EXPERIENCE OF JOINT RUSSIAN-CHINESE MONITORING OF WATER QUALITY IN THE TRANSBOUNDARY WATER OBJECTS

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The joint monitoring of the Amur and Ussuri rivers has been started since 2002 under the agreement on Joint Environment Conservation Measures for the 2000-2005 between the Khabarovsk Krai Administration and the Heilongjiang Peoples' Government. The Russian partner of joint works was the Far Eastern Hydrometeorology and Environmental Monitoring Service. The main goal of the project was to carry out a complex of analytical-chemical, hydro-biological and hydrological activities and collect information on 25 parameters of chemical substance content and concentrations in water of the Amur and Ussuri rivers.

Observations were continued in 2006 unilaterally by Russian scientists as no joint protocol was signed. Samples were taken on the Russian side of the river up to the border.

Following Memorandum of Understanding between the Russian Ministry of Natural Resources and the PRC State Administration on Environment Conservation, representatives of two countries met in Beijing in May 2006 and adopted the Plan of Joint Russian-Chinese Monitoring of Water Quality in the Transboundary Water Objects (Plan). The Plan initiates expansion and intensification of water quality studies of the following water objects: the Argun River (Chitinskaya Oblast), the Amur River (Amurskaya Oblast, Jewish Autonomous Oblast, and Khabarovsky Krai), the Ussuri mouth (Khabarovsky Krai), the Razdolnoe and Khanka lakes (Primorsky Krai).

The works are supervised by the Russian Federal Water Resource Agency and carried out by Hydrometeorology and Environmental Monitoring Services of Chitinskaya and Amurskaya oblasts and Khabarovsky and Primorsky krais.

Since 2007 Russian-Chinese joint activities have been annually continued under the adopted Plan and include collection of water and bottom sediment samples, their analyses by 40 physical and chemical parameters and the exchange of the obtained results.

The water monitoring program includes analyses of stable organic pollutants and polychlorinated biphenols, atrazine, acetochlorine and 2, 3-D chlorophenols in particular.

Bottom sediments are analyzed for cadmium, mercury, lead, sexavalent chrome and arsenic.

To our regret hydrobiological parameter observations were stopped in 2007.

The joint Russian-Chinese monitoring on the Amur is carried out at 2 stations: a base station upper Amurzet village 403 km upper Khabarovsk and a control station at Nizhneleninskoe village 30 km lower the Sungari junction and 237 km upper Khabarovsk.

Fig.1. Stations of Hydrochemical Observations on the Amur River

Observations on the Ussuri River are carried out at one station near Kazakevichevo

Fig.2. Ussuri Station of Hydrochemical Observations

Water samples are collected at 3 verticals across the river from the surface and bottom water layer. Hydrological and meteorological parameters are measured simultaneously with water sampling. The following results of water object monitoring analyses may be ranked of the utmost importance [1].

1. Interseasonal dynamics of the observed parameters in the studied objects depend on water content in transboundary waters and the Zeya, Bureya and Sungari as the main Amur tributaries.
2. Negative anthropogenic effects on the Middle-Amur ecosystems are much aggravated due to:
   - a low self-purifying capacity of the Amur River and
   - a weak activity of soil bioceonoses in the Chinese part of the river basin, a low self-purifying soil potential and the increased length of organic matter decomposition soil there.
3. Observations of water quality physical and chemical parameters across the Middle-Amur revealed that at the base stations of the Amur River (near Amurzet village upper the Sungari juncture) water chemical content revealed that at the station upper the Sungari juncture water chemical composition is more stable and uniformed compared to the river passage lower the Sungari juncture (Nizhneleninskoe village station).
4. Phthalate compounds were registered in the Middle-Amur and Ussuri juncture. If we keep in mind that phthalates are common to industrial and household pollutants and their presence in water seems expected, still the studies of their source and impact on the river ecosystem seem urgent.
5. Results of Ussuri bottom sediment analysis differ much from those of the Amur (near Nizhnelininskoe) mostly due to the sediment structure. Ussuri bottom sediment composition differs much from that of the Amur near Nizneleninskoe. It may be caused by the sediment structure. The Ussuri river sediments are clays and the Amur sediments are small stones and sand. That is why the Amur River sediments have better drainage capacity and the Amur has a better pollutant reduction capacity.
6. During the years of monitoring our analyses revealed not extremely dangerous pollution of the observed water objects.

In 2009, samples were collected in May, July and September. The 2009 hydrological period is characterized with a high water content of transboundary rivers and food formation in July and September. Sample collection had the following features:

1. Water sampling in June was at a time of a rainfall food that occurred after 1.5 month of a spring snow-melting food and so-called summer low water (compared to a low water content period);
2. Water sampling was performed in September after 2 months of continuous rainy periods, one of which was in July-August and 05.-2.5 mms exceeding the others.

Besides, in July the Sungari share in Amur water content was quite significant, i.e. over 50%. That is why Sungari influence was distinctly evident, both visually and by chemical parameters. (Fig. 3, 4).

Fig. 3. Field Analysis of Nitrate Nitrogen (the Amur River at Nizhneleninskoe)

Fig. 4. Sample Filtration for Suspended Mater Analysis

(Amur water collected at Nizhneleninskoe)

Fig. 4 clearly shows the difference between the samples collected at the left Russian bank of the Amur (Fig. left) and the right Chinese river bank (Fig. right).

Besides, only in this period phenanthrene was found in all samples collected in the Amur and Ussuri rivers. This may be explained that phenanthrene to some extent plays the role of an indicator of natural processes [2]. It should be noted that the highest values of average and maximal concentrations were registered in the Amur near Amurzet. This Amur passage usually has increased concentrations of organic substances of natural origin mostly owing to their accumulation of the upstream hydropower station reservoirs. Phenanthrene average concentrations in the Amur lower Nizhnelininskoe and the Ussuri are approximately two times lower. In the 2002-2009 observation period concentrations of organic substances of natural origin here were usually found lower than those in the Amur near Amurzet.

Sungari influence can be also proved with increased microbial pollution at the control station.

In general, in the whole 2002-2009 observation period concentrations of pollutants in Amur and Ussuri water and bottom sediments, discovered during joint monitoring, are not critical, although in some river parts they may be characterized as increased.

Beside, it may be concluded that there is a tendency of improvement of water quality by such parameters, as concentrations of nitrogen compounds, phosphate, petroleum products, copper and lead.

As before, hydrological conditions of the main tributaries of the Amur and intensive economic activities in its basin, especially in the Chinese part, mostly determine the formation of water pollution in the river.

REFERENCES

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