

ISSN 1993-3916

Том 15 Номер 4 (40) Декабрь 2009  
*Volume* *Number* *December*

РОССИЙСКАЯ АКАДЕМИЯ НАУК  
*RUSSIAN ACADEMY OF SCIENCES*

# АРИДНЫЕ ЭКОСИСТЕМЫ ARID ECOSYSTEMS

Журнал освещает фундаментальные исследования и результаты прикладных работ по проблемам аридных экосистем и борьбы с антропогенным опустыниванием в региональном и глобальном масштабах. Издается с 1995 года по решению Бюро Отделения общей биологии Российской академии наук.

*The journal is published by the decision Department of Biological Sciences of Russian Academy of Sciences (RAS). The results of fundamental and applied investigations on the problems of arid ecosystems and on struggle against anthropogenic desertification are published on its pages. Principles of system study of arid territories and the dynamics of their biology potential changes in global and regional aspects are put into basis.*

МОСКВА: Товарищество научных изданий КМК  
MOSCOW: KMK Scientific Press Ltd.



2009

РОССИЙСКАЯ АКАДЕМИЯ НАУК  
ОТДЕЛЕНИЕ БИОЛОГИЧЕСКИХ НАУК  
ДАГЕСТАНСКИЙ НАУЧНЫЙ ЦЕНТР  
ПРИКАСПИЙСКИЙ ИНСТИТУТ БИОЛОГИЧЕСКИХ РЕСУРСОВ  
ИНСТИТУТ ВОДНЫХ ПРОБЛЕМ

*СЕКЦИЯ "Проблемы изучения аридных экосистем и борьбы с опустыниванием"  
Научного Совета по проблемам экологии биологических систем*

## АРИДНЫЕ ЭКОСИСТЕМЫ

**Том 15, № 4 (40), 2009, декабрь**

Журнал основан в январе 1995 г.

Выходит 4 раза в год

Главный редактор

доктор биологических наук, профессор

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Заместитель главного редактора

доктор географических наук, профессор

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Москва: Товарищество научных изданий КМК

2009

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УДК 551.5

### COMPARISON OF MOISTURE INDEXES OF RUSSIAN SUBBOREAL FLAT LANDSCAPES

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**Abstract.** Deciduous, forest-steppe, steppe, semi-desert landscapes are included into subboreal flat landscapes of Russia. Heat and moisture balance plays an enormous role in the zone landscapes identification. M.I. Budyko Aridity Index (the ratio between annual radiating balance and a power equivalent of annual precipitation), N.N. Ivanov-G.N. Vysotsky Moisture Index (the ratio between the annual precipitation and annual evapotranspiration) and G.T. Sielianinow Hydrothermal Index are used for quantitative definition of a heat and a moisture ratio.

Complexity of comparison of quantitative estimations of humidifying with landscapes boundaries is a problem.

Comparison of Moisture Indexes with C. Thornthwaite Index of Moisture is presented in the article. Air temperatures and precipitation only are used for C. Thornthwaite Index of Moisture calculation. These data are the most qualitative and homogeneous.

It is shown that there is a high correlation between M.I. Budyko Aridity Index, N.N. Ivanov-G.N. Vysotsky Moisture Index, G.T. Sielianinow hydrothermal index, Normalized Difference Vegetation Index (NDVI) and C. Thornthwaite Index of Moisture (Fig. 1). There is a linear dependence of Moisture Indexes and C. Thornthwaite Index of Moisture.

Similarity of tendencies of Moisture Indexes and C. Thornthwaite Index of Moisture is observed (Fig. 2, Fig. 3, Fig. 4).

It is possible to recommend C. Thornthwaite Index of Moisture to apply to dry lands of Russia along with widely known Moisture Indexes.

**Key words.** evapotranspiration, moisture indexes, subboreal flat landscapes of Russia, climate change.

УДК 631.48

### ABOUT THE EXISTENT SYSTEM OF MONITORING OVER THE SOILS IN ARID REGIONS

© 2009. Z.G. Zalibekov, A.B. Biarslanov, D.B. Asgerova

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**Abstract.** Under discussion is the experience gained in monitoring of soils and their ecological estimation as exemplified by one of the typical arid regions – Tersko-Kumskaya lowland. At the first stage of research the results have been obtained to study unstable properties including the content of easily soluble salts, the moistening degree, soil-pH and abundance of plant species. The periodicity of operative control over soils, the rate of changes in some soil properties as well as forecasting of their state in the nearest future have also studied.

**Key words:** operative monitoring, control over soils, temporary interval, soils, salinization, erosion, mapping, materials of remote sensing techniques.

## FORMATION OF STEPPE VEGETATION TYPE IN THE NEAR AZOV REGION

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**Abstract.** On the basis of studying the laws of spatial structure of the present vegetation cover and comparison of original palinological researches with data obtained by the other experts it was possible to specify the history of the vegetation cover development at the territory of the Lower Don. The received results testify in favor of a hypothesis that there existed huge wood refuge in the period of transition from Pleistocene to Holocene.

**Key words:** wood, steppe vegetation, halophyte steppe communities, the spore-pollen analysis, phylocoenogenesis, paleogeography, the Lower Don.

## ESTIMATE OF VEGETATION DYNAMICS ALONG THE TRANSECT IN THE NORTHERN PART OF THE VOLGA-AKHTUBA FLOODPLAIN

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**Abstract.** The Volga-Akhtuba floodplain is the part of the Volga river valley located between the dam of Volgograd hydropower station and the Volga river delta. It occupies desert and semidesert areas. The growing azonal plant communities of meadow, marsh and forest species in the Volga-Akhtuba floodplain are caused by regular water release into the [tail-water](#) of the Volgograd reservoir. These reservoir releases imitate natural high waters. The major factors determining character of the vegetation cover of the Volga-Akhtuba floodplain during the centuries are mowing and meadow pasture. A new factor influencing on the vegetation cover in the floodplain has appeared recently. This is recreational using of this territory.

The geobotanical transect 27.5 km long was laid in 1955 in the northern part of the floodplain near Leninsk town in the Volgograd region. Transect was marked on aerial photographs showing the location of key plots. In order to study the vegetation dynamics after 1955 this transect had been observed again in 1971, 1982 and 2008. The results of repeated observations indicate that by 2008 the occurrence of ruderal species has increased: *Conyza canadensis*, *Chenopodium album* + *Ch. acerifolium*, *Lactuca serriola*, *Cannabis sativa* var. *spontanea*, *Sonchus arvensis*, *Cichorium intybus*, taxa of *Polygonum* genus (section *Polygonum*). *L. serriola*, *C. intybus* were not marked in 1955. These species were not noted even in 1971. The presence of hygrophytes has decreased by 2008 (*Sagittaria sagittifolia*, *Carex acuta*, *Lythrum salicaria*) with a simultaneous increase in occurrence of more mesophytic taxa (*Lythrum virgatum*, *Carex agr.*, *Carex praecox*). The adventitious species *Fraxinus pennsylvanica* and *Bidens frondosa* seemed to be widely spread. The fact of the greatest degree of xerophytization and pasture degradation of vegetation in 2008 can be explained by several reasons: 1) general decrease in volumes of spring-summer flooding water under conditions of [regulated stream flow](#), 2) increased use for recreation, 3) local deterioration of floodplain inundation in the area of field work caused by the road dam construction.

**Key words:** Volga-Akhtuba floodplain, [water stream regulation](#), xerophytization of vegetation, [synantropization](#) of vegetation.

УДК 599.735.5.(733.12)

## THE FEATURES OF USING OF STEPPE PASTURES IN EASTERN MONGOLIA BY WILD AND DOMESTIC LARGE HERBIVOROUS

© 2009, I.A. Dmitriev, S.B. Rozenfeld, B.D. Abaturov

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**Abstract.** In this report features of a nutrition of wild and domestic large herbivores mammal are determined by results of carried out cuticular analysis of faeces. Simultaneous research of diets has revealed appreciable overlapping between mongolian gazelle and domestic cattle. Changes of character of use of vegetation during the period of vegetation were observed. It is not revealed an obvious interspecific competition for resources of environment. The botanical structure of pastures appreciably defines a set of kinds in a diet.

The major factor determining functioning of pasturable ecosystems is herbivores animals on which influence in many respects depend composition, structure and efficiency of a vegetative cover of pastures. The understanding of features of functioning steppe ecosystems in conditions of their joint pasturable use wild and domestic mammal demands knowledge of character of trophic influence of animals on vegetation, and, in particular, such parameter, as qualitative structure of phytomass withdrawn by them. Without definition of these values it is impossible to estimate a forage reserve of pastures and their potential suitability for various kinds of pasturable animals, that, in turn, approaches us to understanding of what role resources of environment are played in modern dynamics of populations wild phytofags.

The carried out researches have shown, that on steppe pastures of East Mongolia all complex living there large phytofags uses 65 kinds of plants from 124 marked for this region in general peep. It is possible even, that the real number of names of forages is little bit more, since for a part of fragments their specific belonging has not been identified. Structures of diets and a ratio in them of kinds of plants are substantially defined by botanical structure of pasturable vegetation. Most actively the plants submitted in a quantitative sense in the greatest measure are used. Those for the investigated region are practically all kinds of cereals, лапчатки, горец, a sedge, some kinds of ice-holes. This factor determines high ( $\approx 40\%$ ) factor of overlapping of diets between various kinds of domestic cattle. Nevertheless, the competition between them cannot arise basically as there is a compulsory division by cattlemen of their herds in space, i.e. use of different pastures for the certain kinds of cattle during various pasturable seasons.

The appreciable degree of overlapping of diets of mongolian gazelle and domestic cattle cannot form the unique basis for a conclusion about existence of an interspecific competition. At present all large phytofags in steppe pastures of East Mongolia are quantitatively quite provided fodder resources. We believe, that the increase in number of cattle can serve as the potential reason of reduction of number of mongolian gazelle but basically not due to undermining a forage reserve, and due to its replacement on atypical pastures or pastures with small food capacity. Also there is such danger at active pasturage of cattle in natural reservations in case of the general deficiency of forages owing to droughts and at their insufficient protection.

**Key words:** Mongolian gazelle, livestock, steppes, overlap of rations, grassland, Eastern Mongolia.

## FORMATION OF THE COASTAL VEGETATIVE ECOTON IN CONDITIONS OF UNSTABLE LEVEL OF THE CASPIAN SEA

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**Abstract.** Landscape organization of the terrestrial-water ecotone system of the Caspian Sea shore includes the following blocks: fluctuative, dynamics and distant. These blocks reflect impact of the sea: direct at the fluctuative – prolonged flooding every year; direct-indirect – at the dynamic – short-time flooding; indirect impact at the distant – by ground waters. The structure of coastal ecotone vegetation in limits of the Tersko-Kumskaya lowland is analyzed.

Contact of two essentially different environments in system "water-land" has caused formation of transitive area - ecotone. In ecotonal system in the direction from sea shore line into lowland the water factor gradually weakens and the role of zonal processes increases. Indicator of similarity of species within blocks of ecotone reflects occurring changes as smooth, without sharp visual borders both in vegetation, and in soils. The vegetation of the dynamic block of ecotone is more various because here the humidity has the different character replaced in time and close two nearest blocks. Ecotonal feature of coastal territory is expedient for considering its economic use for preservation of the botanical diversity.

**Key words:** water-terrestrial ecotone, blocks, similarity of species structure.

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### HISTORY OF SCIENCE

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#### ABOUT SCIENTIFIC HERITAGE OF DMITRY KRIVOLUTSKY (FOR 70-YEAR ANNIVERSARY)

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The paper is devoted to 70-year anniversary of Dmitry Krivolutskiy, a famous Russian zoologist, ecologist and biogeographer (1939-2004). A short summary of his scientific heritage is presented.

Dmitry Alexandrovich Krivolutskiy (4.10.1939 – 30.10.2004) is an eminent Russian researcher in the field of zoology, ecology and biogeography. His scientific achievements and merits were rewarded by state and another prestige awards, the encyclopedic knowledge was appraised at its true worth. In October 2009 he would be seventy last birthday.

D.A. Krivolutskiy's heritage contains about 600 publications including papers and books, unfinished manuscripts and scientific archives. Many of them are of great theoretical significance in general biology, acarology, zoology, ecology and biogeography. In his lifetime the main object of research was *Acari*, *Oribatida*. Dmitry Alexandrovich made a valuable contribution to acarology as a successor of E.M. Bulanova-Zakhvatkina in the development of studies on living forms exemplified by *Acari*, *Oribatida*. The fundamental scientific work "Definition of *Sareoptiformes* in Soils" published in 1975 under edition of M.S. Gilyarov and D.A. Krivolutskiy became a great event in the world's acarology.

D.A. Krivolutskiy managed to organize the laboratory of bioindication at the A.N. Severtsev Institute of Problems in Ecology and Evolution, Russian Academy of Sciences, and remained as its head up to the end of his life. The research of D.A. Krivolutsky in studying ecological interactions in biogeocoenoses, biogenic migration of chemical elements, bioindication of radioactive pollutants

acquired especial significance in this field of science. As a result his fundamental monograph "Soil Fauna under Ecological Control" has been published in 1994.

Biogeographic research was also an important sphere in his scientific activity. First of all, it concerns the studies in biogeography of soils. His monograph under the title "Formation of Soil Biogeography" left deep trace in this area of natural science. At the end of the 1990s D.A. Krivolutsky started a new trend in his research relating to the role played by birds in distribution of soil microarthropods and successes achieved by him helped explaining a lot of questions in biogeography of not mobile soil organisms.

Being a department chief at the leading country's university, D.A. Krivolutsky has being seen the main task in preparing textbooks reflecting advanced views of scientific knowledge. On his initiative and with his participation such textbooks have been prepared and published as "Biogeography with Grounds for Ecology", "Biodiversity and its Assessment" (1999), "Biodiversity" (2004).

Dmitry Alexandrovich made progress in science, but his plans and ideas remained unfinished; he intended to organize the laboratory of acarology at the Institute of Parasitology of Russian Academy of Sciences, headed by him within 2002-2004. In the last years of his life Dmitry Alexandrovich collected the materials for a new book about living forms, but this book remained unwritten. Finally, he wished to revert to his favorite theme: taxonomy and phylogeny of ticks. The article presented the investigation results obtained in Mongolia and devoted to *Acari, Oribatida* of Zetomotrichidae family in the arid zone of the Palearctic published in journal "Arid Ecosystems" was last in his lifetime.

**Key words:** general biology, acarology, zoology, ecology and biogeography.

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**CHRONICLE**

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**THE 2nd ALL-RUSSIA CONFERENCE «PROBLEMS OF STUDYING OF REGIONAL STRUCTURES OF BIOCOENOSES»**

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In October, 7-9, 2008 in Saratov the 2nd All-Russia conference «Problems of studying regional structures of biocoenoses» with the international participation has taken place as devoted to the 100 anniversary of the Saratov State University. Sessions passed at the biological faculty of the Saratov State University. At the conference more than 40 representatives of the scientific organizations of Russia and Ukraine took part, 38 papers have been presented. The papers have been published before Conference in the book "Problems of studying regional structures of biocoenoses: Materials of 2nd All-Russia scientific conference with international participation" - Saratov, October, 7-9, 2008. Saratov: Publishing house Saratov University, 2008. 248 p. The major participants paid attention to distinction in the environmental conditions and features inherent to the formation of biodiversity on borders of terrestrial phytocoenoses, soil and water biocoenoses, different environments: water - terrestrial, wood - an edge, water-air environment, and in the same environment on a gradient of changes in the water (river water - water basin waters), soil (forest-steppe catena), etc.