jung S.-O., Lee Y.-M, Kartavtsev Y.P., Park I.-S., Kim D.-S., Lee J-S. 2006. The complete mitochondrial genome of the Korean soft-shelled turtle *Pelodiscus sinensis*. DNA Sequence, 17(6): 471-483.

2. Kartavtsev Y.P., Lee Y.-M, Jung S-O, Byeon H-K, Son Y-, Lee J-S. 2007. The complete mitochondrial genome of the bullhead torrent catfish, *Liobagrus obesus* (Siluriformes, Amblycipididae): Genome description and phylogenetic considerations inferred from the *Cyt b* gene. Gene, 396: 13-27.

Mitogenome in vertebrates is very conservative, ~16000 (base pairs, bp) long. In invertebrates it is much longer, up to 27000-300000 bp. Most conservative is gene order. Still, there are flexible sections. Unknown/weak known are nuclear vs. mitogenome exchange and interaction. Many genes that known to be mitochondrial (*Idh*, Mdh** etc.) are absent in mtDNA. Contrary to that, some mtDNA genes (*Cyt-b, Co-c*) are active in nuclear background. There are mutations in mtDNA that create human deceases. Some mobile elements might be present in mitogenome. These 2 papers as well as research in papers 3-4 performed jointly with Hanyang Unuversity (Seoul, Dr. Lee J.S. Lab).

2. SPECIATION GENETICS

3. Kartavtsev Y.P., Lee J.-S. 2006. Analysis of nucleotide diversity at genes *Cyt-b* and *Co-1* on population, species, and genera levels. Russian J. Genetics, V.42(4). P.341-362 (In Russian, Translated in English).

The results of the analysis of the nucleotide and allozyme divergence within species and higher taxa of animals, first, are in a good agreement with previous results, including data on protein gene markers, and, second, this evidence suggests that in animals, phyletic evolution is likely to prevail at the molecular level, and speciation mainly corresponds to the type D1 (geographic model).

3. PHYLOGENETICS

4. Kartavtsev Y.P., Park T.-J., Vinnikov K.A., Ivankov V.N., Sharina S.N., Lee J.-S. 2007. Cytochrome *b* (*Cyt-b)* gene sequences analysis in six flatfish species (Pisces, Pleuronectidae), with phylogenetic and taxonomic insights. Marine Biol., 152(4): 757-773.
Mitochondrial DNA (mtDNA) at Cyt-b gene region was sequenced for six flatfish and these data allow conclude on the monophyly of Pleuronectidae flatfish family. These data support as well the concept that speciation in the order Pleuronectiformes, in most cases, follows a geographic mode through the accumulation of numerous small genetic changes over a long period of time. Monophyly of major fish families in the study is also supported in other joint research (see papers 1-2).

4. MUSSEL GENETICS

5. Kartavtsev Y.Ph., Chichvarkhin A.Y., Gubanova N.V., Kijima A., Hanzawa N., Park I.-S. 2005. Allozyme and morphometric research on two common mussel species of *Mytilus* genus (Mollusca, Mytilidae) in Korea, Japan and Russian waters. Korean J. Genetics, 27(4): 289-306.
Genetic and morphometric research showed presence a hybrid zone in East Sea, which spread on the north to Russia waters (Joint research with Korea Maritime University, Busan, Dr. Park I.S. Lab).

5. DNA BARCODING

Joint research initiated in 2012 in collaboration with CORDI (Ansan, Dr. Lee Y.H. Lab). The theme is DNA barcoding and molecular phylogenetics of Perch-like fish, scorpion fish, and flatfish of East Sea and surrounding wares. No published results obtained yet. However, Ph.D. student S. Turanov have training at CORDI and joint investigation with Dr. Lee Y.H. staff in June 2012, and sequence 90 specimens of barcoding target gene, Co-1.

Biochemistry of Lipids

Laboratory of Comparative Biochemistry

Head of Lab.: Dr. Andrey B. Imbs

Our laboratory more has more than 40 years of experience in marine lipids and fatty acids research. We investigated lipid and FA structure, composition and distribution actually in all taxones of marine invertebrates, algae and microorganisms. Our results were published in several hundreds of articles in scientific journals.

We suggest several topics of joint investigation:

- **Marine phospholipids as new generation of omega-3 lipids having some advantages over fish oils**
- **Eicosanoids or oxylipins – structures and role in invertebrates and algae**
- **Fatty acids – structure, distribution and role as biomarkers in marine ecosystems**
- **Molecular species of polar and neutral lipid classes**

Dr. V. Svetashev participated in project "Biodegradation of crude oil..." KORDI (Ansan) in 2000-2003 and in Korea-Russia Forum on Investigation and Technology of Natural Compounds of Siberia and Russian Far East, KIST Gangneung Institute, Gangneung Techno Valley. Daejeon-dong. Gangneung. Korea in 2009.

Biodiversity of Fishes

1. Species composition littoral, demersal and deep water ichthyofauna of the Japan/Eastern Sea.
2. Behavior of the costal fishes of the Japan/Eastern Sea.
3. Fishes's Community structure of the costal water of the Japan/Eastern Sea.
4. Taxonomy and systematics of the Japan/Eastern Sea fishes (Zoarcidae, Stichaeidae, Cottidae et al.,).

Biodiversity of invertebrates

- Ostracod biodiversity and ecology
- Bivalve mollusks biodiversity and biogeography
- Other groups (sipunculans, nemertines, etc.)