Recommendations on the revision (modification) of national and regional monitoring programs: optimistic and realistic scenarios

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The A.O. Kovalevsky Institute of Biology of the Southern Seas (IBSS) is one of oldest and reputable marine research centres in the world. In 1871 Biological Station, the first in Russia and the third in Europe, was founded in Sevastopol.

Today IBSS is the largest in Europe marine research centre in the field of biology and ecology, that focuses on preservation and protection of marine environment, studies of biodiversity and dynamics of marine ecosystems, creation of new biotechnologies and methods for integral management of the coastal zones.

The present IBSS includes 12 scientific departments, the Aquarium-Museum, scientific library, the editorial and publishing department, and the R/V Professor Vodyanitsky. At present time 417 researchers work in the Institute; of them about 60% are scientific specialists. In each scientific department they fulfill monitoring investigations in the frames of budget themes, in the field of their scientific interests. All these investigations are of many aspects and cover practically all the groups of hydrobionts of the Black sea pelagial and benthal, as well as abiotic factors – hydrological, hydrochemical, including chemical and radioactive pollution.
In the coastal zone periodicity of fulfillment and location of monitoring stations and transects are determined directly by researchers and only separate kinds of monitoring investigations are of complex character, i.e. there are no unified data collection. Limited access to the primary materials is another important problem. To a great extent it is connected with specificity of hydrobiological samples processing, which needs high qualification of researchers and considerable time expenditures.

That is why results of these works are considered by many scientists to be intellectual property. The primary materials data bases are formed mostly deliberately and are also not quite accessible. The kinds and characteristics of the more important monitoring studies conducted by IBSS were already described at the workshop in Odessa in 2013 and reports of EMBLAS -1. I shall recollect in brief their content and perspectives of their continuation at the local and interregional levels.
IBSS coastal monitoring programmes in the Sevastopol area
Sevastopol Bay Black Sea time series
SBBS 1976-2014

Study area: Sevastopol Bay and adjacent shelf.

Period: samples were taking biweekly during 1976 -1996; 2002-2013.

Existing data: temperature, salinity, transparency, nutrients (NO2, NO3, NH4, PO4, Si, organic P), dissolved O2; chll-a, bacterioplankton; phytoplankton; zooplankton, ichthyoplankton.
Monitoring inshore waters near Sevastopol

Every season (once per season)

Twice a month
Monitoring date

- Ichthyoplankton is sampled via vertical and horizontal tows using Bogorov - Rass net (Br - 80/113, mesh 400 microns).
- Jellyfish is sampled via vertical tows using the same Bogorov - Rass net.
- Zooplankton is sampled via vertical tows using Judey net (opening: 0.1 m², mesh size: 500 μm) by the layered or total catches in inhabited layer.
- Standard hydrochemical data are collected at the most stations.
The works are carried out beginning from 1973, i.e. for 40 years.
The following parameters were identified in more than 700 sediment samples collected during this time:

- Chemical indices (the content of oil hydrocarbons, chloroform-extracted compounds, protein, lipids, carbohydrates)
- Microbiological indices (the abundance and microbiological activity of the heterotrophic, oil-oxidizing, denitrifying, sulfate-reducing and thionic bacteria)
- Macrozoobenthos indices including the abundance, biomass, number of species
Macrozoobenthos biomass of the Sevastopol Bays
(the data of MSH/IBSS)
Scheme of integrated environmental monitoring stations in the Crimean coastal zone (2005 – 2013)
The following kinds of work are fulfilled at all complex stations in narrow coastal zone from the shore line to 10m depth:

- Ichthyological studies: fish catching by different fishing tools (gill nets, trapnets, line), conduction of a complete biological analysis of fish (species identification, size, mass, age, sex, stage of gonads maturation, nutrition).
- Sampling of phyto-, zoo-, ichthyoplankton.
- Sampling of macrozoobenthos.
- Measuring water temperature, water sampling for salinity.
- Sampling of the bottom sediments for determination of the oil products and heavy metals concentrations.
- Visual submarine observations of fish, higher crustaceans and other hydrobionts.
Hydrobiological investigation parameters:

- Taxonomic composition
- Abundance
- Biomass
- Age and size structure
- Invasive species
- Distribution of the invasive and native species in the Black Sea
There were watches in 1998, 2010, 2011, 2013 and they included pelagic, benthic, hydrological observations and some others like bioluminescence, etc.
Monitoring offshore waters of the Black Sea during cruises RV «Prof. Vodyanitsky» (2010-2014)
IBSS PROPOSALS OF THE COMPLEX MONITORING RESEARCH RESTORATION:

1. HISTORICAL LONG-TERM TRANSECTS
2. STANDARD POLYGONS
3. STANDARD POINT TIME SERIES
IBSS STANDARD POLYGON AREAS
LONG-TERM DYNAMICS MACROZOOOBENTHOS RESEARCH NEAR THE COAST OF THE CRIMEA

*Zernov Phyllophora Field*

32 stations (2010-2013)

>210 stations (1979-2011)

813 stations

**Western Crimea**

**Southern Crimea**
Temporal evolution of $^{90}\text{Sr}$ (left) and $^{137}\text{Cs}$ (right) concentrations in seawater (a), alga Cystoseira crinita (b), mussel Mytilus galloprovincialis (c) and fish Merlangius merlangus euxinus (d) in the Sevastopol Bays.
Vertical distribution of $^{134}$Cs and $^{137}$Cs (left) and the activity ratio of $^{238}$Pu to $^{239+240}$Pu (right) in Black Sea sediments adjacent to the Danube delta.

The $^{137}$Cs profiles in the Black Sea sediments show generally two subsurface peaks attributable to global fallout from atmospheric nuclear weapons testing and the Chernobyl NPP accident. The Chernobyl origin of the upper peak of $^{137}$Cs activity was argued using the activity ratio of $^{134}$Cs/$^{137}$Cs, as the short-lived $^{134}$Cs (half-life = 2.06 years) accompanied the longer-lived $^{137}$Cs (half-life = 30.17 years) in the Chernobyl release at the known activity ratio of 0.53. A further differentiation of the pre- and post-Chernobyl sediments was carried out using the activity ratio $^{238}$Pu/$^{239+240}$Pu, taking into account that it was of about 0.04 in the pre-Chernobyl global fallout and 0.47 in the Chernobyl release. The higher activity ratio $^{238}$Pu/$^{239+240}$Pu, found in the upper sediment core from the Danube delta front, have indicated predominant contribution of Chernobyl-derived plutonium in these layers.
It is necessary to mention that monitoring investigations conducted in the coastal zone are being continued and we hope that after stabilization of the organizational and economical situation concerning IBSS the net of monitoring studies at the Crimean peninsula coastal zone will be widened and improved, and problem of access to the data bases under obligatory keeping to the authors rights will be solved positively. As for continuation and widening of the net of monitoring investigations in the limits of the economic zones of separate Black sea countries and in the Black sea in a whole, besides chronic financial problems there exist new political complications. That is why in reality we can hope in the best case for conduction of investigations by each country in its economical zone with further exchange of information on determined scheme of complex stations.
In order to attempt a comparison among Black Sea areas and between Black and Mediterranean seas regarding the mesozooplankton community current status, an intercalibration among the different used nets was considered necessary. For this purpose, a special cruise was performed in the Black Sea where all the nets were used for collecting samples for intercalibration purposes. Scientists from Bulgaria, Greece, Romania, Russia and Ukraine were involved. All samples were analyzed in Plankton Dept., IBSS.
THANK YOU FOR ATTENTION!