

IX Field School on Soil Zoology and Ecology for Young Scientists

Karaganda Buketov University

Association for the Conservation of Biodiversity of Kazakhstan

Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences



SOIL ZOOLOGY RESEARCH IN NORTHERN KAZAKHSTAN: HISTORY AND RESULTS

August 18–24, 2025, Karaganda, Kazakhstan

Doctor of Biological Sciences, Professor

Bragina, Tatyana Michailovna,

Akhmet Baitursynuly Kostanay Regional University



КАРТА КАЗАХСТАНА



Northern
Kazakhstan
includes the
North
Kazakhstan
Region,
Kostanay,
Pavlodar, and
Akmola
regions

**Phytogeographic regionalization
The Republic of Kazakhstan**
(Rachkovskaya, 2006)
1:7 500 000



PHYTogeOGRAPHICAL REGIONS

Oblast	Sub oblast	Provinces	Sub provinces	Plain	Melko-sopochnik	Mountain
Eurasian steppe	Black Sea – Kazakhstani steppe	West Siberian forest – steppe	North Kazakhstani forest – steppe	I		
		Trans Volga – Kazakhstani steppe	West Kazakhstani	IIa		
			Trans Ural – Torgai	IIb		
			Central Kazakhstani		IIc	
			East – Central Kazakhstani		IId	
	South Altai mountain	Ertiss – Kulunda		IIe		
		West Altai			IIIa	
		Kalba – South Altai			IIIb	
		Sauyr – Tarbagatai			IIIc	

Oblast	Sub oblast	Provinces	Sub provinces	Plain	Piedmont	Mountain
Sahara – Gobian desert	Iran – Turanian	North Turanian	Caspian	IVa		
			West – North Turanian	IVb		
			Central – North Turanian	IVc		
		Dzungarian	East – North Turanian	IVd		
			Dzungarian	V		
		South Dzungarian	West – South Turanian	Via		
			East – South Turanian	Vib		
			Cis-North Tien Shanian		VIIa	
			Trans IIe			
			North Zhetysus – Alatau		VIIb	
		Zhetysus – Alatau – North Tien Shanian	Kungei – Teriskei – Uzykarin – South Zhetysus – Alatau		VIIc	
			Kyrgyzian		VIIId	
			Cis-West Tien Shanian		VIIe	
			Kara Tau		VIIIf	
			West Tien Shanian		VIIic	

History of invertebrate studies in Kazakhstan



➤ The first information about invertebrates of Kazakhstan appeared 2.5 centuries ago in the description of the Palearctic fauna in the publications of Carl Linnaeus

➤ In 1785, academician S.G. Gmelin published the work "Journey through Russia to explore all three kingdoms of nature", which contains descriptions of new species from the territory of modern Kazakhstan

- In the second half of the 19th century, a number of expeditions were undertaken in Central Asia and Kazakhstan: Semenov-Tyan-Shansky P.P. (1856-1857); Severtsov N.A. (1857-1858; 1864-1868; 1874; 1877-1879), Fedchenko A.P. (1868-1871), Karelina G.S. (1883), Semenov-Tyan-Shansky A.P. (1888-1889), Oshanin V.F. (1876-1878), Roborovsky V.I. (1893-1895), etc.).
- A.I. Yakovlev's publication (1900) provided information about beetles in the territory of modern Akmola Region (Northern Kazakhstan).

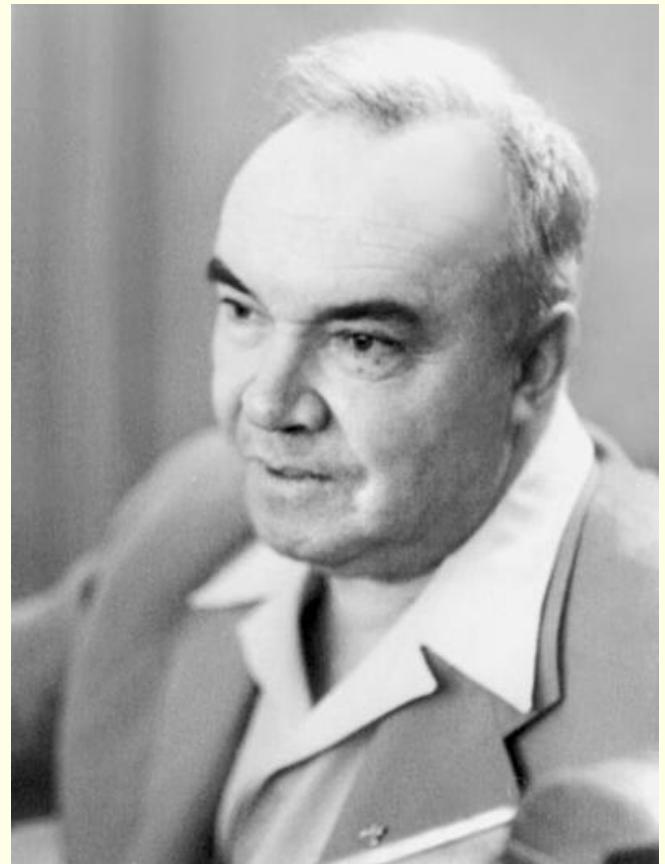
The 20th century

In 1931, the Naurzum State Nature Reserve was created on an area of 250,000 hectares (25,000 sq. km). It included more than 20 thousand sq. km of steppes, pine forests and aspen-birch forests, systems of fresh and salt lakes. In 1936, the area of the reserve increased to 320 thousand hectares.

In 1934, the scientific department of the reserve began its work.

Since the 1930s, the Naurzum Reserve has been a base for the field practice of biologists from Moscow State University.

- Alexander Nikolaevich Formozov (1899-1973) for several years directly supervised field practice in the Naurzum Nature Reserve.
- He contributed to the introduction of mandatory field practice for biology students, and compiled the first program for this practice.

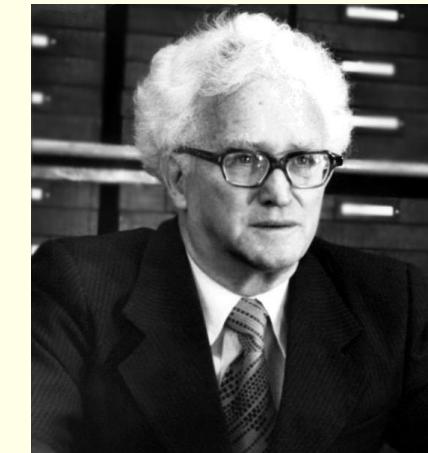


**A.N. Formozov,
Doctor of Biological
Sciences, Professor**

They worked in the Naurzum Reserve as postgraduate students, on expeditions or on staff



Академик
Г.В. Добровольский



Д.б.н., профессор
А. Г. Воронов



Академик
И.А. Крупеников



Д.б.н., профессор
Г. М. Длусский



Ю.Н. Куражковский,
первый териолог, НГПЗ НГПЗ



А. Ф. Каменский 1916–1942



Д.б.н.,
профессор,
Михеев А.В.

А.Ф. Каменский
первый энтомолог

- The results of scientific research were published in two volumes of the “Proceedings of the Naurzum State Reserve” (1938 and 1949).
- These publications played an extremely important role in the development of the country's nature reserves and nature.

КОМИТЕТ ПО ЗАПОВЕДНИКАМ ПРИ ПРЕЗИДИУМЕ ВЦИК

Участникам

ТРУДЫ
НАУРЗУМСКОГО
ГОСУДАРСТВЕННОГО ЗАПОВЕДНИКА

ВЫПУСК I

МОСКВА — 1938

ГЛАВНОЕ УПРАВЛЕНИЕ
ПО ЗАПОВЕДНИКАМ
ПРИ СОВЕТЕ РАБОЧИХ ГРОД
РОССР

УПРАВЛЕНИЕ ЗАПОВЕДНИКАМИ
ПРИ СОВЕТЕ МИНИСТРОВ
КАЗАВСКОГО СФР

ТРУДЫ
НАУРЗУМСКОГО
ГОСУДАРСТВЕННОГО ЗАПОВЕДНИКА

ВЫПУСК II

МОСКВА — 1941

On invertebrates, the publications included the works of

- **A. F. Kamensky, “Experience of zoogeographic characteristics of the entomofauna of Northern Kazakhstan” (1949) with a list of species (371 names, mainly inhabitants of the grass stand).**
- **V. V. Derevitskaya, “Habitats and communities of locusts of the Naurzum Reserve”, where the first example of an ecosystem approach to the study of locusts is considered.**

- The beginning of the 20th century was marked by a targeted study of insects of Kazakhstan by the Institute of Zoology (founded in 1932): ants, Lepidoptera, Orthoptera, dendrophagous beetles, and other beetles.
- In 1946, the entomology laboratory was established at the Institute of Zoology.
- Scientists prepare recommendations to combat harmful species of aphids, coccidians, cicadas, leaf beetles, bugs, xylophages beetles, the use of beneficial ones (entomophagous, pollinators) and to protect rare and endangered insects.

М. С. БАЙТЕНОВ



Жуки-долгоносики Средней Азии и Казахстана

АКАДЕМИЯ НАУК КАЗАХСКОЙ ССР
ИНСТИТУТ ЗООЛОГИИ

И. К. ЛОПАТИН, К. З. КУЛЕНОВА



(COLEOPTERA, CHRYSOMELIDAE)

КАЗАХСТАНА

ОПРЕДЕЛИТЕЛЬ



Издательство „НАУКА“ Казахской ССР
АЛМА-АТА•1986

А. М. ДУБИЦКИЙ



КРОВОСОСУЩИЕ КОМАРЫ КАЗАХСТАНА

И. А. КОСТИН

ЖУКИ-
ДЕНДРОФАГИ
КАЗАХСТАНА



АЛМА-АТА
1973

Г. В. Николаев

Пластиничатые
ЖУКИ
Казахстана
и Средней Азии

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не
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в.
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И. Д. МИТЯЕВ
ЦИКАДОВЫЕ
КАЗАХСТАНА

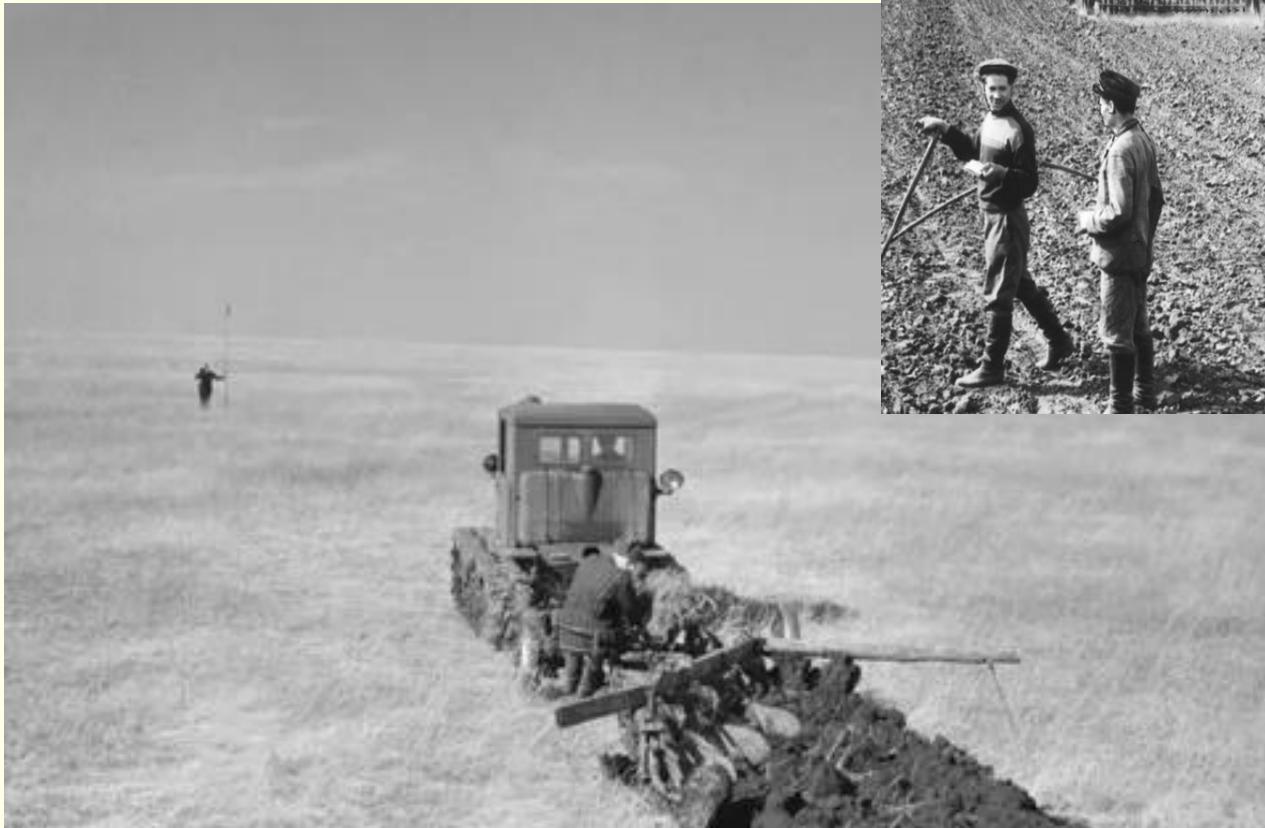
ОПРЕДЕЛИТЕЛЬ



АЛМА-АТА 1971



- Intensive research by scientists began before and during the period of virgin land development (1954 – 1965).





- Research on agricultural and forestry pests was conducted in various regions of Kazakhstan.
- For Northern Kazakhstan, the most important investigations were the protection of grain crops, forests, pastures and forage crops.



- Research institutes developed mainly in Alma-Ata, the capital of the Republic.
- In 1946, an entomology laboratory was established at the Institute of Zoology.
- Recommendations are given for combating certain harmful species of aphids, coccidians, cicadas, leaf beetles, bugs, xylophagous beetles, the use of beneficial ones (entomophages, pollinators) and the protection of rare and endangered invertebrates.

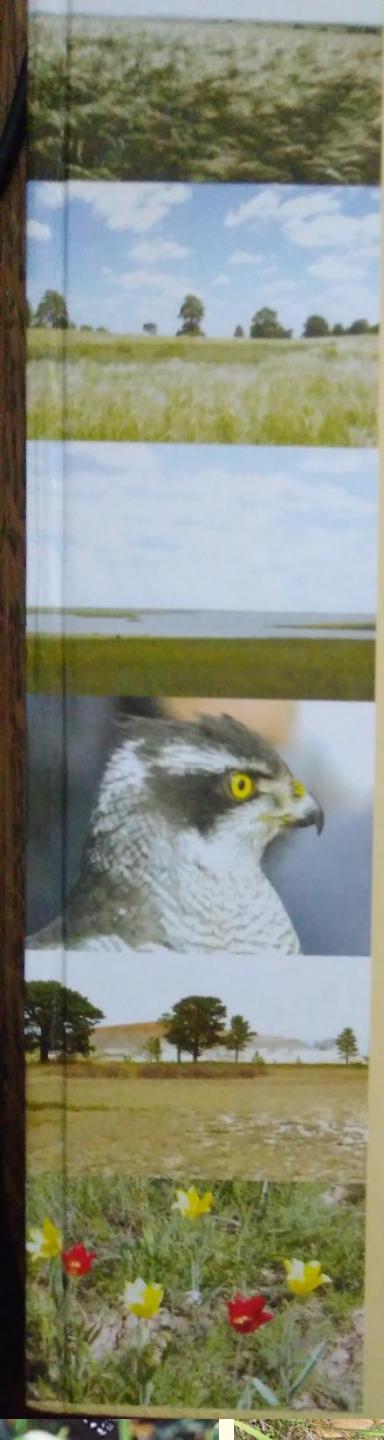
- But in 1951, 80% of the USSR's reserves were closed
- The forestry enterprise was created on the basis of the Naurzum Reserve.
- Scientists, primarily from Moscow State University, fought for the restoration of the reserve.
- In January 1966, after a major fire in 1963, the forestry enterprise was transferred to the Naurzum Reserve and Hunting Grounds with the status of "forest hunting farm"
- In October 1966, the forest hunting farm was transformed into the Naurzum State Reserve.

- In January 1966, after a major fire in 1963, the Naurzum forestry enterprise was transferred to the Naurzum Reserve and Hunting Grounds with the status of "forest hunting farm«
- In October 1966, the Naurzum forest hunting farm was transformed into the Naurzum State Reserve.
- However, the reserve status was declared only on an area of 85.7 thousand hectares. The territory included pine forests, lakes and small areas of steppe.

- The allocation of the territory of the Naurzum Nature Reserve took several years, until the early 1970s.
- In 1976, a decision was made to annex 2,000 hectares of feather grass steppes to the Tersek site of the nature reserve. It was implemented only in 1985 (9 years!).
- The creation of a two-kilometer protected area around the reserve began in 1977 and ended in 1985 - 8 years later!).
- In the 70s, Kazakhstan had 4 nature reserves, 1 national park and several sanctuaries only
- By the time the author arrived in 1976, Naurzum had just begun to recover.

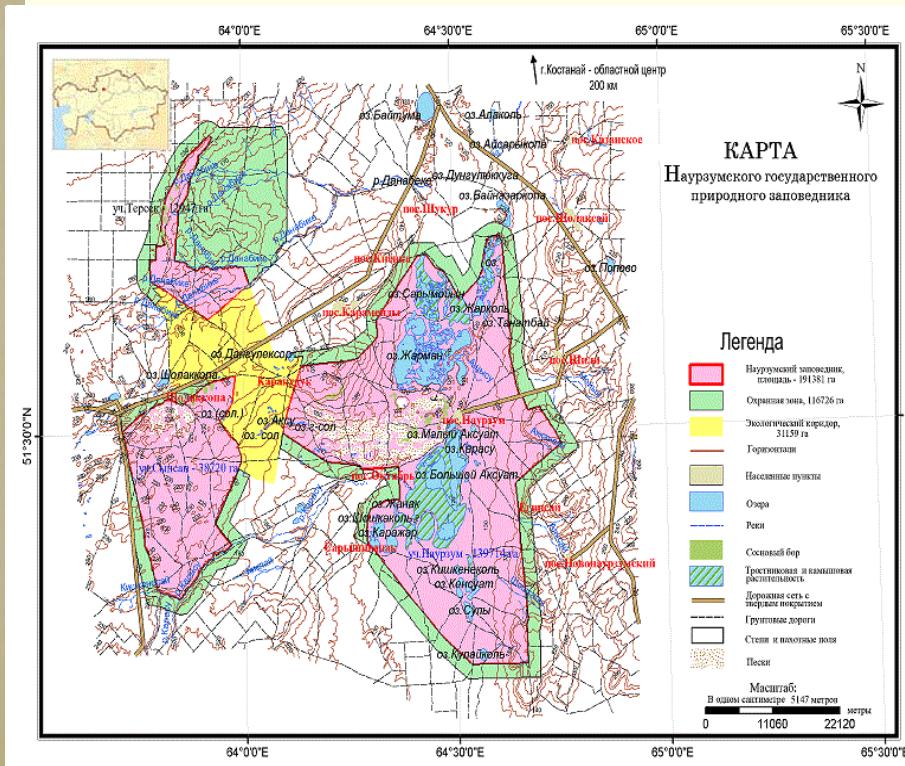
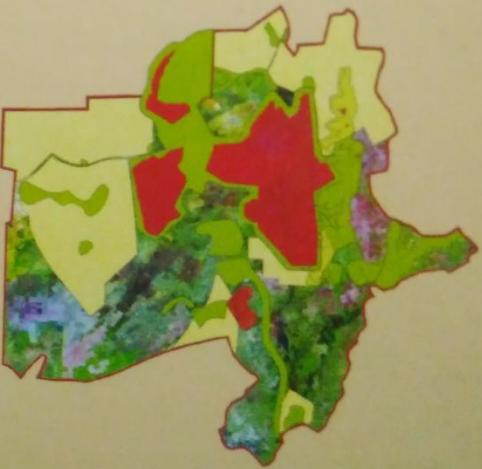
- In 1999, the author submitted materials to government agencies with a request for a major expansion of the reserve by 103,697 hectares and the development of its borders.
- A natural-scientific justification was prepared based on the author's own scientific research and experience.
- My husband, an ornithologist of the reserve, candidate of biological sciences, later professor of the Kostanay Pedagogical Institute, a major researcher of birds of prey in Northern Kazakhstan, Evgeny Aleksandrovich Bragin, helped and consistently supported the author's initiatives.
- The proposed areas were drawn up on the land management map of the Naurzum district.
- A cover letter was signed on behalf of the reserve administration and the NGO "Naurzum", headed by the author.

- At the author's suggestion and in accordance with the prepared documents, by the decision of the district authorities (Resolution No. 1 of January 8, 2004), the areas of the reserve were united by an ecological corridor with an area of 31,253 hectares. This was the first experience of organizing an ecological corridor in the Republic of Kazakhstan.
- More than 5 years of persistent work were required to implement the proposals.
- At all stages, many specialists and government services at the district, regional, national and international levels (WWF and other environmental organizations).
- The Resolution of the Government of the Republic of Kazakhstan was issued on January 26, 2004, No. 79, which approved the new area of the Naurzum Reserve at 191,381 hectares. The reserve includes 3 areas connected by an ecological corridor with the regime of a protected zone.
- In 2005, the allocation of a protected zone on an area of 116.5 hectares around the expanded territory of the Naurzum Reserve was completed



Т.М. Брагина

НАУРЗУМСКАЯ ЭКОЛОГИЧЕСКАЯ СЕТЬ



- In 2001, an International Meeting was held with the Secretariat of the UNESCO World Heritage Committee and delegations of Central Asian countries, from which the first proposals were received (2 per country).
- The technical side of the meeting was prepared by the World Wide Fund for Nature (WWF) Public Association "Naurzum", which the author created in 1995 and headed for more than 25 years.
- At author's request and in agreement with the state structures of the Republic of Kazakhstan, the host party was allowed to report not two, but three proposals from the country-organizer of the meeting. And this was the nomination of the Naurzum Reserve as a UNESCO World Heritage Site. called "Northern Turgai", reported by the author.

- Seven years later, in 2008, the UNESCO World Heritage Committee decided to include the nomination "Sary-Arka - Steppes and Lakes of Northern Kazakhstan" as part of the Naurzum and Korgalzhinsky Reserves in the UNESCO World Natural Heritage List.
- This was the first natural area in Kazakhstan and Central Asia to receive such a high status.
- The preparation of the joint nomination was completed by specialists from NABU - the largest environmental association in Germany and ACBK together with the Government of Kazakhstan .

- Within the modern boundaries of the Naurzum Reserve, steppes make up 63%, forests about 16% and lake systems - 21%.
- On the territory of the reserve, 6 types of vegetation are widespread: steppe, desert, forest, shrub, meadow, marsh; the entire generic spectrum of dark chestnut soils and a variety of steppe formations characteristic only of the Kazakhstan region of Eurasia with an original flora are represented.





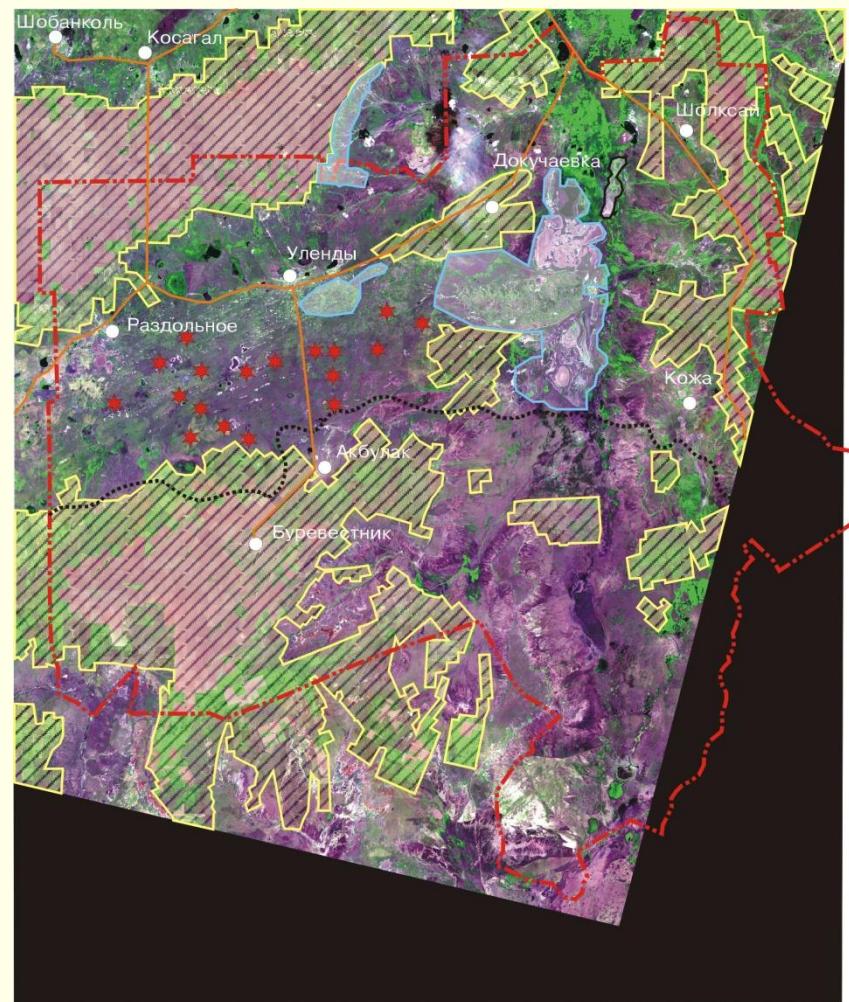
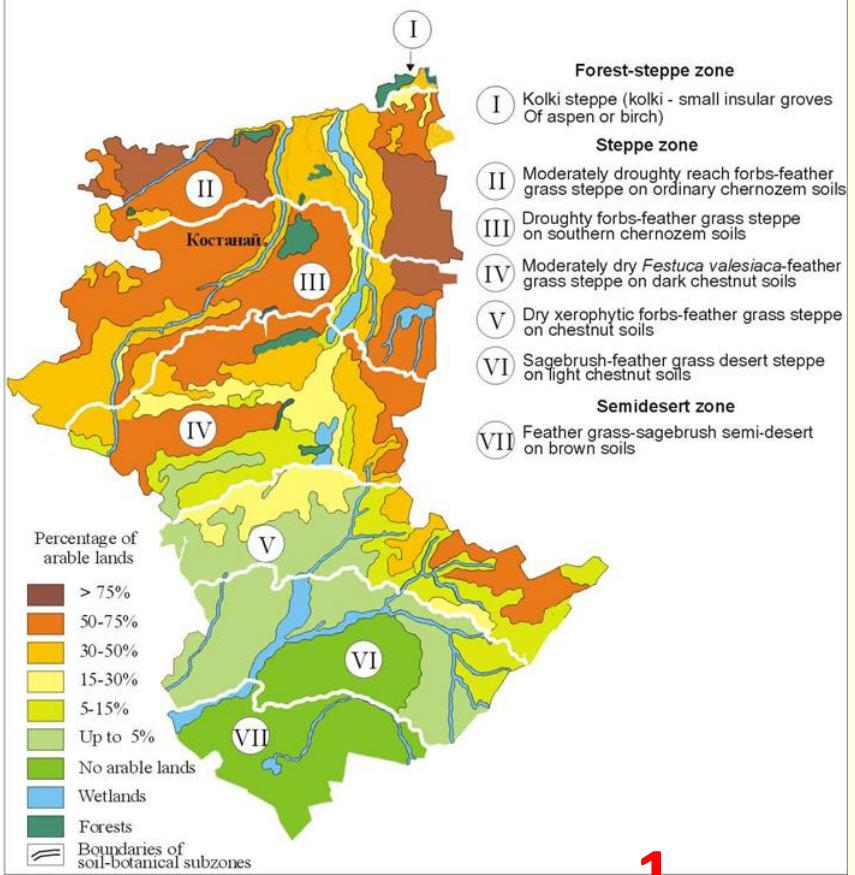




АДМИНИСТРАТИВНАЯ КАРТА РЕСПУБЛИКИ КАЗАХСТАН



**Schematic map of the percentage of arable lands
in Kostanai oblast in 1999**



Map of the arable land in the Kostanay region (1) and the area of grain crops (2). 1999

- The territory of the reserve belongs to the West Siberian climatic region of the temperate zone with a sharply continental climate.
- The area of investigation covers the central part of the Turgay hollow within the North Turgay physical-geographical province
- The territory is part of the Kazakhstan dry steppe province of dark chestnut and chestnut soils. In the treeless areas of the region, dark chestnut, sod-steppe, soddy ground-gley, meadow-chestnut, meadow soils and solonchaks are described, constituting a genetic series from automorphic conditions to hydromorphic.
- The genetic series under forest vegetation from automorphic to hydromorphic soils consists of the following soils: sands, primitive loose sandy soils, soddy-pine forest soils, soddy-pine forest soil-gleyic soils, meadow-marsh humus surface-gley soils, humus-gley soils.

Metods

- **Method of soil-zoological samples.** At each site, 16 samples of 50 cm x 50 cm or 25 x 25 cm in size were collected every 20-30 days during the vegetation period, with layer-by-layer soil sampling (0-10 cm, 10-20 cm, 20-30 cm, 30-50 cm) and manual selection of invertebrates.
- **Sieves and biogeocenmeters, temperature and humidity measurements** of soil layers were also used.
- Each natural site was investigated for **at least 2 years**.
- **Barber traps** were also installed at each site.

- We calculated the average abundance and biomass of samples and used the following variables: (n) = number of the samples; macrofauna species richness (S) = number of fauna groups present; macrofauna abundance, or density (N) = P/A, where P = abundance of soil specimens; A = surface area of the samples ($50 \times 50 \text{ cm}^2$).
- Macrofauna abundance (N) represents the total number of individuals in a sample per 0.25 m^2 , and then calculated per 1 m^2 .

- The first works on studying soil invertebrates were started under the state program of the Ministry of Forestry of the Kazakh SSR on root-eating pests of the pine of the Naurzum pine forest.
- The author applied a standard method of collecting and processing soil-zoological samples. Scientific material was accumulated.
- In parallel, inventory work was carried out on the fauna of individual groups of insects.

As a result of the work carried out in the first years, a number of publications and scientific reports deposited in the All-Union NTI Center were prepared:

- Bragina T.M. **Main patterns of distribution and migration of root-forming insects - pests of forest crops and measures to combat them: Research report** (final) - Deposited in VNTICenter, No. 0283.0019942), 1983. - 74 p.
- Bragina T.M. **Herpetobiont insects of the Naurzum pine forest as a component of soil mesofauna: Research report** (final) - Deposited in All-Union NTICenter, No. 0286.0041973), 1986. - 54 p.
- **Recommendations on measures to combat root-eating pests of forest crops on sandy soils of the dry steppe subzone** / Bragina T.M. - Alma-Ata: Kitap, 1986. 28 p had developed and adopted in the forestry system of the republic level.
- A collection of scientific papers "**Problems of restoration of the Naurzum pine forest**" (Collection of scientific works) was published / Naurzum State Reserve. - Alma-Ata: Kainar, 1991, 178 p.

- I send many warm words to the **Laboratory of Soil Zoology** of the **Institute of Evolutionary Morphology and Ecology of Animals named after A.N. Severtsov** USSR Academy of Sciences, headed by Academician **Merkury Sergeevich Ghilyarov**, the **Founder of Soil Zoology** as a science.
- In 1978, M.S. Gilyarov responded to the request for a scientific internship at the laboratory, and in 1979 I arrived, bringing samples of collected invertebrates and the first published articles.
- The author's correct identification of invertebrates was checked on behalf of the academician. **S.I. Keleynikova** and **Yu.B. Byzova** examined the larvae and imagoes of darkling beetles and click beetles, **V. Yanushev** examined the larvae of Scarabaeidae, and the larvae of ground beetles were examined at the department of Moscow State Pedagogical University under the supervision of **I. Kh. Sharova**.
- The scientific directions of work on the first description of soil mesofauna were discussed with **M.S. Gilyarov**, **Yu.I. Chernov**, **A.A. Zakharov**.
- **A.A. Zakharov** became **the scientific consultant** for the research conducted by the author, and the opportunity arose to come to the laboratory..



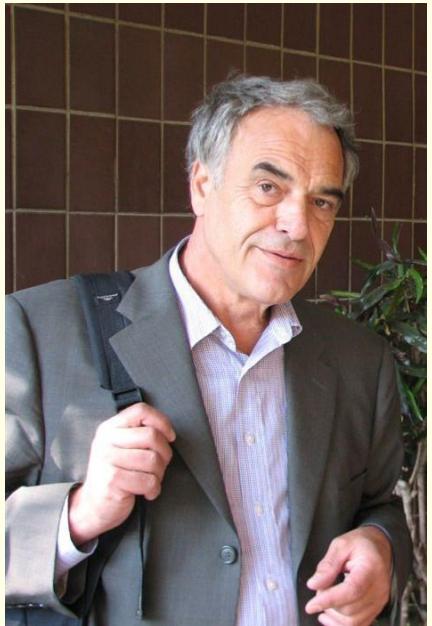
M.S. Gilyarov



Yu. B. Byzova



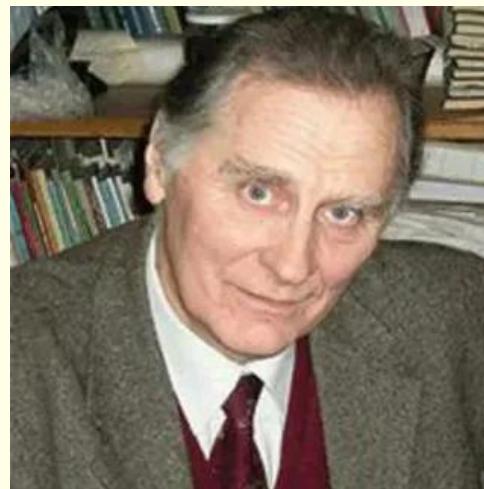
I. Kh. Sharova



A.A. Zakharov



V. V. Yanushev



Yu. I. Chernov

In 1987, the author defended her dissertation for the degree of candidate of biological sciences, “Structure, distribution and dynamics of soil mesofauna of dry-steppe Kazakhstan” (Sverdlovsk: Institute of Plant and Animal Ecology, 1987).

This was the first comprehensive classical study of communities of large soil invertebrates (mesofauna) of Northern Kazakhstan.

АКАДЕМИЯ НАУК СССР
УРАЛЬСКИЙ НАУЧНЫЙ ЦЕНТР

Институт экологии растений и животных

На правах рукописи

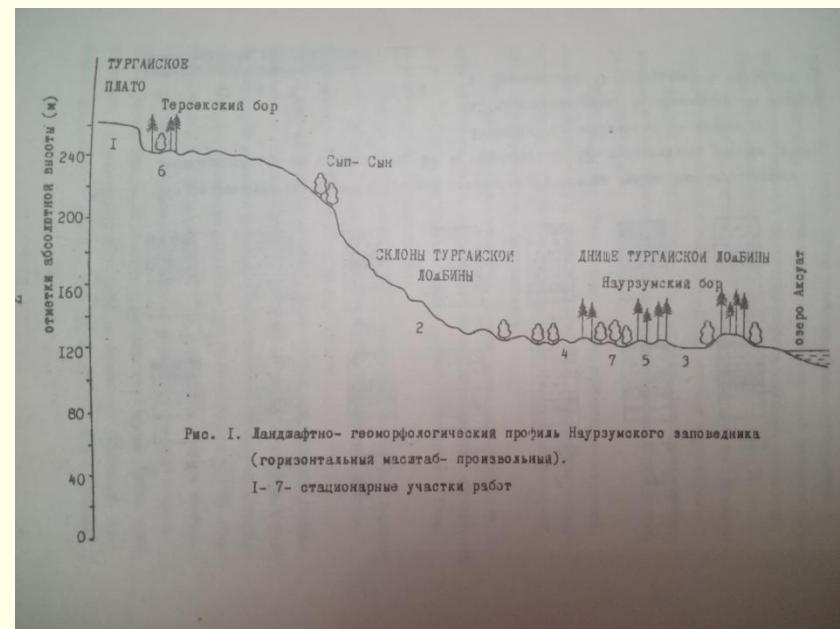
УДК 574 : 591.5 : 595.3/7

БРАГИНА Татьяна Михайловна

СТРУКТУРА, РАСПРЕДЕЛЕНИЕ И ДИНАМИКА
ПОЧВЕННОЙ МЕЗОФАУНЫ СУХОСТЕПЕННОГО
КАЗАХСТАНА
03.00.16 - экология

Автореферат
диссертации на соискание ученой
степени кандидата биологических
наук

Свердловск - 1987



Main conclusions:

- A unique combination of species with different ecology (from taiga to desert) differentiated by variations in the conditions of intrazonal biotopes was revealed in the Turgai depression.
- About 400 species were identified in the soil mesofauna, 200 of which are new to the reserve, 6 are new to Kazakhstan, and 1 is a new species to science.
- The mesofauna was characterized by a diverse composition with a relatively low population density
- The mesofauna (excluding ants) was dominated by beetles, with dipterans as codominants
- Steppe and desert-steppe species predominated in the ecological composition.
- 16 groups were identified in the spectrum of life forms of ground beetles.
- The allochthonous origin of the fauna of the Turgai hollow has been proven
- The soil population of pine forests and glades of island pine forests has lost the features of forest communities, elements of which have been preserved in aspen-birch forests.
- Seasonal and vertical migraphies of invertebrates, trophic structure and other issues are considered.



- In 1994, the Institute of Evolutionary Morphology and Ecology of Animals was transformed into the **Institute of Problems of Ecology and Evolution** of the Russian Academy of Sciences (**IEE RAS**).
- In 1997, the author was invited to a doctoral program by **Bella Rafailovna Striganovna** at the A.N. Severtsov Institute of Animal Ecology and Evolution, Russian Academy of Sciences.
- **B.R. Striganovna**, Doctor of Biological Sciences, Professor of Moscow State University, Head of the Laboratory of Soil Zoology and General Entomology (1985-2012).

На правах рукописи

БРАТИНА Татьяна Михайловна

**ЗАКОНОМЕРНОСТИ ИЗМЕНЕНИЙ ЖИВОТНОГО НАСЕЛЕНИЯ
ПОЧВ ПРИ ОПУСТЫНИВАНИИ**
(на примере сухостепной зоны Центральной Азии)

Специальность 03 00 16 - Экология

АВТОРЕФЕРАТ
диссертации на соискание ученой степени
доктора биологических наук

Москва - 2004

In 2004, a dissertation was defended for the degree of Doctor of Science "Patterns of changes in the animal population of soils during desertification (using the example of the dry steppe zone of Central Asia)"

- The work examined complexes of large soil invertebrates on transects in a series of ecosystems according to the increase in aridity of habitats, according to changes in the mechanical composition of soils, an increase in soil salinity, as well as changes under the influence of anthropogenic activity (grazing, plowing, arable land).
- The Lexis formula was used to determine the type of invertebrate distribution in the biotope:
 - $L = Q/M$, where
 - L is the aggregation coefficient;
 - Q is the standard deviation;
 - M is the arithmetic mean.

Species richness (W) was estimated using the Menhinick index (Mehinick, 1964):

- $I = W / \sqrt{N}$, where
- W is the number of species found, and
- N is the number of individuals counted during the sample analysis.

The dominance index was used to analyze species diversity (Magarran, 1992) - Berger-Parker index (Berger, Parker, 1970):

IBP = N_{max}/N , where

N - abundance of the most abundant species,

N_{max} - total abundance of species

The similarity of biotopes in terms of species composition was estimated using the polythetic unification method of hierarchical non-overlapping cluster analysis and the Chekanovsky-Sjerenssen coefficient (Pesenko, 1982):

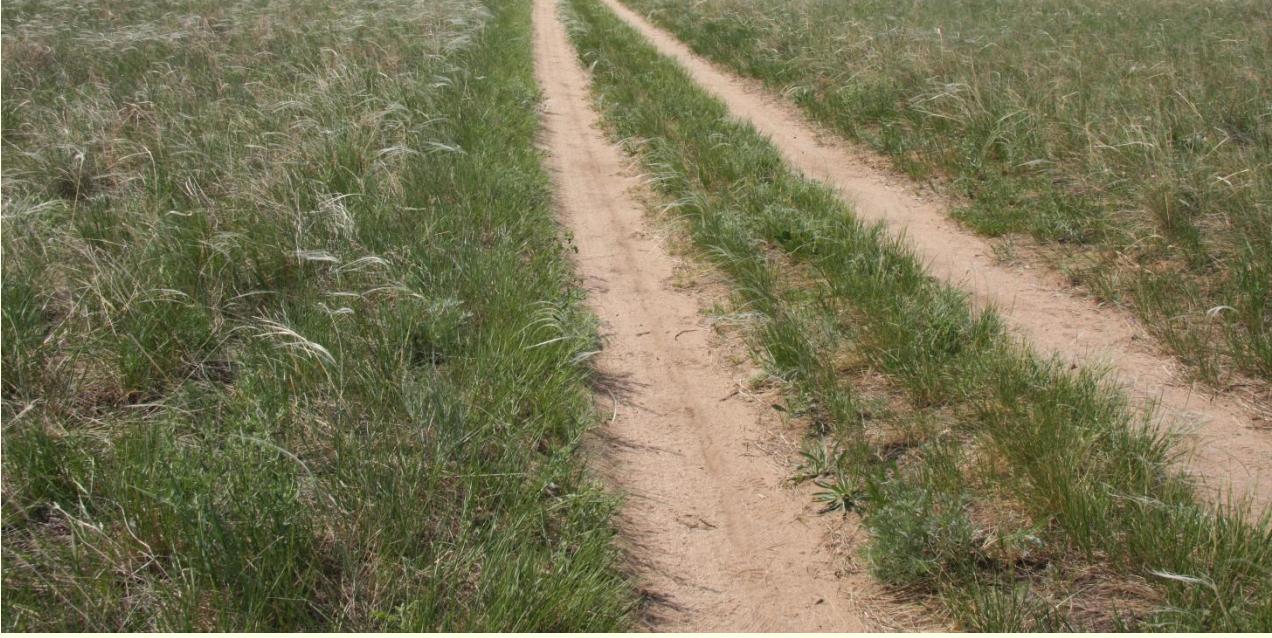
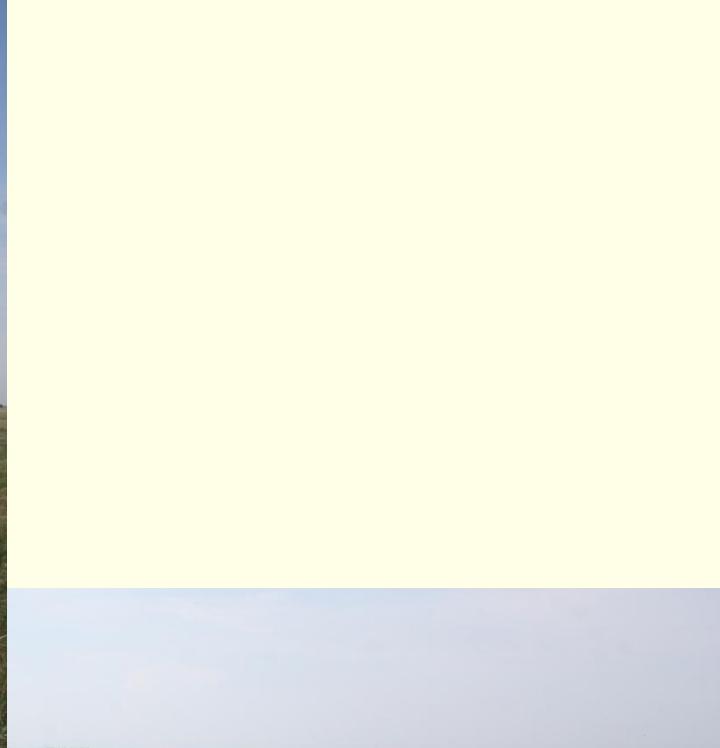
$K = 2I/a+b$, where

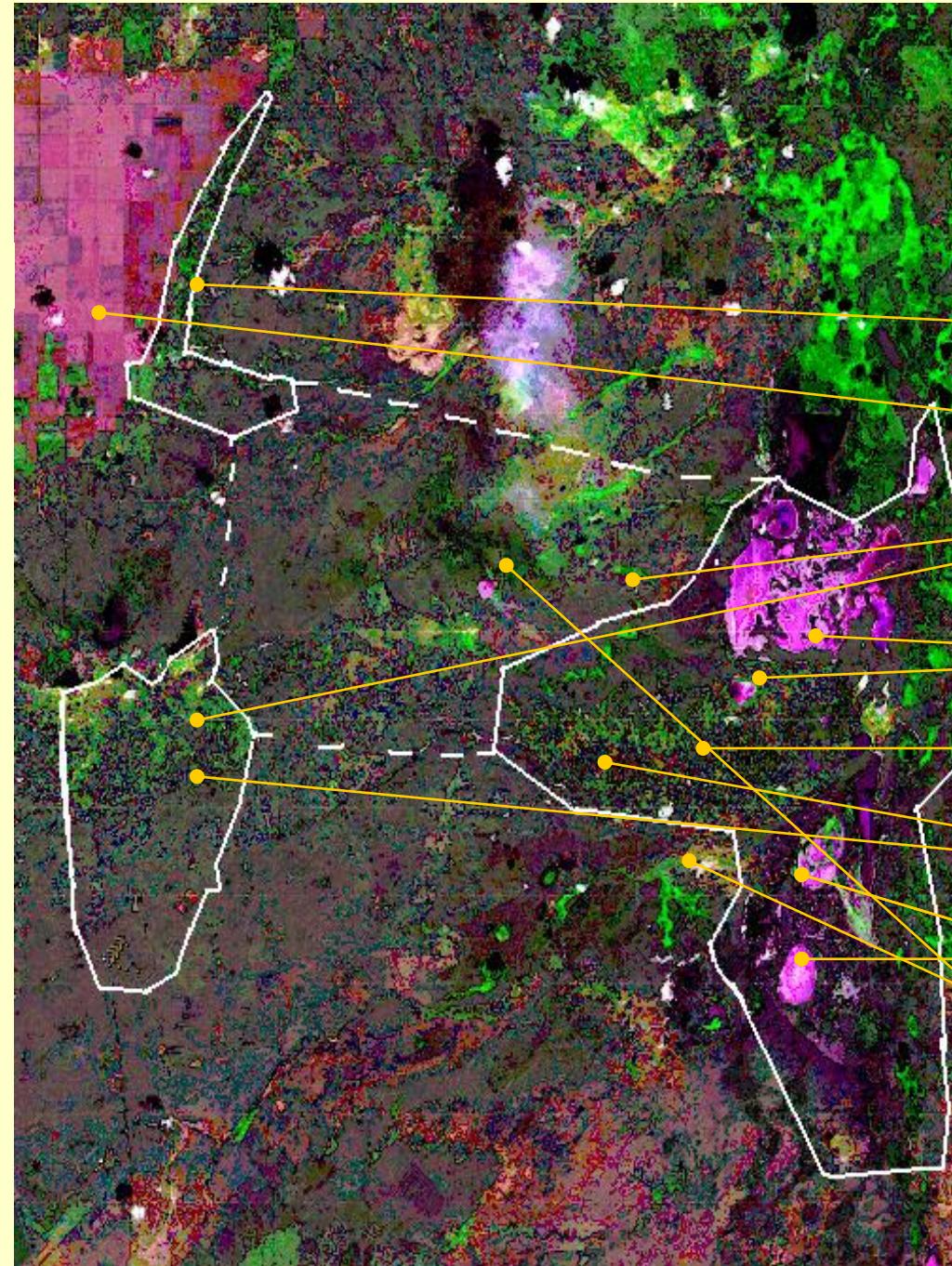
I is the number of common species in the compared biotopes;

a and b are the number of species in biotopes a and b, respectively

A soil-vegetation profile was laid out for the synchronous study of biota and environmental factors.

Soil and vegetation descriptions were conducted at each site.





SATELLITE IMAGE OF THE AREA OF THE NAURZUM NATURE RESERVE

ТЕРСЕКСКИЙ БОР

АГРОЦЕНОЗЫ

**ОСИНОВО-БЕРЕЗОВЫЕ
ЛЕСА**

СОЛОНЧАКИ

НАУРЗУМСКИЙ БОР

ПЕСЧАНЫЕ МАССИВЫ

ОЗЕРНЫЕ СИСТЕМЫ

**НАСЕЛЕННЫЕ
ПУНКТЫ**

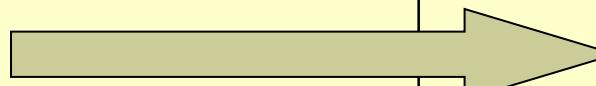
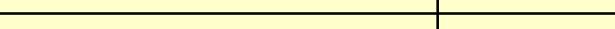
SOME RESULTS

- The desert-steppe ecotone of continental Asia is characterized by contrasting faunal-genetic and ecological characteristics of the animal population of the soils, which determine the high level of diversity of soil communities.
- an assessment of the faunistic diversity of soil invertebrate complexes of the desert-steppe ecotone of continental Asia in the landscapes of Northern Turgay is given
- analysis of the structural and functional organization of the animal population of soils of zonal, intrazonal and azonal ecosystems in the conditions of the subarid climate of the southern border of the steppe zone
- the features of changes in the structure of pedobiont communities along the gradient of increasing aridity of natural habitats have been identified

SOME RESULTS

- taxonomic richness of the main groups of soil-litter invertebrates of Northern Turgay
- zoogeographical elements in the composition of the fauna of Northern Turgay
- ecological groups in the composition of communities on the example of ground beetles (Coleoptera, Carabidae)
- the main directions of changes in the structure of the animal population of soils in the desert-steppe ecotone under different types of anthropogenic load were determined
- features of the structural organization of the animal population of soils have been identified, which can be used for early indication of desertification processes

Changes in the ranges of some invertebrate species after the development of virgin lands

50-60-е годы (до освоения целины)	Современная фауна
<p>Опустыненные степи и более южные местообитания (Арнольди, 1969)</p> <p><i>Cicindela atrata</i> <i>Carabus bessarabicus</i> <i>Pterostichus serviceus</i> <i>Pterostichus crenuliger</i> <i>Harpalus akinini</i> <i>Harpalus anxius</i> <i>Taphoxenus gigas</i> <i>Cymindis picta</i></p>	<p>Плакорные ковылковые степи</p> 
<p>Опустыненные степи и пустыни</p> <p><i>Cicindela elegans</i> <i>C. besseri</i> <i>C. littoralis</i></p>	<p>Интраzonальные местообитания, антропогенные участки, экстраzonальные пустынные</p> 
<p>Светло-каштановые песчаные почвы</p> <p><i>Platyope leucogramma</i> <i>Anatolica abbreviata</i></p>	<p>Темно-каштановые песчаные почвы</p> 
<p>Пустыни</p> <p><i>Oodescelis polita</i> <i>Scythis macrocephala</i></p>	<p>Плакорные степи</p> 
<p>Пустыни</p> <p><i>Lactrodetus lugubris</i></p>	<p>Приозерные участки с комплексной растительностью</p> 





In total,

For the first time, the composition and functional structure of the population of different types of soils of the Turgai plateau and natural ecosystems of the slopes of the Turgai hollow in the territory of Northern Kazakhstan have been studied in detail

Using the example of large soil-dwelling invertebrates, the relationship between the taxonomic and functional structure of biotic communities and environmental factors of the habitat has been considered

- The main signs of degradation of the animal population of soils under the influence of economic development of the territory as a factor of desertification have been established.
- It has been shown that degradation processes at different levels of the ecosystem are not synchronous and at different depths.
- Research has been conducted on changes in community structure under the influence of anthropogenic and climatic factors

ТРАНСФОРМАЦИЯ ПРИРОДНЫХ ЭКОСИСТЕМ И ИХ КОМПОНЕНТОВ ПРИ ОПУСТЫНИВАНИИ



Алматы, 1999

NOMINATION

To the
Director of the UNESCO
World Heritage Center
Paris
Chairman of the
Committee of
World Heritage Sites

"STEPPE AND LAKES OF NORTHERN KAZAKHSTAN" ("SARIARKA")

Additional Information of cultural resources to
the Republic of Kazakhstan to the
Committee of Cultural and Natural
World Heritage Sites

For inscription on

THE LIST OF CULTURAL AND NATURAL WORLD HERITAGE OF UNESCO

Heritage Site nomination and the materials for the nomination of the
Supported by the Government of the Republic of Kazakhstan

Naurzum State Nature Reserve

This dossier is the Steppe and Lakes Natural Heritage site submitted by the Republic of Kazakhstan to be included to the list of Cultural and Natural World Heritage Sites of UNESCO.

We are asking you to consider this nomination and undertake all necessary
procedures in order to include the site to the List mentioned above.

Sincerely Yours,

Prepared by:

- Naurzum State Nature Reserve (Bragina T.M., Bragin E.A., Tairbergenov Y.)
- Korgalzhinskiy State Nature Reserve (Sidorova T.V.)
- NPO "Ecological scientific center "Enviric" (Rachkovskaya E.I.)
- Institute of Geography MON RK (Geldieva G.)

Under support and participation of:

- World Wildlife Fund (WWF) (Shestakov A.S., Pereladova O.B.)
- German Society for Nature Conservation (NABU) (Dieterich T., Ablaikhanova G., Lenk M., Brombacher M.)

December 2001

Marinus J.A. Werger
Marja A. van Staalduinen
Editors

Eurasian Steppes. Ecological Problems and Livelihoods in a Changing World

 Springer

3.2 Diversity of Steppe Ecosystems (Natural-Territorial Complexes)

Current Status of Kazakhstan's Steppes and the Main Threats

Agriculture and, in recent years, also other anthropogenic factors have had very extensive effects on the vegetation throughout Kazakhstan. Arable farming (cultivation) replaced natural vegetation by agroecosystems. Cultivation and regulation of watercourses not only transformed the natural ecosystems of the Kazakhstan steppes, but also damaged local water balances, resulting in lowering of groundwater levels and the disappearance of many small water bodies, while the desiccation of large ones have become more frequent and prolonged (Bragina 2007). Grazing also affects the natural vegetation. Anthropic impacts, such as roads,

The differences in natural conditions in Kazakhstan (climate, topography, soils, vegetation) determine the differentiation in natural-territorial complexes or ecosystems in the country. For our purpose an ecosystem, or natural-territorial complex, is characterized by a homogeneous relief, one type or subtype of soil, a set of plant communities with a common structure (life forms) and characteristic species composition, a similar range in fluctuation in species composition and productivity, a similar successional trend, and similar responses to natural and anthropogenic effects (Ogar 1999, 2006). This ecosystem concept, considering elements of topography, soil, vegetation and associated animal populations, we use to assess the potential development of habitats, their potential flor and faunal diversity, and the potential consequences of disturbance.

This concept was first used in classifying and mapping the natural ecosystems of Mongolia (Ecosystems of Mongolia 1995), and later in creating the first small-scale maps of ecosystems of Kazakhstan, taking the peculiarities of the natural conditions of Kazakhstan into account (Ogar and Rachkovskaya 2006). This allows us to determine the differences in the natural ecosystems of the two largest steppe regions of Eurasia: Kazakhstan and Mongolia. On this basis of small-scale maps of ecosystems, made for the National Atlas of the Republic (2006) and using the materials of the UNEP/GEF/WWF project "Development of the Ecosystem for Long-term Conservation of Biodiversity in the Central Asia Ecoregions", we are able to provide (qualitative and quantitative) area data on the landscape diversity of the main forest-steppe and steppe ecosystems (Table 3.1).

Forest-steppe ecosystems occupy 2.4% of Kazakhstan, and steppes, including those on the foothills and mountains, 42.4%.

In the plain and malkosopochnik part in the north of the country large areas of dry and desert steppes (11%) are mainly found on the Sub-Ural and Turgai Plateau (Photo 3.1). Dry and desert steppes are also associated with the elevated deserts-prairie plains, mainly among the hills of Central Kazakhstan (6.7%), and are widespread in the lowland plains of the Caspian Lowland (4.8%), while in the lowland plains of the West Siberian Plain, forest-steppe ecosystems and humid temperate-droughty and droughty steppes are widespread (6.3%). Note that the steppes ecosystems on aeolian plains occupy a very small area in Kazakhstan (1.6%). Special for Kazakhstan are the steppes of malkosopochnik (8.6%). Low inselbergs do not occupy large areas (2.4%), but allow the penetration of the northern steppes far to the south, and they comprise many rare types of ecosystems in the region.

The area of the foothills and mountain ecosystems is small (3.4%), but their importance for the conservation of biodiversity and for economic use, especially in desert regions, cannot be overestimated.

This paper will mainly deal with vegetation, as it is the major and most informative biotic component of terrestrial ecosystems.

Soil macrofauna (invertebrates) of Kazakhstanian *Stipa lessingiana* dry steppe

Tatyana M. Bragina^{1,2}

Key words: dark chestnut soil, *Stipa lessingiana* steppes, soil invertebrate communities (macrofauna), structure.

Ključne besede: temna kostanjeva prst, stepe z vrsto *Stipa lessingiana*, talne združbe nevretenčarjev (makrofauna), struktura.

Abstract
Stipa lessingiana steppes used to be prevalent on the dry Trans-Ural denudation plains, particularly, on the Sub-Ural and the Turgay Plateau. But, most of them have been lost because they were plowed up during the Virgin Land campaign in the second part of 20th century. This paper presents a detailed study of the faunistic composition and the structure of soil-dwelling invertebrate communities (macrofauna) of a temperate-dry bunch feather grass steppe in the Turgai Plateau (Northern-Turgai physical-geographical province of steppe Kazakhstan, Kostanay Oblast). The study site is located in the territory of the Naurzum State Nature Reserve, a part of the UNESCO World Heritage site "Saryarka - Steppe and Lakes of Northern Kazakhstan", where remnants of Virgin *S. lessingiana* steppes have been preserved to the present day. This region is the driest and most continental in climate of all the dry steppes of Kazakhstan. The total abundance and biomass of soil invertebrate communities in the investigated site were lower than in the northern and western steppe areas. Soil invertebrates are among the major components that determine the functioning of terrestrial natural ecosystems.

izvleček

Stepe z vrsto *Stipa lessingiana* so nekoč na suhih ogoljelih ravnicah Trans-Urala prevladavale, se posebej na podtalnem plateau v planoti Turgay. Številne so uničeli z preoravanjem med kampanjo "Devška zemlja" v Kazahstanu v drugi polovici 20. stoletja. Raziskava predstavlja natančno analizo sestave favne in strukturo talnih združb nevretenčarjev (makrofauna) v zmerni suhi stepi z baladicno na plateau Turgai (severno turskijska fizikalno-geografska provinca step Kazahstan, oblast Kostanaj). Raziskovano območje je del državnega naravnega rezervata Naurzum, ki je del zavarovanega območja svetovne naravne dediščine pri UNESCO „Saryarka – stepe in jezera severnega Kazahstana“, kjer so ohranjeni ostanki step z vrsto *S. lessingiana*. Ta regija ima najbolj sušno in kontinentalno klimo izmed vseh suhih step v Kazahstanu. Za preučevanje talne favne in strukturo njihovih združb med vegetacijsko sezono smo uporabili talno-zoološke vzorce (monoliti). Skupna abundanca in biomasa združb talnih nevretenčarjev v preučevani suhi stepi z vrsto *Stipa lessingiana* v Kazahstanu je bila manjša kot v severnih in zahodnih stepah, kjer sta delež humusa v tleh in količina padavin večja. Talni nevretenčarji so eni izmed najpomembnejših dejavnikov, ki so ključni za delovanje naravnih kopenskih ekosistemov.

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СТРАТЕГИЯ РАЗВИТИЯ СЕТИ ОСОБО ОХРАНЯЕМЫХ ПРИРОДНЫХ ТЕРРИТОРИЙ В СТЕПНОЙ ЗОНЕ РЕСПУБЛИКИ КАЗАХСТАН НА ПЕРИОД 2013 – 2030 гг.



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РЕФЕРАТ



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Steppe Marmot (*Marmota bobak*) as ecosystem engineer in arid steppes

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ABSTRACT

Burrow-dwelling rodents are often considered ecosystem engineer species in arid environments. They create distinct habitat patches by building burrows: they move large amounts of soil, mix soil layers and change soil

Брагина Т.М.

ОСОБО ОХРАНЯЕМЫЕ ПРИРОДНЫЕ ТЕРРИТОРИИ
КАЗАХСТАНА И ПЕРСПЕКТИВЫ ОРГАНИЗАЦИИ
ЭКОЛОГИЧЕСКОЙ СЕТИ



Брагина Т.М.

ОСОБО ОХРАНЯЕМЫЕ ПРИРОДНЫЕ ТЕРРИТОРИИ КАЗАХСТАНА
И ПЕРСПЕКТИВЫ ОРГАНИЗАЦИИ ЭКОЛОГИЧЕСКОЙ СЕТИ
(с законодательными основами в области особо охраняемых природных
территорий)



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ПОЗВОНОЧНЫЕ ЖИВОТНЫЕ НАУРЗУМСКОГО ЗАПОВЕДНИКА



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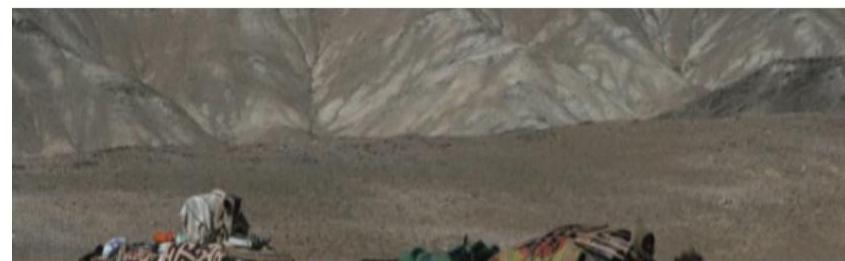
Commission on Ecosystem Management

Our work

Holarctic Steppes

- OEM's Specialist Groups
- Agro-ecosystems
- Arctic
- Coastal and Marine
- Deep sea mining
- Desert and Oasis
- + Dryland Ecosystems

The main goal of HS SG is to improve management and conservation of steppe ecosystems, and to harmonize this with the needs of the human society.



Links

- Virtual Encyclopedia of Key Steppes
- Eurasian Steppes (book)
- Virtual Encyclopedia of the Steppes - China
- Virtual Encyclopedia of Steppes - Kazakhstan
- Steppes of Mongolia



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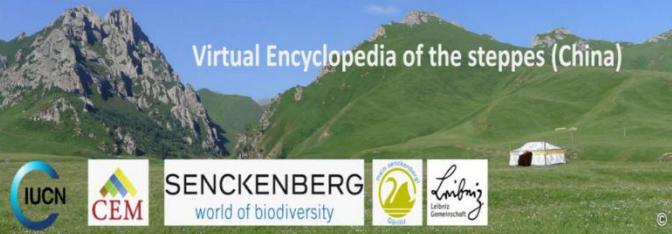
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Virtual Encyclopedia of the steppes (China)

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← → ⌂ ⌂ https://steppes.ksp.kz/pages/introduction.html

Virtual Encyclopedia of the Steppes (Kazakhstan)

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Home Introduction Authors Kazakhstan Our projects Publications

Introduction

The largest steppe areas of the world are located in the Asian part of Eurasia (Kazakhstan, Mongolia, Russia). However, if extensive long-term studies of steppe territories were conducted in Mongolia and Russia, including with the participation of international teams, the study of the natural steppes and their management problems in Kazakhstan is insufficient. At the same time, Kazakhstan is one of the largest countries and ranks 9th in the world. The area of the Republic of Kazakhstan is 2,724,900 km², and more than 40% is occupied by steppe ecosystems. The main goal of the **Group of Specialists of the «Holarctic Steppes»** of the Commission for the Management of Ecosystems of the International Union for Conservation of Nature (CEM / IUCN) is to promote steppe conservation and harmonization of protection with the needs of human society, to analyze the distribution of steppe ecosystems in the Holarctic, their current status and effective management.

The preparation of accessible information on the steppe territories of the world - the Virtual

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С ОСНОВАМИ ПОЧВОВЕДЕНИЯ

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ПО ПРИКЛАДНОЙ БИОЛОГИИ
С ОСНОВАМИ ПОЧВОВЕДЕНИЯ



Bragina T. M.

**INTRODUCTION TO ENTOMOLOGY
PART 1: THE EXTERNAL
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Textbook

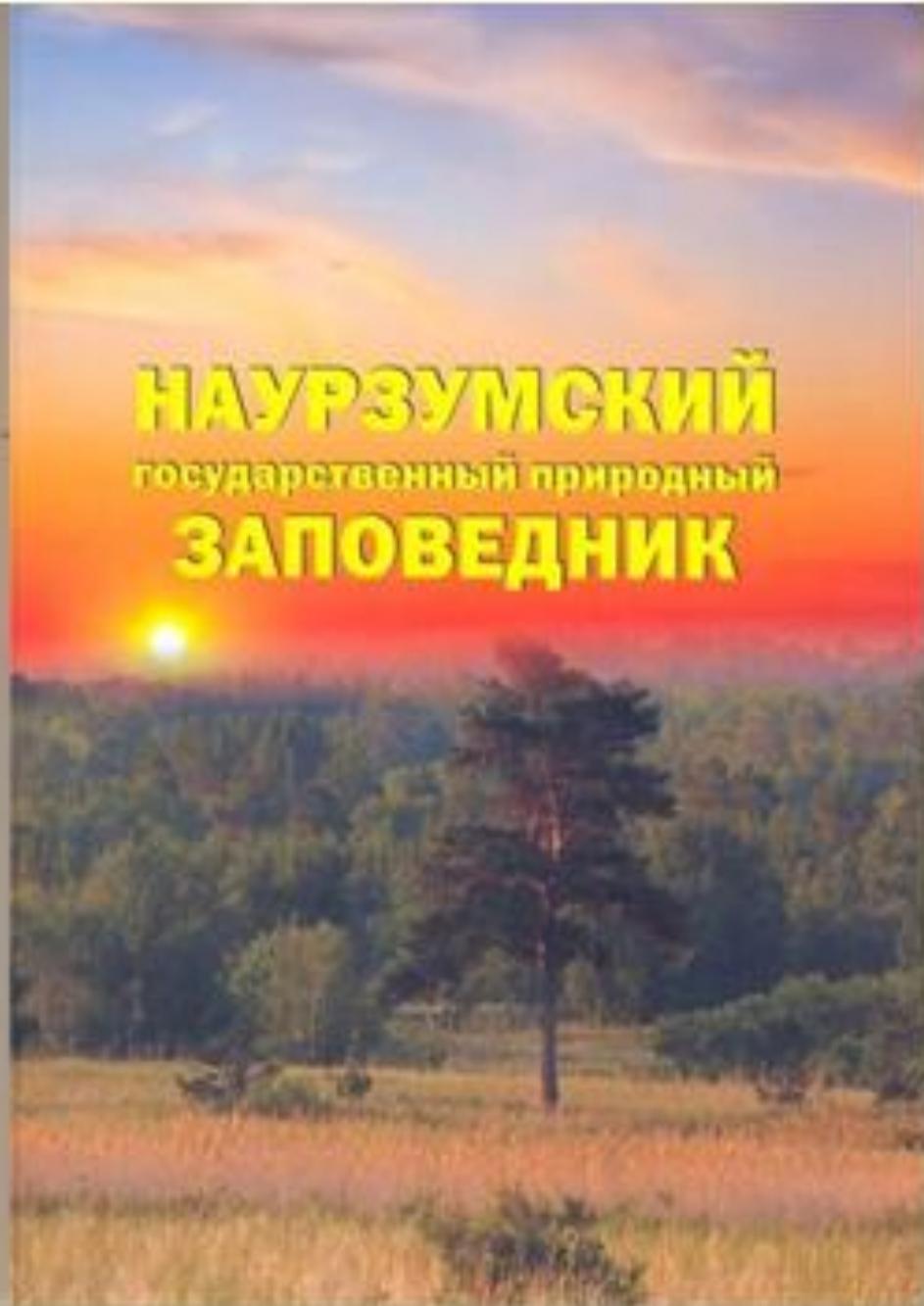


Bragina T. M.

**INTRODUCTION TO ENTOMOLOGY
PART 2. INTERNAL MORPHOLOGY AND
PHYSIOLOGY. REPRODUCTION AND
DEVELOPMENT**

Textbook





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Педагогический институт имени У. Султангазина
Кафедра естественно-научных дисциплин

Т.М. Брагина

ПРАКТИКУМ ПО ЗООЛОГИИ БЕСПОЗВОНОЧНЫХ

Учебное пособие
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Костанай, 2024

Брагина Т. М.

СОСТАВ И СТРУКТУРА СООБЩЕСТВ ПОЧВЕННЫХ БЕСПОЗВОНОЧНЫХ (МЕЗОФАУНА) НАУРЗУМСКОГО ЗАПОВЕДНИКА



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Peace and goodness to all!



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