SELECTED ASPECTS OF MINERAL SPRINGS PROTECTION IN THE SIBERIAN BAikal REGION

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Introduction

Mineral springs keep a special place among the natural resources of Baikal Siberia. They vary in physical, chemical and gas water constitution. They can be cold and hot, carbonic-acid, nitrogen, sulphate, hydrogen sulphide and radon.

In zones of mineral water discharge that differ in particular microclimatic conditions, deposit zones with intrazonal natural complexes are formed. The stronger the hot spring heating effect is, the more pronounced the relict features of these complexes become. Terrestrial ecological systems where more warm-loving flora and fauna representatives are discovered can serve as an example. For a long geological period, these ecological systems have been a habitat of warm-loving organisms: amphibians, reptilians, insects, plants and mushrooms. The special microclimate of warm and hot springs create conditions for organisms of the pre–Ice Age period, which are relic for the area of Baikal Siberia. Moreover, a number of zonal flora representatives taken root into hydro-thermal ecological systems display the species formation process.

Mineral springs are considered to be holy for natives, and traditionally serve as a place of worship and medical treatment. Intensive use of mineral waters for a long time causes high anthropogenic load on the territory around them. A great number of people come to the springs, especially in summer time, making the springs non-official watering-places. And as it is known, wrong use can load on the territory around them. A great number of people come to the springs, especially in summer time, making the springs non-official watering-places. And as it is known, wrong use can result in a disturbance in the balanced functioning of the ecological system of the springs. Taking this into consideration, for further prospective use of the springs it is necessary to do the following: ecological certification of the springs, formation of mountain-sanitary protection zones, state monitoring research.

Materials and Methods

The object of our research is the group of Baikal Siberia mineral waters: Khotto-Gol, Khutan Uzan, Dunda-Gol, Shukhtikhuli, Krassony Kamni, Gugian, Shumak, Khongor-Ula, Suburga, Papiy Arshan, and Kunstenskije springs (Fig. 1). The water is characterized by low mineralization, alkaline and weakly alkaline pH index; in volcanic fluids of some of the springs there is evidence of hydrogen sulphide; some of them are radio-active; the water temperature is 4.0 - 47.5ºC.

Considering this connection with the territory of mineral waters discharge, the following types of work have been carried out: soil probing for further physical and chemical analysis and determination of carbon 14 C migration in water-soil-plants system, the physical parameters and chemical constitution of water, phyto- and zoo plankton probing, phyto- and zoo benthos, stocktaking of floral varieties surrounding the springs, and making geo-botanical descriptions of the springs ecological systems using the Braun-Blanquet method.

Results

Physical and chemical analysis of the soils of earlier examined springs showed that the mineral springs soils of Baikal Siberia are represented by several types: mountain humus, meadow, travertime-formed, peat-bog, parasols and meadow-boggy. These soils are characterized by low capacity, a weak show of soil formation process, detritus; upper horizons are humus, weakly decayed; humus horizon as such is absent. The soils are characterized by alkaline and heavy alkaline pH indexes (7.70 - 9.20). Average humus content in upper horizontal soils is rather high (within 5-9%). Salt content changes between 0.10 and 0.46%; the soils are weakly or mid-salted; salt type is mainly sulphate hydro-carbonate, dominated by highly dissoluble salts: CaHCO3, Mg HCO3, CaSO4, Mg SO4, CO2 carbonates content changes within 0.2 and 42.5.

In examined soils formed in mineral springs discharge zones of Baikal Siberia, two hundred and thirty-four species of algae were discovered. According to systematical analysis, the most fully represented of soils algae are of the Cyanophyta branch (109 species); they make up about half of flora (46.6%).

Spring vegetation is a weakly known component of Baikal Siberia vegetation. Published data includes only the positions of rare species connected with these communities. To date, no complex geobotanical or ecological research has been carried out. During the course of our research, the following were recognized and documented: 4 vegetation communities from the Monito-Cardaminetea class and 5 independent spring moss communities. Particularly interesting are the lime-loving Cratoneuron commutatum communities. These communities are connected with intensive underground water outflows containing a high concentration of lime; this causes lime deposits in the form of travertines. Sparse plants such as mosses, liverworts, algae, and bacteria, are the main components of spring communities. These are actively involved in the formation of extensive travertine areas. Dried-out travertines, during the long-term ecosystem transformation process, become home for many other vegetation formations.

Complex estimation of the ecological state of carbonic groups of mineral springs of the Baikal Siberia will be carried out on the basis of additional work done in the summer of 2006. Using data from the hydro-chemical analysis of waters, physical and chemical analysis of soils and the chemical content forming water conditions will be studied, information about chemical content of soils will be completed, and a number of problems of evolutional formation of intrazonal ecological systems of mineral springs will be examined.

At the same time, mineral springs are significant not only from the theoretical scientific point of view, but they are also valuable objects for balneology and recreation, and considering this, it is considered reasonable to deem them to be the water monuments of nature and to look at them as objects requiring special protection.

Conclusion

Management of mineral deposits protection of the territory includes three main aspects: 1. legislative-legal; 2. management-technical; 3. scientific-methodical (ecological education of people). The social value of the springs serves as a criterion for the necessity of mineral springs protection.

One must save monuments of nature, first of all, for protection of their natural heritage, as well as for preservation of biological variants and balance of ecological environment. Most importantly natural monuments can be used for ecological tourism with the goals of reaching maximal contact of a human being with wild nature, saving unique landscapes, and providing necessary comfort in his habitual climatical conditions. The main kinds of ecological tourism are scientific and cognitive tourism. For fulfilling Article 12 of Law “About Lake Baikal Protection” it is crucial to determine the maximal load quota on the surrounding environment, according to which tourist activities on Baikal Siberian territory should be organized.