
8th INTERNATIONAL
CONFERENCE
ON SALT LAKES
23-26 July 2002
Zhemchuzhny
Republic of Khakasia, Russia
ICSL'2002

International Society for Salt Lake Research
Institute of Biophysics of SB RAS
Administration of Republic of Khakasia
Administration of Krasnoyarsky krai
Scientific Education Center "Yenisei"
Scientific Biophysical Council of the Russian Academy of Sciences

8th INTERNATIONAL CONFERENCE ON SALT LAKES

Program
Abstracts

23-26 July 2002
Zhemchuzhny, Republic of Khakasia

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Summary

Salt lake studies are of great interest for limnology and harbor a source of numerous discoveries in this science. This is mostly caused by hydrological closedness of watersheds which build up and fix effects of climate changes and anthropogenic impacts. Another important but underestimated motive to study salt lakes is their potential to serve good models for marine systems, some crucial properties of seas, at least; the lakes feature small response time, at that. Salt lakes are found in all continents but so far have received poor study and are still underestimated.

The book is a collection of abstract of the 8th International Conference on Salt Lakes, that maintains traditions of the previous conferences. Inherent to the conference is a meeting of INTAS project participants working on slat lake subjects. The conference is held in the Republic of Khakasia, Shira district – land of exceptional ecological cleanliness that holds innumerous salt and fresh-water lakes miraculously neighboring each other. Getting together in the land of Khakasian lakes will promote establishment of long-term international contacts for joint work on these lakes.

Editor-in-chief:
A.G. Degermendzhy, Corresponding Member of RAS

ISBN

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SCIENTIFIC PROGRAM

I. Geological history and paleoecology of salt lakes.
II. Structural organization of salt lake biota, e.g., genetic diversity, demography, spatial heterogeneity, seasonal variability.
III. Functioning of salt lake ecosystems, e.g., trophic structure and interactions, biogeochemical interactions, movements of organisms.
IV. Management of salt lakes for biotechnological and medical purposes.

Conference events							
Location*	**Event**	**21-22 July**	**23 July**	**24 July**	**25 July**	**26 July**	**27 July**
Hotel "Krasnoyarsk", Conference hall,	Registration	09:00-23:00	08:00-09:00				
Canteen, café	Breakfast		07:30 - 08:30	07:30 - 08:30	07:30 - 08:30	07:30 - 08:30	07:30 - 08:30
Conference hall	Opening Ceremony		09:00-10:30				
	Lake tour		11:00-19:00				
Conference hall	Conference program			09:00 - 10:20	09:00 - 10:20	09:00 - 10:40	
Conference hall	Coffee-break			10:20 - 10:40	10:20 - 10:40	10:40 - 11:00	
Conference hall	Conference program			10:40-14:00	10:40-14:00	11:00-14:00	
Canteen, café	Lunch		14:00-15:00	14:00-15:00	14:00-15:00	14:00-15:00	
Conference hall	Conference program			15:00 - 17:00	15:00 - 17:00	15:00 - 16:40	
Conference hall	Coffee-break			17:00 - 17:20	17:00 - 17:20	16:40-17:00	
Conference hall	Conference program			17:20 - 19:20	17:20 - 19:20		
	INTAS monitoring meeting					17:00-19:00	
Canteen, café	Dinner	19:00 - 20:00		19:20 - 20:20	19:20 - 20:20		
Conference hall	Closing Ceremony					19:00-20:00	
Canteen	Welcome Party		20:00				
Canteen	Farewell Party					20:00	
* See the scheme of spa "Shira Lake"	Departure, postconference tours						9:00
Arrival at Krasnoyarsk							18:00

Section sessions

	24 July 2002	25 July 2002	26 July 2002
Session I	09:00 - 14:00		
Oral presentations	09:00 - 10:20		
Coffee-break	10:20 - 10:40		
Oral presentations	10:40 - 11:20		
Oral presentations of the posters (Session I)	11:20 -11:55		
Poster presentations (Session I)	11:55 - 14:00		
Lunch	14:00 - 15:00		
Session II	15:00 - 19:20		
Oral presentations	15:00 - 17:00		
Coffee-break	17:00 - 17:20		
Oral presentations	17:20 – 19:20		
Session II		09:00 - 14:00	
Oral presentations		09:00 - 10:20	
Coffee-break		10:20 - 10:40	
Oral presentations of the posters (Session II)		10:40 - 12:30	
Poster presentations (Session II)		12:30 - 14:00	
Lunch		14:00 - 15:00	
Session III		15:00 - 19:20	
Oral presentations		15:00 - 17:00	
Coffee-break		17:00 - 17:20	
Oral presentations		17:20 - 19:20	
Session IV			09:00 - 10:40
Oral presentations			09:00 - 10:40
Coffee-break			10:40 - 11:00
Oral presentations of the posters (Session III)			11:00 - 12:25
Poster presentations (Session III)			12:25 – 14:00
Lunch			14:00 – 15:00
Oral presentations of the posters (Session IV)			15:00 – 15:35
Poster presentations (Session IV)			15:35 – 16:40
Coffee-break			16:40 – 17:00
"INTAS monitoring meeting"			17:00 – 19:00

TUESDAY 23 JULY 2002

08:00-09:00 Registration

09:00- 10:30 OPENING CEREMONY
(Conference Hall)

09:00-10:05 Welcoming addresses

Prof. Andrey G. Degermendzhy, The Chairman of the Scientific Organizing Committee

Alexei I. Lebed, The Head of the Government, Republic of Khakasia

Anatoly A. Lepeshev,The Head of the Committee for Science and Higher Education, Krasnoyarsk krai Administration

Jellison R.S., Secretary of the International Society for Salt Lake Research

Makarchuk A.P., Head of Shira Region Administration

Conference Guests (2-3 minutes per presentation)

Kondrin V.K., Acknowledgements to Conference Sponsors

10:05-10:30 Press-conference

11:00-19:00 Lake tour

20:00 Welcome Party

WEDNESDAY 24 JULY 2002

SESSION I
Geological history and paleoecology of salt lakes
Chairmen: Prof. Krivonogov S.K., Dr. Oberhänsli H.

9:00-9:20
Biogeochemistry of hydrocarbons in hypersaline lake Karachi
Kurakolova E.A., Burkova V. N., Vorobyeva N. S., Russia

9:20-9:40
Holocene climatic variability and evolution of human settlement in the Aral Sea Basin (CLIMAN)
Oberhänsli H. (Germany), Wünnemann B. (Germany), Riedel F. (Germany), Keyser D. (Germany); Hoelzmann P. (Germany), Heller F. (Germany), Mackay A. (Switzerland), Aladin N.V. (UK), Nourgaliev D.K. (Russia), Krivonogov S.K. (Russia), Baipakov K.M. (Kazachstan), Shirinov T.S. (Uzbekistan)

9:40-10:00
Geological conditions of formation and ecological and geochemical peculiarities of salt lakes in North Central Asia
Taisaev T.T., Russia

10:00-10:20
Organic Substances in Khakasia Salt Lakes Sediments
Turov Yu.P., Gooznjaeva M.Yu., Russkikh I.V. and Kadichagov P.B., Russia

10:20-10:40 **Coffee-break**

10:40-11:00
Trophic ranging of reservoirs and water fitosystems on totality of biogeochemical characteristics
Khailov K.M., Yurchenko Yu.Yu., Ukraine

11:00-11:20
Trends of climatic parameters in lake regions of the South of Siberia (20th century)
Vysotskaya G. S., Russia

11:20-11:55 ***Geological history and paleoecology of salt lakes***
ORAL PRESENTATIONS OF POSTERS. SESSION I
Chairmen: Prof. Krivonogov S.K., Dr. Oberhänsli H.

Carotenoids occurring in west siberia lacustrine sediments and in East Siberia ancient rocks
Burkova V.N., Kurakolova E.A., Russia

Production and hydrochemical characteristics of salt lakes of Odessa region
Goncharov A.Yu , Yurchenko Yu.Yu., Ukraine

Geoinformational support of the CLIMAN project (Aral Sea)
Krivonogov S. K., Russia

Usage of salty lake waters for producing biologically active additions and mineral concentrates
Burkova V.N., Boyev S.G., Russia

Early diagenetic variations of lipid antioxidants in saline environments
Burkova V.N., Kurakolova E.A., Mozzhelina T.K., Nikolaeva T.L., Russia

Caratinoid pigments in the sediments of salty lakes of West Siberia and ancient rocks of East Siberia
Burkova V.N., Kurakolova E.A., Russia

11:55-14:00 **Poster viewing**

14:00-15:00 **Lunch**

SESSION II
Structural organization of salt lake biota, genetic diversity, spatial heterogeneity, seasonal variability
Chairmen: Prof. Gulati R.D., Prof. Pechurkin N.S.

15:00-15:20
Some features of algoflora of ultrahaline bay Kara-Bogas-Gol (Turkmenistan)
Bulatov S. A., Turkmenistan

15:20-15:40
Zooplankton of brackish-water Karstic Lakes of Middle Volga Region
Derevenskaya O.Yu., Russia

15:40-16:00
On the differences between trophic structure and foodweb in fresh-water, brackish-water and saline-water ecosystems
Gulati R.D., van Donk E., The Netherlands

16:00-16:20
Biogeochemistry of sulfur and carbon cicle in Mogilnoye lake (island Kildin, Russia)
Ivanov M.V., Russia

16:20-16:40
Genetic diversity of halophilic organism in Chinese saline lakes and the application prospect of gene engineering for plant

salt tolerance
Kong F., Zheng M., Liu J., Tian X., China

16:40-17:00
Biota and Limnology of Inland Salt lakes of Western Australia under stress
John J., Australia

17:00-17:20 **Coffee-break**

17:20-17:40
Cohort analyses of *Artemia* populations in hypersaline Mono lake, California, USA
Jellison R., USA

17:40-18:00
The limnology of the saline lakes of the central and eastern inland of Australia: a review with special reference to their biogeographical affinities
Timms B.V., Australia

18:00-18:20
Spatial heterogeneity of hydrobionts' distribution in Chany lake
Kipriyanova L.M., Yermolaeva N.I., Mitrophanova E.Yu., Bezmaternykh D.M., Dvurechenskaya S.Ya., Popov P.A., Yakovchenko S.G., Russia

18:20-18:40
Microbial sulfate reduction in a brackish meromictic shira lake
Kosolapov D.B., Rogozin D.Yu., Gladchenko I.A., Zakcharova E.E., Kopylov A.I., Russia

18:40-19:00
Biota structure of salt lakes of Altai Region
Vesnina L.V., Russia

19:00-19:20
Hydrobiological characterisation of mineral lakes located in the south-eastern part of the Irkutsk region
Pen'kova O.G., Popovskaya G.I., Sheveleva N.G., Korovyakova I.V., Russia

THURSDAY 25 JULY 2002

SESSION II
Structural organization of salt lake biota, genetic diversity, spatial heterogeneity, seasonal variability
Chairmen: Academician Zavarzin G.A., Prof. Timms B.V.

9:00-9:20
Study Advances in Saline Lake Resources on the Tibet Plateau
Zheng M., China

9:20-9:40
Anaerobic chemotrophic communities in highly mineralized lakes
Zavarzin G. A., Russia

9:40-10:00
Seasonal biota variation of salt lakes of the South of West Siberia
Yasuchenya T. L., Russia

10:00-10:20
The new moderately haloalkaliphilic methanotrophs isolated from geographically distant soda lakes
Eshinimaev B.Ts., Khmelenina V.N., Trotsenko Yu.A., Russia

10:20-10:40 **Coffee-break**

10:40-12:30 ***Structural organization of salt lake biota, genetic diversity, spatial heterogeneity, seasonal variability***
ORAL PRESENTATIONS OF POSTERS. SESSION II
Chairmen: Academician Zavarzin G.A., Prof. Timms B.V.

A note on the effects of an extreme and unexpected meteorological phenomenon on lake Alchichica
Alcocer J., Filonov A., Mexico

On the ecology of *Caecidotea williamsi* (Crustacea: Isopoda: Asellidae) from Alchichica saline lake, Central Mexico
Alcocer J., Escobar E., Mexico

The impact of hypersaline mine water discharge on ecosystem function in Kambalda region playas
Foster J., Fergusson B., Australia

Vertical structure and photosynthetic properties of phytoplankton in relation to *in situ* irradiance and temperature gradient in Shira lake measured by diuron-state and variable chlorophyll fluorescence
Gaevsky N.A., Gorbaneva T.B., Belonog N.P., Koltashev A.A., Russia

Primary production of halophilic cyanobacterial association of Sivash lagoons (Krym)
Gerasimenko L. M., Orleansky V. K., Russia

Experience of biological-hydrochemical zoning of semi-closed Sevastopol bay as a basis for varied approach to ecological monitoring of aquatic environment
Gevorgiz N., Lopukhin A.S., Ovsjany E., Romanov A., Osadchaya T., Ljashenko S., Lopukhin S., Kemp R.B.

Investigation of depth adaptation fotosyntetic pigments in phytoplankton of Shira Lake by epifluorescense method
Gorbanyova T. B., Russia

Tools for bioassessment of inland salt lakes in Western Australia
John J., Australia

Distribution and habitat conditions of the ciliate *Frontonia leucas* (Ciliofora, Hymenostomatida) from lake Shira
Khromechek Elena B., Barkhatov Yu.V., Musonova M.V., Russia

Some aspects of conservation and management of salt lakes of South of Siberia
Kirillov V.V., Russia

Bacteria and heterotrophic flagellates in the pelagic carbon cycle in stratified brackish Shira lake (Russia)
Kopylov A. I., Kosolapov D.B., Romanenko A.V., Degermendzhy N.N., Russia

The mongolian toad *Bufo raddei str.* in mineral lakes located on the western coast of lake Baikal
Litvinov N.I., Russia

Composition of fatty acids of *Gammarus lacustris* and its food sources from the salt lake Shira compared to those from a small freshwater Siberian reservoir
Makhutova O. N., Russia

Unique of structure of brackish-water lakes ecosystems of middle Volga region
Mingazova N.M., Derevenskaya O.Yu., Palagushkina O.V., Monasypov M.A., Sayfullin R.R., Unkovskaya E.N., Barieva F.F., Russia

Heuristic mathematical modeling for water ecosystem studies
Pechurkin N. S., Russia

The measure of kinetic characteristics of hydrobionts (*Gammarus lacustris*) of Shira and Bele lakes by electrode methods
Pechurkin N. S., Boyandin A. N., Somova L. A., Russia

Autotrophic picoplankton of Shira Lake
Romanenko A. V., Russia

The program shell of the informational - analytical system for the forecast of a state ecosystem and qualities of water in reservoirs
Turbov V.V., Degermendzhy A.G., Gubanov V.G., Russia

The effect of environment factors on the vertical distribution of copepoda *Arctodiaptomus salinus* (from Shira lake) in laboratory conditions
Zadereev Ye.S., Gubanov M.V., Russia

The formation of the vertically stratified distribution of zooplankton in Shira lake
Zadereev Ye.S., Tolomeev A.P., Russia

Modeling of vertical distribution of phytoplankton in Shira lake
Zotina T.A., Degermendzhy A.G., Tolomeyev A. P., Gavrilova L.V., Russia

Some aspects of ecology and nutrition of amphipod *Gammarus lacustris* from Shira lake
Yemelyanova A.Yu., Russia

12:30-14:00 **Poster viewing**

14:00-15:00 **Lunch**

SESSION III
Functioning of salt lake ecosystems, trophic structure and interactions, biogeochemical interactions, movements of organisms
Chairmen: Prof. Degermendzhy Andrei G., Prof. Coleman M.

15:00-15:20
The Crimean Hypersaline Lakes: I. Bioenergetics of the Microbial Community and the Sedimentation-to-Mineralization Ratio
Mukhanov V.S. (Ukraine), Naidanova O.G. (Ukraine), Shadrin N.V. (Ukraine), Lopukhin A.S. (Ukraine) and Kemp R.B. (UK)

15:20-15:40
Biological mechanisms and a mathematical model of vertical structure of Shira lake ecosystem
Degermendzhy A G., Russia

15:40-16:00
Salinity of water as a factor to determine the development of the shrimp Artemia in the lakes of South of Western Siberia
Litvinenko L.I., Kozlov A. V., Kobylina T.E. and Bauer D.S., Russia

16:00-16:20
Features of development of brine shrimp Artemia on the border of an area in lakes
Rostovcev A. A., Vizer L.S., Russia

16:20-16:40
Characterization of Artemia populations of Western Siberia lakes: morphometry and cytogenetics
Boyko E.G. (Russia), Saukova N.A. (Russia), Sorgeloos P. (Belgium)

16:40-17:00
Has *Artemia parthenogenetica* been introduced into Western Australia through human agency?
McMaster K., Savage A., Finston T., Johnson M.S. and Knott B., Australia

17:00-17:20 **Coffee-break**

17:20-17:40
The ecology and distribution of Samphires (Salicorniae) in the goldfields of Western Australia
Datson B.M., Australia

17:40-18:00
Modeling environmental processes in large saline wetlands in Western Australia
Coleman M. U., Australia

18:00-18:20
The effect of landuse on benthic microbial communities in salt lakes of the northern agricultural region, Western Australia
Smith D., Eliot I., Knott B., Australia

18:20-18:40
Halophilous microorganisms in water – settlements from salt dumps of potassium mines, subsurface waters and paleozoic marine lagoons

Oborin A. A., Ilarionov S.A., Seleznev I.A., Rubinstein L.M., Bulbovich A.R., Vetlugaev A.A., Russia

18:40-19:00
Water resources of the Republic of Khakasia: biological diversity, management, protection
Nedvetsky V.I., Tatarintsev V.I., Gilenberg V.I., Devyatkin G.V., Russia

19:00-19:20
Microbial processes of carbon and sulfur cycles in the salt lake Shira (Khakasia)
Pimenov N.V., Rusanov I.I., Karnachuk O.V., Brjanseva I.A., Rogosin D.Yu., Russia

FRIDAY 26 JULY 2002

SESSION IV
Management of salt lakes for biotechnological and medical purposes
Chairmen: Prof. Dzhabarova N.K., Prof. Knott B.

9:00-9:20
The Monitoring of natural balneological resources of the Republic of Khakasia
Troyanov G.Yu., Russia

9:20-9:40
Application of peloids and dry brine with additional components in medicine
Tchistokhin Yu.G., Shelepanova O.A., Subbotin A.V., Pivovarov A.A., Russia

9:40-10:00
Thermohaline structure of salt lakes with "greenhouse" effect and possibility its use
Yegorov A.N., Russia

10:00-10:20
Complex study of bottom sediments occurring in Khakasia lakes for medical purposes
Dzhabarova N.K., Yudina N.V., Karelina O.A., Klopotova N.G., Russia

10:20-10:40
Slide show "MY FIELD TRIPS TO THE PAROO (Australia)"
Timms B.V., Australia

10:40-11:00 **Coffee-break**

11:00-12:25 *Structural organization of salt lake biota, genetic diversity, spatial heterogeneity, seasonal variability*
ORAL PRESENTATIONS OF POSTERS. SESSION III
Chairmen: Prof. Dzhabarova N.K., Prof. Knott B.

First results obtained from a study of micro-zoobenthos of mineral lakes located in the Taheranskaya steppe, the west coast of Lake Baikal
Arov I.V., Pen'kova O.G., Russia

System for analysis of time series of satellite images of internal reservoirs with atmospheric correction algorithms usage
Chernetsky M.M., Russia

Benthic diatoms in the salinas of the DryCreek Saltfields
Cook F. S., Coleman P.S.J., Australia

The variability of life history parameters in Artemia as the adaptive mechanism for the existence in unpredictable salt lake ecosystems
Golubev A.P., Roschina N.N., Russia

On the composition of heteroorganic compounds of the lipids of recent sediments
Golushkova E.B., Sagachenko T.A., Burkova V.N., Russia

The effect of the wood on the water analysis and the quality of river waters of the basin of lake Shira
Gribov A.I., Anyushin V.V., Khabarov N.N., Budaeva L.I., Russia

Some aspects of the thermal regime and phytoplankton distribution of the brackish Shira lake
Kartushinsky A.V., Russia

Chemical composition of lakes Shira region
Kopylova J.G., Smetanina I.V., Lysova O.V., Russia

Water chemical composition in Artemia lakes ofWestern Siberia
Kovalenko A.I., Litvinenko L.I., Russia

Biogeochemical background and technogenic pollution of the altai lakes by mercury
Leonova G.A., Scherbov B.L.

The community of phototrophic sulfur bacteria in meromictic salt lake Mogilnoye
Lunina O. N., Gorlenko V.M., Russia

Microbial processes of methane cycle in meromictic lake Mogilnoye (Islend Kildin, Barents Sea)
Rusanov I.I., Yusupov S.K., Pimenov N.V., Russia

On the effect of cannibalism intensity on the functioning of aquatic ecosystems
Shirobokova I.M., Pechurkin N.S., Russia

Trophic ranging of reservoirs and water fitosystems on totality of biogeochemical characteristics.
Yurchenko Yu.Yu., Ukraine

The biological characteristic of small salt lakes of Odessa region
Yurchenko Yu.Yu., Goncharov A.Yu., Khutornoy S.A., Zotov A.B., Drimanova I.A., Nastenko E.V., Ribalko A.A., Ukraine

The adaptation analysis aspect of the vegetation of halophytic grasslands to different salinity conditions at red lake of the Republic of Khakasia
Zorkina T.M., Zhukova V. M., Russia

12:25-14:00 **Poster viewing**

13:20-14:00 ***ISSLR member meeting***
Chairman: Prof. Jellison Robert

14:00-15:00 **Lunch**

15:00-15:35 Management of salt lakes for biotechnological and medical purposes
ORAL PRESENTATIONS OF POSTERS. SESSION IV
Chairman: Prof. Degermendzhy Andrei G.

Maintenance of the genetically modified strain *Escherichia coli* Z905/pPHL7 in the sterile water of Shira lake
Boyandin A.N., Lobova T.I., Popova L.Yu., Russia

The use of salines to produce bioactive additives to food and mineral water concentrate
Burkova V.N., Boev S.G., Russia

About possibility of application haloalkalophilic microorganisms in oil-polluted extreme ecosystems bioremediation
Bulbovich A.R., Oborin A.A., Ilarionov S.A., Russia

The inhibition kinetics and adaptation of *Escherichia coli* to lithium ions
Evdokimov E.V., Sharubin S.A., Russia

Morphological characteristics of biofilms formed by some *Bacillus* species isolated from Shira lake
Krylova T.Yu., Mogilnaya O.A., Popova L.Yu., Russia

Dynamics of manifestation of antibiotic resistance by heterotrophic bacteria of Shira lake during 1999-2001

Lobova T. I., Popova L.Yu., Russia

The growth of heterotrophic aerobic bacteria of Shira lake influenced by monovalent alkaline cations K+ and Cs+
Tyumentseva A.V., Ganusova E.E., Russia

Applications of *in vivo* and *in vitro* bioluminescent systems for ecological monitoring of Shira lake
Vetrova E.V., Kratasyuk V.A., Kudryasheva N.S., Russia

Lipid and hydrocarbon compositions of a wild sample of the green microalga *Botryococcus braunii* isolated from Shira lake
Zhila N.O., Russia

15:35-16:40 **Poster viewing**

16:40 - 17:00 **Coffee-break**

17:00-19:00 INTAS monitoring meeting
Chairman: Prof. Degermendzhy Andrei G.

17:00-17:20
The Crimean hypersaline lakes: II. Microbial community structure and potential influence on the temperature fields
Shadrin N.V. (Ukraine), Mukhanov V.S. (Ukraine), Naidanova O.G. (Ukraine), Nevrova E.L. (Ukraine), Kemp R.B.(UK), Yeremin O.Yu. (Ukraine)

17:20-17:40
Numerical modeling of hydrophysical processes in lake Shira
Belolipetskii V.M., Gavrilova L.V., Genova S.N., Kompaniets L.A., Lukavenko P.N., Russia

17:40-18:00
Patchy environment as a factor of complex spatio-temporal plankton dynamics: a theoretical study
Medvinsky A.B. (Russia), Tikhonova I.A. (Russia), Malchow H. (Germany)

18:00-19:00 **Discussion**

19:00-20:00 CLOSING CEREMONY
(Conference Hall)

19:00-19:40 Addresses

Prof. Andrey G. Degermendzhy, The Chairman of the Scientific Organizing Committee

Jellison R.S., The Secretary of the International Society for Salt Lake Research

Conference Guests (2-3 minutes per presentation)

19:40-20:00 **Press-conference**

20:00 **Farewell Party**

HYDROGRAPHIC ASPECTS OF APPLICATION OF GEOINFORMATION TECHNOLOGIES IN RESEARCHES OF WATER AREAS

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Now it is commonplace that Geographic Information Systems (GIS) promote a better understanding of land and water peculiar properties in common for science and practice purposes. As to lakes GIS are one of the most popular and useful instruments for hydrographic data representations and investigation. The State Research Navigation-Hydrographic Institute has been the leading Russian research organization responsible for the development of the state technical policy in the area of navigation, hydrography, oceanography and marine cartography since its establishment in 1939. The Institute provides the scientific and technical support for carrying out the international obligations of Russia aimed at provision of navigation safety, exchange of cartographic data and oceanographic information. The Institute offers as the services to different customers a design and delivery of components of navigation-hydrographic and hydrometeorological support systems for transport activities at seas and lakes including production of problem-oriented licensed cartographic materials in digital and graphical form for the World ocean as well as for the rivers and lakes of Russia, in compliance with international standards. The Institute has a modern technical base at its disposal, including the unique facilities intended to survey the bottom relief and bottom soils of the seas and oceans, oceanographic and navigational equipment. The Oceanographic Centre of the Institute has one of the most comprehensive data banks in Russia on oceanography, marine meteorology, magnetic, gravitational and seismic fields of the World Ocean, seas and lakes. More than 50% of the data in the Oceanographic Centre has been obtained by the Hydrographic Service of Russia and is unique. Since the early 90s we have expanded our services to include both military and civil customers. The Institute has the state licence for carrying out its activities. As an example of GIS Institute's activity for lakes the computer bathymetric map of Lake of Baykal may be offered. This map was made on the basis of the data the Head Department of Navigation and Oceanography of RF of Ministry of Defence, received in 1979 – 1985, and other organizations received recently. The primary data exist as paper logs only. They are already re-compiled, quality controlled, digitized and combined into a single DTM. All echosounding the data taken from different sources, are processed on a uniform technique, that provides for close coordinates their small divergence (less than 1 m). With out application of such technique divergence for depth 1600 m reaches 77 m. The work above a computer map of Lake of Baykal assumes, except for basic bathymetry of a map, drawing up of a number of auxiliary maps reflecting the various geological phenomena such as a Obruchev's fault, earthquakes, underwater and surface terraces, canyons etc. On bathymetric sounding data, including study original echo records, the traces Obruchev's fault are in details seen which are traced on all bottom of Lake of Baykal.

CAROTENOIDS OCCURRING IN WEST SIBERIA LACUSTRINE SEDIMENTS AND IN EAST SIBERIA ANCIENT ROCKS

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Tetraterpenoid pigments (carotenoids) occurring in recent sediments are inherited from photosynthesizing organisms that are the main producers of the sedimentary organic matter (OM). Fulfilling protective and photosynthetic functions in living organisms carotenoids are species-specific compounds. By this reason they are used as biological markers to reconstruct palaeoenvironmental conditions during early diagenetic stages of OM formation. In the present work we have studied distributions of carotenoids occurring in the primary bioproducers (*Artemia salina, Microcystis salina*, photosynthesizing sulfur and non-sulfur purple bacteria such as *Rhodospirialles and Chloroflexaceae)* and in the sediments of several Siberian saline lakes (Karachi, Tukhloye, Chebakly, Lechebnoye, Shira and Tus). The results have revealed that carotenoids have similar qualitative compositions in the sediments of all lakes and differ in their quantitative distributions. Xanthophylles predominate among sedimentary carotenoids. Their portion in sediments of hypersaline basins is less as compared with that determined in salted and freshwater lakes. Carotenoids of hypersaline sediments by their origin are divided into following groups: carotenes, echinenone, cantaxanthine, myxoxanthophylls, chlorophylls and their derivatives are originated from primary aquatic photosynthesisers (i.e. algae and cyanobacteria); lutein, zeaxanthene and chlorophyll a - from terrestrial higher plants, spheroidenone, rhodovibrine and bacterial chlorophylls - from bentic microorganisms. Besides, the highest carotenoid of non-photosynthesizing methanogenic bacteria is available. The total amount of carotenoids evaluated in the surface sediments reaches 20 mg per 100 g of dry sediment. Cantaxanthine is the most resisted pigment, which does not undergo decomposition while grazing by zooplankton. This carotenoid was discovered even in desert soils. The quality of sedimentary carotenoids in salines slightly change in course of burial, confirming biocoenosis similarity during the basin history. For Lake Karachi one has noted synchronous accumulation of carotenoids of all sources with increased amount of total OM, that is most likely resulted from extremely high salinity of bottom water. On the contrary, the portion of keto-carotenoids including cantaxanthin is higher in the sediment cores which were deposited at lower salinity. An artificial experiment carried out in order to bacterial reworking of the sedimentary OM has revealed that originally *trans*-isomers of carotenoids were first subjected to *cis*-isomerization. The products of geochemical transformation of carotenoids – carotan, lycopane, isolycopane and others were discovered in crude oils and in ancient rocks. However, fossil carotenoids were found in rocks aged 100 thousand years. We were the first to identify carotenoid pigments in argillites from the southern Prikolymskoye elevation of Nyatvinskaya area (East Siberia) (rock age is 350 million years) and in carbonate rocks from lacustrine facies of Kavino-Tauyskaya depression aged 45 million years. Discovered keto-carotenoid has not been found in animate nature and it is probably the product of carotenoid transformation proceeding under specific conditions of sedimentary lithogenesis.

EARLY DIAGENETIC VARIATONS OF LIPID ANTIOXIDANTS IN SALINE ENVIRONMENTS

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Oxidation of organic compounds in the mode of radical chain reactions is a widely distributed process, which can disturb a system of bioregulation of a living organism, cause rock weathering, spoil food, lubricants and fuels. Therefore, search of natural oxidative inhibitors is considered as an urgent scientific problem. It was previously shown, recent lacustrine sediments contain lipid substances-antioxidants (AO) (Bolshakov et. al.), exhibiting biological activity. In this study we estimated AO contents and activities in the sediments of some saline lakes, which are located in the south of West Siberia (Karachi, Chebakly, Krasnovishnevoye, Tuchloye, Gorkoye and Krivoye) as well as in Khakassiya (Shira, Tus, Utichye 2, Utichye 3 and Shunet) and differ in biocenosis, trophic level, salinity and in other sedimentation conditions. Besides natural environments, AO were studied in the sediments that had been reworked by a benthic bacterial community since microbial processing of the organic matter (OM) is one of the main processes at early diagenesis. The content and inhibitory efficiency of AO in the samples were determined by a kinetic method based on a model reaction of initiated cumene oxidation. The results obtained were as follows. There was inverse relationship between a portion of lipids in the sediments and AO content. Polar lipid components, such as tetraterpenoid and tetrapyrrol pigments of plant and bacterial origin, were the main group of sedimentary AO. Mainly keto- and methoxy-carotenoids of cyclic and acyclic structures defined antioxidative activity among carotenoids. *Cis*-isomerization, as the earliest process of diagenetic transformation of initially *trans*-structures of biogenic carotenoids, increased antioxidative and also biological properties of the sedimentary lipids. Isolated lipids *per se* exhibited higher antioxidative characteristics as compared with that of a lipid concentrate in the whole, which was probably the result of polar components interaction within a lipid mixture. Model experiment has revealed that bacterial degradation of OM promoted the enrichment of residual lipids with AO. First of all, this phenomenon was caused by degradation of lipids which exhibited no antioxidative properties, for instance, hydrocarbons and then by *cis*-isomerization of carotenoids, and finally by biosynthesis of bacterial pigments, such as spheroidenone, rhodovibrine, bacterial chrolophylls. The microorganisms distribution along the sedimentary column as compared with that of AO amounts testified to saprophytes to be responsible for transformation of lipid fraction and its enrichment with AO.

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NEW IDEAS OF GENESIS OF SALT LAKES OF PRIBAIKALYE AND TRANS-BAIKAL AREA

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About 500 salt lakes with a basic depth of 1-2 m are known. The lakes that periodically dry up are sometimes observed. The same number of hydrocarbonaceous sodium and chloride sodium (halitic) lakes is distinguished from the components dominating in the lake water. Sulfate sodium (mirabilite) lakes are less in number; sulfate or chloride magnesium lakes are of an episodic occurrence. The mineralization of the most of sodium lakes is 2-6 grams per liter, sometimes it is 30-40 grams per liter. A small part of mirabilite lakes contains about 1 gram per liter, but the major part of them – about 30-50 grams per liter, with the maximum about 150-200 grams per liter. The salt content in halitic lakes varies from several units to 300-320 grams per liter. It may be quite different even in the nearby lakes. Arid climate plays an important role in salt concentrations. The mountainous relief of the regions causes a complex distribution of moisture. The evaporation in basins is almost a half more than the rate of atmospheric precipitation. Low rates of an atmospheric humidity and intensive insolation result in steppe vegetation both in Late Quaternary and now. In publications on genesis of salt lakes of Pribaikalye and Trans-Baikal area it is usually emphasized that the drainage composing rocks are the sources of an accumulated mineral substance. This fact may seem to be the most convincing if they are large. But a lake basin more often controls the drainage area of salt lakes in essence. The basin substratum is in many cases composed by magmatogene and intensively metamorphized crystalline rocks, steady against weathering, which were washed out many hundred millions years. The salt lakes are observed both in sites presented by the past marine gypsum-bearing deposits and within sulfate-free freshwater sediments. A leading part of deep underground waters played in formation of salt lakes is more probable. Direct evidences of their discharge are of rather frequent occurrence. The temperature of the bottom sediments is much higher than that of the background in the seeps. The relationship between fault tectonics and distribution of salt lakes is significant. The unit of crossing of local faults controls a single salt lake; the groups of salt lakes are related to zones of crossing of regional faults. A generality of hydrogeochemical fields finally occurred. Sodium lakes are related to basins which contain hydrocarbonaceous sodium deep underground waters; mirabilite lakes – to zones of discharge of nitric sulfate sodium hydrotherms; mirabilite-halitic – to places where deep underground waters have a high content of chlorine, sulfate-ion and sodium.

PRODUCTION AND HYDROCHEMICAL CHARACTERISTICS OF SALT LAKES OF ODESSA REGION

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In 2001-2002 years 14 salty lakes of the Odessa region were investigated. Volume of reservoirs varied from 400 m^3 up to 150 millions m^3. Mineralization varied from 9 up to 184 g/l. All investigated reservoirs in the past have a sea origin. It is the lagoons separated from the sea and limans. In all reservoirs primary production of fitoplancton and concentration of basic nutritions was measured. Almost all of the investigated reservoirs in a different degree are exposed to antropogeneous influence, therefore were found out interesting features of formation of primary production in these reservoirs. The level of the total primary production have exceeded in some lakes 10 $mgC*l^{-1}*day^{-1}$ (max - 30). Thus in the most productive lakes the ratio between nitrogen and phosphorus is moved in the party of increase of phosphorus (instead of known 1:8 is present 1:2), it proves to be true by almost complete absence of accessible nitrogen (mineral); the concentration of organic nitrogen do not exceed 2,5 mg/l. The concentration of total phosphorus frequently surpass 1 mg/l. Thus the stocks of phosphorus are not spent to the full (stocks of mineral phosphorus for 2 order exceed those of nitrogen). The permanganate oxidation is very high (21,33-42,67 mgO/l). The high level of pH (8,77-8,84) even at low autumn temperatures (13-15^oC) speaks about high level of production processes; the water all time is oversaturated by oxygen; it proves to be true by measurements of primary production. The disbalance of nitrogen and phosphorus is observed practically in all supersmall ($V < 100\ 000\ m^3$) reservoirs (even in the winter period). In these lakes there is not enough of accessible mineral nitrogen at surplus of phosphorus. The concentration of organic nitrogen change within the limits of 2-4 mg/l. Only in one lake (Kuyalnitsky liman) at mineralization more than 150 g/l the lack of phosphorus is observed. The concentration of total phosphorus do not exceed 0,1 mg/l. The concentration of total nitrogen reaches 7,9 mg/l; the share of organic nitrogen is about 90%. The mineral nitrogen is in enough (up to 0,8 mg/l) basically for the account of accessable ammonia nitrogen (0,23-0,54 mg/l). Such quantity of ammonia nitrogen is explained, apparently, by *Artemia salina* excretion. The high productivity of *A. salina* is provided with high primary production, which even in february at temperature 10^oC reaches 2,7 $mgC*l^{-1}*day^{-1}$. Permanganate oxidation in Kuyalnitsky liman is high and is stable during the year (20,15-22,86 mgO/l). Thus, in all researched reservoirs (except Kuyalnitsky liman) the abnormal situation is observed, when production is limited by nitrogen not by phosphorus. The processes in Kuyalnitsky liman are limited by phosphorus, which supplies are many times less than of nitrogen.

TROPHIC RANGING OF RESERVOIRS AND WATER FITOSYSTEMS ON TOTALITY OF BIOGEOCHEMICAL CHARACTERISTICS

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Trophical descriptions and classifications of water objects the more often is based on totality of the biological and hydrochemical characteristics with prevalence of the first or second depending on a task and specialization of the researchers. At such approach the information consists both in meanings of separate parameters, and in estimations of ratio between "Bio" and "Chem". However, their ratio can not be always successfully calculated. The main condition of the bigeochemical approach to the trophic characteristics of reservoirs consists in use by all means of three components - "Bio", "Geo" and "Chem". The importance of each component is equal. The most valuable information about the trophic status of objects, including reservoirs, is taken at such approach from ratio "Bio"-"Geo", "Geo"-"Chem" and "Bio"-"Chem". The objects having three named characteristics in biogeochemistry are named bio-abiotic bodies (Vernadsky, 1926, 1965). The bio-abiotic objects of biological rank are the bodies of any organisms. The bio-abiotic objects of a geographical rank are any reservoirs (ponds, lakes, limans, seas, oceans with their biota). From the party of "Geo" for the description of lakes, limans and other reservoirs in the report the stationary volume the water (V), surface area (S) and their ratio (V/S = L) are used. As the chemical substances enter and emanate through boundary surfaces, besides of alive weight (W) in a reservoir or its parts are used the areas of boundary surfaces - biological (S_{bio}) and ecological (S_{eco}). It adds to a number of essential parameters of reservoirs; These are the ratio which in the approach "Bio"-"Chem" are not used: S/S_{bio}, S/S_{eco} and others. For the characteristic of a section "Bio"-"Geo" in reservoirs are calculated trophodinamic parameters - intensity of molecular flows of nutrition substances proceeding through inhabited water space. They are calculated on the unit of inhabited volume of system (μ_V = DW/Vt; DW- weight of the substance which has entered in time **t**) and on the unit of different boundary surfaces (μS = DW/St; instead of S can be used S_{bio} and S_{eco} and others). The task of the report is the description in named above parameters of lakes and limans with different salinity in structure of an extensive line of water bio-abiotic systems of a different type and size (from 10^{-5} up to 10^{18} m^3), continued ranging of reservoirs, comparison of biological-chemical and biogeochemical analysis of reservoirs.

BIOGEOCHEMISTRY OF HYDROCARBONS IN HYPERSALINE LAKE KARACHI

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Hydrocarbons (HCs) are well documented to be the end products at acid metabolism within the cells of living organisms. Inherit the acid structure which is specific for each living organism, HCs serve as taxon signs. Buried in the recent sediments HCs can be used as biomarkers of a contribution of separate organisms to the sedimentary organic matter (OM), as well as the indices of a route and degree of its diagenetic transformation. Thus, HCs are an important tool for estimation of conditions favorable source rock formation. In the present work one has studied the compositions and distributions of HCs in main bioproducers and in the sediments of Lake Karachi (West Siberia). The surface sediments were sampled across the lake. The sediment column was obtained from the depth up to 1 m**.** Sediment accumulation in the lake proceeds under strong sulfate-reducing conditions; the water salinity exceeds 130 g/L. Biocenosis is presented by salt plants, phyto- and zooplankton, as well as by various microflora. Separate bioproducers of ecosystem contained similar amounts of HCs as usual 100-200 mg per 100 g of dry biomass. Maximum HCs concentrations were observed in microorganisms of a sulfur cycle (up to 1 g/100 g). The HCs contributions of bioproducers under study to the sedimentary HCs accounted in total to 10-40 % rel., a greater part of which was produced by microorganisms. The rest HCs were the components of unknown bioproducers, as well as those redeposited from surrounding rocks. One observed competitive distribution for HCs contributions of saprophytic against sulfate-reducing bacteria and synchronous – of photo-synthetics. As to polycyclic aromatic hydrocarbons benz(a)pyrene was identified (in trace amounts) in the surface sediments and chrysene – in the most submerged sediments. The contents of aliphatic HCs varied from 10 to 20 mg per 100 g in the surface sediments and ran up to 150 mg/100 g of the sediment deposited at a depth of 10-20 cm. Both in the surface sediments along the cross-profile of the lake and in the sedimentary column HCs contents distributed extremely non-uniformly, reaching higher values in those sedimentary layers, which were deposited at hypersalinity. The conditions of less salinity caused degradation of low molecular components of aquatic organisms yielding molecular-mass redistribution of HCs. Rapid bacterial processing of unsaturated, low molecular and straight-chained HCs of aquatic organisms was a reason for accumulation more likely of allochthonous material and HCs synthesized by bottom microflora. The compositions of HCs adsorbed by minerals and that of included into protokerogen matrix differed by an increased portion of microbial components. According to the total content of free and bound HCs (HCs/Corg 50 mg/g) and to the compositions of sterane and hopane biomarkers as well as light isoprenoids the sediments from Lake Karachi corresponded to source rocks of “biogenic” oils. The temperature during their maturation did not exceed 50-60 ^{o}C. One connects their genesis with strong microbial activity during diagenesis. Thus, biogeochemical conditions of OM burial in hypersalines may be favorable to the formation of immature oil of nonmarine type.

HOLOCENE CLIMATIC VARIABILITY AND EVOLUTION OF HUMAN SETTLEMENT IN THE ARAL SEA BASIN (CLIMAN)

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This proposed multidisciplinary study in the Aral Sea Basin will improve our understanding of climate variability during the last 10-15 000 years. And it is through the understanding of this climatic aspect that we aim to also elucidate the human settlement history here: a key, internationally important archaeological region. In the Aral Sea area (44-46^{o} N), affected by extreme seasonal atmospheric conditions, changes in the hydrologic balance (evaporation and fluviatile input) in Eurasia at Termination I and during the Holocene are of great interest in association to the prevailing atmospheric circulation dynamics in the Northern Hemisphere. The river discharge is controlled by the precipitation budget West Wind Drift in mountain chains E-SE of the Kasyl Kum desert which are located at the northernmost end of the Asian monsoonal trajectory, while evaporation is controlled by NE winds, which (depending on the season) are bringing dry and cold or dry and warm air masses from the continental interior. With high-resolution core studies based on a balanced data set consisting of biotic and abiotic parameters, climate fluctuations will be documented for the past 10-15 ka. The proxies will be used to trace hydrological changes in the water column. The age model for sediment cores will be based on paleomagnetic and rock magnetic measurements, and AMS radiocarbon dating on ostracods and molluscs. Sediments deposited within the last 150 years will be dated with ^{210}Pb. This technique will be fundamental in dating recent hydrological changes, and will help secure the age model in the uppermost core sections. Instrumental measurements of the lake level stands will be used together with meteorological parameters (collected over the last few decades) for modelling variations of the water body and to determine the controlling mechanisms for these fluctuations. The 3-D modelling tool for the water balance will allow us to extrapolate historic lake-water body sizes. Using an iterative approach, lake size and its catchment area will be reconstructed over at least several hundred years. For climatic events further back in time, the 3-D model will be verified using the combination of remote sensing and geomorphological & archaeological mapping, together with mineralogical, geochemical and paleontological data.

GEOLOGICAL CONDITIONS OF FORMATION AND ECOLOGICAL AND GEOCHEMICAL PECULIARITIES OF SALT LAKES IN NORTH CENTRAL ASIA

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Salt lakes in the Mezo-Cenozoic riftogenic troughs within Prebaicalia, Transbaikalia, North Mongolia and China are located in the ore provinces with various deposits. The troughs have sedimentary-volcanogenic, carbonaceous, bituminiferous and ore-beaing deposits. Mud and gas volcanisms, and discharge of mineral water are observed in the oil- and gas-bearing troughs along faults [7,8]. Small salt lakes form in the troughs of deflation [4,5,6]. There are identified under-pond and karst lakes. Formation of drainless troughs in intermountain depressions and peneplain occurred in periglacial landscapes of Upper Pleistocene and was associated with selected weathering and deflation. The troughs are typical elements of eolian relief of the region. Salt accumulation occurred in the troughs during Upper Pleistocene-Holocene under effect of cryogenic and salt weathering, freezing out and evaporafory concentration of salts. The sources of salts in the lakes were pressure cold and thermal water of fault zones and artesian basins. Influence of underground mineralized sulphate and soda water is specific of salt recharge of the lakes [1,8]. Some soda lakes and solonchaks are associated with the Neogene-Quaternary alkaline basalts [3]. Stable functioning of salt lake ecosystems depends on their geological history, constant introduction of ground water into the troughs, cryogenic metamorphization and evaporatory concentration of salt and biogeochemical processes. In soda lakes of Transbaikalia, alkophile cyanobakterial mats – i.e. benthos populations of microorganisms – actively participate in biological circulation of atoms [2]. Medicinal resources of hydrogen sulphide muds in salt lakes are great in the region. The role of steppes and forest-steppes with the salt lake and solonchaks is also significant for paleoecology of man. Nomad civilization appeared there. Salt-bearing landscape were an important source of mineral nutrition of animals and man. Ecologically safe meat and milk products are notable for high gustatory, nourishing and medicinal qualities. A phenomenon of such quality of products is the result of purposeful selection of domestic animals in the landscapes with optimum contents of chemical elements. Biogeochemical hearths of endemic diseases of domestic animals and man are related to the salting of steppes and forest-steppes within rare-metal zones.

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ORGANIC SUBSTANCES IN KHAKASIA SALT LAKES SEDIMENTS

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The goals of this work are to describe the status and trends in the Khakasia Salt Lakes waters quality and to gain a better understanding of the natural and human factors that affect the quality of these resources. Water and sediment samples from Shira, Bele, Tus and Utichye-III Lakes were collected and analysed for total petroleum hydrocarbons, PAHs and others organic chemicals by using gravimetry, spectrophotometry and GC/MS analytical methods (Methods 624, 625, 8260, 8270, 8275 EPA US). The multivariate database (DB) was generated from the water and sediment samples collected and analysed. DB is operated and managed by Microsoft Exel and Access software. It includes name, formula, molecular weight, concentration and properties for more than 300 contaminants (phtalates, paraffines, benzenes, PAHs, amides, acids, ethers *etc*) identified and quantified by GC/MS and other techniques. DB can be used for environment monitoring as well as for technological and social management in Khakasia region. Unfortunately, in most cases any organic chemical constituent can be derived from both natural and artificial sources. Instead, the concentrations of multiple chemical constituents are measured, and this large multivariate data set is used to recognize these kind sources. Statistical analytical techniques (PCA, Factor Analysis *etc*) enhance the interpretation of multivariate databases such as the one generated from the water and sediment samples and were used to separate the natural and human-caused processes that control observed variations in the chemical composition of the lake sediment and water samples. High-molecular C27 – C30 steranes and C27 – C35 hopanes fingerprints were studied. The distribution and fingerprints of these components were used for geochemical transformation processes of organic matter in saline water environment evaluation. In sediment muds (therapeutic) the macrocyclic sulfur contained compounds – dithiacycloparaffines – were identified. The interest and concern for these matters is conditioned not only their presumable biological potency, but also that they are the relevant link in a global biocycle of one of the least studied biogenic element - sulfur.

TRENDS OF CLIMATIC PARAMETERS IN LAKE REGIONS OF THE SOUTH OF SIBERIA (20TH CENTURY)

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Although the mean temperature of the Earth surface has increased by 0.3±0.6ºC from the middle of the nineteenth century, an analyses of climate has shown that processes are not similar in different regions of the Earth. Investigations have revealed too, that trends of the basic climatic parameters do not coincide for different seasons and time intervals. For many Siberian areas diversity of trend signs for winter and summer is typical. As well the question of certainty of obtained results always arises in studies of climatic processes. As an example the trends values of winter temperature (1900-1990) for Uman' (48º46´N 30º14´E warming by 0.7ºC) and Kiev (50º24´N 30º 27´E colding by 0.4ºC) may be given. Consequently, for reliability estimation of conclusions on "warming" or "colding" it is necessary to take into account the neighboring points data in addition to statistical criteria. In this paper a review of the basic climatic parameters trends is given for the South of Siberia with emphasis on the Lake Shira region. The main attention is centered on dynamics of summer temperature and precipitation. The daily, monthly and seasonally averaged data on temperature and precipitation over the period from 1886 to 1995 have been used in this paper.

INTERACTION COEFFICIENTS IN THE SHIRA LAKE ALGAL-BACTERIAL COMMUNITY

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A new method is proposed to evaluate the interaction coefficients in microbial communities interacting due to physical-chemical environmental factors. This method differs from the classical one suggested by E.P.Odum. Redefinition of the interaction coefficients allows the evaluation of the experimental (actual) and theoretical values of the coefficients for the hypothetical interaction layout. The interaction layout is considered to be a set of factors, the values of their transformation ratios and the form of dependence of a population's specific growth rate on these factors. A comparison of theoretical and experimental values of interaction coefficients enables us to assess the adequacy of the hypothetical interaction scheme in the microbial communities. We have tested this method on a natural algal-bacterial community of Shira Lake (Khakasia, Russia), which has been the object of detailed and concerted limnological studies and for which detailed data are available. Feedback coefficients of phyto- and bacterioplankton and the coefficients of influence of phytoplankton on bacterioplankton have been defined. Dominance of negative experimental IC values has been experimentally shown, which is indicative of the negative feedback in bacterio- and phytoplankton links of Shira Lake and of negative interpopulation (phytoplankton on bacterioplankton) interactions. The considerable differences observed between the experimental and theoretical coefficients indicates inadequacy of the assumed interaction layout of the community under study. Further investigations are needed to provide a precise sketch of the interactions.

A NOTE ON THE EFFECTS OF AN EXTREME AND UNEXPECTED METEOROLOGICAL PHENOMENON ON LAKE ALCHICHICA

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The perturbations of the water column of Lake Alchichica, a saline lake in Central Mexico, by a local heavy rainfall were analyzed. Alchichica is located in the "Llanos de San Juan", a high-altitude plateau (i.e. lowest portion at 2,300 m above sea level) with an arid climate; the annual precipitation regime is less than 400 mm and the annual evaporation rate of 500-600 mm. An extreme and unexpected precipitation raised the lake's water level up to one meter. Considering 1.81 km^2 of lake surface area and one-meter elevation, around 1,810,000 m^3 of rainwater were suddenly added to the lake. After a couple of days, the lake returned to its original level presumably through water percolation. Mixing throughout the upper layer (from surface to 5-10 m) was indicated by changes in temperature and salinity. Atypical temperature and salinity profiles in the upper layer showed a temperature inversion reaching up to 1°C and a salinity decrease in up to 0.5 g L^{-1}. Turbidity and pH were also altered but not dissolved oxygen concentration, nutrients or chlorophyll "a". The combination of the heavy rain and wind effects were limited to the upper half of the epilimnion; the meta- and hypolimnion were not altered in any way. After one a half days we ended our every 3 hr sampling program when "normal conditions" re-established.

ON THE ECOLOGY OF *CAECIDOTEA WILLIAMSI* (CRUSTACEA: ISOPODA: ASELLIDAE) FROM ALCHICHICA SALINE LAKE, CENTRAL MEXICO

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Caecidotea williamsi Escobar-Briones & Alcocer 2002 is the first asellid described from a saline aquatic habitat in America, Alchichica crater-lake, Puebla, Central Mexico. No previous reports exist for asellid isopods from inland saline waters in America in spite of the extensive research undertaken so far along the continent. Differing to other asellids, *C. williamsi* lives cryptically in tufa crevices. It inhabits the saline (i.e. 7 to 8 $g.L^{-1}$) waters of the lake dominated by sodium, magnesium, chloride and bicarbonate ions. Alchichica water is alkaline (pH= 9.0±0.1). Water temperature ranges from 14.5°C throughout the water column in winter and in the deep waters the rest of the year, up to 20°C in the surface waters along the summer. *C. williamsi* occurs in a depth range of 3 to 30 m (lake's maximum depth is 64 m), below which an anoxic layer is found during nine months of the year. A large number of specimens at shallower depths inhabit empty trichopteran cases embeded within the tufa crevices. Some specimens are heavily covered by epizoids, ciliates, on the thoracic and abdominal segments of the exoskeleton and the pleopods.

FIRST RESULTS OBTAINED FROM A STUDY OF MICRO-ZOOBENTHOS OF MINERAL LAKES LOCATED IN THE TAHERANSKAYA STEPPE, THE WEST COAST OF LAKE BAIKAL

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Mineral lakes, located in steppes of the western coast of Lake Baikal, have been studied along different seasons of 2001. The lakes are fed by atmospheric precipitation and underground waters, not out-flowed, and well warmed. The bottom of most lakes is covered with silt, abundant in detritus, and often with smell of sulphured hydrogen. In many lakes, there intensively develops aquatic vegetation, for example, *Potamogeton*, and *Myriophyllum*. Total mineralization of the lakes varied between 0.3 and 9.8 g·l-1, thereby most lakes may be regarded as saltish, belonging to hydrocarbonate-magnesium and hydrocarbonate-sodium types. The macro-fauna of invertebrates numbers more 60 taxa, mainly of the species range. These data do not reflect their real species diversity because a number of ticks as well as some presenters of *Coleoptera* and *Diptera* in the larva stage have been identified only to the level of genus. A species list may be added by quite unstudied *Chironomidae*. Most rich were the groups *Coleoptera* (17 taxa), *Diptera* (10 ones, besides *Chironomidae*) and *Heteroptera* (9 species). The maximal species diversity, up to 16, has been observed in lakes exhibiting lowest mineralization. The macro-fauna in these lakes is presented mainly by commonplace widely distributed species among them there are numerously herbivorous organisms, for instance, larvae of *Coenagrionidae*, *Lestidae*, *Phryganea bipunctata*, and *Cloeon dipterum*. Species diversity was as lower as raised total mineralization, sometimes decreasing to 2-3 species, usually *Gammarus lacustris*, and one of *Corixidae* or (and) *Hydrophilidae*. An exception was the lake № 6, belonging to chloride-sodium type, in which was abundant fauna of *Corixidae*, 4 species. At the same time in lakes with raised mineralization, there was increased a mission of specific halophile inhabitants, i.e. some of *Hydradephaga* and *Heteroptera*. Entered this faunistic community were also several species, areas of which do not spread outside West Siberia and Kazakhstan, i.e. *Coelambus enneagrammus*, *C. nigrolineatus* (found for the first time in East Siberia), and *Arctocorisa carinata*. Such a disjunction of inhabitation areas is whether caused by natural geographical barriers, remained after the glacial epoch, or provoked by insufficiency in the study of mineral lakes. Almost in all the lakes, there dominates a nektobenthic community composed of *Gammarus lacustris* and 6 species of *Corixidae*. In the benthic zone, *Chironomidae larvae*, and *Anisus acronicus* (*Planorbidae*) prevail but some lakes are abundant by larvae of *Colimbetini*, *Coelambus spp*. and *Berosus spinosus*. It pays attention to wide spreading and abundance of imagoes and larvae of *Macroplea mutica* (*Chrysomelidae*) known to belong to microphytes. These preliminary results, obtained from the study of the vertebrate micro-fauna of the Tazheranskie lakes, showed rather species richness along the basic taxonomic groups. Findings of some species, rare and new for the region, enabled us to regard that further research of steppe lakes nearby Lake Baikal is perspective.

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SEVERAL FEATURES OF ALGAL FLORA IN ULTRAHALINE KARA-BOGAS-GOL BAY (TURKMENISTAN)

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Kara-Bogaz-Gol is the biggest salt bay of the Caspian Sea, with a surface area of about 18000 km^2 (Proshkina-Lavrenko and Makarova, 1968; Karaeva, 1972, The Kara-Bogaz-Gol yesterday, today, tomorrow, 1988). Located in the Eastern edge, it is a natural evaporator basin for seawater flowing in from the Caspian Sea. The mineralization of waters in bay changes in enough long limits, from 40 till 100 ppt (a mixing zone of waters) and from 170 till 250 ppt (the northwest and southwest part of a bay), places on shallow sites from 272 ppt and is higher, that results to fall of salts from the oversaturated solution. A study of algal flora in the brine of Kara-Bogas-Gol Bay found 80 species, varieties and forms of algae belonging to 4 divisions and dominant development of diatomaceous – 65 species, blue-green – 9, green – 3 and dinogflagellate – 3 species. Nearly all representatives of algal flora found in the Bay belong to those widely spread in continental brackish water bodies, the Caspian sea among them, and except for several hyperhalobs *Dunaliella salina* Teod, *Dunaliella viridis* Teod, *Aphanothece salina* Elenk. et Danil., the habitat of the latter is quite limited, at that (Kogan, 1973). In terms of the number of species the Bay is dominated by diatomaceous algae found all over the Bay and featuring high halobic spectrum – this was on repeated occasions evidenced by researchers of other ultrahaline water bodies (Proshkina-Lavrenko, 1950; Blyumina, 1957; Felix and Rushforth, 1979, other authors). Diatomaceous cenoses of coastal parts of the Bay where the content of biogenic elements, salinity and temperature are subject to permanent changes are most representative. Among dominant species in different parts of the Bay the diatomaceous are: eurihalobs *Actynocyclus ehrenbergii* Ralfs *var. ehrenbergii* and *var. tenellus* (Breb.) Hust., *Thalassiosira weissflogii* (Grunow) G. Fryxell et Hasle, *Cocconeis scutellum var. adjuncta* Ehr., *Cocconeis pedisulus var. pediculus f. ultrasalinus* Pr.-Lavr., *Mastogloia pusilla* Grunow, *Synedra tabulata var. tabulata* (Ag.) Kutz., *Surirella fastuosa* Ehr., *Navicula gracilis* Ehr., *Nitzschia sigmoideae* (Ehr.) W.Sm. etc., green: ultrhalobs *D. salina* Teod., *D. viridis* Teod., blue-green – *A. salina* Elenk. et Danil., *Spirulina tenuissima*, dinoglagellates - *Exuviaella cordata* Ostf. Specificity of abiotic environmental features of Kara-Bogas-Gol Bay brought forth marked ecologo-morphological changes in certain algal species attended with decrease of the number of structural elements (diatomaceous), increase in the size of shells (dinoflagellates). Diatomaceous of Artemovskiye lakes have been found to change the number of structural elements (Proshkina-Lavrenko, 1950). High mineral content considered the highest productivity was found in the species of *Dunaliella* Teod genus, e.g. in August 2000 with the density of 408 thousand cells/l it was 1324.729 mg/m^3. Of no little importance in the productivity were the diatomaceous, but their biomass increased due to large forms. In June 2001 the biomass value dropped significantly. High productive potential of the algae was observed mostly in the zone where the Bay water (2000) and in the littoral of Karasukut spit (1999-2000); they seem to be associated to the effect of biogenic elements coming through the channel into the Bay from the Caspian sea. So, distribution of composition and number of algal species is regulated by the inflow of marne waters from the sea, frequent mixing of water layers in the shallow Bay (up to 7 m), and mostly by high mineral content of waters in Kara-Bogas-Gol Bay.

THE IMPACT OF HYPERSALINE MINE WATER DISCHARGE ON ECOSYSTEM FUNCTION IN KAMBALDA REGION PLAYAS

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Mining operations in Western Australia commonly discharge groundwater inflow into nearby playas to evaporate excess water. This study aims to understand the impacts and the paths of recovery for playa ecosystems in the Kambalda region in the Goldfields of Western Australia following inundation by hypersaline mine water discharge. As Goldfields playas represent the terminal foci of inland drainage, the basins have a limited capacity to absorb contaminants. What is added to the playa system remains within the basin unless lost by seepage to underlying drainage or to the atmosphere. Prior to receiving mine water discharge, Lake Tee was a saline environment, with a hydrological, pH and geochemical regime similar to other Kambalda region playas. In 1991 Lake Tee started to receive mine water discharge between 1 – 5 L/s from the nearby Mariners Mine located under Lake Zot. In early 1997, following rockmass failures in the hanging wall of the underground workings, connection with a regolith aquifer occurred, resulting in an increase of mine water discharge rates up to 45 L/s. This increase in mine water discharge to Lake Tee was more than the playa system could sustain and subsequently, inundation of the playa shore environment occurred. Combined with inundation, the hypersaline nature of the mine water discharge (mean 285 000 mg/L TDS) killed riparian vegetation. Over the summer of 1998-1999 precipitation of salt occurred producing a thick crust. Hypersaline water remained above the crust, evaporating over time. Heavy summer rainfall events in 1999-2000 and 2000-2001 flushed salt from the surrounding catchment back into the playa. This rainfall maintained water levels in the playa and natural regeneration of the riparian vegetation began to occur. Regrowth provides an opportunity to study succession processes in the vegetation fringing playas. Combining the use of vegetation monitoring techniques and Ecosystem Function Analysis (a tool for examining resource utilisation), the direction of catchment system recovery can be indicated. Suspended solids, discharged with mine water have formed a plume, rapidly diminishing in volume away from the discharge point, on the sediment surface of Lake Tee. Metals and ions have remained within this plume, with minimal contamination of the underlying sediments. Geochemical analyses of the salt crust and surface water on Lake Tee indicate that rainfall is driving the system towards the conditions of an unaffected playa, whereas the salt crust remains a similar composition to the discharged mine water. The presence of *Dunaliella salina* on a sample of salt from Lake Tee provides the system with the basis for a functioning trophic structure.
Comparison with other local playas will allow an estimation of the capacity of playas to absorb such discharge. This impact to, and recovery of, a natural playa ecosystem represents a unique opportunity to examine the processes leading to a relatively sustainable system.

STRUCTURAL-FUNCTIONAL COMPONENTS OF THE BACTERIOPLANKTON COMMUNITY OF ECOSYSTEM OF SIBERIAN SALT LAKE, SHIRA LAKE, KHAKASIA, RUSSIA

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The work is dedicated to a study of plankton organisms of Lake Shira (salty medical lake of the south of Siberia) in the form of a review of the data of field observations and obtaining kinetic characteristics. The main microbiological characteristics of bacterioplankton are estimated by seasons and by stations. Special experiments with isolated groups of microorganisms have been carried out for estimation of growth rates and their dependence on limiting substrates. The researches are generalized for the last ten years. Aggregate number bacerioplancton for this period oscillated between 3.01 and 4.58 million number/ml. Seasonal the changes bacerioplancton had maximal number in the winter, in the minimum spring and summer. Productivity of lake oscillated between 0.01 And 0.83 g/cub.m per day, biomass 0.50 - 0.83 g/cub.m, time generation of 34.1- 261.6 clocks. Coefficient P/B - 0.12 and 0.54, K2 - between 0.02 and 0.96. Bacterial production and bacterivory rates were investigated in epi- and metalimnion of Lake Shira. The integral phytoplankton production in water column under m^2 was 0.786-1.121 g C m^{-2} d^{-1}. The integral production of phototrophic sulfur bacteria was 50.45 mg C m^{-2} d^{-1}, accounting for 5.7% of primary production. The microbial production varied from 1.097 to 1.771 g C m^{-2} d^{-1}. Up to 8% of the microbial production was atributed to chemosynthesis in the water column. Bacterivory was estimated by fluorescently labeled native bacteria. Predation rates of heterotrophic flagellates on bacteria were 8-27 bacteria $cell^{-1}$ h^{-1}. A carbon budget showed that in epi- and metalimnion heterotrophic flagellates consumed from 3.7 to 116.2 of the bacterial carbon production.The number and kinetic characteristics (the bacterial reproduction rates and their dependence from the limiting factors, the oxygen consumption rate) different physiological groups bacterioplancton (the total abundance of bacteria, sulphate-reducing microorganisms, heterotrophs, denitrifiers, aerobic cellulose-destroying bacteria, phosphoric bacteria) was studied for further usage in prognostic models.

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ZOOPLANKTON OF BRACKISH-WATER KARSTIC LAKES OF MIDDLE VOLGA REGION

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There are some brackish-water lakes in Middle Volga Region. The mineralization of water in such lakes is increased (more then 2 g/l). The sulphate ions and ions of calcium are prevail in ion composition of water. The high transparency and light-blue shade of water are characteristic of these lakes. Our investigations were conducted as part of the complex researches of water ecosystems laboratory of Department of ecology. Were studied the communities of zooplankton of 8 brackish-water lakes since 1998 for 2000 year. The lakes zooplankton consists of 81 species. The species are typical for freshwater and brackish-water lakes of midlatitudes. The number of dominant in lakes was insignificant (usually 1-2 species). *Eudiaptomus gracilis* (Sars), *Daphnia cucullata* Sars, *Keratella cochlearis* (Gosse), *Filinia longiseta* (Ehrenberg), *Mesocyclops leuckarti* (Claus) were dominated. Density and biomass of zooplankton in the majority of brackishwater lakes were low. The negative correlation of quantitative parameters with conductivity, mineralization, ion composition values and contents of biogenic elements is revealed. Speed of water flow, the contents of sulphuretted hydrogen and oxygen are strongly influence allocation of the zooplankton on depths. Rotifers and crustaceans are evenly distributed in water in lakes with high speed of water flow. In lakes with slow speed of water flow and good oxygenous conditions the zooplankton concentrates in a hypolimnion or metalimnion. In lakes with the high contents of sulphuretted hydrogen in hypolimnion zooplankton occupies mainly superficial layer of water. The lowest values of daily production of plankton rotifers and crustaceans were in Light-blue lakes (in all cases did not exceed 3 kal/m^2). In lakes Yugidem, Schungaldan, Light-blue-oxbow production was 290-807 kal/m^2. The greatest values of zooplankton daily production were in shallow lake Karakaer - 1444 kal/m^2 and in littoral zone some lakes (283 - 600 kal*day/m^3). In the zooplankton communities of Light-blue lakes in transformation of energy are participate mainly crustaceans. In transformation of energy are participate both rotifers and crustaceans in lakes Yugidem, Schungaldan, Karakaer, Light-blue-oxbow, Salt. In lake Yugidem the role of rotifers in this process is small, but in Salty lake - all basic energy flow (92 %) passes through communities of rotifers. Lake Karakaer differs by the greatest sizes of production. The food chains in these lakes are longest. Obligate predators *Polyphemus pediculus* are present.

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THE NEW MODERATELY HALOALKALIPHILIC METHANOTROPHS ISOLATED FROM GEOGRAPHICALLY DISTANT SODA LAKES

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Soda lakes are characterized by high values of pH (9.0 – 10.5) and relatively high concentrations of NaCI. Their alkaline buffer capacity was created by high level of sodium carbonate and establish optimal conditions for development of various group of haloalkaliphilic microorganisms. Among them methanotrophic bacteria able to utilise methane and methanol as the sole carbon and energy sources have been recently found. Methanotrophs are very important with regard to their potential for the production of bulk and fine chemicals, as biodegradation and bioremediation agents, and in the greenhouse effect by lowering emission of methane into the atmosphere. We investigated soda lakes with different salt content located in Southeastern Siberia, Mongolia, Egypt and USA on the presence and activity of methanotrophs. The rates of methane consumption (oxidation and assimilation) by microbial communities in soda lakes were measured by using radioisotopic method. Activity of methane consumption in sediment samples from low mineralized Southeastern Siberian soda lakes (7-33 nmol $ml^{-1}day^{-1}$) were higher than in those from highly saline Mongolian and Egyptian soda lakes (0.1-6.5 nmol $ml^{-1}day^{-1}$). PCR-amplification of genes encoding particulate methane monooxygenase (*pmo*A) and methanol dehydrogenase (*mxa*F) with total DNA extracted from the first enrichments isolated from Mongolian soda lake samples gave the products of corresponding sizes in all DNA probes, but the primer on soluble methane monooxygenase (*mmo*X) gene was not amplified. The phylogenetic primers specific for Type I methanotrophs belonging to the *Methylomicrobium* and *Methylobacter* genera were amplified in all the samples tested. Type II methanotrophs (*Methylocystis/Methylosinus*) were detected only in one sample. Using several special approaches five new methanotrophic strains were isolated from geographically distant soda lakes. Four strains (B5, E3, FM3 and ML4) of moderately haloalkalophilic methanotrophs growing fastest at pH 8.5-9.5 and requiring 0.75-1.5% NaCI were shown to belong to Type I methanotrophs and tentatively assigned to the novel genus *Methylohalonatronum* based on their pheno- and genotypic properties. Alternatively, strain B3 growing optimally in diluted nitrate mineral salt medium at pH at 9.0-9.5 in the presence of 0.2 % NaCI was representative of Type II methanotrophs. Comparative sequencing of 16S rDNA and *pmo*A genes showed that that strain B3 was most closely related to the *Methylocystis* genus. However, strain B3 differed from the known members of this genus by some phenotypic properties and DNA-DNA hybridization and was classified as a new species *Methylocystis gottschalkii*.

VERTICAL STRUCTURE AND PHOTOSYNTHETIC PROPERTIES OF PHYTOPLANKTON IN RELATION TO *IN SITU* IRRADIANCE AND TEMPERATURE GRADIENT IN SHIRA LAKE MEASURED BY DIURON-STATE AND VARIABLE CHLOROPHYLL FLUORESCENCE

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Shira lake is a brackish thermally stratified lake with H_2S in hypolimneon. The epilimneon is the layer 6 m from surface (temperature 19-22 °C). The thermo cline is at a depth of 6-8 m where the temperature jump is up to 12 °C. The metalimneon located between 6 and 12 m, where the temperature decrease from 12 to 2.5 °C. In the bottom layers temperature fell from 2.5 up to 1.2 °C. The oxic–anoxic boundary is at a depth of 12-13 m. Green algae *Dictyosphaerium* and cyanobacteria Lyngbya and Microcystis dominate in phytoplankton. Water samples were collected at three station (St.1 N54°29.400' E90°10.900', h=12 m; St.2 N54°29.622' E90°11.303', h=16 m; St.3 N54°29.982', E90°11.598', h=20 m). The water column was sampled in 1 - 2 m intervals. About 500 water samples were proceded from 1998 to 2001. In situ attenuation of solar radiation was measured with underwater irradiance meter with passband 540±30 nm, fabricated at Krasnoyarsk State University. Light extinction coefficients were minimal (0.133 m^{-1}) in the layer 0 – 8 m, and increased to 0.218 m^{-1} and 0.486 m^{-1} in layers 0 – 12 m and 12 – 16 m respectively. Because of green algae and cyanobacteria were considered, fluorescence was excited by two wavelength with λ_{max}=510 and λ_{max}=540 nm. The fluorescence of green algae (F_{510}^{Chlor}) and cyanobacteria (F_{510}^{Chlor}) at λ_{max}=510 nm was determined as $F_{510}^{Chlor} = 1.290 \times F_{510} - 0.581 \times F_{540}$ and $F_{510}^{Cyan} = -0.290 \times F_{510} + 0.581 \times F_{540}$, where F_{510} and F_{540} are net phytoplankton fluorescence excited by two wavelengths respectivety. Chlorophyll *a* concentration (mg/m^3) was determined from equation:
$C_{chl-a}^{Chlor} = 20.1 \times F_{490}^{Chlor}$; $C_{chl-b}^{Cyan} = 34.6 \times F_{490}^{Cyan}$. Formation of temperature stratification begins in the first half of June and accomplishes to the end of June. The maximum of green algae in the depth layer forms due to redistribution in the water colunm, and cyanobacteria - due to growth at the definite depth. During the period of temperature stratification (July – September) the depth maximum of phytoplankton is settling down (from 8 m to 13 m). The variable DCMU-induced fluorescence (Fv) within one summer was maximum (0.4 - 0.5) in a layer 8 - 12 m, where the peak of chlorophyll *a* was located. Decrease Fv in epilimnion can be explained by the effect of photoinhibition, and in a hypolimnion – by suppression of oxigenic photosynthesis by hydrogen sulfide. Gross primary production (GPP) was minimum (< 0.05 gO_2 m^{-3} day^{-1}) on a surface and reached its maximum (~ 1 gO_2 m^{-3} day^{-1}) at 10 m. Average day time GPP was estimated as 2.7 gO_2 m^{-2}. For 120 days from June to September GPP reach the value of 320 gO_2 m^{-2} (4545 J m^{-2}). The cells of green alga and cyanobacteria from depth chlorophyll maxima (10 – 13 m) have features of chromatic adaptation. The penetration cyanobacteria into hydrogen sulfide layer can be accompanied by occurrence of "red color" forms at a depth of 16 m. *The work has been supported by Federal Special-Purpose Program 'Integratziya' No 73,. Ministry of Education of Russian Federation and American foundation of civil researches and development (REC002 "Enissey").*

PRIMARY PRODUCTION OF HALOPHILIC CYANOBACTERIAL ASSOCIATION OF SIVASH LAGOONS (KRYM)

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A study has made of the productivity of halophilic cyanobacterial association in shoreline pools at Lake Sivash (Crimea). Productivity was shown to vary over a wide range [from 8 to 380 mg C/($h \cdot m^2$)] and to be governed by photosynthesis in the upper cyanobacterial layers. Anoxygenic photosynthesis accounted for no more than 20% of the total. Chlorophyll "a" content was not an absolute indicator of mat productivity, since its photosynthetic activity differed at different times of year and depended on weather conditions. Maximum mat productivity [380 mg C/($h \cdot m^2$)] accompanied by maximum chlorophyll content (2 g/m^2) was observed in lagoons with a salinity of 16%. Total mat growth averaged 1 mm/year. A halophilic cyanobacterial mat is a high-productivity biological system in which the productive component dominates. Production and destruction processes become equilibrated after sharp changes (increases or decreases) in lagoon salinity. Vital activity of different groups of microorganisms (cyanobacteria, purple bacteria, sulphidogenes) located in certain layers of the mat provides creation of geochemical barrier which promote deposition of a number of minerals. Microcoleus chthonoplastes (Fl.Dan) Thur. is a predominating form in cyanobacterial communities or mats which develop in the hypersalty lagoons of the Sivash. Threads of M.chthonoplastes enclosed in the polysaccharide covers form dense mucous film in the upper layer of the mat. The film absorbs 81% of the insident light. Low permeability ($2 \cdot 10^{-6}$ mm/s), high strength (0,1-0,7 kg/cm^2) of this film creates good bed which prevents from stirring-up of water and destruction of a mat under water wave in the lagoon.

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EXPERIENCE OF BIOLOGICAL-HYDROCHEMICAL ZONING OF SEMI-CLOSED SEVASTOPOL BAY AS A BASIS FOR VARIED APPROACH TO ECOLOGICAL MONITORING OF AQUATIC ENVIRONMENT

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The problem of the most appropriate way comprehensively to monitor marine aquatic areas that are subjected to a long-term anthropogenic impact have been studied for Sevastopol Bay over many years. This bay was partly blocked by two barrage piers 20 years ago. The resultant decrease in the water exchange with the open sea (Black Sea), together with the regulation of river drainage (Chernaya River) resulted in considerable negative changes to the bay ecosystem. Constant discharge of insufficiently purified sewage caused eutrophication of the bay water, affecting the natural function of the hydrobionts, their species diversity and their quantitative composition. In order to determine the most effective, differentiated monitoring and the corresponding conservancy measures it was necessary to undertake long-term observations aimed at separating typical biohydrochemical zones and provinces in the bay. The research was conducted from 1998 until now, within the INTAS projects 96-01961 and 99-01390.
Optimization of the network of sampling stations and the consequent cartographic analysis allowed the delimitation of biogeochemical zones in the bay, each of which has its own specific character. The chemical composition of the pollutants and the level of them, together with the irregularities in the distribution of the indices of the physical-chemical state (pH, Eh) of the environment and the biotic factors were taken as the basis the principle of zoning for the bay. The distribution of oil products, chloroform bitumoids and organic matter generally confirmed the localization of the main pollution zones. On average, the oil products in the bay were from 0 to 0.113 mg/l. For the latter case, this was twofold more than the maximum accepted concentration. Biological observations showed that the changes due to the anthropogenic impact concerned the hydrobionts at all systematic levels. Maximum pollution, disturbance of hydrologic-hydrochemical regime, the degree of eutrophication and considerable disturbance in the biodiversity are the most strongly typical of the subsidiary Southern Bay and the upper part of the main Sevastopol Bay. The region close to the outlet to the open sea is the least polluted. Depending on the type and the scope of the anthropogenic impact on the ecological state of the bay, three principal factors determine this state:

(i) local – pollutants come into the bay from local sources (discharge of conditionally clean and insufficiently purified industrial and everyday sewage, water transport);
(ii) regional – transportation of pollutants to the bay from the drainage area (river discharge and rainfall run-off);
(iii) global (trans-interface) – income of pollutants together with precipitation.

Analysis of the magnitude of these main sources of pollution as well as the assessment of their scale show that the local sources, i.e. everyday sewage and water transport, have a considerable part in play in the delivery of pollutants (nutrients, oil products, etc.).

INVESTIGATION OF DEPTH ADAPTATION FOTOSYNTETIC PIGMENTS IN PHYTOPLANKTON OF SHIRA LAKE BY EPIFLUORESCENSE METHOD

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Shira lake, meromictic salt lake, have a specific compositoin and vertical distribution of phytoplankton. Distribution of the Shira's phytoplankton in all layers of water assumes existence of adaptations of algae pigment apparatus to intensity and spectral structure of light. The adaptation of microalgae to low intensity of light attended development of antennae systems, and sometime , variation of ratio accesary pigments. The algae genera *Microcystis, Lyngbia, Cyclotella, Dictyosphaerium, Oocystis* by investigated by us. This genera is dominanted in sammer phytoplankton. The epifluorescence signal of algae cell was registered by luminiscent microscope LUMAM-I (LOMO) and fotometric nozzle FMEL (LOMO). The fluorescence was excited alternately by blue (400 nm), blue-green (510 nm) and green (540 nm) of light beam. The useful increase of part accesory pigments at cell of blue-green algae from a deep laers is revealed.The fluorescent parameters green and diatom algae from the top and bottom layers were defferent in a smaller degree, then at blue-green algae.The ration of signals of fluorescence F_{510}/F_{540} at algae of one department varied in a mach smaller degree, then ration F_{510}/F_{400} and F_{540}/F_{400}. It testifies a relative constancy of structure of pigments within an accesory complex and variability of portion of accesory pigments in comparison with chlorophyll.

ON THE DIFFERENCES BETWEEN TROPHIC STRUCTURE AND FOODWEB IN FRESH-WATER, BRACKISH-WATER AND SALINE-WATER ECOSYSTEMS

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Salinity of inland waters, including fresh-water, brackish and highly saline-water lakes, varies by roughly five orders of magnitude i.e. from a few mg l^{-1} to >300 gl^{-1}, respectively. The type of salinity and scale of temporal variations in the salinity concentrations in typically saline lakes (endorheic lakes) are reported to be large. It may be generalised that salinity threshold dividing the fresh, brackish and saline water lakes lies at <5 g l^{-1}. Saline lakes are more sensitive to climatic changes (e.g. wet *vs.* dry years) so that the annual salinity changes are more important in controlling the species composition and distribution rather than salinity itself. Negative relationships between salinity and species richness or species diversity lead to large diversity differences between freshwater and saline lakes. Biotic interactions governed by changes in water chemistry appear to be responsible for reduction of diversity, including that of benthic communities in saline lakes. Much higher stability imparted by salinity to stratification (meromixis) in saline lakes results in greater differences in the development of bacterial flora and in microbial foodweb in saline lakes. Chemotrophic bacterial production can be very important in saline lakes, especially under stratified conditions. Saline lakes are, however, apparently less productive in terms of their planktonic or macrobial food web. Whereas phytoplankton primary production in these lakes may lower than predicted from phosphorus (P) concentrations (based on relationships in freshwater lakes), zooplankton production may be higher than predicted from phytoplankton. Threshold levels for P for algal growth have been shown to be much higher in saline lakes, than in freshwater lakes; more efficient uptake of P by bacteria may explain the discrepancy between the two lake types. Some freshwater, grazer zooplankton, *Daphnia* spp., are very sensitive to salinity and disappear at salinity levels >2 g l^{-1} to be replaced by less efficient filterfeeders (*Eurytemora*), more so due to salinity fluctuations. *Trichocorixa* sp. (water boatmen), an invertebrate predator, and brine shrimp (*Artemia* sp.), become important if fish predation is low, or absent as at high salinity levels. The food web of highly saline lakes (>50g l^{-1}) is stunted generally due to the paucity of typical consumer species of zooplankton (daphnids) and absence of fish, the top predators (e.g. Lake Shira, Siberia; Lake Mahoney, Canada). Zooplankton diversity in such lakes is low and grazing food-chain simple. *Arctodiaptomus salinus* and some rotifer species and gammarids (e.g. *Gammarus lacustris*) are important consumer zooplankters of littoral zone and pelagic zone of lakes, respectively, e.g. in Lake Shira, with salinity levels of c. 80 g l^{-1}.

BIOTA AND LIMNOLOGY OF INLAND SALT LAKES OF WESTERN AUSTRALIA UNDER STRESS – A CASE HISTORY

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Unpredictable rainfall, prolonged dry spells, a wide range of salinity and unique flora and fauna with intriguing survival strategies are some of the salient features of the inland salt lakes of Western Australia. They are mostly palaeodrainage channels associated with significant mineral resources. The biodiversity of these systems is surprisingly high and is linked to a large variety of Avian fauna including migratory birds. The common habitat and water quality stresses of the lakes are associated with land use including mining. Among the more direct impacts of mining on these salt lakes are disposal of waste mine tailings, slimes and waste rock into salt lakes, and dewatering discharge of hypersaline underground water. Lake Miranda in the arid zone of Western Australia (area 200 km^2) was studied in 2000 and 2001 after winter and summer storm events. The limnology and biota were investigated during the filling and drying period in 2000 and 2001. Water quality, nutrients, algae, macrophytes and invertebrates were surveyed. The impact of mining, specifically dewatering discharge on the limnology of the lake, was investigated. The biota focussed on were algae and invertebrates – the most important components of the food web. Considerable increase in salinity was observed in the lake in 2001 compared with 2000, attributed to low rainfall and dewatering discharge. Diatoms were the most important component of the primary producers. The species diversity decreased as salinity increased in the periphyton. However, the benthic algal assemblages continued to harbour viable diatoms in dormant forms. The invertebrates also decreased in diversity, but the *Parartemia* cysts showed different degrees of viability. The difference in limnology and biota observed before and after dewatering discharge is discussed. The implications of continuous and prolonged dewatering discharge on the biota are discussed in this paper.

TOOLS FOR BIOASSESSMENT OF INLAND SALT LAKES IN WESTERN AUSTRALIA

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Most of the salt lakes of Inland Western Australia are temporary seasonal or intermittent alternatively wet and dry every year or once in 2 to 3 years. As they get filled mostly during the storm events, water is available in the lakes only for a short period (2 to 3 months). The biota in these lakes are adapted to the filling and drying cycle. As these salt lakes are increasingly subjected to human impacts, there is an urgent need to monitor their water quality and biodiversity. Physico-chemical data on several salt lakes in Western Australia along with data on biota have been collected over the past several years as the basis for a possible biomonitoring system. Case histories are provided which illustrate the use of two methods for bioassessment involving periphyton and invertebrates in Lake Miranda in Western Australia. As the lake got filled by winter storm events in winter 2000, and summer storms of 2001 the flood plain of the lake showed the highest diversity in macrophytes and periphyton. During the drying period the biodiversity decreased . An artificial substrate collector called the JJ Periphytometer was used to assess the changes in periphyton as the salinity changed during the filling and drying period in 2000 and 2001. Diatoms dominated the periphyton. The invertebrates were monitored by sediment incubation as well as by sampling of standing water when the lake was filled. *Parartemia* spp. emerged as the dominant invertebrates in the system. Protocols for monitoring the diversity of both periphyton and invertebrates are described in this paper with the key species illustrated. It is recommended that these tools of bioassessment should be followed to monitor any impact on the salt lakes caused by human activities.

COHORT ANALYSES OF *ARTEMIA* POPULATIONS IN HYPERSALINE MONO LAKE, CALIFORNIA, USA

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In many large permanent salt lakes (e.g. Mono, Great Salt, and Urmia) the brine shrimp, *Artemia*, dominate the zooplankton community. Determining brine shrimp development and mortality rates under natural conditions is essential for understanding seasonal and year-to-year variations in these brine shrimp populations and designing appropriate management strategies. A variety of different "cohort analysis" methods have been developed to derive life-history parameters from stage-specific field data. Here, I develop and apply a daily cohort simulation model to estimate stage-specific development and mortality rates of *Artemia* from field data collected at Mono Lake. While development rates are fairly well determined, the uncertainty associated with the estimated mortality rates is high (~80%) even with frequent (~weekly) sampling at 10 to 20 stations. I discuss the implications of this to designing sampling programs and interpreting the observed variation in the 20-yr record of *Artemia* population data from Mono Lake.

DISTRIBUTION AND HABITAT CONDITIONS OF THE CILIATE *FRONTONIA LEUCAS* (CILIOFORA, HYMENOSTOMATIDA) FROM LAKE SHIRA

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The studies addressed the distribution and the ecological role of the ciliate *Frontonia leucas* in summer. This ciliate is a dominant species in the littoral zone of Lake Shira. Representatives of the family Frontonidae are eurytopic species found among both plankton and benthos. *F. leucas* in Lake Shira is the permanent inhabitant of a water-soil contact layer. Soil mechanical structure, gas mode and feeding conditions are the key factors influencing the distribution of ciliates. The investigation has shown that *F. leucas* inhabit a certain area and are most abundant in areas with similar soils (sand, silt). In close-to-bottom samples the number of infusoria amounts to 2.5-3.0 thousand cells l^{-1} (2 mg l^{-1} if to accept one infusorium to weigh 0.0008 mg). The feeding of ciliates in the lake was analyzed by the composition of food vacuoles. It is shown that the main food objects of *F. leucas* are diatoms and blue-green algae. They also feed on green and filiform algae. It has been shown in laboratory experiments that the ciliates can grow on bacterial food or on yeasts only *(E. coli)*. The horizontal distribution of ciliates in a close-to-bottom layer is non-uniform and is characterized by the local maxima, which are located at a distance of 5 and 15-25 m from the shore. Some portion of ciliates actively moves horizontally during a day, at least within the bounds of the littoral zone. The absence of the stable form of distribution suggests a complex pattern of *F. leucas* migratory behavior. Studies were also conducted to estimate the tolerance of *F. leucas* to the varying salinity and hydrogen sulfide content. It was shown that *F. leucas* can tolerate a decrease in the total mineralization to 25 % during 2-3 days; however, in the completely desalinated water it dies within 30 minutes. The hydrogen sulfide concentration up to 400 g l^{-1} did not affect the viability of the *F.leucas* laboratory culture. At a hydrogen sulfide concentration of 500 g l^{-1} the population died within 1.5 hours and at a concentration of 700 g l^{-1} within 40 minutes.

SPATIAL HETEROGENEITY OF HYDROBIONTS' DISTRIBUTION IN CHANY LAKE

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Chany Lake (the largest lake of internal-drainage zone of Ob-Irtysh interfluve) represents the unique object for the investigations of hydrobionts' performances modification on the salinity gradient. Chany Lake water supply was mainly fed by Chulym and Kargat rivers inflow into the lake from south-east. As the distance from these tributaries moves in the direction: rivers outlet – Small Chany Lake – Chinyakhinsky pool – Yarkul Lake – Tagano–Kazantsevsky pool – Yarkovsky pool – Yudinsky pool, salinity of water varies in a such a way: 0,9 – 0,8 – 3,1 – 3,6 – 5,6 – 6,4 – 6,5 g/l, respectively. Sodium- and chloride-ions mainly influence the salinity of Chany Lake water. Their concentrations dynamics virtually reiterated the salinity dynamics all along the length of the lake and varies in a wide ranges: for Na^+ – from 149 mg/l in Fadikha up to 1686 mg/l in Yudinsky pool waters; for Cl^- – from 248 mg/l up to 3802 mg/l, respectively. The variation of species diversity, phytoplankton, zooplankton, zoobenthos and fishes number and biomass, specific and cenotic structure of macrophyte aquatic vegetation on a gradient of salinity of Chany Lake were ascertained**.** The influence of the major environmental factors on hydrobionts' performances was estimated.

Biodiversity. It was shown, that the species diversity of aquatic vascular plants decreases from 16 to 3 species with salinity increase, and cenotic diversity of macrophyte vegetation – from 8 to 2 syntaxons of association range, respectively. The species diversity of phytoplankton (Safonova, Yermolaev, 1983) decreases in accordance with the salinity growth since 98 till to 52 species, zooplankton – since 61 till 6. The negative correlation of zooplankton species diversity with the total salinity revealed is statistically reliable.

Functional adjectives. According to the correlation analysis data the high values of salinity, sodium-, chloride- and magnesium-ions concentrations depressed the phytoplankton number. The correlation analysis has shown the absence of connection of projective cover of macrophytes with water salinity, that can be explained by the presence in Chany Lake the species of wide ecological tolerance: *Cladophora* sp., *Potamogeton pectinatus* L., actively capturing a littoral zone of high salinity (Tagano–Kazantsevsky and Yarkovsky pools). The tendency of the growth of zooplankton number and biomass in accordance with the growth of salinity was marked owing to mass development of typical salt–tolerant species. The same trends were observed for number and biomass of zoobenthos. The heterogeneity of chemical structure of water in long-term and seasonal aspects is exhibited in irregular distribution of different kinds of fishes, conditions of their migration into Small Chany Lake for spawning, total fish productivity decreasing .

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GENETIC DIVERSITY OF HALOPHILIC ORGANISM IN CHINESE SALINE LAKES AND THE APPLICATION PROSPECT OF GENE ENGINEERING FOR PLANT SALT TOLERANCE

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Most Chinese saline lakes occur in the west and northeast. They belong to many types according to their chemical composition, such as Chloride type, Magnesium sulfate subtype, sodium sulfate type, carbonate type et al. Since the varied climate, geological position and chemical type of saline lakes, the halophile has much genetic diversity. The species of halophile studied mainly were halophilic bacteria, *Artemia*, *D.salina, Spirulina* et al. Most of them have different strains that have special characters. The genetic diversity of these halophilic organisms not only provides directly economical application, but also provides gene resource for gene engineering, especially for the salt tolerance. Many kinds of salt tolerance genes may be cloned from the halophilic organism, and used for plant transformation. The strategy and methods for cloning salt tolerance were discussed. These methods are difference display, position map cloning, transposon tagging cloning, homology cloning, and gun-shot cloning et al. Plant transformation can be carried out using the following established systems: 1. Transformations mediated by *Agrobacteria tumfeciens* or *A. Rhizogenes*, 2. The use of particle bombardment for transferring DNA into plant cells or tissues, 3. Direct gene transfer by electroporation or chemical method.

BACTERIA AND HETEROTROPHIC FLAGELLATES IN THE PELAGIC CARBON CYCLE IN STERATIFIED BRACKISH LAKE SHIRA (RUSSIA)

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The total bacterioplankton number and biomass at different depths of pelagic part of the lake Shira varied from 3.3 to 16.1 × 10^6 cells·mL^{-1} and from 0.6 to 4.0 g·m^{-3}, respectively. The maximum values were registered in the monimolimnion and the minimum values in the mixolimnion. Small free-living cells dominated in the heterotrophic bacterioplankton accounting for 75 to 90% of total bacterial abundance and 72 to 88% of total bacterial biomass. The number of actively respiring bacteria changed with depth from 0.6 to 6.5 × 10^6 cells mL^{-1} that corresponded to 14.7 to 79.8% of the total bacterial abundance. The peak of active cells number was found in the chemocline. Bacterial production as measured with protein hydrolisate incorporation varied considerably with depth. The highest values (150-245 mg C m^{-3} d^{-1}) were measured in upper warm mixed layer. The depth of the bacterial production maximum was related to the depth of the primary production maximum in the water column. Below the chemocline, the production rates were generally lower, in the range 22-60 mg C m^{-3} d^{-1}. The integral bacterioplankton production under meter squared (1594 mgC m^{-2} d^{-1}) as an average for July-August exceeded total photosynthesis by a factor of 1.5. There were found 36 species of colorless flagellates in the lake. The tendency for a decrease in flagellate species number with depth was revealed. The abundance and biomass of heterotrophic flagellates at different depths of pelagic part of the lake ranged 29 to 10652 cells·mL^{-1} and 39 to 341 mg·mg^{-3}, respectively. The portion of heterotrophic flagellates associated with detritus particles was not large reaching up to 2% of the total abundance. In average, for the different zones of the lake, the ratio between the number of bacterioplankton and the number of heterotrophic flagellates increased with the depth and amounted to 2 × 10^3 in mixolimnion, 6 × 10^3 in chemocline and 196 × 10^3 in monimolimnion. The ratio between the biomass of bacterioplankton and the biomass of heterotrophic flagellates decreased with the depth and the biomass of heterotrophic flagellates averaged 12% from the bacterial biomass in mixolimnion, 6% in chemocline and 2% in monimolimnion. The double-staining epifluorescence technique allowed to detect heterotrophic bacteria and cyanobacteria in digestive vacuoles of a significant number (from 5 to 59% of their total abundance) of heterotrophic flagellates. As a rule, these were large bacteria. The bacterial mortality due to flagellate grazing was estimated along the depth profile in mixolimnion and chemocline. Grazing rates by heterotrophic flagellates ranged from 8 to 27 bacteria $cell^{-1}$ h^{-1} with higher values at the depths 0-3 m. Corresponding clearance rates were higher in mixolimnion than in chemocline. We estimated that heterotrophic flagellates removed 12.1-116.2% of the bacterial production in the mixolimnion and 3.7-23.8% of bacterial production in chemocline. As a result, in the euphotic pelagic zone heterotrophic flagellates consumed in water column under square meter 835 mg C per day, which constituted 54% of total bacterial production in mixolimnion and chemocline. Very similar doubling times of protists and bacteria indicate a very tightly coupled predator-prey linkage in the lake. The amount of bacterioplankton organic carbon channeled to higher trophic levels thus seems to hinge largely upon the fate of heterotrophic flagellates.

MICROBIAL SULFATE REDUCTION IN A BRACKISH MEROMICTIC SHIRA LAKE

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Sulfate reduction is an important process in marine and lacustrine environments, playing a key role in anaerobic mineralization of organic carbon and geochemical cycling of carbon, sulfur, and metals. Patterns of sulfate reduction were studied in water and sediments of brackish meromictic steppe Lake Shira of maximum depth 24 m, located in the Khakassia, Russia. The lake is characterized by high contents of sulfate (91.3-116.3 mM), which is the main anion in water. The hydrogen sulfide accumulates in the monimolimnion, where its concentration reaches 0.60 mM. In July and August, sulfate reduction rates in water, measured by radiometric technique, varied from 0.25 to 9.81 μmol l^{-1} d^{-1}. The process of sulfate reduction was recorded in the anoxic water in an interval of depths from 13 m to the bottom. There were two peaks of sulfate reduction rates: just below the chemocline and near the sediment surface. It is noteworthy that sulfate reducers were active at a water temperature from 1.1 to 1.4°C. Since, environmental conditions in the littoral and profundal zones differ sharply, sulfate reduction rates in the sediments at the different parts of the lake varied greatly. Sulfate reduction rates in the profundal silts ranged from 4.44 to 90.66 μmol l^{-1} d^{-1}. The zone of most intense sulfate reduction was restricted to the surface layers of the sediment. Sulfate reduction rates decreased markedly with depth. Sulfate reduction was most active in the littoral sediments adjacent to the mouth of Son River and sewage discharge of the spa and town, yielding a high sulfate reduction rate of 236 μmol l^{-1} d^{-1}. Here, the highest density of viable sulfate reducers, equal to 2×10^5 cells cm^{-3}, was recorded. The activation of sulfate reduction in the littoral sediments was apparently caused by input of allochthonous organic substrates and also by high environmental temperature (22.0-23.1°C). Significantly lower sediment sulfate reduction rates of 1.03-7.53 μmol l^{-1} d^{-1} were measured at the localities far from natural and anthropogenic sources of allochthonous organic matter. Rates of sulfate reduction in nature are undoubtedly governed by a number of factors, but in Lake Shira during the summer these rates are probably limited mostly by the availability of organic matter. Sulfate reduction rate in the profundal sediments was higher than those in water, but calculated per square meter it turned out, that the production of hydrogen sulfide in water was approximately 7.7 times higher than that in sediments. The areal sulfate reduction rates in water and sediments in the profundal zone of the lake averaged 32.03 and 4.09 mmol m^{-2} d^{-1}, respectively. Tentatively assuming that all sulfate reduction in the littoral sediment occurs only in the sampled uppermost 8-12 cm of the sediment, this corresponds to a sulfate reduction activity of 0.23-9.38 mmol SO_4^{2-} m^{-2} d^{-1}. Although these values probably underestimate the true area-based sulfate reduction rates at these sites, they are still high in the littoral sediments near sewage discharge of the spa. Sulfate reduction is the dominant process of anaerobic oxidation of organic carbon in Lake Shira. In the profundal zone, about 66.7% of the daily integrated primary production of phototrophic and chemotrophic organisms was mineralized as a result of sulfate reducing activity.

BIOGEOCHEMICAL BACKGROUND AND TECHNOGENIC POLLUTION OF THE ALTAI LAKES BY MERCURY

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Biogeochemical sampling was done for seven lakes, located in different landscape zones of the Altai region (1998-1999). The investigated lakes are fed by both flood and ground water. The lakes are diverse in terms of the water chemical composition and total mineralization: from fresh (Chayach'e, Kolyvanskoe) to significantly salt (Big Yarovoe). The plankton, water plants and bottom sediments were selected as indicator environments. The mercury in biological objects and in bottom sediments was determined by atomic-absorption method of the "cold steam" using the amalgamation via "Perkin Elmer 3030B" device with the MHS-20 attachment (chemists-analysts: N.V. Androsova, Zh.O. Badmaeva). The computer classification of correlation between mercury contents in biological objects, bottom sediments and regional soils was done using the cluster analysis. The features of the background structure of investigated water reservoirs have been revealed. The mercury contents in biota components (0.005-0.32 mg/gr of dry mass) and bottom sediments (0.02-0.09 mg/gr of dry mass) of such lakes are considered as the background. Local zones with the increased mercury content in biological objects and bottom sediments, associated with spills of discharge waters of the chemical plant (Joint Stock Company "Altaikhimprom" (Yarovoe city), which uses mercury-containing compounds in the technology are found in the Big Yarovoe lake. So, in the zone of a direct impact of the chemical plant the mercury content in the zooplankton, represented by the only species Artemia salina L (100% of the biomass), reaches to 1.5 mg/gr of the dry mass, (the background – 0.64 mg/gr) while in bottom sediments the Hg content is 0.77 mg/gr of the dry mass (the background is 0.05 mg/gr). The results of the cluster analysis shows the technogenic nature of the mercury in the Big Yarovoe lake, as Hg doesn't correlate with the association of the lithogenic elements of natural origin in sediments and regional soils. Thus, it confirms the fact that the living substance is significant for identifying the nature of pollution of water ecosystems by mercury. There is the condition, which makes the problem of mercury pollution of water reservoirs more complicated. It is the ability of the mercury to be accumulated in different sections of the trophic chain, which is evident from the calculated coefficients of the biological mercury accumulation relative to its contents in bottom sediments: K_d in the plankton of Big Yarovoe lake is 12, in filamentous algae – 4. Giving a characteristic to the environmental situation in terms of mercury pollution, it should be noted that the Altai region can be regarded as low polluted. The average Hg concentration in bottom sediments of forest-steppe and dry steppe zones is similar to that in soils of the Altai region. The increased mercury concentrations are found in biological objects and silts from the lakes, on the shores of which the industrial plants or settlements are located (Big Yarovoe Lake). The main conclusion is that the alive substance is significant in identification of the technogenic component of the water reservoir pollution by heavy metals. The further investigations of heavy metal modes of occurrence in the water solution are required to separate the natural and technogenic factors of the pollution. This factor determines the localities of the metals of the technogenic nature.

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THE MONGOLIAN TOAD *BUFO RADDEI STR.* IN MINERAL LAKES LOCATED ON THE WESTERN COAST OF LAKE BAIKAL

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The Mongolian toad *Bufo raddei Str.* inhabits Korea, North-East China, Mongolia, North-East Pakistan. In Russia, it is met in the southern part of the western cost of Lake Baikal, on areas eastwards Lake Baikal, and in Far East. In the Irkutsk region, the Mongolian toad has been first found on the western cost of Lake Baikal nearby the Olkhon island in 1959 (Litvinov & Gavrilova, 1960). Later this species was observed to inhabit shallow waters on the cost of the baikalian bay Mukhor, nearby Sarma and Tonta, on the Olkhon island (Litvinov, 1977; Litvinov & Pyzhyanov, 1981; Pleshanov & Popov, 1981). It is known that toads prefer well warmed shallows with stagnant or slightly flowing waters in order to get favourable conditions for reproduction. In 1991 and 2001, 28 lakes located in the Tazheranskaya steppe, nearby the Olkhon island, have been studied. The largest one of them, Nashim-Nur, is 1500 m long, 800 m wide, and 5.5m deep. Some lakes are populated by littoral vegetation, i.e. *Polygonum amphibium*, *Potamogeton sp.*, and reed. The summer-time, water temperature reaches 21-23^0 C. The lake waters are regarded as carbonate-magnesium and sulphate-sodium, pH of them varies between 8.2 and 9.4 during the summer (Sheveleva et al, 2001). Our observation, carried out in June when toads are known to sing and assemble in reservoirs, allowed us to reveal 11 lakes in which they spawn. There were found no preferences in lake sizes: toads were observed in lakes of different sizes from smallest to the largest, Nashim-Nur. Mineralization of lakes in which singing toads have been detected was as follows: 0.58, 0.98, 1.81, 2.11, 2.46, and 2.97 $g \cdot l^{-1}$. Hence it means that high mineralization, at least 3 $g \cdot l^{-1}$, does not lay obstacles to the toad reproduction. One can hear nuptial shouts of toads not only at night but at day as well. Over all the time of the expedition 4-12th June, we did not find laying of toads, only in one little lake 7th June 2001 we observed their tadpoles. In reservoirs located on the cost of Lake Baikal, first tadpoles were met 5-6th June (Litvinov & Pyzhyanov, 1981). Intensive singing and tadpole presence in neighbouring lakes at the same time mean that the toad reproduction differ in time. The more so, toads spawn asynchronously in lakes far off Lake Baikal and close to it. The area of the Mongolian toad nearby Olkhon is a pre-Quaternary relict. This area is sized not so much therefore the total number of toads is low as well. This means that the Mongolian toad here is greatly vulnerable. Especially dangerous is industrial activity, for example, a gravel extraction near one of the lakes in which toads inhabit. Providing protection of the near-Olkhon steppes, it is necessary to bear in mind preservation of places where the Mongolian toad dwells.

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TROPHIC INTERACTIONS BETWEEN THE INVERTEBRATE COMMUNITY AND THE GREATER FLAMINGOS OF THE MAKGADIKGADI SALT PANS, BOTSWANA

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The Makgadikgadi Salt Pans complex is one of the largest ephemeral salt lake ecosystems in the world. After seasonal rains Sua pan, the lowest part of this endorheic system becomes a vast shallow saline lake. Greater (*Phoenicopterus ruber roseus*) and Lesser flamingo (*Phoeniconaias minor*) suddenly arrive in their hundreds of thousands to feed on the abundant algae and small invertebrates, that emerge within a few days of the establishment of ephemeral standing water. Flooding is variable however, and the numbers of flamingos that arrive depends on the extent of flooding and hence the amount of rainfall. In years of higher than average rainfall though, Sua provides excellent feeding conditions and one of the most important breeding sites for both species in southern Africa. The different species of crustaceans that make up the invertebrate community of Sua pans saline lake were sampled, identified and quantified over three years. In addition the numbers of flamingos on the pan was estimated by aerial surveys and breeding events were observed and monitored. Species from anostraca, conchostraca, anomopoda, copepoda, and ostracoda were all present. There are obvious changes in the community structure and abundance of the different crustaceans over time. Typical ephemeral habitat opportunists like *Branchinella spinosa* and *Moina microcopa* are dominant in the initial stages of large inundations and almost alone during seasons of small flooding when the pan rapidly dries up. While variation in community diversity and abundance occurs within and between wet phases, a large Branchiopod, *Branchinella spinosa*, is one of the most important in terms of its contribution to total biomass and secondary productivity. Variation in the relative *B. spinosa* productivity between seasons was observed and this coincided with differences in the numbers of Greater flamingos present on the pan. A difference between the potential total productions calculated for *B spinosa* and the production observed, was calculated as production lost to flamingo predation, (assuming that there was also some loss to other predators and natural mortality). The importance of this trophic level interaction in relation to Greater flamingo breeding success is discussed.

FATTY ACID COMPOSITION OF FRESHWATER *GAMMARUS LACUSTRIS* AND ITS FOOD SOURCES COMPARE TO THOSE OF A SALT LAKE (SIBERIA, RUSSIA)

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We studied fatty acid composition of *Gammarus lacustris* Sars from a freshwater Siberian reservoir and compared it with that of another population of this species inhabited a salt Siberian lake, as well as seston and bottom sediments of these water bodies. FA composition of bodies of these two populations differed significantly, while those of seston and intestinal tract contents were practically similar. Besides the well known difference in contents of 20:5ω3, 22:6ω3 and 20:4ω6, the freshwater *Gammarus* had the high content of 16:1 and 16:0 acids compare to the saltwater population. This difference in C16 acids composition assumed to be a general tendency of FA contents of freshwater and saltwater crustaceans. The peculiarities of FA content should be regarded as a special metabolic adaptation of crustaceans to salt- and freshwater conditions, which is possible within one biological species. Some biochemical mechanisms of such adaptation are discussed.

UNIQUE OF STRUCTURE OF BRACKISH-WATER LAKES ECOSYSTEMS OF MIDDLE VOLGA REGION

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There are about 0.1 % brackish-water lakes in the Middle Volga Region from total number of lakes. Mineralization of water in lakes is raised (from 1-1,5 till 10-12 g/l). The results we report here were obtained on a complex expeditions of water ecosystem laboratory of Department of ecology KSU. The 8 brackish-water lakes were investigated in 1998 – 2000 years. Water of Light-blue lakes are concern to medical waters of a VI class, with the high contents of sulphuretted hydrogen and radon. The oozes of Light-blue lakes concern on physical and chemical parameters to mineralize sulphate medical oozes. In phytoplankton of researched lakes was revealed 136 taxons. Structural parameters of phytoplankton were low. Determinal factors for formation of phytoplankton in these lakes were the area, depth and volume of water of lakes and also contents of sulphuretted hydrogen, mineralization, and ionic composition of water. The intensity of total productivity of organic matter during open water season on researched lakes varied from 0,06 up to 4,03 mg O_2/l in day. The productivity of phytoplankton is substantially defined by hydrological conditions. 39 species of water vegetation were met in lakes. The majority of species concerns to eurysynusic. To infrequent the green glues concern *Myriophyllum alternifolium* D.C., *Hippuris vulgaris* L., *Chara contraria* A.Br., *Cladophora glomerata* (L.) Kutz., *Enteromorpha pilifera* Kutz. A degree of an overgrowing of the majority of lakes is high (35-70 %), except for lake Salty (3 %). The zooplankton includes 81 species. The most of the rotifers and crustaceans are eurysynusic. Almost of them are dwell both in fresh-water and in brackish-water lakes. It is revealed, that determining for the zooplankton in Light-blue lakes are high speed of water flow and low temperature of water, increasing mineralizaton, high contents of sulphuretted hydrogen and absence of oxygen, high contents biogenic and organic matters. Zoobentos and nectobentos of brackesh-water lakes was submitted 207 taxons. The majority of the species are fresh-waters, for exception *Chironomus aprilinus* and *Sigara concinna*. For Light-blue lakes the specific complex of species are characteristic. Here meet infrequent for Middle Volga Region Turbellaria (1- 4 species); crustaceans (*Asellus aquaticus*, *Gammarus pulex*); Oligochaeta and Chyronomidae are present. The biodiversity of zoobentos in lakes abyssal smaller then in litoral zone. Ichtiofauna of brackish-water lakes consist from 10 species. The analysis of the data has shown, that on early stages of ecosystems development of these lakes various abiotic factors, such as temperature, illuminating intensity, high speed of water flow, mineralization and others render influence on allocation and formation of biotic communities. They result in formation of specific complexes of species in phyto- and zoobentos. During evolution of ecosystems of brackesh-water lakes the action of former ecological factors is reduced and the role of salinity is increased.

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THE CRIMEAN HYPERSALINE LAKES: I. BIOENERGETICS OF THE MICROBIAL COMMUNITY AND THE SEDIMENTATION-TO-MINERALIZATION RATIO

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The Crimean saline lakes are amongst the ecosystems whose biogeochemical cycling is closely coupled with and, in fact, formed by the microbial processes, including primary production, heterotrophic uptake, digestion and mineralization of the accumulated organic matter. Being a major trophic component with the highest *in situ* abundance and biomass, the planktonic microbial communities (PMC) can be studied successfully by microcalorimetry, which is a powerful tool for quantifying the integral metabolism of microbiota and its components. In this study, we have applied conventional and original techniques to: (i) estimate the overall heat energy dissipated by the PMC; and (ii) differentiate between the heat flow by the heterotrophic picoplankton and by the phototrophic nano- and microplankton. The surface water samples were collected in January-February 2002 in a coastal shallow hypersaline lake at Cape Khersones in the South-West Crimea). Subsamples of lake water were poured into calorimetric 3-ml glass ampoules. Heat flow was registered in a BioActivity Monitor 2277 (Thermometric AB, Sweden). A two-step filtration technique was used to: (i) remove nano- and microplankton, screening the samples with a 3 μm nitrocellulose membrane; and (ii) concentrate heterotrophic picoplankton onto a 0.2 μm membrane. For quantifying the metabolic activity of the "plated" plankton, the membrane was placed into calorimetric 3-ml glass ampoules containing 2 ml of the lake water <0.2 μm filtrate. 2-ml unaltered water subsamples were poured into ampoules to measure the heat flow of the total PMC. The PMC nano- and microfractions were found to be dominated by photosynthetic prokaryotes (cyanobacteria *Gloeocapsa spp*.- 3.6 mg wet weight (WW) ml^{-1}, and *Phormidium spp*. – 16.3 mg ml^{-1}) and eukaryotes (dinoflagellates – 16.3 mg ml^{-1}, diatoms – 8.1 mg ml^{-1}). Total nano- and microplanktonic biomass was about 30 mg WW ml^{-1} (that is 5 orders of magnitude higher than in the Black Sea winter phytoplankton), with the nanoplankton contributing about 80 % of it. The winter picoplankton was a minor component of the PMC in terms of biomass (about 0.004 %). Heterotrophic bacteria dominated it. Their average abundance and biomass (5.89×10^6 cells ml^{-1} and 1.18 μg WW ml^{-1}, respectively) were slightly higher than in the coastal seawater. Under the experimental conditions (at 20 ^oC), the bacterial heat flux averaged 25 fW $cell^{-1}$, which is within the data range obtained for the Black Sea coastal bacterioplankton (4 to 70 fW $cell^{-1}$ in different seasons). The overall bacterial heat flow (0.07 to 0.15 μW ml^{-1}) amounted to as little as 1.6 to 4.9 % of the total heat dissipated by the PMC. The rest of the lost heat energy was associated with metabolism of the larger phototrophs in the >3 μm fraction, with biomass- and cell-specific heat fluxes of 95 nW mg^{-1} WW and 72 pW $cell^{-1}$, respectively. The results demonstrate that the winter phototrophic production and accumulation of living biomass significantly exceed the heterotrophic mineralization in the lake photic layer. The calorimetric estimates have allowed approximations of the sedimentation-to-mineralization ratio, giving values up to 50.

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THE TROPHIC STRUCTURE OF THE MICROBIAL COMMUNITIES OF SALT AND BRACKISH LAKES OF ASIA-PACIFIC REGION

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The biodiversity of prokaryotes and the rate of microbial processes were studied in salt lakes of Transbaikalie, Mongolia and Kermadek Island (New Zealand). The salt concentration is 2-350 g/l. PH range to 8,5 – 11,2. The prokaryote community of the alkaliphilic and galophilic bacteria participate in the cycle of the biogenic elements in salt lake. The microbial mats reveale in the shallow water of the lake. Cyanobacteria and anoxygenic photobacteria are the main of the primary organic matter producers. The rate of the photosynthesis is 1275-16420 mg C/ m2 day, the dark fixation – 832 – 13137 mg C / m2 day. The intensity of sulfate reduction varied over a wide range from 0,6 to 93,4 mg S / l day. The rate of organic matter utilization in the course of sulfate reduction was 0,45-70 mg C / l day, a value 3-4 orders of magnitude higher that characterizing the activity of methanogenic bacteria. These data demonstrate that sulfate reducing bacteria play a crucial role at the terminal stage of organic matter decomposition in the salt and brackish lakes.

HEURISTIC MATHEMATICAL MODELING FOR WATER ECOSYSTEM STUDIES

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The anthropogenic impact on the earth's natural systems has been steadily growing during recent decades. Results of this growth are leading to dramatic changes in ecosystem functioning and even to destruction of natural ecosystems. Simplified heuristic models of natural ecosystems can be an effective means to determine the main biological interactions and key factors that are of high importance for understanding the development of biosystems of superorganismic level. Simplified mathematical models of the functioning of the biotic cycles can provide the possibility for solving one of the main problems of the theoretical ecology: how to join two principal directions of studies, which have not traditionally been properly connected: population-community dynamics (from one side) and ecosystem theory (from another side). The usual crude way in which these are joined is non-productive because of super-complexities of mathematical descriptions and low tractability of models. Taking into consideration the cycling of the limiting nutrient (limiting substances are few even in complicated natural ecosystems -nitrogen, phosphorus, oxygen) we can combine these two approaches. Therefore, the cycling of the limiting substance, induced by the external free energy flux, is the basis of the mathematical modeling studies to be presented to the conference. Mathematical models describe the dynamics of simplified ecosystems having different characteristics:1.Different degrees of biotic turnover closure (from open to completely closed).2.Different numbers of trophic links (including both "top-down", "bottom-up" regulation types).3.Different intensities of input - output flows of the limiting nutrient and its total amount in the system.4. Linear-chain and partly-web trophic structure (with or without competition of trophic chains). Adaptive values of the changes of lower hierarchical levels (organismic, populational, trophic chain level) is to be estimated by integrity indices for total system functioning (NPP, total photosynthesis). The possibility of quantitative evaluation and further monitoring of the "normal" functioning of ecosystems (their "health" or "integrity") is analyzed using measurements of the residual concentration of the limiting nutrient in environment. The developed approach is of use for different applications: for evaluating the contributions of lower hierarchical levels to the functioning the higher hierarchical levels of the system. For example, we will be able to estimate the positive (negative) role of consumers introduced into the lake ecosystem, measure NPP or the rate of limiting nutrient cycling in the system. Or we can determine increasing the biotic turnover rate caused by cannibalism or wider spectra of age groups in one population. In any case this approach is of high value for possible biomanipulation actions and their assessment.

THE MEASUREMENT OF KINETIC CHARACTERISTICS OF HYDROBIONTS (*GAMMARUS LACUSTRIS*) OF SHIRA AND BELE LAKES BY ELECTRODE METHODS

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Investigations of the respiration rate – the integrated parameter of energy exchange for living organisms – are of great significance for the quantitative estimation of aquatic ecosystems and their components. The application of the state-of-the-art devices, e.g. polarograph and potentiometer sensors, ensures a reliable quantification of respiration rates (and photosynthesis of hydrobionts) in natural ecosystems and in experiments with natural populations. In this work gas exchange and respiration rate of the freshwater shrimp *Gammarus lacustris* from Lakes Shira and Belyo were measured in relation to the mass of animals, using a RA-9503 polarograph oxygen sensor of an "Aquacheck-3" portable device (Hungary). In the general case, the gas exchange of organisms is expressed with the equation $Q = am^k$, where Q is oxygen uptake by one organism, m is its mass, a is specific respiration rate, and k is coefficient. Hence, respiration rate (oxygen uptake relative to weight) is defined as $Q/m = am^{k-1}$. In experiments we determined oxygen uptake by freshwater shrimp individuals of mass 4 to 70 mg, hydrobionts of Lakes Shira and Belyo (in July-August of 1998-2001); as the mass of the animals increased, the oxygen uptake also increased, from 0.07 to 0.69 mg O_2 per individual per day. The calculations made using Microsoft Excel 7.0 for Windows showed that gas exchange of *Gammarus lacustris* is expressed with equation $Q = 0.0221m^{0.8275}$ (standard error s = 0.13); thus, the average respiration rate is $Q/m = 0.0221m^{-0.1725}$. The temperature dependence of respiration rate of the freshwater shrimp in Lake Belyo had a distinct maximum at 18°C and noticeably decreased with an increase in temperature of 2-4°C. The freshwater shrimp individuals that had been kept without food for 24 hours featured a sharp increase in respiration rate when potato slices were supplied to them as food: the oxygen uptake in the feeding individuals increased 1.8-2-fold. Obtained data can be used to construct a general model of the Lake Shira ecosystem's functioning and to further investigate aquatic arthropods as an important component of most lake trophic chains.

HYDROBIOLOGICAL CHARACTERISATION OF MINERAL LAKES LOCATED IN THE SOUTH-EASTERN PART OF THE IRKUTSK REGION

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The report presents results of a study on phyto- and zooplankton and hydro-chemical analysis of water in 13 mineral lakes located on the western cost of Lake Baikal, in the valleys Khontoy and Borsonskiy Tazheran which situated in the valley of the river Anga. The lake beds are saucer-like shaped, not large in area (do not exceed 2 km^2) and not deep (the maximal depth equals 5 m), pebble and silt grounded, being often with strong smell of the sulphured hydrogen. The lakes are fed by atmospheric precipitation and underground waters and not out-flowed. Summer, they are well warmed so their water temperatures reach 23^0 C. Their chemical compositions have been found to belong to carbonate-magnesium and sulphate-sodium types, sometimes to chloride-sodium one. In the open water time, their mineralisation were low, 1.5-9.8 $g \cdot l^{-1}$, at pH of 8.2-9.3 but widely varied between 1.9 and 23.8 $g \cdot l^{-1}$ at pH of 7.9-9.2 in the ice-covered time. Water transparency has been found to be low, 0.3-0.5 m. Phytoplankton of the studied lakes were poor, present by 60 species and subspecies, 32 of which included green algae, 18 blue-green ones, 4 diatoms, 3 cryptophytes, and 3 dinoflagellates. By species number, there dominated green algae (Chlorococcales). But in number and biomass, blue-green algae prospered, present by the saltish-freshwater species *Lyngbia contorta, L. lagerheimii, Merismopedia tenuissima, M. minima, Rhabdoderma lineare.* Zooplankton were presented by 41 taxa, including 24 Rotifers, 12 species of Cladocera and 5 Copepoda. In all the lakes during the open water time, the halophiles *Arctodiaptomus (A.) salinus, Arctodiaptomus (Rh.) bacillifer, Eucyclops arcanus, Daphnia (C.) magna, Moina mongolica, Alona rectangula, Filinia longiseta, F. passa, Keratella valga, K. quadrata, Asplanchna sieboldi, Brachionus plicatilis asplanchnoides, B. variabilis, B. urceus, Hexarthra mira,* and *H. fennica* mainly contributed to the total number and biomass. In ice-covered time, zooplankton were very poor in species diversity, present by only *A. (A.) salinus* in all its age stages and the rotifer *Synchaeta tremula.* The studied lakes have been found to be abundant in number and biomass of phyto- and zooplankton. Phytoplankton biomass varied between 58 and 82 $g \cdot m^{-3}$ in many lakes, reaching the maximal values 273-333 $g \cdot m^{-3}$ in the lakes "Krestovskoe" and "Dlinnoe". In other lakes, these indexes were significantly lower but not less than 4 $g \cdot m^{-3}$. Zooplankton were abundant in the lakes, varying within wide limits of 14 and 525 thousand individuals per m^3. The maximal value has been observed to equal 21053 thousand individuals per m^3 in lake "Dvoinoe". Along all the seasons of the year except winter, there dominated *K. quadrata, F. longiseta,* and *B. plicatilis asplanchnoides.* From season to season and lake to lake, zooplankton biomass varied between 2 and 8 $g \cdot m^{-3}$, reaching the maximal values 18 and 24 $g \cdot m^{-3}$ only in two lakes by intensive development of *D. magna*.

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AUTOTROPHIC PICOPLANKTON IN A STRATIFIED BRACKISH LAKE.

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The determination of abundance, biomass and production of autotrophic picoplankton were conducted in a water column of the brackish lake Shira (Khakassa) in 1999 - 2000. Water mineralization was 16 - 17 mg · l^{-1}. The lake water is alkaline, sulphate - chloride - sodium - potassium. During the summer stratification the surface layers of water column were heated up to 20 - 24°C, the thermocline was at depths of 6 - 8 m. The maximal oxygen content was registered in a layer of the temperature peak. In the hypolimnion the temperature didn't exceed 4°C. Hydrogen sulphide was recorded from depths of 12 - 13 m and its concentration reached 30 mg · l^{-1}. The microaerophil zone was located at depths of 12 - 14 m. The main representatives of autotrophic picoplankton in the mixolimnion were cyanobacteria of genera Synechococcus and Synechocystis which amounted to 60 - 80 % of the total abundance of picophytoplankton. Abundance and biomass of small cyanobacteria varied along the vertical from up to and from 17 up to 1554 mg · m^3, correspondingly. The highest values of these parameters were registered above the thermocline at 8 - 10 m in depth. In the aerobic zone the biomass of small cyanobacteria accounted to 34 % of the biomass of heterotrophic bacterioplankton. The experiments to asses the reproduction rate of cianobacteria in natural conditions using the method of «dilution» (Landry, Hassett, 1982) had shown that the specific rate of their growth varied in the range 0,008 - 0,037 h^{-1} in depth and the time of their abundance doubling was 19 - 87 h. The largest picocyanobacteria production ran 35 - 42 mg C · m^3 and was registered in the thermocline and above. Their contribution to a primary production of phytoplankton was significant and reached 50%. Large abundance of anoxygen phototrophic bacteria - representatives of families Chlorobiaceae and Chromatiaceae developed in microaerophylic and anaerobic zones of the lake. Green and purple bacteria were concentrated at depth of 13 - 15 m, i.e. in a water layer located at the border of hydrogen sulphide distribution where their abundance reached (2,0 - 2,5) X 10^6 cells · ml^{-1} and (1,3 - 1,6) X 10^6 cells · ml^{-1}, correspondingly. The maximum of Chlorobiaceae development was recorded lower than that of Chromatiaceae. Here the abundance of sulphuric phototrophic bacteria accounted for 16 - 48 % of the total number of heterotrophic bacterioplankton and their production of organic matter was in the range 10 - 14 mg C · $(l \cdot day)^{-1}$. It turned out that in the summer period the main portion of organic matter in the lake was produced as a result of algae and cyanobacteria photosynthesis. The contribution of anoxygen bacterial photosynthesis to a primary production in the lake pelagial was minor and accounted to about 7,3 % as calculated per m^2.

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THE CRIMEAN HYPERSALINE LAKES: II. MICROBIAL COMMUNITY STRUCTURE AND POTENTIAL INFLUENCE ON THE TEMPERATURE FIELDS

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There are more than 50 hypersaline lakes in the Crimea peninsular, which is situated in the Northern Black Sea and has the total surface area of ~27,000 km^2. Most of the lakes, including the largest ones, are of marine origin with a permanent infiltration of water from the sea. A number of the sulphate lakes in the East Crimea, however, are of continental origin and therefore have never been connected with the sea. All the lakes are characterized by high primary production and great seasonal variability in volume, surface area, salinity and water temperature. The taxonomic composition and the abundance of the microbial community were studied in nine lakes, 5 marine and 4 continental in origin. Samples were collected in different biotopes, including dry areas and mineral deposits. Diatoms and cyanobacteria were the dominant benthic unicellular phototrophs, with their biomass reaching 170 and 4 g WW m^{-2}, respectively. Other major components of the microplankton in the water column were the dinoflagellates and the green microalga, *Dunaiella salina*. Notably, diatoms were not found in the continental lakes. The biodiversity of the unicellular organisms was significantly higher in the marine lakes in that 40 species of diatoms and more than 20 species of cyanobacteria were found as against zero and 17 species, respectively, in the continental ones. Distinct spatial heterogeneity on the fine-scale of 1 to 5 m was observed in both the microbial biomass and the temperature. Higher concentrations of living biomass coincided with local peaks of water temperature, exceeding the ambient by more than 5 ^oC. Additionally, some anomalies in fine-scale temperature distribution and dynamics were found that can not be due only to the abiotic factors. A hypothesis to explain the observed phenomenon is that the system involves additional, biogenic heat energy that is produced by the living matter, firstly by the microbial biomass. First round numerical and microcalorimetric experiments provided evidence that the halophilic microbiota are potentially able to dissipate enough heat energy to warm up the local microenvironments. Thus, there may exist not only the direct coupling of 'environmental temperature-to-cell metabolism' but also a feedback mechanism. This phenomenon could transform our understanding of the regulatory mechanisms controlling the microbial processes taking place in highly productive saline lakes.

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STRUCTURE OF THE LARGE ARAL SEA ZOOPLANKTON IN JULY 2000

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Investigation of zooplankton in the Large Aral Sea have been conducted in the north-west part on six stations. Indices of water salinity on stations varied from 61,7 to 68,7 g/litre, temperature from 23,7 to 28,7°C, concentration of dissolve oxygen from 6,6 to 8,6. Zooplankton consist of 15 species, including 8 species and subspecies of Rotatoria, 6 species of Crustacea (Cladocera – 2, Copepoda – 2, Branchiopoda – 1, Ostracoda – 1) and Chironomidae larvae – 1: Synchaeta vorax Rousselet, *Brachionus quadridentatus brevispinus* Ehrenberg, B. q. ancylognathus Schmarda, *B. plicatilis* Muller, Keratella quadrata (Muller), *Kellicottia longispina* (Kellicott), *Filinia longiseta* (Ehrenberg), *Hexarthra fennica* (Levander), *Moina mongolica* Daday, *Bosmina longirostris* (O.F.Muller), *Acanthocyclops sp*., *Cletocamptus retrogressus* Schmank., *Artemia sp*., *Cyprideis torosa* (Jones), *Chironomus salinarius* Kieffer. The most wide spread Rotatoria were *H. fennica* and *B. plicatilis* (83,3 – 33,3 % frequency of meet ,accodingly) This two species are halobionts. Other Rotatoria species were discovered on one station only, where spring of freshwater is possible. *M. mongolica*, C. retrogressus and Artemia sp. (species status of Aral Artemia population until not determine, but, by our data, it is bisexual) were constant component of Crustacean faune in this part of the Sea (they inhabited on all stations). In high salinity of sea water the populations of these three species were prospered and represented by all stages of development. According to biological peculiarities of development adult specimens predominated in populations of Moina and Cletocamptus in July (64,3 and 73,1% general abundance). On the contrary, Artemia populatian in the main part consist of juveniles – 82,7 – 100%. Number of females with eggs was small – 3,2 – 27,2%. Artemia abundance varied on stations from 0,37 to 1,63 thousand specimen/m^3, biomass from 34,5 to 826,93 mg/m^3. Female had a low prolificy – 8 – 37 eggs (average – 22,2). Quantitative development of all zooplankton was determined by these three species. Average abundance and biomass of July zooplankton were 7,6 thousand specimens/m^3 and 808,39 mg/m^3. Moina created 63,1% of abundance and 36,3% of biomass, Artemia – 14,4% of abundance and 61,5% of biomass, Cletocamptus 20,5 and 2,1 % accordingly. Indices of other species were very low: 2% of abundance and 0,02% of biomass. To 2000 planktofaune of the Large Aral Sea reformed from fresh–brackishwater to hiperhalinic water faune. The Large Aral Sea became an Artemia waterbody on indices of biomass and there is fine perspective on storage of this species.

THE LIMNOLOGY OF THE SALINE LAKES OF THE CENTRAL AND EASTERN INLAND OF AUSTRALIA: A REVIEW WITH SPECIAL REFERENCE TO THEIR BIOGEOGRAPHICAL AFFINITIES

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In 1984 when Bill Williams highlighted the regionalization of salt lakes in Australia, little was known about lakes in the remote inland. It was thought the invertebrate fauna of such lakes was depauperate due to their being poor evolutionary loci associated with extreme episodicity. However work in the last two decades, has shown the fauna of many lakes is relatively rich and that part of the reason for reduced faunas is habitat homeogeneity in the larger lakes. Nevertheless there is little diversification at the species level, indicating restrictions on speciation. There are also limits on diversity imposed by the harsh environment, as indicated by the lack of forms unable to survive severe desiccation, e.g. higher crustaceans. Lakes in central and the eastern inland are dominated by characteristic lower crustaceans such as Parartemia minuta, Daphniopsis queenslandensis, Moina baylyi, Trygonocypris globulosa and a new mytilocyprid ostracod, as well as some forms widespread in Australia and in world salt lakes. This invertebrate fauna is just as distinct as those of other salt lake districts in southern Australia, further reinforcing the concept of regionalization in Australia. The fish fauna of central and eastern salt lakes of is also largely specific, but the waterbirds are not as they have responded to the episodicity by nomadism and habitat flexibility.

THE PROGRAM SHELL OF THE INFORMATIONAL - ANALYTICAL SYSTEM FOR THE FORECAST OF A STATE ECOSYSTEM AND QUALITIES OF WATER IN RESERVOIRS

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Informational - analytical system (IAS) is intended for realization of quantitative experiments with mathematical model of the ecological system of internal reservoirs for the forecast of its(her) state and quality of water at various scripts of water use. The program shell is an integral part developed IAS. She prepares for the initial data (natural, experimental etc.) for quantitative прогнозного calculation and fulfils a number of the functions necessary at preparation of the cartographical and tabulared information on the object. The program provides operation with разноформатными the data that allows optimally and to expedite data origination. In the built - in DBMS there are resources for import and export of the data, for their review in the various form, and permitting to work with structure of available tables. In the program both mouse buttons are actively used. The program shell not only prepares the data for calculations, but also translates them in the required format for a designed part. The cartographical data prepare in the specific form, i.e. the cartographical information is stored in a computer memory, and on the screen all is displayed in the color graphic palette. The Itar-map can be represented in three sorts: area of a reservoir in gradation of green color and a coast, area of a reservoir in gradation of dark blue color and a coast green color, only a reservoir in gradation of green color. The gradation of green color at mapping a reservoir is selected because by virtue of specific construction of model and the program we enter a relief of a bottom of a reservoir. Main advantages of this program from its previous versions is: operation under a Windows, visualization of the entered data (the index of color for input of maps), the three-level system of check on correctness of the entered data, operation with a plenty of data formats is used (that the simplicity in usage, the standard Windows - interface will allow to use in the future the designed data in other packages, in particular, for a statistical analysis). Main directions of usage IAS: scientific researches, wildlife management, training of students. Possible paths of development IAS: development and connection of the grafichesko-character language for designing models of objects, usage GIS at creation of maps.

BIOTA STRUCTURE OF SALT LAKES OF ALTAI REGION

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The population cancer Artemia sp. in small lakes for summer a season 2001 educed at obvious a favourable temperature schedule (early warm spring and lingering warm autumn), except for first years June of a subseason. Simultaneously, the population educed at some deflections from optimal parameters of other abiotic factors of a habitat, but tendentious their deteriorations as contrasted to by data of 2000 (decrease of saltiness of water, some augmentation of volumes of zoetic region, and stability of inflow of biogens). For last years saltiness lake Malinovoe regularly oscillated, that is caused first of all by some augmentation in the vernal season and decrease by autumn of its liquid water content; dynamics of general mineralization is represented by the following data: 1996 - 105,3; 1997 - 149,1; 1999 - 189,4 g/kgs. In a season of 2000 the range of fluctuatings of saltiness compounded 193,3 - 235,5 g/kgs, i.e. Has left for limens of its best values for reproduction cancer Artemia sp. (100-180 g/kgs), but did not reach borders of depressing of vital signs Artemia sp. (280 g/kgs). Level and consequently, and volume of "zoetic" region cancer in small lakes, under effect of evaporation of water step-by-step exempted a littoral fringe on 10-20 cm per summer months. By autumn practically of steel unsuitable for a habitation Littoral fringe of lake Malinovoe. Actually volume of "zoetic" region cancer was pruned per 2000 by autumn up to 4,7 million m^3, i.e. more than twice as contrasted to by accepted base data (area 11,4 km^2, average depth 1 m). Per 2001 volume of "zoetic" region was increased up to 7,98 million m^3. The assessment of numerical parameters Artemia sp. in the first decade of July on harbour area of both lakes demonstrates, what is it there was a season of maximal development of populations cancer. It is necessary to remind, that was simultaneously marked minimum saltiness and maximal water-level. In September the manifestative depression of a population cancer was watched. In the proof the minimum number and biomass, fallout from age structure of a population Nauplii, minimum linear dimension cancer is marked. Under the available data, the numerical parameters of a state of a population cancer oscillate:

	Number, thousand ekz/m^3	Biomass, g/m^3
1996	24,0	11,87
1997	38,0	17,22
2000	30,0	16,00
2001	35,0	18,00

Thus, except for a temperature schedule of lakes, abiotic conditions of forming of numerical parameters cancer Artemia sp., switching on and the trade clumps winter ovum, were far from optimal conditions. Allowing, that the similar abiotic conditions were characteristic and for other Artemia sp. of lakes of a hydraulic-circuit system, it is possible to stress, that controlling factors influential in bioproductivity Michaylovsky of saline lakes, are the conditions of their liquid water content conditioning dimension by "lode" of region and condition of a habitation cancer in sublethal conditions of saltiness.

SEASONAL BIOTA'S VARIABILITY OF A BIOTA OF SALT LAKES OF THE SOUTH OF WESTERN SIBERIA

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Generically all salt lakes in the south of Western Siberia occupy sewage hollow in sedimentary rocks and are usually devided into two types: the first ones are with sauce-like hollows and often with precipitous banks; the second ones are with hollows of wrong shape with cut and swampy shore line. To characterize the seasonable variability two pools of mentioned types were taken: the first is Lake Bolshoye Yarovoye in Slavgorod Region (water area 66,7 km^2, average depth of 4,7 m, salinity 150-164 ‰) and the second one is Salt Lake in Zaviaylov Region (1,2 km^2, depth of 1,5 m, salinity 85-115 ‰). The Algaevegetation of Lake BolshoyeYarovoye is represented by 10 kinds: Cyanophyta - 2, Diatomeae - 5, Chlorophyta - 3. In Spring Cyanophyta Lyngbya limnetica grows (in April there are 5,5 mln.cell/l); in June the number of Chlorophyta Chlorococcum sp. is decreasing (about 400000 cell/l exist only). In July and August the number of algaes is shaply reduced (up to 50000 cell/l) because of a great number of their consumers - artemia. Lyngbia kassinskajae and Cladophora glomerata var. glomerata are mass kinds existing in Salt Lake. They often cause the so-called "blooming" of the lake (4,4-6,0 mln. cells/l). Crustoceous plankton is represented by Artemia extremely in Lake Bolshoye Yarovoye (2001 – number 640-69930 sp/m^3), but besides a lot of Copepoda: Cyclops sp. and Diaptomus salina can be seen in Salt Lake in April - May (1800-2500 sp./m^3). The correlation of sexes varies greatly: the stable dominance of females during the parthenogenesis and unstable dominance of males during the period reproduction (there are 99,9-97,1% of females in Lake Bolshoye Yarovoy, and in Salt Lake there are only 41,2-52,7%). Artemia's seasonal and morphological changes show some varieties: Artemia salina var. milchausenii Fischer in Lake Bolshoye Yarovoye number from 75 up to 99 % and 1-25% is left for Artemia salina var.arietina Fischer, and in Salt Lake A.s.var.arietina exists with the number from 92 to 96 % and 3-13% is left for Artemia salina var.principalis Simon. The differences in line sizes of generations are noted (the body length of spring artemia is 11,6 mm long, summer artemia is 10,8 mm long, and autumn artemia -10,1 mm long in Lake Bolshoye Yarovoye). In Salt Lake artemia stretches for 8,5 mm long in Spring, for 7,9 mm long in Summer and for 7,1 mm long in Autumn. The change of ways of reproduction during vegetative period of generation takes place. 80,5% of spring generation are reproduced by viviparity 40,3% of summer generation are reproduced by winter (diapause) eggs, 54,2 % of summer generation are reproduced by summer eggs; autumn generation produces only winter (diapause) eggs.

SOME ASPECTS OF ECOLOGY AND NUTRITION OF AMPHIPOD GAMMARUS LACUSTRIS FROM SHIRA LAKE

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Amphipod *Gammarus lacustris* belongs to benthos-plankton animals in Shira lake. For the lack of ichthyofauna in Shira lake it is the terminal link of "algae – zooplankton – amphipod" trophic pyramid. Spatial distributions of Gammarus lacustris in Shira lake (1999-2000) and its nutrition have been studied. Major bulk of amphipods is concentrated in the littoral, sublittoral and aphytal zones in summer time (up to 13 m). Young animals sizing from 2 to 4 mm concentrated over the littoral zone (total contribution up to 96% of the total numbers) and the number of age groups and bodysize of dominant animal groups increased with depth to 16.0 m. At the depth of 22.0 m dominant were individuals with the body length of 9 mm (most mobile group of amphipods). In years the age structure of brine shrimp population was practically uniform. Vertical distribution of gammarides differed in summer under different depths. Over the sublittoral zone they concentrated near the bottom (200 ind./m^3). Over the depth of 13.0 m the brine shrimp had maximum numbers at the layers 7-10 m. The littoral *G. lacustris* from Shira Lake during the investigated period ingested primarily fresh seston, likely settled on the bottom surface. A considerable part of the ingested seston comprised cells of *Botryococcus braunii,* which passed the intestinal tract in living and even amended form. So, the major bulk of amphipods is concentrated in shallow water and medium depth of the lake, which is about 50% of the lake area. The young are found in shallow water, the adult – over the medium depth zones. *Gammarus lacustris* is not an obligate predator in Shira lake or consumer of allochthonous organic matter, but an omnivorous consumer of lake seston.

THE EFFECT OF ENVIRONMENT FACTORS ON THE VERTICAL DISTRIBUTION OF COPEPODA *ARCTODIAPTOMUS SALINUS* (FROM SHIRA LAKE) IN LABORATORY CONDITIONS

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The vertical structure of biotic community is one of the factors that determine the development of aquatic ecosystem. Experiments were carried out on dominant representative of zooplankton *Arctodiaptomus salinus* in brackish lake Shira (Russia, Republic of Khakasia) to study the effect of environmental factors on the vertical distribution of *A.salinus* in laboratory conditions. The study was performed in glass rectangular vials (60 cm height, 5 cm width, 1.3 l volume) in a thermostat at the constant temperature (17-19^{o}C) and the photoperiod (16 h day: 8 h night). Natural phytoplankton community from the lake was used as a food source. The food concentration was controlled with a fluorimeter. In all experiments (three replicates each) 40-45 individuals of *A. salinus* were added to each vial. To evaluate the effect of food concentration and chemical composition of water a complete two-factor experiment was carried out (variation levels for food concentration - a) maximum concentration of chlorophyll "a" in the lake (at the depth of 10 meters), b) concentration of chlorophyll "a" at the lake surface; for chemical composition of water - a) water from the depth of 10 meters, b) water from the surface of the lake). It has been found that significant for the vertical distribution of *A.salinus* is the effect of food concentration and combined effect of food concentration and chemical composition of the lake water. To study the effect of concentration and quality of food on the vertical distribution of *A.salinus* we tested four food supplies corresponding to the chlorophyll "a" concentrations and species composition of phytoplankton in the lake at the depths of 7, 8, 9 and 10 meters. The species composition of phytoplankton has been shown to have no significant effect on vertical distribution of *A.salinus*. In experiments to study the effect of chemical cues from predator *Gammarus lacustris* on vertical distribution of its potential prey - *A.salinus* - two food concentrations (maximum concentration of chlorophyll "a" in the lake and chlorophyll "a" concentration at the lake surface) have been tested. The water from the mass culture of *Gammarus* was used as a predator treatment. Three predator densities of 10, 20 and 30 *Gammarus* per litre were tested. The water for predator treatment was made by adding adult *Gammarus* (8-10 mm body length) to the surface water from the lake and by keeping the animals in this water for 24 hrs. Lake water was used as control medium. The variance analysis showed valid effect of aggregate water of *G.lacustris* on the vertical distribution of *A.salinus* ($P<0.01$)**.** With the food concentration corresponding to the chlorophyll "a" maximum in the lake animals in the experiment cylinders were situated higher as compared to control (the difference between control and experiment is valid by the pair Wilcoxon test). Average depth of *A.salinus* population decreases as the density of *G.lacustris* increases. For the food concentration corresponding to the surface of the lake the difference between the average depth of control and experimental groups is also valid. However, in this case the experimental group of crustaceans was situated deeper than animals in control. It is worth mentioning the opposite nature of vertical distribution of *A.salinus* with different levels of food supply. On the whole we should note, that among all tested factors the effect of chemical cues from *G.lacustris* on vertical distribution of *A.salinus* was the most pronounced. *Research was supported by grant No. 261 (6th competition of young scientists of Russian Academy of Sciences).*

THE FORMATION OF THE VERTICALLY STRATIFIED DISTRIBUTION OF ZOOPLANKTON IN SHIRA LAKE

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We examine the relationship between vertical distribution of zooplankton and vertical stratification of main physico-chemical and biological parameters of the ecosystem of meromictic lake Shira during vegetation season. The reproduction peak of *Arctodiaptomus salinus* was detected at the beginning of summer. At that time *A.salinus* constitutes up to 99% of total zooplankton biomass. During the vegetation season transition of only one generation occurs in the population of *A.salinus.* Animals appeared at the beginning of summer do not produce pronounced second reproduction peak at the middle of summer, as the majority of late copepodides (C4-C5) submerge into the oxygenic hypolimnion where their development slow down under the effect of low temperature. The mass reproduction of rotifers is at the middle of summer (July-August). As a result the biomass of rotifers during this period reaches 50% of total zooplankton biomass. The vertical distribution of all dominant zooplankton species is limited by anoxic hypolimnion. Nauplii and young copepodides (C1-C3) of *A.salinus* as well as *Brachionus plicatilis* prefer upper warm waters. During summer stratification the maximum of zooplankton biomass which consist mainly of late copepodides and females of *A.salinus* is "tied" to the deepened maximum of green algae biomass. The vertical distribution of *Hexarthra oxiuris* is bimodal with two maximums in epi- and hypolimnion. Numbers of all recorded species and all detected size and age classes of *A.salinus* sharply declines in the thermocline. The average depth of copepodides and females of *A.salinus* increases during summer season. Thus, the reproduction peaks of dominant species is separated in time while dominant species and different size and age classes of the same species separated in space.

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ANAEROBIC CHEMOTROPHIC COMMUNITIES IN HIGHLY MINERALIZED LAKES

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Due to high osmotic pressure mineralized water bodies limit growth of eukaryotic organisms, which are alien intruders. Prokaryotic communities in these habitats might be regarded as relict analogous to Precambrian biosphere. Highly mineralized water bodies are from marine thalassic and continental athalassic origin. Marine hyperhaline habitats like lake Sivash, lagoone of the Sea of Azov, might be regarded as representative for the oceanic stromatolites building habitats[1]. Alkaline soda lakes in spite of variation in hydrochemistry represent end products of subaerial weathering leading to "soda continent". Prime producers in these habitats are cyanobacteria in their benthic communities, or "mats", forming below the surface anaerobic pockets analogous to anoxic atmosphere of Precambrian. It is demonstrated that in these extreme habitats anaerobic prokaryotes form metabolic pathways for decomposition of organic matter under the similar lines as neutrophiles but with participation of organisms adapted to high osmotic pressure and/or alkalinity. Organisms representing main steps of decomposition are isolated and described. At high osmotic pressure specific requirement is production of compatible solutes, which might comprise up to 30% in biomass of *Microcoleus*. These compounds are decomposed by Halanaerobiales, which are members of low G+C clostridial branch[2]. The key reactions are homoacetic fermentation of osmoprotecting sugars and decomposition of betaine by *Acetohalobium* with production of trimethylamine. TMA is decomposed by *Methanohalophilus* and *Methanohalobium* species representing serial adaptive dynamic to increasing salinity. Decomposition of TMA occurs via non-competative C-1 pathway of methanogenesis[3]. In alkaline lakes this pathway is operated by *Methanosalsus.* Hydrogenotrophic and acetoclastic pathways of methanogenesis are either suppressed or occur at lower salinity. High mineral content with availability of sulfate makes preferable decomposition via sulfidogenesis[4,5]. Sulfur cycle operates as closing decomposition pathway. It is initiated by hydrogenotrophic sulfate reducers while anoxygenic phototrophs close the cycle by regeneration of sulfate[6]. Anaerobic decomposition in soda lakes involves homoacetogens among which a number of new genera and species are described. An additional difficulty is caused by high Na^+ content supposing sodium bioenergetic. However it was demonstrated that extreme alkaliphiles like *Natroniella* and *Desulfonatronum* produce ATP ether on H^+ or Na^+ impulse depending on the species and thus both proton and sodium pumps are operating in alkaliphiles[7]. Diversity of new alkaliphiles represents main phylogenetic branches of prokaryotes indicating that these extremophiles really could be descendants of terrestrial biota of the past.

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STUDY ADVANCES IN SALINE LAKE RESOURCES ON THE TIBET PLATEAU

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This paper presents a summary report on the progress in the evaluation of the saline lake resources of the Tibetan Plateau over the past ten-old years made by the R & D Center of Saline Lake and Epithermal Deposits. The research has been carried out by integrating closely the comprehensive saline lake resource investigation with the typical saline lake research and development under the guidance of "salinology". It has for the first time revealed that the Laling area of Huan'ang is a gigantic lithium-boron-cesium-(potassium-rubidium) metallogenic province and points out that the superlarge Zabuye lithium-boron salt lake deposit presents a multistage, shallow-basin metallogenic model in a continent-continent collision area, which is differen from the high range-deep basin lithium-boron saline lake metallogenic model in back-arc rifts of South America. Through an extensive comprehensive investigation of saline lakes it is for the first time ascertained that the Tibetau Plateau is an important Artemia prospect and *Daphniopsis tibetana Sars* area. In the light of the principle of taking such measures as are suitable to local conditions, obtaining raw materials locally and developing advantages and avoiding shortcomings and through a study of experimental salinology, we have found a way of lithium saline lake development that is suited to the special environment of the plateau.

MODELING OF VERTICAL DISTRIBUTION OF PHYTOPLANKTON IN SHIRA LAKE

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During summer stratification Shira lake is observed to have a sustainable depth maximum of all species dominating in phytoplankton except for diatoms (1, 2). To verify the hypothesis explaining the mechanism of this phenomenon vertical turbulent diffusion model has been developed. The model includes two species of algae with different light demands and one species of copepods. All of them are biomass-dominant in phyto- and zooplankton of Shira Lake. The model is based on species specific kinetic constants obtained in experiments. Light limitation and inhibition, grazing and biogenic limitation were examined as basic mechanisms, responsible for depth maximum of algae. The depth maxima of light-demanding (green algae) and shade-adapted (cyanoprocaryota) algae have been found to be able to form concurrently when both the light-dependent growth of algae and the temperature-dependent growth of copepods and their grazing are considered together. The maximum growth of light-demanding algae corresponds to the maximum growth of copepods. So, the maximum of light-demanding algae forms in the depth beyond the reach of grazers. At the same time the depth maximum of shade-adapted algae forms due to its growth at the depth with low light conditions, which is favourable for them. Addition of phosphorus limitation mechanism decreases the growth rate of algae. It helps the zooplankton to eliminate the light-demanding algae. As a result, the light-demanding algae exhibit the depth maximum when the numbers of the grazer is lower - closer to the numbers of crustaceans in the lake. All calculation versions demonstrate that with time the light-demanding alga is eliminated. The calculated vertical profiles of temperature, phosphorus and light are in good agreement with the field ones.

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NUMERICAL MODELLING OF HYDROPHYSICAL PROCESSES IN LAKE SHIRA

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Hydrophysical processes determine to great extent the habitat of hydrobionts, as well as determine the transfer and sedimentation of substances, the intensity of pollution and rate of natural purification of water bodies. Mathematical models and computer programs of different levels of complexity can be used to investigate the hydrophysical processes in stratified water bodies. The one-dimensional model is used to determine the vertical distribution of temperature. The hydrostatic and non-hydrostatic models help to simulate the influence of wind and stratification on the pattern of water currents. In non-flowing resevoirs dynamic processes take place mainly under the influence of wind stress. The model of wind flows depends on resevoir, direction and force of wind, depth and stratification. The significant density stratification is formed in Shira Lake, defined by gradients of water temperature and salinity from the depth. Based on the detailed weather data, the calculations of the thermocline were conducted using the one-dimensional model. The comparison of the calculation data with the observation evidence suggests that in the deep-water area the temperature profile can be determined using the one-dimensional approximation. The basic calculation were made using the two-dimensional models in a vertical section taking or not the salinity into account. Two circulation areas were formed for the characteristic summer stratification whether or not salinity was taken into account. It is shown that even small relative variations in density (of the order of 10^{-3}) lead to a change in the pattern of the current. The bathymetry also influences the formation of the wind-induced current. In order to construct a realistic pattern of currents, a 3-d computer model of Lake Shira must be developed and used to estimate the validity of the two-dimensional and one-dimensional models.

CHARACTERIZATION OF ARTEMIA POPULATIONS FROM WESTERN SIBERIA: CYTOGENETICA AND MORPHOMETRY

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The brine shrimp Artemia is inhabit of saline lakes. The genus is a complex of species and superspecies defined largely, though not completely, by the criterion of reproductive isolation. Artemia is considerable of economic importance in fish and shellfish larviculture. Although the distribution of Artemia is well studied in many countries, Artemia from Russia has been payed less attention. Russian populations of Artemia have not been identified to species yet. Therefore we use only name of Artemia genus. The purpose of our work is determination of tacsonomical status of Russian Artemia. This work is very important and actual. In this trend we are conducting a few researches. The present report consists of chromosome numbers dates, the biometric characteristics of adults in 13 Artemia populations from Russia (Shamilja, Iljenei, Medvezje, Soljonoe (Setovo), Soljonii Kulat, Vishnjakovskoe, Tibizgol, Gashkovo, Oktjabrskoe, Nevidim, Aktoban, Soljonoe (Umreshevo), Svetlenkoe). Chromosome number was studied by instar – I nauplii, using the changeable method of Graphodatsky A.S. Five populations were investigated (Medvezje, Kulundinskoe, Kureinoe, Uljzai, Bolshoe Jarovoe). All populations were inferred as diploid (2n=42) after examination of nauplii. More detail research of Artemia from Bolshoe Jarovoe shows that chromosomes are telocentric. It needs to conduct additional investigations in this direction. Adults were examined by 11 morphometric parameters. Compared analyses of biometrical parameters of Artemia partenogenetic populations has been shown that medium length of the furca and number of furcal setae are reduced under increasing of salinity. There is not positive correlation between salinity and length of the abdomen. Females of Artemia from Aktoban (station 1) are characterized of the highest total length, length of the abdomen and rate length of the abdomen to total length. Females from Shamilja are characterized of the lowest dates of these parameters. We discovered significant differences between females from different stations of one and the same lake. As for Medvezje and Soljonii Kulat, females from two stations of Soljonoe lake (Umreshevo) are not differed. Compared analyses of phenotypic structure of pure males and females Aktoban and Iljenei shown that females from both populations have more total length, length of the abdomen, width of the abdomen, width of head, ra. Pure males excel on maximal diameter of complex eyes, distance between complex eyes, number of furcal setae, length of the first antenna. There isn`t any sexual dimorphism on furca length. The level of variation of analyzed parameters is insignificant. Furca length and number of furcal setae in all populations are the most unstable. Total length and rate length of the abdomen to total length are the most stable. It was observed that there were differences in morphometrical characteristics of Artemia populations from Russia. All populations were inferred to be parthenogenetic and diploid (2n=42) after examining nauplii. Rare tetraploid cells were observed in Medvesje.

SYSTEM FOR ANALYSES OF TEMPORAL SERIES OF SATELLITE IMAGES OF INTERNAL RESERVOIRS WITH ATMOSPHERIC CORRECTION ALGORITHMS USAGE

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Analysis of satellite data for phytopigment concentration in the surface layer of internal reservoirs lets their dynamics throughout the whole area of measurements to be observed. Most amount of satellite data that provide statistically sufficient sampling was received by the satellite NOAA (AVHRR). The accumulated time series of images of the Shira lake area provide possibility to analyze the dynamics of suspended sediments for 6 years. The amount of sediments determined from the satellite is related both to terrigenous sediments and chlorophyll concentration. Water-leaving radiance is registered by the satellite sensor distorted by atmospheric influence. Thus, this issues the challenge of development of an accurate scheme of atmospheric correction for internal reservoirs. In processing ocean satellite images the algorithms created specially for ocean condition are used. They have been successfully realized for CZCS and SeaFiWS scanners. With significant modifications such types of algorithms can be applied for correcting information of NOAA satellites. For this purpose algorithm and program capable to realize atmospheric correction for AVHRR data have been developed. This program has been created for processing large arrays of data.

MODELING ENVIRONMENTAL PROCESSES IN LARGE SALINE WETLANDS IN WESTERN AUSTRALIA

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Western Australian wetlands are dominated by large saline playas that are often dry, only filling during episodic rainfall events. Fresh (relatively) water wetlands are typically only found along the coastal fringe. The larger saline wetlands typically have a high proportion of endemic species that are not found elsewhere. These plants and animals have adapted to a suite of hydrological and chemical characteristics that are increasingly changing due to the mobilisation of salt and water in the catchments. The changes have been brought about by climate changes, farming practices and active ground water pumping by the resource industry. Awareness of the diversity and importance of these wetland systems is increasing with time, but it is also recognised that irreversible changes in wetland function and loss of species will occur in the short term. This paper will outline a short-term management option for assessing whether a proposed change will have a significant impact on the wetland's primary processes. These processes have been identified as hydro period, salt concentration, salt load, ionic composition, and nutrient load, within the context of the perceived conservation value of the wetland.

BENTHIC DIATOMS IN THE SALINAS OF THE DRY CREEK SALTFIELDS

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Diatoms assemblages are a well-recognised method of characterising the water quality in freshwater streams. Solar saltfields and inland lakes frequently experience eutrophication events and it would seem reasonable that different assemblages of diatoms may be present in saline waters of differing nutrient status. The first part of this ongoing study is the collection of information about the assemblages of benthic diatoms in a South Australian solar salt facility. The facility inputs seawater from a low nutrient samphire creek and poorer quality, high nutrient samphire creek. The salinas are series-flow, so each tends to remain at a given salinity, with the salinity change taking place spatially, rather than over time within one pond. Data about the salinity and nutrient status of the salinas has been gathered for several years for a number of sampling locations. The addition of JJ periphytometers (1) to the sampling regime has allowed the collection of benthic diatoms from these chemically well-characterised locations. This paper presents the summer diatom assemblages found in the two samphire creeks that provide seawater to the ponds, and in five of the concentrating salinas, along with a summary of the chemical characterisation of the brines at each location.

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THE ECOLOGY AND DISTRIBUTION OF SAMPHIRES (SALICORNIAE) IN THE GOLDFIELDS OF WESTERN AUSTRALIA

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Samphire is the common name for a group of succulent sub-shrubs and shrubs, which in Australia include Tecticornia, Halosarcia, Sarcocornia, Sclerostegia, Tegicornia and Pachycornia, all of which belong to the Tribe Salicornieae of the Family Chenopodiaceae. Samphires in Australia have a rich diversity not generally found in other countries. Interestingly Russia appears to have a similar diversity though shares none of our Samphire Genera. Samphires are spread all over Australia but tend to be regional in distribution. For example there are tropical species, sub-tropical species and species that are in the great artesian basin in central Australia. Often a species will only be found in one region however others are found over a wide range. Most of the Australian species of Samphire are unique to Australia (endemic), not occurring anywhere else in the world. The Western Australian Goldfields region has a good representations of most of the Samphire species. A total of 5 Genera, 19 species and a further 5 sub-species are found in the Goldfields. Most of the lakes share cosmopolitan species, however some lakes have species endemic to them. Samphire species appear to have evolved to fill different niches in the hostile environments they inhabit. To gain a better understanding of Samphire zonation, actis Environmental Services has taken soil samples from beneath many Samphire plants. These samples were tested for salinity, moisture content and pH, and a rough estimation of soil type. For the purpose of this presentations the salinity has been expressed as concentration of total salts in the soil moisture (g/L) and the moisture as grams per kilogram of dried soil sample. The principal factors that affect species zonation seem to be drainage, or hydroperiod, and salt load, or salt concentration. Other factors that affect where a particular species will grow are soil composition (gypsum, sand, limestone, clay) and temperature (tropical species, sub-tropical species). pH does not seem to be a factor.

BIOLOGICAL MECHANISMS AND A MATHEMATICAL MODEL OF VERTICAL STRUCTURE OF SHIRA LAKE ECOSYSTEM

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Field data on seasonal vertical distribution of physical-chemical and biological components of thermally stratified Shira lake ecosystem components in 1996-2000 have been analyzed. The interaction mechanism between plankton populations in aerobic and anaerobic zones through the transport of carbon and sulfur, the mechanisms of primary production limitation (by light and phosphorus) and inhibition (by light) and experimental kinetic characteristics of plankton populations in Shira lake have formed the basis to develop the layout of interaction of biological components in the lake ecosystem. A mathematical model of the vertical structure of the lake plankton based on the ecosystem layout and taking into account vertical turbulent diffusion of the matter has been developed. The role of each mechanism: grazing, light and biogenic limitation in forming vertical inhomogeneities and, particularly, deepened maximums of cyanobacterial biomass has been demonstrated. The theoretical curves of biological-chemical components' stratification have been made adequate to the field observations (depth of peaks, "width" of peak soles, biomass maximum of cyanobacteria, sulfur cycle bacteria (purple and green sulfur), oxygen, hydrogen sulfide). The calculations showed that to achieve better adequacy of hydrogen sulfide zone parameters requires to introduce flows of allochthonous organic matter. Theoretically the relationship between the allochnthonous flow of organics and the hydrogen sulfide from the bottom as control factors of the hydrogen sulfide zone has been investigated for the first time. Theoretical limit for the hydrogen sulfide zone rising depth under allochthonous load with organic matter has been established.

LIMNOLOGY OF DEEP AND SALINE LAKE BURDUR IN TURKEY

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Limnological characteristics of Lake Burdur, a deep (estimated max. depth 54 m), highly alkaline and saline lake in Lake District in south-western Turkey are presented. Lake Burdur is a closed basin and tectonic. The water level descends year by year attributed to evaporation during summer. Its level descended approximately 6 m between the years 1985 and 1996. This is dangerous for biodiversity. A set physical and chemical variables were monitored in 1997. According to composition of athalassic lakes it is sulphate-chloride type. Phyto and zooplanktons were sampled from surface layer of the lake. The phytoplankton composition of Lake Burdur consisted of Cyanophyta (*Anabaena sp., Chroococcus turgidus, Gleotrichia natans, Microcystis aeruginosa, Oscillatoria limnetica, O. limosa, O. redeckei, O. tenuis*), Chlorophyta (*Acanthosphaera zachariasii, Cladophora sp., Chlorococcum infusionum, Chodatella, quadriseta, Dictyosphaerium sp., Lagerheimia genevensis, Zygnema sp*.), Bacillariophyta (*Chaetoceros diadema, Cocconeis placentula*), Dinophyta (*Ceratium hirundinella, Peridinium cinctum*) and Chrysophyta (*Dinobryon sertularia, D. sp*.). While *Microcystis aeruginosa* was dominant in March (27.3 %), *Lagerheima genevensis* was dominant species in April and June (77.7 % and 47.4 % respectively). *Anabaena sp*. was dominant in July (77.3 %). The zooplankton composition of Lake Burdur consisted of Rhizopoda (*Difflugia sp., Vahlkampfia sp*.), Rotatoria (*Asplanchna sp., Brachionus plicatilis plicatilis, B. urceolaris, Filinia longiseta, Lepadella patella, Notholca acuminata, Platyias quadricornis*) and Crustacea (*Arctodiaptomus burduricus, Nauplius larvae*). *Arctodiaptomus burduricus* is an endemic species and it was dominant in March (46.6 %). Nauplius larvae was dominant in June (76.4 %). *Brachionus plicatilis plicatilis* was dominant species in June and July. Its dominance was over 90 % in these periods. The diversities of the phyto and zooplanktons were calculated according to the Shannon-Wiever diversity index. According to the results the highest diversity of phytoplankton was calculated as 1.97 in March. The lowest diversity was 0.43 in April because of high quantity of *Lagerheima genevensis* (62.4 org/ml) and low quantity of species. The diversity of both phyto and zooplanktons decreased in this period. While the lowest diversity of zooplankton was 0.12 in June, the highest was 1.08 in March. The diversity of each group was found low in the lake.

ON THE COMPOSITION OF HETEROORGANIC COMPOUNDS OF THE LIPIDS OF RECENT SEDIMENTS

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The lipids of organic matter play the main part in oil generation. The hydrocarbon composition of the lipids of recent sediments has been studied in detail by now but little is known on heteroorganic compounds of such sediments. The present paper describes N, S, O-containing components of the lipids of recent sediments of Utichie-3 lake (Khakasyia, East Siberia). By the sedimentation conditions this lake is envisaged as a typical representative of the terrestrial basins of reducing facies. Recently the sedimentary deposits of this type are widely believed to be potential oil-source rocks, which is justified. The lipids were isolated via cold extraction of air-dry sediments by methanol-chloroform mixture (1:1). The lipids yield was 0.6 wt% per dry sediment. The lipids concentrate contains 0.55, 12.6 and 10.5 wt% of nitrogen, sulfur and oxygen, respectively (O=100-(C+H+N+S)). Using the methods of non-aqueous potentiometric titration and IR-spectroscopy, it has been shown that nitrogen compounds of the lipids are represented by the components of basic (18 rel.%) and non-basic nature. Nitrogen-containing organic compounds are similar to diethylamine and/or tetraphenylporphyn by their basicity. 96.1 rel.% of elementary sulfur is co-extracted with the lipids. The remaining moiety of sulfur compounds enters into the composition of saturated sulfides. Oxygen compounds are represented by acids and ethers. To separate the polar compounds of the lipids by the functional feature, we used the consecutive extraction of the components by 0.1 N aqueous solutions of hydrochloric acid (acidic extract) and sodium hydroxide (alkaline extract). In accordance with the data of elementary, functional, and spectral (IR, UV) analyses, organic compounds of nitrogen in the acidic extract are represented only by the bases (82 rel.%), in the alkaline extract - by non-basic nitrogen-containing compounds (20.5 rel.%). The non-extracted residue contains mainly non-basic nitrogen organic compounds and about 15 rel.% of bases. The nitrogen bases may be represented by amines and aminoacids, non-basic compounds – by amides and tetrapyrrol pigments. The acids and the compounds containing ether groups are present in all the fractions obtained. All the organic sulfur compounds are concentrated in the residual fraction. A comparative analysis of heteroorganic compounds of the lipids of the sediments and oil of terrestrial genesis has been carried out.

THE FOREST INFLUENCE UPON CHEMICAL COMPOSITION AND QUALITY OF RIVER WATER OF SHIRA LAKE BASIN

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The role of wood ecological systems in the pure sweet water reproduction in the southern districts of the Middle Siberia is investigated. The investigation objective is a natural complex with the basin of the river Son 56 m in length from the river head to the river outlet and the area of 500 km (the Republic of Khakasia). The modern wood vegetation of the reservoir is represented in larch planting of the multi grass group of wood types with the density of 0,3-0,4 and multi grass birch planting of the 2nd - 3d age class with the density of 0,3-0,4. The big stand with stream of the river Son extends for 23 km2. Law water observations were held in 1981, 1982, 1997 in 5 points: 1 (control) is located near the river head, 1,5 km above the population place (the station of Son), 2 - is below the population place and the railway station, 3 - is on the river out from the big stand. Then the river Son runs for more than 12 km among the agricultural fields, which are located on slopes with the grade of 3-5. The 4th point is located on the out from these grounds. The 5th point is situated at the inflow place of the river Son and the river Shira. The analyses results (acidity, weighted materials, permanganate oxidation, biological oxygen drain, hardness, ammonium nitrogen, nitrite and nitrate nitrogen, sulfates, chlorides, magnesium, calcium, phosphates) testify that the water in the river Son in the observation points differs on the concentration on a great number of characteristics. The greatest water correspondence to the maximum allowable concentration on all characteristics is found out at the river head and after its out from the wood (points 1 and 3). In the rest of observation points the content of these components often goes beyond the maximum allowable concentration. First of al, it concerns weighted materials, nitrite and nitrate nitrogen, biological oxygen drain. The maximum number of weighted materials is registered after the river passes through the population point and agricultural grounds (points 2 and 4). Their minimum concentration is observed at the river out on the forested part of the reservoir (point 3), and at the river heads these materials in the water are not detected (point 1). Apart from that, the water clarity in these points (point 3 and 1) is the highest (30 cm) and the biological oxygen drain is less than 1 of the maximum allowable concentration. Such toxicological harmful characteristics as ammonium nitrogen are absent and occurred at permissible rates, nitrite nitrogen is not detected. The river water from the forested part of the reservoir basin is of high quality. So, wood plantings of drainage basins of salt lakes in the wooded steppe part of the south of Siberia act as natural biogeochemical filter-cleaners. They improve the water analysis and bacteriological characteristics of water, protect it from products of erosivity. When the forestation of reservoirs of small rivers is in the range of 15-25%, wood ecological systems are able to improve the quality of sweet waters what is of positive ecological effect.

THE VARIABILITY OF LIFE HISTORY PARAMETERS IN *ARTEMIA* AS THE ADAPTIVE MECHANISM FOR THE EXISTENCE IN UNPREDICTABLE SALT LAKE ECOSYSTEMS

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In experiments the quantitative aspects of variation of the principal growth and reproductice parameters parameters in *Artemia salina* and *A.franciscana* family groups (progeny from a single brood) originated from several Eurasian populations (Krimea, Altai, Wietnam) have been determined. Special attention was paid to the influence of alterations of reproductive modes (parthenogenesis and bisexual reproduction) and density of rearing. In *A.salina* the transition from parthenogenesis to bisexual reproduction reduces the duration juvenile period and the whole life cycle, decreases the total number of broods per life cycle, but increases the proportion of nauplia in total fecundity of female from 14 to 73%. However, it does not influence the mean size of individuals on the comparable stages of the life cycle and the sexual products amount in separate broods. The variation coefficients (*C.V.*) of the majority of parameters (with except of the female size at reaching of maturity) at bisexual reproduction are much higher than at the parthenogenesis. At both reproductive modes in two species individual sizes at different stages of life cycle retain the highest stability (C.*V.* < 10%). The total brood number span and absolute fecundity per the life span are most variable (*C.V.* up to 150%). Duration of the juvenile period and of the entire life span are characterised by the intermediate level of variation (*C.V.* in limits of 16 - 37%). The acceleration of maturation of females does not influence the survival (in both species) and the number of sexual products in the first brood (in *A.salina*), but leads to an increase total number of broods and fecundity per life span. As a rule, strong correlations between the majority of life-history parameters are not revealed. It provides the rapid re-adjustment of reproductive processes in natural populations. The heritability for the duration of juvenile period at both modes of reproduction is very high (up to 0.5 – 0.6), therefore the natural of artificial selection on changing of this parameter may be rather effective. In contrary, the heritability for the all reproductive parameters is very low (<0.2). The high level of variation and presence of alternate reproductive modes in life cycle increase significantly the dynamic stability of *Artemia* populations in unstable and unpredictable conditions of saltwater bodies. Variability of the age of maturity in family groups shows that individuals in a progeny from a single female enter the reproduction at different times. It reduces the probability of the death of specimen belonging to one family as a result of water salinity decrease after heavy rains or a lack of food. At both reproductive modes the intrinsic rate of population growth of *A.salina* are almost equal. However, the bisexual reproduction provides the current functioning of populations, but parthenogenesis secures their future existence.

SOME ASPECTS OF THE THERMAL REGIME AND PHYTOPLANKTON DISTRIBUTION OF SALT LAKE SHIRA

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Researchers studying biological processes in the aquatic ecosystem encounter the problem of estimating the effects of factors of biological and physical nature on distribution and functioning of phytoplankton. The reasons for non-uniformity of phytoplankton distribution are essentially related to meteorological and hydrophysical processes. These processes in Lake Shira change a temperature and salt regime, and a density changing shows approximately a some biological components changing. Determination of the regimes changing time is necessary for an exact seasonal and daily prediction of an ecosystem dynamics. Anomalous changes in water temperature reflecting the effect of physical factors (primarily water movement and turbulent mixing) on the ecosystem are important for the investigation. The forecast of phytoplankton distribution is hampered by the diversity of relations among factors of the environment and hydrobiocenosis. It is extremely difficult to evaluate prognostic value of each separate element of the aquatic system. To obviate the limitations of the prognosis of formation and dynamics of various-productivity zones, experiments can be made on mathematical models using ground-truth and satellite data. The appropriately processed satellite information can be used to record dynamic changes in inland waters. The main aim of the work is to estimate quantitatively and qualitatively the interaction of two structures of aquatic systems: physical and biological, using numerical modelling, satellite information and ground-truth data. The main problem is that phytoplankton inhomogeneity and hydrophysical fields have different spatial-temporal scales of existence. However their effect can be estimated by numerical modelling and regular application of satellite data to verify the solution in modelling. In our case study, one of the most important stages was information establishing the relationships between meteorological and hydrological data. The algorithm of mathematical model has been developed to calculate hydrological and biological parameters of Lake Shira. In this case the model is adapted to an aquatic ecosystem for which vertical profiles of water temperature, nutrient and phytoplankton concentration are calculated. For computer modelling we used spatial-temporal diagrams of the dynamic processes and the analytical equations. This approach we used to estimate the scale of variation in phytoplankton inhomogeneity under the impact of hydrophysical and hydrodynamic processes. Numerical modelling based on this approach is the way to combine the data of the ground-truth experiments and the remote sensing data to obtain the prognosis of dynamic changes in the inland waters. The software developed initially enabled us to analyse satellite data of Lake Shira using the distribution of the radiation temperature and turbidity retrieved in the spring-to-summer periods from 1998 to 2001. It remains a problem to restore vertical profiles of phytoplankton on the basis of the satellite information that gives horizontal distribution of chlorophyll concentration. Models on the basis of meteorological and hydrological algorithms, in combination with the data of satellite measurements, can give more information on the intensity of dynamic changes in some regions of the lakes and internal waters.

WATER CHEMICAL COMPOSITION IN *ARTEMIA* LAKES OF WESTERN SIBERIA

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Western Siberia is the most extensive zone of saline lakes distribution in Russia. These lakes are an inhabitation of brine shrimp *Artemia* which is certainly considered to the best starting forage for fish and crustaceans. Studing of chemical composition and mineralization in *Artemia* lakes was the purpose of this work. 28 lakes located on territory of Chelyabinsk (4), Kurgan (20), Tyumen (2) and Omsk (2) regions were chosen. Hydrochemical sampls were selected during summer season 2001. All investigated lakes were brine; the area of water mirror was small or medium. One lake was self-sediment. For the researched period general mineralization of a lake brine was from 20,0 up to 299,0 ‰. Cyclic changes of water mineralization were legiblly traced. The least salt content in mineral lakes was observed during a spring high water at dilution brine by thawed snow, maximal salt content was at the end of summer and at the beginning of autumn. The relation of the least mineralization to the greatest one was from 0,19 up to 0,73. Using Alekin's classification, water of the majority of lakes was related to chloride class, sodium group, III type. Five lakes had II type of water. In one lake there was sulphate class and one lake had chloride-sulphate class of water. A number of lakes changed type of water from III to II or from II to III type. Water of one lake had I type; water of another one had sodium-magnesium group. Maximal concentration of chlorides reached 142,0 g/l; it was 97,5 g/l for sodium and potassium cations. The relation of chloride ions to sulphate ones was in average from 1,2 up to 5,5. Hydrocarbonaceous and carbonaceous ions had low concentration and only in one lake their concentration achieved some more numbers. Water in lakes was very hard mainly due to high concentration of magnesian cations. The ratio of magnesian ions to calcium ones averaged from 24,2 up to 34,9. The content of calcium ions which is a necessary element of shrimps ability to live in water of the most numbers of lakes was on rather high level. Exception was made with water of one lake where calcium ions had concentration of 3,0 mg/l at total hardness in 5 mmol/l. Water of the majority *Artemia* lakes had alkalescent reaction (pH 7,5-8,5); there was a displacement in separate lakes to the neutral side during a high water (pH 7,0-7,5). In 5 lakes there was alkaline reaction. To know organic content in *Artemia* lakes they were used on data of permanganate oxidizability and data of biochemical oxygen consumption within 5 day (BOD_5). The data of permanganate oxidizability for the researched period changed from 6,7 up to 106,6 mgO_2/l. BOD_5 size in *Artemia* lakes reached 20,0 mgO/l. Maximal values of BOD_5 were in autumn hydrochemical survey. Thus, water of the majority *Artemia* lakes investigated in summer season 2001 was highly mineralized, chloride class, sodium group of III type. A number of lakes were II type or changed it during a season, one lake had I type. In general, reserched lakes were characterized by typically high content of chloride, sulphate anions, and also sodium, potassium and magnesian cations, organic matters. Water of the majority of lakes was very hard; it had alkalescent reaction; there were lakes with alkaline or neutral water.

SALINITY OF WATER AS A FACTOR TO DETERMINE DEVELOPMENT OF THE BRINE SHRIMP ARTEMIA POPULATION IN THE LAKES

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On the basis of researches Artemia parthenogenetic population in 28 lakes of Kurgan, Omsk, Tyumen and Chelyabinsk regions in season of 2001 the influence of salinity on some productive and size and weight parameters Artemia was revealed. Average per season parameters of water salinity in researched lakes were ranged from 51 up to 265 ‰. Productional and biometric- weight parameters were analyzed too: 1) Average biomass of shrimp (B; lim: 0,1-48,7 mg/l); 2) The maximal biomass of shrimp in a season (B_{max}; lim: 2,4-253,9 mg/l); 3) Average number of planktonic cysts (C; lim: 0,8-517 per l); 4) Average number of benthos cysts (C_b; lim: 0-5834 thousand per m^2); 5) Average weight of females (P; lim: 1,0-7,5 mg); 6) Average number of cysts in ovisac (N; lim: 7-46 piece); 7) Average length of adult females body (l; lim: 8,0-12,3 mm); 8) The ratio of cephalotoraks length to abdomen length (C/A; lim: 0,7-1,5); 9) Average number of setae on each furcal branch (Nf; lim: 2,2-13,3). Regressive linear analysis between salinity (y) and parameters (x) listed above has shown:
- the presence of rather high negative connection between (y) and Nf with a correlation index r_{xy} =-0,78;
- the presence of average negative connection between (y) and C/A with a correlation index r_{xy} =-0,32;
- the absence of connection or presence of weak connection (r_{xy} not more than 0,29) with other parameters.

All researched lakes are divided into 4 groups:
I-10 lakes with average salinity of water 51-76 ‰; II-13 lakes with average salinity of water 77-144 ‰; III-3 lakes with average salinity of water 168-199 ‰; IV-1 lake with average salinity of water 265 ‰.
In the first group of lakes Artemia was appeared, but because of a plenty of alimentary competitors it was in a depression condition. In the second group of lakes Artemia, as a rule, dominated in community, but it was accompanied with other species. In the third group of lakes Artemia was developed practically in a monoculture. In the fourth group of lakes Artemia tested toxic action of high salinity.
For each group of lakes average productive and biometrical- weight parameters mentioned before were calculated, and relative analysis was carried out with help of Student t-criterion on 5 % level of significance. IV group was not analyzed because of small number of sample.
Thus the productive parameters of Artemia population (shrimp biomass, number of planktonic and benthos cysts) are the lowest in lakes with salinity of water lower then 76 ‰; as a rule, they are average in lakes with salinity of water 168-199 ‰ and they are the highest in water with salinity 77-144 ‰. Considering biometrical and weight characteristics of shrimps, the relation C/A and number of setae on each furacal branch are influenced of salinity most of all. These parameters naturally are decreased with increasing of water salinity.

MICROCALORIMETRIC MEASUREMENT OF HEAT FLOW RATE AS AN INDICATOR OF THE SALINITY-DEPENDENT PHYSIOLOGICAL CONDITION OF MICROALGAE

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This study demonstrates the successful use of the microcalorimetric measurement of the instantaneous heat flow rate to determine the effect of environmental salinity changes on the physiological condition of a model algal system under stress. As remarked by Criddle and Hansen (1), "Calorimetry plays a unique role in measurements of plant metabolic properties. Calorimetry provides more than just another means for measuring metabolic rate because it measures a fundamentally different property (energy) while other methods measure mass". The microalgal cells of *Chlorella vulgaris* were used to investigate the correlation between the heat flow rate and the growth rate as energetic and material indicators, respectively, of overall metabolism under different salt conditions. The physiological condition of the cells monitored from the rates of respiration and photosynthesis by measuring the consumption and evolution of oxygen, respectively. Chlorella cells were grown in the low-salt, Tamiya medium at 30^{o}C (2). NaCl was added to the cell suspensions in a range of concentrations from 75 to 550 mM. The rate of oxygen consumption and evolution were measured by the polarographic method using a Clark electrode. The heat flow rate was measured in a 3-cm^3 glass ampoule of an LKB Bioactivity Monitor, a type of heat conduction microcalorimeter. The results in terms of respiration and photosynthesis showed that the physiological activity are kept close to the control value at low salt concentrations. Under these conditions the heat flow rate also remains to close to the control. At 150-450 mM NaCl the heat flow rate increased in comparison with the control. This was accompanied by an increase in the rates of oxygen consumption and evolution, meaning that there was more demand for the respiration and photosynthesis to provide the energetic requirements of the cells. In specific terms, it seems likely that these responses of plant cells are connected with the additional expenditure of energy to pump out salt and thus maintain ion homeostasis and osmoregulation. Above 450 mM NaCl, there was a marked decrease in the rates of respiration and photosynthesis that were accompanied by the decline in the heat flow rate at higher salt concentrations. Based on the above data, and supported by information available in the literature, it would appear the heat flow rate is an objective and sensitive indicator of the functional, physiological condition of the algae in response to the increased stress due to the changes of the salt concentration in the medium.

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THE COMMUNITY OF PHOTOTROPHIC SULFUR BACTERIA IN MEROMICTIC SALT LAKE MOGILNOYE

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Meromictic lake Mogilnoye is located in southeastern part of Isle Kildin (Barents Sea). The total area of the lake is about one hectare; the largest depth is 16 m. The penetration of sea water results in a considerable salinity gradient along the depth, from nearly fresh upper layers of water (4.1 NaCl g/l) to highly saline water of the near-bottom layers (18.8 g/l). Below 9 m, the anaerobic zone enriched with hydrogen sulfide occurs. As a result, the upper part of the hydrogen sulfide zone (8.5 – 11 m), in which 5% - 22% of light penetrates, is pink-colored due to intense development of phototrophic sulfur bacteria. Using the ^{14}C incorporation technique, we measured the seasonal production of organic matter (OM) by phototrophic sulfur bacteria. It was demonstrated that in all causes the OM production by phototropic bacterial is sufficiently higher than the OM production by phytoplankton in the upper oxic layers of the water column. For example, in June 1999 at depths between 8.5 and 11 m the total OM production was 620 mg C (m^2 day), and in the 0-8 m layer, it was only 280 mg C (m^2 day). The results of light and electron transmission microscopy, as well as the absorption spectra analysis of pure cultures and acetone extracts of bacteriochlorophylls, showed that the predominant bacteria within the pink water layer were green phototropic sulfur bacteria *Chlorobium phaeovibriodes, Pelodictyon phaeum, Prostecochloris phaeoasteroidea*, containing bacteriochlorophill *e.* Due to the presence of the brown carotenoid isorenieratin in their cells, they are able to utilize light with wavelengths of 450 – 500 nm, which can reach the depth of 8-10 m. The maximum concentration of green phototrophic bacteria, observed at the depth of 9 – 9.5 m, was up to $40 \cdot 10^6$ cells/ml. These species are adapted to life in saline water. Dominant species *Ch. phaeovibriodes* has small nonmotile vibrio-shaped cells (0,3 x 0,5 μm.). *P. phaeum* has larger oval cells (0.5 – 0.7 x 1.0 – 1.5 μm) containing gas vacuoles; they can occur in microcolonies of irregular shape measuring 5– 15 μm. Minor species *Pr. phaeoasteroidea* has irregular-shaped cells with prostheca. Purple phototrophic sulfur bacteria could be rarely detected in the lake. In some years and seasons, single *Marichromatium purpurata* cells were demostrated. Oval cells (1.5 x 3.5 μm) of *Marichromatium* containing okenone and producing in liquid media with 20 g/l NaCl large macrocolonies several mm in diameter were also found. Spherical halotolerant species *Thiocapsa sp.* cells (1 – 3 μm.) were found. They contained bacteriochlorophyll *a* and the pink-red carotenoid spirilloxantine. The presence of spherical motile halotolerant purple-violet *Thiocystis sp.* (2.5 – 3 μm) that contained bacteriochlorophyll *a* and rhodopenal was shown. In chemocline nonsulfur phototrophic bacteria were not found in the lake. The fresh water phototrophic bacteria *Chlorobium limicola*, *Allochromatium vinosum* and *Rhodopseudomonas palustris* were found in the near-short sediments.

HAS *ARTEMIA PARTHENOGENETICA* BEEN INTRODUCED INTO WESTERN AUSTRALIA THROUGH HUMAN AGENCY?

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Populations of *Artemia parthenogenetica* have been known for several decades to occur in coastal salt lakes at Rottnest Island and Lake Hayward, and in salterns at Port Hedland and Shark Bay. The origins of these populations have been interpreted as due to introductions by humans. Further, within the past ten years, populations of *A. parthenogenetica* have been found in playa salt lakes in the hinterland of south western Western Australia where none had been recorded in previous salt lake studies. In the absence of unambiguous historical records to the contrary, we question the initial hypothesis that these brine shrimp populations result from translocations by humans. The coastal salt lakes of Western Australia are visited annually by large numbers of waterbirds migrating from Asia/Siberia which have the potential to transport cyst stages of brine shrimp. We used allozyme analysis to identify the clonal types (multi-locus genotypes), clonal frequencies, genotypic diversities (G_O) and genotypic identities (I_G) of six populations (three coastal, three inland), and as a basis for analysis of clonal relationships. One clonal type dominated all except the Rottnest Island population. The Rottnest population had the highest genotypic diversity and genotypic identity furthest removed from the remaining five populations, but shared some clonal types with the Shark Bay population. The inland and Lake Hayward populations were characterised by little genetic diversity, nearly identical clonal compositions and high level of genotypic relatedness. We discuss these genetic results in the context of the two questions: (1) Were humans responsible for transporting *A. parthenogenetica* to Western Australia, and (2) Which coastal populations have been sources for the spread of *A. parthenogentica* into the hinterland?

PATCHY ENVIRONMENT AS A FACTOR OF COMPLEX SPATIOTEMPORAL PLANKTON DYNAMICS: A THEORETICAL STUDY

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The current turn-of –the-century period witnesses the intensive use of the bioproducts of lakes, rivers and the ocean while at the same time calling for precautions to preserve their ecological stability. This requires that biophysical processes in aquatic systems be comprehensively explored and new methods for monitoring their dynamics be developed. This paper is focused on the processes underlying the dynamics of spatially inhomogeneous plankton communities. We use a minimal reaction-diffusion model of the nutrient-plankton-fish food chain to simulate the diffusive interaction between fish-populated and fish-free habitats. We show that such interaction can give rise to spatiotemporal plankton patterns. The plankton dynamics depend on the fish predation rate and can exhibit both regular and chaotic behavior. We show that limit cycle and chaotic attractor coexist in the system. The entire basin of attraction of the limit cycle is found to be riddled with "holes" leading to the competitive chaotic attractor. The chaotic dynamics is typical of a wide range of the fish predation rates.

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HALOPHILOUS MICROORGANISMS IN WATER – SETTLEMENTS FROM SALT DUMPS OF POTASSIUM MINES, SUBSURFACE WATERS AND PALEOZOIC MARINE LAGOONS

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Halobacteria are representatives of Archeabacteria. Four genera of extremely halophilous Archeabacteria – *Halobacterium, Halococcus, Natronobacterium, and Natronococcus* are recognized at present. These are aerobic heterotrophs that occur under salt concentrations from 18 to 30%. Extremely halophilous microorganisms are found in salt lakes, marine lagoons, and salt brines of the Dead Sea. The growth of halophilous heterotrophic microorganisms was observed in samples of salt brines from the water – settlements of potassium dumps in Bereznikovsky mines at Upper – Kama deposit of potassium – magnesium salts. Halophilous methanogenic microorganisms that are referred to *Methanococcoides euhalobius* and *Methanococcus halophillus* species, respectively, are found in subsurface waters of Paleozoic sediments from Perm Pre-Urals. Halophilous methanogenic microorganisms belonging to *Methanococcus* genus were determined in lake water that is less mineralized. Two strains of moderately halophilous alkalophilous aerobic hydrocarbon – oxidizing bacteria were isolated from hydrocarbonate – calcium mineral waters of aerated springs (with nitrogen, methane) that are characterized by presence of organic substances with hydrocarbon composition. One of the strains isolated was presumably referred to *Natronobacterium* genus. Viable cells of halophils were isolated from salt strata of Permian deposits in Poland and USA that were dated at 250 – 300 million years. Undetermined species-specific bacterial cells were found in clays of sylvinite band from Upper-Kama deposit.

MICROBIAL PROCESSES OF CARBON AND SULFUR CYCLES IN THE SALT LAKE SHIRA (KHAKASIA)

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The microbial and biogeochemical investigations of salt lake Shira were curried out in the August of 2001. Total bacterial number in the water column varied from 1.5 to $22x10^5$ cells/ml with maximums at the depths of 8 and 14 m. The increase in the bacterial plankton number at the depth of 8 m can be explained by the development of the processes of degradation of organic matter (OM) produced by phytoplankton. The second maximum of the bacterial number located in the upper part of the anaerobic zone at the depth of 13.5-14 m is characterized by the presence of H_2S at a concentration 0.59 mg/l. The water samples collected from this depth were pink-colored due to the presence of purple sulfur bacteria ($6x10^5$ cells/ml). Based on morphological and spectral properties, these bacteria were identified as *Lamprocyctis purpurea* (earlier *Amoebobacter purpurea*). Moreover, as the minor component, two groups of nonsulfur purple bacteria were found in enrichment cultures. The bacteria of the first group bore certain morphological similarity to the *Rhodobacter-Rhodovulum* morphotype. The cells were nonmotile, oval-shaped, 0.3-0.4 x 0.5-0.7 μm in size. The second group of nonsulfur bacteria can be identified as exospores formed *Rhodomicrobium vannieli*. These cells were oval-shaped, 1.0-1.2 x 2.0-2.8 μm in size. The primary production value measured by the ^{14}C method was 943 mgC/(m^2 day). The contribution of anoxygenic photosynthesis was relatively insignificant – approximately 7% of the total production of OM. The activity of bacterial chemosynthesis was still less: not more than 2%. In the anaerobic water column, sulfate reducing bacteria (SRB) play the main role in the terminal phase of OM decomposition. The highest rates of sulfate reduction were determined in the near-bottom water and in the upper (0-2 cm) sediment layer: 114 μg S/(l day) and 901 μg S/($дм^3$ day), respectively. Based on our calculations, 73 % of daily produced Corg was consumed by SRB. The methane distribution in the water column and sediments was typical for meromictic lakes. In the water column, methane concentration increased in the termocline at the depth of 7-8 m and reached the highest value (17 μl/l) in the near-bottom zone. The highest CH_4 concentration (up to 57 μl/l) in sediments was found in the upper layer (0-3 cm). According to ^{14}C measurements, the total rate of methane production in the anaerobic water column and upper part of sediments was almost an order of magnitude higher than the rate of CH_4 oxidation by aerobic and anaerobic methanotrophs.

THE TAMBUKAN LAKE – THE RETROSPECTIVE LOOK AT THE PROBLEM.

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The bitter-salt Lake Great Tambukan, the sludge muds of which are well known owing to its unique bactericide wound-treating and curable properties, is situated 12 km off the south-east of Pyatigorsk, on the border of the Stavropol territory and Kabardino-Balkaria. The Lake is undrained, it's rainfed. Water-freshening of the Lake, caused by rapid rise of the water level, brought the ecological system of the lake to deep ecological crisis. The given data is the authors attempt to estimate the present ecological situation of the lake. At the beginning of the 20th century the area of the lake was about 170 hectars. It sometimes became dry, and as a result of it the mineralization of the water was 41gr/lt. The organic life in the lake is presented by the bluish-green water-plants (22 species), crawfish Artemia Salina L (up to 10 000 specimens to 1 m^2), flies Ephydra riparia Fll. and different sulphur bacteria [1,2] which served the initial (forming-up) material for the curable mud, according to the opinion of academician L. B. Isachenko. The first attempts of artificial filling the lake with water were made at the beginning of the 20th century. Then in 1930 fresh water from the river Etoka was drawn to the lake. And by the early 50s the mineralization of the water had dropped to 70-120 gr/lt, and the depth of the lake increased up to 2m. 10 species of the blue-green algae, revealed there in the beginning of the previous century, disappeared, but 69 forms of the chlorophyll-bearing algae appeared[3]. But by the late 60th the water link between the river and the reservoir had stopped functioning. The mineralization of the water began to grow, a great amount of A. salina appeared, as well as E. riparia; the bottom of the lake was covered with the undergrowth of Ruppia maritime L., which had been known before only in half-fossil state[3]. In 1977-1978 two slits (holes) were bored at the western shore of the lake with the day water debit of more than 1500 m^3 of thermal fresh water each. In 1978 they both were closed but their closuve was not a success. Thermal fresh water began to filter into the lake through alluvial-deluvia deposits. Some hundred cubic metres of fresh water got into the lake every day. During 20 years by 1997 the level of the lake had risen up to 7m, its area increased up to 200 hectars, the mineralization of the water dropped to 12-24 gr/lt. Nowadays salt-loving plants and animals are being replaced by fresh watered ones; deoxidization of the curable mud is going on, its supplies are under the threat of extermination. We think that the sharp rise of the water level in the lake is explained by the functionity of the slits, which were closed down contrary to the tecnological rule.

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FEATURES OF DEVELOPMENT *ARTEMIA* BRINE SHRIMP IN LAKES ON A BORDER OF AREA

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Salt lakes of Novosibirsk region are on a border of geographic area dated to arid zones steppes and forest-steppes. A relief of basin is crest-flood-lands; and there are lakes in its declined places. The surface of area is combined clay, covered by thickness of sand, sandy loams and loams. The most repeated type is a lake with a high compound of silt, shallow, difficult to reach because of saline soils. A heterogeneity of soils and weak development of river system has caused a various chemical composition of water in lakes. A total mineralization of water in lakes of Novosibirsk region where *Artemia* is observed, changes from 22 up to 243 ‰. All lakes are chloride type. The general water area of *Artemia* lakes has made nearly 8000 ha (on incomplete identification of 2000). *Artemia* was found individually in isolated Udinsk stretch of Chany Lake when water salinity was increased up to 22‰. Thus *Hexarthra mira*, *Arctodiaptomus salinus* and *Moina microphtalma* were observed there in mass amount. In process of salinity expansion predominance of *Artemia* becomes stronger in Salty (Soljionoe) Lake too, for example, it dominates where salinity achieves 34 ‰, but thus also there are numerous of rotifers *Hexarthra mira* and calanoid *Arctodioptomus salinus. Moina microphtalma* is not observed any more there. For lakes in Novosibirsk region salinity equal of 50‰ is a barrier where zooplankton forms are not observed. If the total mineralization is higher, *Artemia* is found in a monoculture. The average biomass of brine shrimp for a season changes from 5,9 up to 11,6 g/m^3. Higher values of biomass are marked at an average mineralization (117‰). Maximal *Artemia* fertility was observed in reservoirs with optimal mineralization for development of shrimp. The residual fertility is equal 14 individuals in reservoirs with low mineralization for salty lakes, reaching 34‰; it achieves 25 individuals at average salinity (117‰ in Gorkoe lake); a residual fertility is reduced and compounds 13-16 ones at higher mineralization (up to 243‰). Number of eggs in thickness of water also varies in dependence on level of mineralization. The maximal amount of eggs was marked in lakes with mineralization from 89 up to 117‰ and reached 93 000 per m^3. The reservoirs located on a border of geographic area of steppe and forest-steppe arid zone are less productive in comparison with lakes located in semi-desert and desert zone. Thus, the lakes located on a border of geographic area of steppe and forest-steppe arid zone are characterized by the big variety of water salinity and significant distinctions in biological characteristics of shrimp *Artemia*.

MICROBIAL PROCESSES OF METHANE CYCLE IN MEROMICTIC LAKE MOGILNOYE (ISLE KILDIN, BARENTS SEA)

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Microbial methane production and methane oxidation in the relict meromictic lake Mogilnoye located beyond the polar circle on Isle Kildin (Barents Sea) were investigated. The lake is separated from the sea by a sandpebble ridge through which the sea water is filtered into the lake. A steep salinity gradient occurs in the deep part of the lake. From the depth of 8 m, the H_2S concentration dramatically increases to more than 100 mg/l in the near-bottom water. Aerobic water column is characterized by a low concentration of methane (0.1-0.9 µl/l). Beginning from the upper part of the H_2S zone, the concentration of methane rapidly increases to 1-10 µl/l in the redox zone and to 50 µl/l in the near-bottom water. The measurement of the rates of microbial methane oxidation was carried out using the ^{14}C radioisotopic technique, which allows not only the production of $^{14}CO_2$ during the oxidation of $^{14}CH_4$ but also the incorporation of ^{14}C in the organic compounds to be measured. The rate of methane oxidation increased with the depth from 1 to 270 nl/(l day) and in the near-bottom water reached the value of 1860 nl/(l day). From 10 to 90% (average 50%) of oxidized ^{14}C was found in the organic C. Based on our measurements, the integral rate of methane oxidation in the water column was approximately 2.5 ml/(m^2 day). The rate of methane production in the water column measured by the ^{14}C method was sufficiently high. Varying from 20 to 655 nl/(l day), the rate of methane production increased with depth, and the highest values were demonstrated in the near-bottom water layers. Surprisingly, a significant rate of methane production was found in the aerobic water column at a depth of 1-6 m. Probably, the process of methane production occurred in zooplankton digestive tracts or in pellets, as well as in the microzones of large particles of suspended matter. According to our measurements, the integral rate of methane production in the water column was more than 3 ml/(m^2 day). Based on the comparison of the rates of methane production and methane oxidation in the water column, it is possible to conclude that in the summer time lake Mogilnoye is a source of atmospheric methane. The seasonal change in methane concentration indicates that in the summer-autumn time methane is accumulated in the water column and sediments; but in winter and spring, a significant part of soluble methane is oxidized by the microbial community.

ON THE EFFECT OF CANNIBALISM INTENSITY ON THE FUNCTIONING OF AQUATIC ECOSYSTEMS

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Cannibalism frequently occurs in natural food webs. The aim of the work was to construct a mathematical model of the effect of cannibalism intensity on the dynamic behavior and functional characteristics of simple aquatic ecosystems. A mathematical model of an aquatic ecosystem has been constructed, with the following principal trophic links: limiting nutrient concentration, producers (phytoplankton), predators of the first order, and predators of the second order. The model takes into account the age structure of the second-order predator and includes two age groups (the young and adults). The adult predators of the second order are cannibals feeding on both first-order predators and their own young, which consume phytoplankton. The model was used to investigate the effect of cannibalism intensity on the net primary production and the dynamics of trophic links in the aquatic ecosystem characterized by cannibalism at the upper trophic level or by the emergence of a third-order predator in the system. It has been found that when cannibalism increases above a certain level, the concentrations of both adults and the young of the 2nd-order predators decrease. At the same time, the concentrations of the 1st-order predators and of nutrients increase, while the biomass of producers decreases. When the cannibalism intensity is low, the net primary production of the system increases to a certain level with the increase in cannibalism intensity and drops sharply when the level of consumption of the young is high. The emergence of the 3rd-order predator in the system leads to a change in the dynamics of links in conformity with the "bottom-up" and "top-down" control. Thus, cannibalism of a certain magnitude can lead to an increase in integrated parameters of aquatic ecosystems: the amount of energy used by the ecosystem and the productivity in the photosynthesis link.

THE EFFECT OF LANDUSE ON BENTHIC MICROBIAL COMMUNITIES IN SALT LAKES OF THE NORTHERN AGRICULTURAL REGION, WESTERN AUSTRALIA.

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Salt lakes of the northern agricultural region of Western Australia, through their highly variable physical and chemical characteristics, provide an array of microhabitats for a potentially large diversity of benthic microbes. The benthic microbial communities (BMCs) that colonise the sediment surfaces of these lakes remain largely undescribed and hence little is known of the causative relationships between the salt lake environment and community structure and function. The salt lakes of the region are located in a catchment in a state of severe degradation caused primarily by past and current agricultural and pastoral landuse practices. The immediate threat to the salt lakes has involved modification of lake hydrologies, particularly increased volumes of saline surface flow entering the lakes and rising groundwater caused by wide spread vegetation clearance in the catchment area. This paper describes the impact of catchment degradation on the structure and functioning of salt lakes, including the BMCs, of the Yarra-Yarra – Mongers Lake system in the northern agricultural region of Western Australia using data gained from a study which commenced in 2001.

THE BIOLOGICAL CHARACTERISTIC OF SMALL SALT LAKES OF ODESSA REGION

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For research were chosen 3 groups of lakes. The first group (7 lakes) are the small reservoirs, separated from the sea, of volume up to 100 000 m^3 (salinity - 10-18 g/l). These lakes are situated between the sea and urban territory. The sewer drains are constantly flow from that territoty into lakes. Therefore into lakes the significant amount of biogenes acts. The second group (5 lakes) is a system of lakes in a gulf of Khadgibeysky liman (salinity - 9-42 g/l). The high concentration of dissolved organic substance and mineral phosphorus are characteristic for this group of reservoirs. Water in some of them blooms during the year. In addition12 lakes in the system of Sukhoy liman were investigated. The mineralization in them grew from 1,25 (top reservoir) up to 15 g/l (lower reservoir). In all reservoirs the complex hydrobiological and hydrochemical researches were carried out. Besides of traditional definition of species structure and calculation of biodiversity indexes and mass characteristics of biota, the calculation of size structure of biota was made. In a line of the factors forming structure and an abundance of biota of reservoirs such as morphology of reservoirs, salinity, concentration of biogenes are pionted. Numerical value of morphological parameters, salinity and the concentration of biogenes varied more than in 10 times. It has allowed to find out some rules which are described numerically. In particular, the dependence of biomass concentration of organisms from salinity looks like one-peak curve with a maximum at salinity 12-18 g/l. The characteristics of a biota diversity change according the same rule. The value of primary production is increased at increase of value of parameter S/V of a reservoir (S - surface area of a reservoir, V - volume of a reservoir). The maximum density of organisms settling was found out in supersmall reservoirs of the first group. Its concentration recalculated on volume sometimes exceeded 1500 g/m3 (fish - more than 20 g/m^3, zoobenthos - more than 1000 g/m^3, zooplancton - about 1,5 g/m^3, fitoplancton - about 1 g/m^3, macrofitobemthos - more than 500 g/m^3). At small volume (less than 100 000 m^3) in these reservoirs every day during the warm period of year the withdrawal a fish and *Palaemon adspersus* in significant quantities occurs. These reservoirs are natural high-productive systems. Simultaneously they carry out a role of original buffers between urban territory and sea. Probably, most quantities of biogenes acting from urban zone with sewer drains get in these reservoirs and concentrate as bioweight, which is then withdrawn by people. Thus the blooming of water in these reservoirs is not observed. Accordingly, it is possible to investigate a question of expediency of artificial creation of similar small reservoirs in some recreation zones of the Odessa region for reduction of of biogenes flow into the sea and for attraction of the fishers-fans.

THE ADAPTATION ANALYSIS ASPECT OF THE VEGETATION OF HALOPHYTIC GRASSLANDS TO DIFFERENT SALINITY CONDITIONS AT RED LAKE OF THE REPUBLIC OF KHAKASIA

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In Khakasia degraded and saline soils usually located around salt lakes constitute 9,8 % of the total soil area. Grassland phytocenosys of saline soils as well as steppe phytocenosys are the main feed source of Khakasia. At present the man's impact on the vegetation grows up. As a result, degradation and salinity processes are observed. Therefore the detailed study of the vegetation and halophytic community processes is necessary and of theoretical importance for the Republic of Khakasia. Study of species composition, structure, dynamics, crop yield, water regime, rootage absorption of vegetable community and decomposition dynamics of organic remnants of the saline soil were conducted at salt Red lake of the Ust-Abakanskiy region. In the flora of studied phytocenosys the following families dominated: Poaceae (21,9%) and Chenopodiaceae (17,4 %). Perma-forms prevailed. By the ecological type mesophytes prevailed (56,2 %). Xerophytes (21,7 %) occurred on the moistened solonchak Four types of phytocenosys with different ecological parameters of moistening, salinity degree and pasture degression were distinguished. The productivity of saline grasslands is in direct proportion to the structure and projective cover of grass crop of these grasslands. The crop yield dynamics within the vegetation period is different depending on species composition, biological and ecological characteristics. So, the crop yield of multi spear grass and multi-grass puccinellia phytocenosys reached its maximum at the end of July and at the beginning of August. On the contrary, the rise of feed gross of halophytic phytocenosis took place at the beginning of September. Water supply analysis of dominated species revealed a high degree of water deficit in vegetable cells, which increased to the end of the vegetation period. The gradual water binding into the inaccessible for plants form was supposed to take place at the investigated place. In the end it resulted in gradual salinity at the given territory. The working absorption of plant rootage of nearly all investigated plant phytocenosys dominated over its inactive surface area. The decomposition degree of organic remnants on saline soils correlated to the salinity degree. On the investigation ground the classification of plants with Ph and salinity degree for saline grass lands was made up. It is likely to be of bioindicative value for the further usage in the working out of practical measures on the differentiated usage and the improvement of grass crop quality of halophytic grass lands.

MICROFLORA OF THE LAKE RAZVAL IN THE ORENBURG REGION

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On the territory of the Orenburg Region there are groups of salt lakes (Dunino, Tuzluchnoye, Razval, Novoye and etc) composing the Sol-Iletsk resort basis. The Lake Razval was formed about 90 years ago as a result of natural accumulation of underground subsoil and high-flood waters in a foundation pit, having been left after sult-mines. The bength of the lake is 300 m., the width is 25 m., the depth ranging from 12 m. to 18 m. As for quantity of dissolved salts, it is a typical ultrahalic lake (degree of mineralization is 290 g/l). The aim of investigation is to study the microflora from the Lake Razval and to analyse its seasonal dynamics. As a result of research, it has been determined that microbiocenosis of the Lake Razval is represented by insignificant quantity of species of microorganisms, predominantly by galotolerant and galophilic species of algae and bacteria: green alga D.salina, ancient galophilic archaebacteria, prostecobacteria, spora-forming bacilli, anoxygenic phototrophic bacteria, as well as gram-positive and gram-negative aerobic and facultative anaerobic bacteria. Protozoan flora is scanty and rarely found. Algae biomass accounts for 7.5 ± 0.4 mg C/l, the number of algae is 2.501 ± 120 cell/l. The number and biomass of protozoa in study water specimen accounted for 223 ± 11 cell/l and 0,19 ± 0,09 mgC/l, respectively. Total number of bacteria in the lake water does not exceed 3.000 cfu per millilitre, but biomass accounts for 4.2 ± 0.2 mgC/l. Analysis of seasonal dynamics in lake microflora showed that ancient galophilic archaebacteria, prostecobacteria, spore-forming bacilli, anoxygenic prhototrophic bacteria, Marinobacter, Sporosarcina Paracoccus and Halovibrio were the representatives of autochthonous microflora, whereas others such as Hyphomicrobium, Preudomonas, Artrobacter, Acinetobacter, Esherichia and Micromonospora were the representatives of allochtonous microflora. As a result of carried out investigations, it was determined that an average number of bacteria, inhabiting the lake during spring – summer time period, exceeded the same index obtained during autumn-winter time period (5.480 ± 27 cfu/ml versus 150 ± 57 cfu/ml). The increasing number of bathing persons in the lake was estabiliched to result in the increase of concentration of coliform microorganisms in salt water. The given conformities with were described by the regression equations that allowed to make operative orienting assessment of the concentration of coliform bacteria in salt water depending on a number of bathing persons. Experimental simulation of salt water self – purification from the representatives of facultative and pathogenic microflora showed the dependence of bactericidal effect of salt water on an incubation period that allowed to calculate self-purification period due to its anthropogenic loading (9 – 1 4 hr). Above mentioned conformities with laws coincided with the results of field investigations on determination of dates of lake self-purification. Accordingly, it is evidently necessary for the self-purification processes to have not only osmotis effect of high concentrations of the salts of sodium and magnesium but also the competative intrerrelations of allochthonous microorganisms with autochthonic microflora.

MAINTENANCE OF THE GENETICALLY MODIFIED STRAIN *ESCHERICHIA COLI* Z905/PPHL7 IN THE STERILE WATER OF SHIRA LAKE

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The application of genetically modified microorganisms (GMMOs) in biotechnology makes it necessary to conduct investigations aimed at estimating the possible fate of these microorganisms under various conditions, including environmental ones. Bioluminescence can be used as a marker character in this research: the *lux*-genes cloned in transgenic strains provide the basis for the investigation of such parameters as the persistence of the recombinant genome, its regulation, and the stability of its expression. To estimate the possibility of steady existence of the GMMO *E. coli* Z905/pPHL7 under an elevated concentration of mineral salts, we used the mineralized water taken from Lake Shira. Upon the introduction of the recombinant strain of *E. coli* into the sterile lake water the characteristics of the strain population were estimated during 160 days. Luminosity was recorded in the lake water samples themselves during 9 days after plating; within that period the population plated on agar media numerically decreased approximately by an order of magnitude. To analyze the survival of microorganisms, we also used the method of rapid determination of luminescent strain persistence in samples taken from microcosms: the water samples from microcosms were plated on the liquid medium M9 that contained peptone and either glycerol or glucose as well as a selective factor (in this case ampicillin); then batch cultivation was conducted. Batch cultivation of samples in the presence of ampicillin resulted in the growth of the culture of microorganisms, and luminescence was recorded. The GMMOs introduced into the microcosms based of the Lake Shira water survived through the observation period. The concurrent plating of samples from microcosms on solid media showed that the population density of the introduced strain capable of growing on solid media remained steady, about 10^4 cells/ml. Besides estimating the survival of GMMOs in the lake water, we also investigated the heterogeneity of their population in terms of the GMMOs' resistance to ampicillin. The ability to grow on the antibiotic-containing medium is a marker character indicating the presence of the recombinant plasmid in the cells. The analysis of the GMMO isolate growth on the agar medium containing different ampicillin concentrations showed that the recombinant plasmid was not lost through the experiment (160 days). A reduced threshold of resistance to 50 μg/ml ampicillin was recorded in less than 10% isolates, irrespective of the extraction time. A lower level of bioluminescence of the microorganisms plated on the batch culture, observed differences in the sample luminescence intensity in the glucose-containing and the glycerol-containing cultures, and the dynamics of these differences suggest a conclusion about considerable changes in the regulation of luminescent gene expression occurring when the introduced strain adapts to new conditions.

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ABOUT POSSIBILITY OF APPLICATION HALOALKALOPHILIC MICROORGANISMS IN OIL-POLLUTED EXTREME ECOSYSTEMS BIOREMEDIATION

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Methods for bioremediation of oil-polluted soil with the use of microorganisms – hydrocarbon destructors are widely applied at present. However, relative to extreme ecosystems that are characterized by a number of unfavorable physical-chemical conditions, namely, high pH, mineralization, salinity, and low oxygen concentration, conventional methods for remediation are not so efficient, as far as the majority of cells simply die. Therefore, the necessity arises in isolation of microorganisms – destructors of hydrocarbon with present properties, such as salt-tolerance and resistance to high pH values in environment. In the course of microbiological investigations two strains of moderate halophilic alkalophilic microorganisms that utilized oil hydrocarbons as a sole source of carbon and energy were isolated from hydrocarbonate – calcium underground water of Petropavlovsk reservoir (Oktyabrsky district. Perm Region, Russia) that was characterized by presence of organic sabstances of oil origin. Thus, the necessity in expanded study of extremophilic microorganisms, and haloalkalophilic ones in particular, is conditioned not only by their biologically unique character but also by possible influence on global and local biogeochemical processes, and the development of novel biotechnologies with the use of cultures of microorganisms and enzymes being active within a broad range of physical-chemical parameters.

THE USE OF SALINES TO PRODUCE BIOACTIVE ADDITIVES TO FOOD AND MINERAL WATER CONCENTRATE

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Numerous geochemical studies testify that lipids of recent sediments are inherited from the organisms of various evolutionary levels that are bioproducers of the sedimentary organic matter. The sedimentary lipids have been shown to contain bioactive substances (Burkova et. al.). There was null information on detailed chemical composition of sedimentary organic matter occurring in lakes of the Russian region and imperfect methods of their extraction. That all restrained making of high-effective medical cures, bioactive additives to food (BAF) as well as cosmetic remedies based on natural substances. The studies carried out on chemical composition of sediments buried in a number of Siberian saline lakes allowed us to single out several of them as sources of natural raw materials being promising for practical use. To estimate pharmacological activity of the extracted lipids one used a method of assessment of their activity as antioxidants. Sedimentary lipid extracts which were capable to inhibit the process of oxidation *in vitro* in the model chemical experiment, then they were tested *in vivo* in the different models of experimental inflammation and hepatitis. As a result of the testing (Saratikov et. al.) the lipids from salines Karachi, Krivoye, Gorko-Solyenoye, Tukhloye (West Siberia) and those extracted from salines Shira, Utichye 2 and Utichye 3 (Khakassiya) have been proved to be the most effective. Our Institutes together with Siberian State Medical University have been developed a hepatoprotective cure based on a polar lipid fraction from Lake Tukhloye sediments. We named it EPLIR. EPLIR is a highly effective hepatoprotector that competed with the well known analogous remedy ESSENTIALE. EPLIR was registered by Ministry of Health as BAF. One more high-effective medicine ESOBEL that revealed antiinflammatory property has been developed based on a water-soluble extract of saline sediments. In contrast to synthetic antiinflammatory medicines ESOBEL causes no side effects. We have also found out that brine of several salines enriched with minerals (such as of Lake Shira) is appropriate to produce a dry concentrate and then to prepare mineral water of any dilution. The qualitative composition of the produced mineral water is similar to that of native one. We registered several combinations of the dry brine concentrate of Lake Shira: with LOKHEIN as an effective hepatoprotector; with FLORENTA as an adaptogen and with some other additives. They intended to treat the diseases of either alimentary canal or other organs. Dry brine concentrates from Lake Shira is applied by several Siberian companies to produce mineral water.

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APPLICATION OF PELOIDS AND DRY BRINE WITH ADDITIONAL COMPONENTS IN MEDICINE

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In recent decade the salient feature of the population structure in economically developed countries, including Russia, is substantial growth of senior people. Incidence of osteoarthrosis, osterchondrosis, caries drastically increases with age and amounts to 90%. This senile pathology calls for special approach to developing treatment methods for aged patients. Until recently osteoarthrosis, osterchondrosis, caries have been treated with symptomatic medicines, yet deleterious effect of side reactions decreased their efficiency. This call for the use of new resources, among them – peloids of Siberia, specifically in Khakasia. Tomsk scientists from the Institute of Health Resorts and Medical University have studied activity of peloids produced from brine from Gorkoye (Khakasia) and Karachi (Novosibirsk) lakes. The aim of the work is to continue research to find out a formula to develop medicinal forms used both in neurology and stomatology and clinical studies. The authors propose a formula of medicinal forms of the following composition depending on the disease:

- native brine, fir-tree oil 1%, anesthesin, dimexide 0.1%;
- native brine, fir-tree oil 1%, anesthesin, sodium bromide 0.1%;
- dry brine, extract of red pepper 2%, menthol 0.2;
- dry brine, fir-tree oil 1%, sodium bromide 0.1%;
- dry brine 3%, sodium carboxymethylcellulose 3%, glycerol 2% (as film).

The proposed medicinal forms based on peloids and dry brine demonstrated their therapeutic efficiency. Since many patients are unable to go to resorts it is expedient to treat them in hospital and clinics of university department in their residence areas.

COMPLEX STUDY OF BOTTOM SEDIMENTS OCCURRING IN KHAKASIYA LAKES FOR MEDICAL PURPOSES

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The objects of resort and recreation importance were chosen for biotechnological purposes based on mud prospecting of 25 lakes located in Altaisky, Bogradsky, Beisky, Azskizsky, Shirinsky and Ust-Abakansky regions. Rich in the composition lacustrine potential of Shirinsky region is considered as a fine recreation zone. According to probable reserves of therapeutic muds the following lakes can be distinguished: Toos - 1325, Dzhirim - 1778, Fyrkal – 331 and Vlasyevo – 1877 thousand cubic meters, respectively; by physico-chemical properties – medium and high mineralization sulfide therapeutic muds. Organic matter (OM) of therapeutic muds has been studied to prepare biologically active substances (BAS). The presence of the following complexes – carbohydrates, vitamins, lipids, humic substances etc determines biological activity of lacustrine sediments. Specific activity of lipid complex extracted from sulfide silt therapeutic muds has been proved (1). We studied the samples of bottom sediments recovered from the following lakes: Shunet, Utichye, Ayevskoye, Shira, Solyenoye, Gorkoye, Altayskoye-1 and Altayskoye-2. Elemental composition of OM occurring in lacustrine sediments and their atomic ratios (C/H, C/N, C/O) have been studied. The following BAS concentrates were sequentially extracted: water soluble carbohydrate complex fractionated into polysacharides and polyphenols; lipid complex (hydrocarbons, oxygen-containing compounds, carotins, chlorophylls, sulfo- and phospholipids); and humic complex (humic and fulvic acids). Antioxidant activity of the extracted BAS was estimated by a kinetic method. The content of antioxidants in the bottom sediments along with chemical composition serves as a criterion for their biological activity. Therapeutic muds of Shira and Gorkoye lakes exhibit the highest antioxidant activity among the lakes under study. The content of ascorbic acid in these muds is very high. These indices trend to decrease for bottom sediments of Altayskoye-2, Altayskoye-1 and Ayevskoye lakes. Intensive fermentative processes proceeding in the bottom sediments decrease the content of polyphenol compounds. In the bottom sediments of the lakes located in Shirinsky region the activity of polyphenol oxidase reaches 85 mg of quinone per 10 g of mud during 30 minutes. Increased catalytic capacity of the bottom sediments occurring in Khakasian lakes is connected with reduction in accumulation of ascorbic acid. Thus, bottom sediments of Shira, Gorkoye and Altayskoye lakes can be used as raw material to prepare BAS of certain directive effect, while brine of Shira and Toos lakes can be used to prepare therapeutic agents in the form of dry concentrates.

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THE KINETIC INHIBITION AND ACCLIMATIZATION OF A POPULATION ESCHERICHIA COLI TO LITHIUM IONS

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The salty lakes are obliged to the unique properties to mineral components, keeping in their waters, which structure is individual for each lake. As a result of anthropogenic factors there can be both qualitative, and quantitative change of structure of mineral salts and as a consequence a change species of a diversification of a microflora of these lakes. In the given work the kinetics inhibition and acclimatization of a population of bacteria E. coli strain B-2956, to change salt of structure. As model the raised(increased) concentration LiCl was used. At cultivation was used auxoautotroph on aminoacid strain. Finding - out of a type kinetics inhibition carried out with measurement of specific growth rate on fluid mediums, at a constant of concentration of ions natrium, equal 0.5 M. As a result of experiments on submerged cultivation of bacteria E.coli at the presence of ions lithium it is possible to make a conclusion that they render manifestative inhibition effect on body height of crates, thus the kinetics inhibition carries nonlinear cooperative character and concerns to competitive phylum. The experiment on study of acclimatization of a population of bacteria E.coli to inhibition to influence of ions lithium was carried out(spent) in controlled gradostate. A constant level of pressure of the factor in this case was sustained, at the expense of maintenance of concentration of ions lithium in medium equal 0.5 M. Thus for 550 hours of cultivation the growth rate of a population of crates E.coli has increased from 0.13 till 0.58 $hours^{-1}$, that testifies to acclimatization of a population to inhibition to the factor. The nonlinear character of curve auto selection reflecting its acceleration is marked during cultivation. The assessment of speed of acclimatization $\mu=1.64*10^{-2}$ (μ_{max}/generation) is carried out(spent), these values will be enough well coordinated to the literary data. For study of the possible(probable) molecular mechanism of acclimatization of a population E.coli to ions lithium were investigated kinetics of distinction initial strain and strain received as a result of auto selection. By experiments is established, that new strain is more adapted to body height at the presence of ions lithium. Thus the change of morphology of bacteria and form of colonys was not observed. As it is revealed that, strain received as a result of auto selection does not grow at alkaline values pH at the presence of ions lithium and natrium. Initial strain of bacteria E.coli had Na^+/H^+ - dependent transport system aminoacid. Autoselection strain E.coli has lost ability to use ions lithium and natrium in transport system aminoacid, it testifies to change conformations of a transport molecula of protein. As on size ions of radius lithium there is between natrium and proton, that, apparently, there was a decrease of geometrical dimension of the center of linkage of ions. It can be dependent by point mutation. For this reason at received strain of bacteria transport aminoacid becomes only H^+ - dependent, and the ions lithium lose an opportunity to inpour(insinuate) into a crate. Thus is removed inhibition effect lithium, however crates lose ability to grow in conditions low concentration pH.

MORPHOLOGICAL CHARACTERISTICS OF BIOFILMS FORMED BY SOME *BACILLUS* SPECIES ISOLATED FROM SHIRA LAKE

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In nature bacteria as a rule exist as communities forming microcolonies, flakes, and biofilms on various surfaces. These are mainly multi-species communities with some species dominating, which is accounted for by metabolic interactions inside the consortium. At present it is known that the bacteria united in communities differ from the free-living ones or the bacteria cultured in liquid laboratory media in their morphological characteristics and physiological parameters. The existence in biofilms makes them resistant to treatment with detergents and to the action of antibiotics. We have studied natural bacteria of the genus *Bacillus* extracted from the soil of the nearshore part of Shira lake and the transgenic microorganism (TM) *Bacilus subtilis 2335/pBMB 105*, which is used in veterinary as a probiotic preparation. Without mixing, both objects were able to form biofilms, with both spores and vegetative cells used as inocula. The investigated natural strains maintained in laboratory retain their ability to form biofilms (the maintenance period 1 to 5 years). It has been noted that all the study strains form films of two types: “matt” and “glossy”, depending of the medium conditions. All the films, formed by both natural strains of the genus *Bacillus* and the TM *Bacillus subtilis 2335/pBMB105*, go through the same phases of development, differing only in the time needed for the formation and degradation of a biofilm. Microscopy has shown that as the films develop, their structure changes (whatever the inoculum – vegetative cells or spores): from short cell chains positioned in one plane, to large strands making up several layers, and to unlinked separate cells located in exopolysaccharide matrix. The formation of biofilms by bacilli and the presence in them of both active (vegetative) cells and dormant forms (spores) may suggest the feasibility of maintaining the *B.subtilis*-based TMs in real conditions on various surfaces of biotic and abiotic nature.

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DYNAMICS OF MANIFESTATION OF ANTIBIOTIC RESISTANCE BY HETEROTROPHIC BACTERIA OF SHIRA LAKE DURING 1999-2001

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The assessment of human impact on natural ecosystems is one of the currently most important tasks for ecology. Particular consideration is given to the ecosystems featuring therapeutic properties. One of such ecosystems is Shira – a brackish lake. There are various ways to estimate the human impact, including bioindication, bioassay, etc. One of the ways to monitor the level of the anthropogenic load is to estimate antibiotic resistance of bacteria. The aim of the work was to investigate the dynamics of antibiotic resistance of heterotrophic bacteria varying in halotolerance in Lake Shira and to reveal a possible relationship between antibiotic resistance of microorganisms and anthropogenic and natural impacts for the period between 1999 and 2001. As Na+ is one of the predominant cations in the Lake Shira water, we presumed that it could affect the distribution of autochthonous and allochthonous microorganisms in the lake. Horizontal and vertical distributions of heterotrophic bacteria have been investigated, taking into account their halotolerance. It has been shown that freshwater bacteria are omnipresent over the lake water area, but dominate in the close-to-resort part. In the central part of the lake the freshwater bacteria mostly occur in the surface layer of the epilimnion (0.5 m), whereas marine and moderate halotolerant bacteria dominate in deeper water layers. Studies have been conducted to investigate the seasonal dynamics of antibiotic resistance featured by freshwater, marine, and moderate halophile bacteria isolated from the close-to-resort and the central parts of Lake Shira. In summer, the number of freshwater bacteria displaying multiple antibiotic resistance increases not only in the close-to-resort part but also in the epilimnion of the central part of Lake Shira. In winter and in spring, when the resort does not function, the number of bacteria featuring multiple antibiotic resistance significantly decreases. Alternating domination of bacteria resistant and sensitive to antibiotics can be accounted for by the effect of effluents of the actively functioning summer resort. Ampicillin resistance of freshwater and marine bacteria isolated from the central part of the lake, at a depth of 10 m, can be related to the development of blue-green and green algae.

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LAKE BALKHASH: CREATION OF AN ARTIFICIAL FLOWAGE AS A NEW APPROACH FOR DECISION OF ILY-BALKHASH PROBLEM

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Lake Balkhash is one of the largest in the world inland closed waterbody, that is located at the central part of Republic of Kazakhstan. It is elongated from the west to the east approximately on 589-614 km. The western part of the Lake Bakhash content the fresh water, the eastern shallow part – saline waters, this is a specific feature of is water regime of this lake. The main source of the fresh water to the lake is produced by river Ily (85 %), which inflows to south-western part of Bakhash. Water flow of Ily refreshed 8 separable regions at the western part of the lake (till the Uzun-Aral Strail). This strait resulted in the limitation of fresh water penetration to the eastern part of the lake. Construction of the Kapchagayskaya Hydro Power Station and organizing of Kapchagayskaya Reservoir in 1970 hardly restricted the input of fresh water to the Lake Balkhash. The increase of salinity of the lake (especially at the in the western part of the waterbody) resulted in ecological problem for a large industrial region here where mineralization is grown catastrophically. Several Environmental scientific centres and research institutes from Russia and Republic of Kazakhstan investigated this problem and studied water-saline balance of the lake many years. It was suggested the proposal to divide the lake by dams and different kind of dead bridges with organizing the artificial transmission of some portions of waters between these separate reservoirs. All these proposal were dismissed as unproductive. But the situation continue to go down and the opinion about inevitability of critical situation with the Lake Balkhash (similar with the Aral Sea) is dominated now. But, in our opinion, the decision of the Balkhash problem is possible and the proposal for organizing of the artificial flowage is our idea. According to our calculations, spooling of 1 km ^{3}/yr of more mineralized water from the eastern corner of the lake (5-6 g/l) allows to exclude 5-6 million tons each year. Omitted waters should be delivered to the other lakes which are located eastward from the Lake Balkhash. Our calculations demonstrate that the 3 years spooling of the saline waters from the eastern part of the lake produced the decrease of salinity of the western part of the Lake Balkhash from 1,3 till 0,4 g/l. At the eastern part of the lake the salinity should be fall on 0,12 g/l. Effect of spooling of 1 volume of the water at the east is equivalent to income of 12 volumes of fresh water from the Ily river. Organizing of the regular overflow from the wet to the east through the Uzun-Aral Strait helps to desalination of the water at the western part of the lake – this region is more important for Republic of Kazakhstan as industrial and agricultural area. De-mineralization of the waters follows up the increase of biogenical matter and rise of salts slugging to the bottom of the lake. Transfer of the saline waters could be organized to the lakes Sassykkol, Uyaly and Alakol that locates 70 km eastward from the Balkhash (the altitude of the watershed here is not exceeded 20-30 m). The recommended regime for spooling is 1 km ^{3}/yr, it constitutes approximately 8 % of the input part of the water balance of the lake (commensurable value with the accuracy of calculations of water balance).

THE GROWTH OF HETEROTROPHIC AEROBIC BACTERIA OF SHIRA LAKE INFLUENCED BY MONOVALENT ALKALINE CATIONS K+ AND Cs+

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Technogenic pollution of the environment is one of the most actual problems of mankind. That is why the main aim of modern biotechnology is to develop technologies for biological inactivation of pollutants. This work is devoted to the isolation of natural bacteria that are able to accumulate cesium. Preliminary investigations have been conducted to estimate the effect of the univalent alkaline metals, potassium and cesium, on the growth of heterotrophic bacteria isolated from natural ecosystems of various mineralization. It has been shown that a simultaneous introduction of potassium and cesium cations into nutrient media leads to an increase in the number of colony-forming bacteria isolated from 10-m depth of the salt Shira lake (the mineralization of the water is 20740 mg dm^{-3}). Four halophilous bacterial species (*Micrococcus* sp., *Corynebacterium* sp., *Cellulomonas* sp., *Bacillus* sp.) have been isolated from Shira lake. Kinetic characteristics of growth of these strains have been studied while cultivating in periodical culture with 0,001 M; 0,01 M, 0,1 M and 1M of KCl and CsCl. The highest growth rate and glucose consumption of bacterial strains have been obtained at concentration 0,01 M of the both alkali metals. Strong growth inhibition of isolated bacteria by high concentrations (up to 1 M) of alkali metals has been no observed.

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THERMOHALINE STRUCTURE OF SALT LAKES WITH "GREENHOUSE" EFFECT AND POSSIBILITY OF ITS APPLICATION

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Practically, on all continents meet, so called, heliothermic salt lakes with "greenhouse" effect. Heliothermic lake is special type of the mesothermic lake in which the maximum of temperature in a phase of open water is located on some depth (Yoshimura, 1937). The series of conditions is necessary for origin "greenhouse" effect: the difference in mineralization of water on surface and bottom should be not less 15г/л, in lake should be generated surface layer of fresh water by a thickness up to 15 cm at the expense of entering surface water and underground water, atmospheric precipitation and melted waters. Types of vertical thermohaline structure and the explanation of a physical essence of origin "greenhouse" effect enough explicitly is explained in a series of work (Sonnenfeld and Hudec, 1980; Kirkland at all., 1983; Egorov, 1991, 1994). And only in 1999 theoretical explanation have been gave: on basis natural data was decide a system from three equations: the equations of a condition, equation of a heat balance on a lake surface and equation of transposition of heat in lake (Egorov and Zilinticevich,1999). Such structure of lake can be used for deriving an electrical energy by a mode concluded in extraction and transformation of a thermal energy of lake in electrical. The small power station constructed on a coast of such lake is capable to supply with the electric power small settlments, agricultural production. So, on an example small (surface area less than 10 км2) high-mountainous lake Sassykkul (East Pamir), the difference in temperature water on surface and near bottom at the time of maximum solar input reached 40oC. Calculations indicate that at the time of maximum solar input, the energy content of the lake is 2450 kilowatt, a value corresponding to an annual output of power of 10x106 kilowatt hour, an amount sufficient to provide electric power to a small village (Egorov, 1998).

APPLICATIONS OF *IN VIVO* AND *IN VITRO* BIOLUMINESCENT SYSTEMS FOR ECOLOGICAL MONITORING OF SHIRA LAKE

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Bioluminescent bacterial systems are used successfully for ecological monitoring. The main principle of the bioluminescent bioassay is to correlate toxicity of samples under study and changes of kinetic parameters of bioluminescent reaction. Response of biological systems to the effect of exogenous substances is integrated characteristics and in a complicated manner depends on characteristics of these substances. Bioluminescent bioassays based on luminous bacteria (*Photobacterium phosphopreum)* and coupled enzyme system NADH-FMN-oxidoreductase-luciferase have been adapted to the conditions of saline water monitoring of Shira lake. It was shown that bioluminescent test systems are sensitive to salt compositions, pollutants and redox properties of the lake water. Time-prolonged bioluminescent monitoring and complex one-time bioluminescent investigations of natural and waste waters were made. It has been demonstrated that the bioluminescence assay measurements should be provided within two hours after the sampling time. The bioluminescence parameters obtained have been used for making partial maps of the inhomogeneity of Shira lake water. The maps were based on the bioluminescent characteristics of water samples taken along the shoreline, sampling stations in the different places of the lake and in different depths.

LIPID AND HYDROCARBON COMPOSITIONS OF A WILD SAMPLE OF THE GREEN MICROALGA *BOTRYOCOCCUS BRAUNII* COLLECTED FROM SHIRA LAKE

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The green colonial alga *Botryococcus braunii* widespread in the fresh- and brackish waters is characterized by a very large content of hydrocarbons; its content in different strains amounts to from 15 to 75% (of dry weight). *B.braunii* appear capable of providing a renewable source of hydrocarbons. A field sample of *Botryococcus* was collected from littoral surface waters of Lake Shira during a bloom event (July 2000). Microscopic analyses revealed that this sample contained up to 95% *Botryococcus*. *Botryococcus* collected from Shira Lake had a high lipid content, about 40% of the dry biomass. The main fraction of lipids (~60% of total) was represented by liquid hydrocarbons. Polar lipids, sterols, free fatty acids, triacylglycerols and an unidentified compound were also detected. The fatty acids (FA) composition of the Shira Lake strain was represented mostly by saturated and monoenoic acids with chain lengths ranging from C_{l2} to C_{32}. Linoleic acid found (3.6% of the sum of FAs), was the only one polyenoic acid. The FAs present in the lake sample also contained very long-chain monoenoic FAs: $C_{28:1}$, $C_{30:1}$ and $C_{32:1}$. At the mass-spectra of their dimethyldisulphide adducts showed ion at *m/z* 173, indicative of an unsaturation at position ω9. Hydrocarbons of the *Botryococcus* strain from Shira comprised dienes and trienes ranging from C_{23} to C_{31}. The $C_{29:2}$ dienes, represented by two isomers were dominant in the hydrocarbon fraction. The main isomer accounted for 51% of the total hydrocarbons. The relative content of the second minor isomer was lows ≤2%. $C_{27:2}$, $C_{25:2}$ and $C_{23:2}$ hydrocarbons have been found in two isomeric forms. Relative content of the *cis*-isomer $C_{27:2}$ was 13.4%, of the *cis*-isomer $C_{25:2}$ was 3% and of the *cis*-isomer $C_{23:2}$ was 0.6%. The parts of *trans*-isomers of these hydrocarbons did not exceed 1.6 % of the total hydrocarbons. Trienes $C_{27:3,}$ $C_{29:3}$ and $C_{31:3}$ were found in small amounts (0.5, 0.8 and 1.3 %, respectively). Other hydrocarbons (alkanes) of the field sample probably arise from some other microalgae present in the lake. Identification results of fatty acid composition and hydrocarbon structure of the organism isolated from Shira Lake are in good agreement with literature data related to the known strain of *Botryococcus braunii*, the A race.

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ANNUAL AND SEASONAL DYNAMICS OF NITROGEN AND PHOSPHORUS AT THE SALTON SEA, 1997-1999

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The Salton Sea is a polymictic, large (980 km^2) and shallow (8 m mean depth) lake located in the southeast of California, USA. Located in a below sea level depression (elevation –68 m), the Sea subsists primarily on agricultural wastewater that flows into the Sea from a watershed that encompasses both Mexico and The United States. A closed basin lake, the Sea has undergone increasing salinity and eutrophication since it was created by an engineering accident in 1905. Currently the salinity is ~43 g l^{-1} and nutrient loading is ~12 g N m^2 yr^{-1} and ~1.6 g P m^2 yr^{-1}, with the majority of the nitrogen generated by agricultural areas and the majority of the phosphorus generated by urban areas. To assess annual and seasonal changes in nitrogen and phosphorus concentrations and their affect on biota, nitrogen (ammonia, nitrate/nitrite, dissolved organic nitrogen, and particulate nitrogen) and phosphorus (orthophosphate, dissolved organic phosphorus, and particulate phosphorus) were measured at 2-5 week intervals at 3 mid-lake stations from 1997 through 1999 and 2 additional near shore stations during 1999. Total nitrogen varied little throughout the year with a mean concentration of 330 uM for the three years. Nitrogen was found primarily as dissolved organic nitrogen and dissolved organic nitrogen showed little annual and seasonal variation. Ammonia, particulate nitrogen, and nitrate/nitrite made up less than 30% of total nitrogen and showed seasonal variation driven by algal population dynamics and mixed state. Spatial variation in both total nitrogen and the nitrogen species were found between the near shore and mid-lake sampling stations and among mid-lake stations. Total phosphorus varied annually and seasonally with a mean total concentration of 5.4 uM for the three years. Total phosphorus was highest in spring due to yearly increases in both dissolved organic and particulate phosphorus. With the exception of winter and spring 1999 when particulate phosphorus dominated, dissolved organic phosphorus accounted for the majority of total phosphorus. Orthophosphate was always below 1 uM. The molar N:P for the three years was 90:1, with the minimum value well above Redfield (50:1). Stoichiometric theory suggests that phosphorus is the limiting nutrient for algal growth, although absolute algal growth is probably limited by light.

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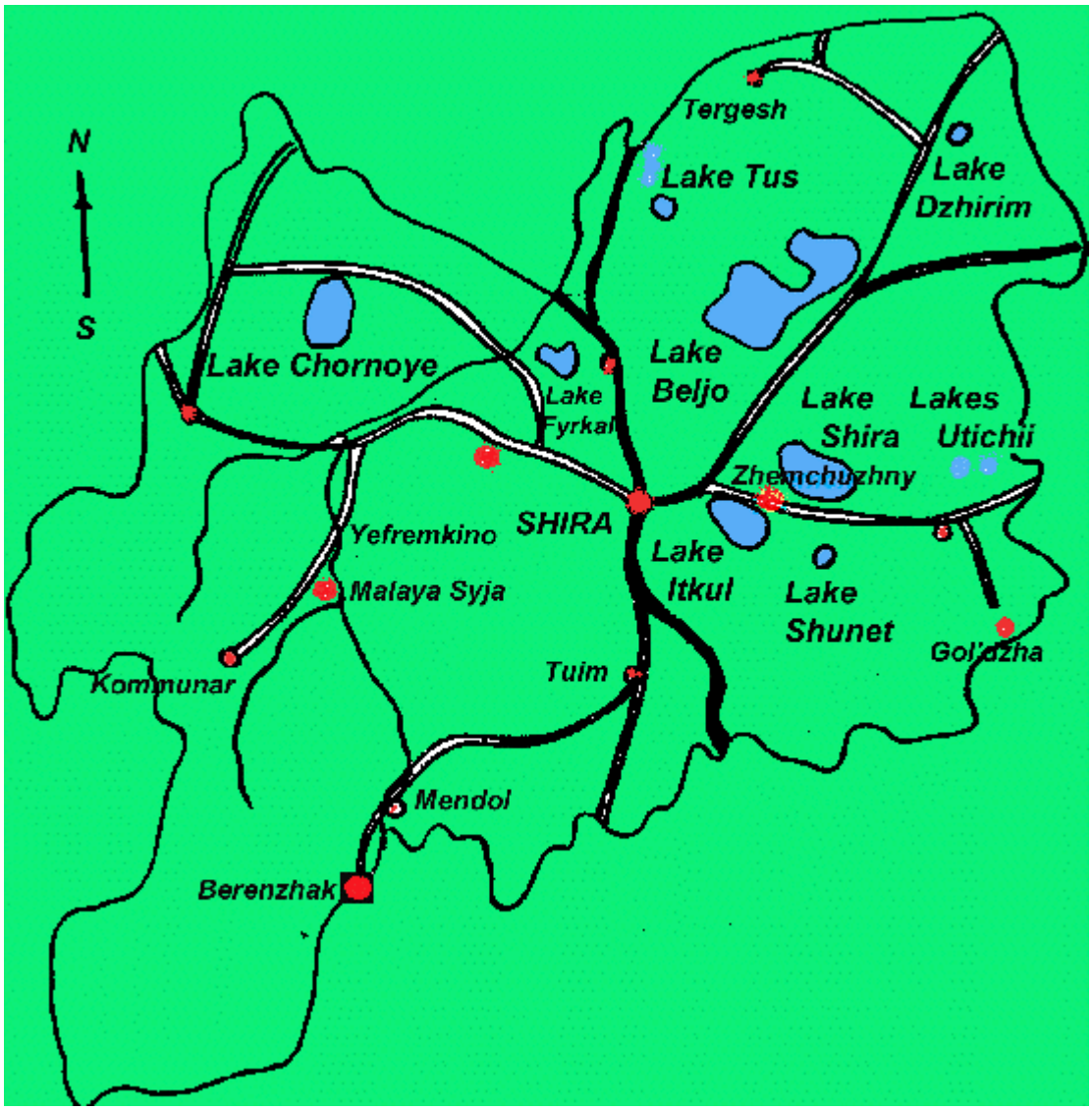
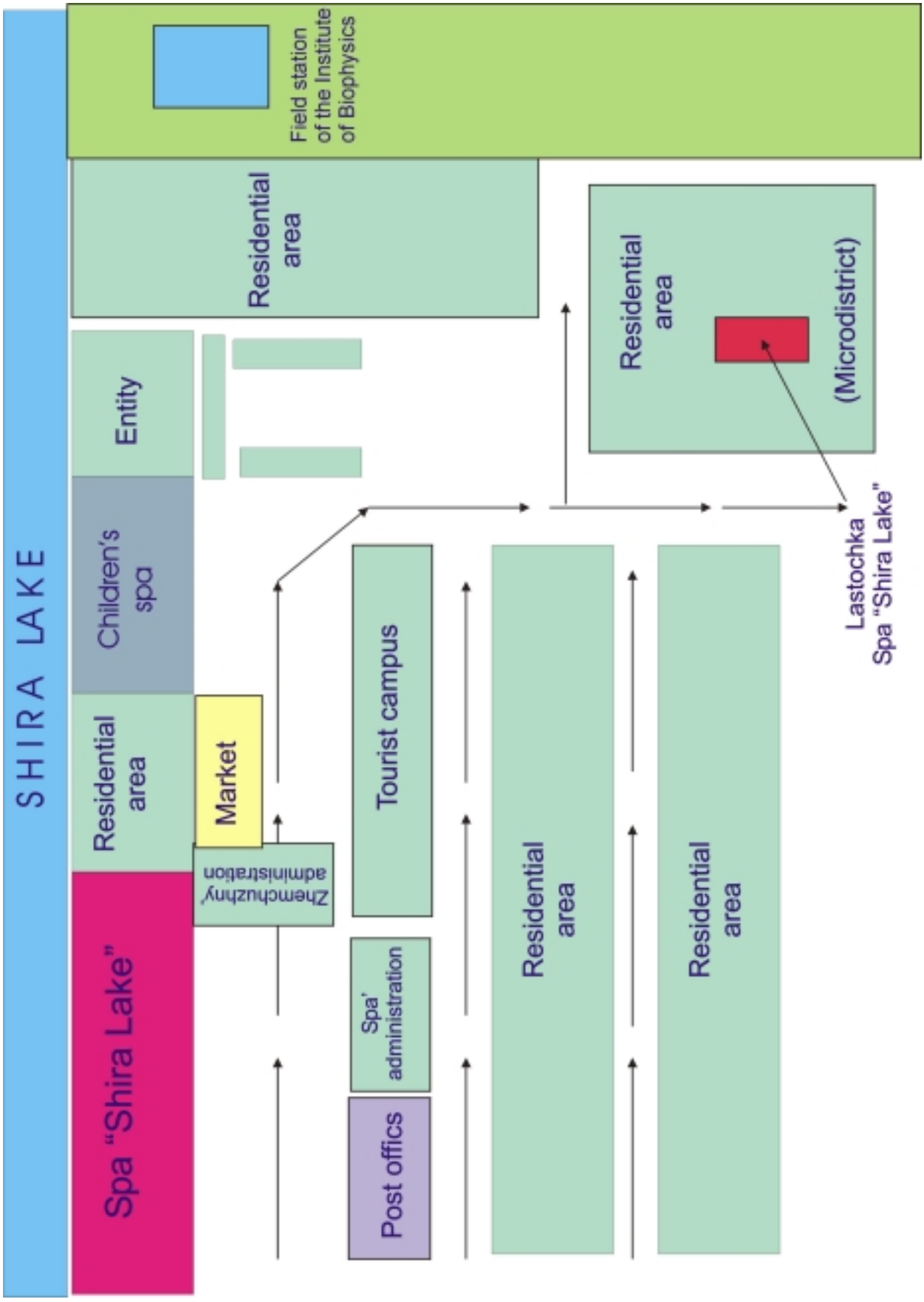


Map-shceme of Shirinsky region


SHIRA LAKE
Spa "Shira Lake"
Residential area
Market
Zhemchuzhny, administration
Children's spa
Entity
Tourist campus
Spa' administration
Post offics
Residential area
Residential area
Residential area
(Microdistrict)
Lastochka
Spa "Shira Lake"
Field station of the Institute of Biophysics


SHIRA LAKE
Beach
Tennis-court
Café
Building #7
Bakery
Building #8
Building #9
CONFERENCE HALL
Central entrance
Building #1
Building #2
Building #3
Building #4
Building #5
Medical building
Building #6
CANTEEN