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## CONTENTS

- 1 Modern condition of coenopopulation of *Eremurus robustus* Regel (Xanthorrhoeaceae) in Kashkadarya Basin, Uzbekistan **UKTAM E. KHUJANAZAROV, HABIBULLO SHOMURADOV & ELENA A. AFONINA**
- 11 Body mass index and body composition in carriers of polymorphic variants of beta 2- and 3- adrenergic receptors **ANNA S. ISAYEVA, OLENA V. KOLESNIKOVA, IURII S. RUDYK, MARYNA M. VOVCHEKNO, VALENTINA YU. GALCHINSKAYA & LARYSA A. RIEZNIK**
- 23 Optimal timing for Prestance administration in patients with hypertension **ALEXANDER A. UPNITSKIY & OLGA S. LAVRINENKO**
- 47 Aging Society: Public policy issues to improve well-being of population **AISTĖ DIRŽYTĖ, ALEKSANDRAS PATAPAS & MAKSYM PYLYPENKO**
- 77 Instruments of the state regulation of agri-food systems of the regions unfavourable for agricultural production **SERGEY A. ANDRYUSHCHENKO, ANDREI P. POTAPOV, MARIANNA YA. VASILCHENKO, ELENA N. TRIFONOVA & ELENA A. DERUNOVA**
- 99 Situational diagnosis as one of the aspects of epistemology **ASANBEK T. TOKTOMUSHEV, UMETALI K. SAYAKOV, BOLOTBEK M. IBRAEV, SUYUTBEK M. DOOLOTBKOV & RAKHIMA I. SALIKHAR**

Cont. on Next Page

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**Reviewers for this Issue:** Refer to pages 681-686 of this Issue.

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## **Contents**

- 115** The process of staff motivation under the conditions of intellectualization of enterprise activity  
**KATERYNA S. KHAVROVA, NATALYA V. LOKHMAN, VIKTORIIA S. KOVERZA & NATALIA V. PASICHNYK**
- 127** Urban space in the context of social practices and living standards of the citizens **SVETLANA A. ILYNYKH, ELENA V. NAUMOVA, NATALIA G. SUCHORUKOVA, SVETLANA V. ROVBEL & PAVEL A. NOVGORODOV**
- 139** Outreach of sustainable development principles in physical culture and sports  
**VICTORYA V. YERMILOVA & GULSINA H. MURTAZINA**
- 159** The effectiveness of local municipal authorities of Ukraine in the exercise of powers delegated by the Government  
**VYACHESLAV I. SHARIY**
- 169** Regional aspect of formation: The potential of financial safety in agrarian enterprises of Ukraine  
**NATALIA V. TRUSOVA, OKSANA V. HRYVKIVSKA, NATALIYA S. TANKLEVSKA, LARYSA A. VDOVENKO, OLEKSANDR S. PRYSTEMSKYI & SVITLANA V. SKRYPNYK**
- 187** Basic scientific principles of the national idea “Mangilik El” in the studies of Kazakh scientists  
**RAKHYMZHAN TURYSBEK, KARLYGASH SAREKENOVA, MAINURA BURIBAYEVA, BIBIGUL KUSSANOVA, ZHAMALADEN IBRAGIMOV & BOLAT ZHUMAGULOV**
- 199** Children’s choral theatre – Technology for development of creative abilities **ANATOLY M. REDKO**
- 217** Guidelines of the syntactic models analysis of complex sentences in Spanish  
**NINA N. KORBOZEROVA**

## Contents

- 227** Aral physical and geographic district, Uzbekistan  
and Kazakhstan **RANA A. IBRAGIMOVA,**  
**SHAVKAT M. SHARIPOV, UKTAM K. ABDUNAZAROV,**  
**MIRALI T. MIRAKMALOV & AZIZA A. IBRAIMOVA**
- 237** Attitudes towards income: Implications for decision  
making in public administration **AISTÈ DIRŽYTĖ**  
**& ALEKSANDRAS PATAPAS**
- 249** Problems and methods of creation of ultra-large  
information systems (as exemplified by the data of the  
Federal Service for State Registration, Cadastre  
and Cartography) **SERGEY N. GRINYAEV,**  
**DMITRIY A. MEDVEDEV, MITRIY I. PRAVIKOV,**  
**ILYA V. SAMARIN & ANDREY YU. SHERBAKOV**
- 261** Age-specific prevalence of diabetes in Baku,  
Azerbaijan **IRADA J. ALIYEVA**
- 267** Edmund Husserl and Gustav Shpet – two  
phenomenologists of the 20th century: A look at  
aesthetics **EVGENIA G. KHILTUKHINA**
- 275** Geodynamic zoning of the Kuzbass territory based on  
the integrated analysis of the cartographic material  
**VLADIMIR A. KISELEV & NATALIA V. GUSEVA**
- 287** Interaction of psychology and ecological-legal  
personality on the way of formation of normative-legal  
regulation in the 21st century **OLEKSII YU. PIDDUBNYI,**  
**DARIA S. PIDDUBNA, INNA V. HORISLAVSKA,**  
**ANNA M. KOVAL & INNA V. LEBID**

# Contents

- 303** About origin of the person: Religious aspect of the concept “Adam” (“Person”)  
**MAKKAMBAY E. DARBANOV,  
BURKUTBAY E. DARBANOV & NUSKA M. ESENOVA**
- 313** “Polar work” as an object of legislative and technical regulation of research in the Arctic  
**MIKHAIL YU. KUPRIKOV, LEV N. RABINSKIY,  
NIKITA M. KUPRIKOV & ARKADY A. TISHKOV**
- 329** Philosophical purpose of social communication in the aspects of sustainable development of modern social reality  
**YURY S. KRAVTSOV,  
NADEZHDA A. CHETNVERIKOVA,  
ISMAIL S. SAIFNAZAROV, OKSANA V. DOMBROVSKA  
& OLEKSII S. KHOVPUN**
- 339** Current state characteristics of acne causative agents’ susceptibility to antimicrobial medicines  
**VALENTIN P. KOVALCHUK, IRINA M. VOVK,  
INNA YU. SIDKO & MAXIM S. TRETYAKOV**
- 347** Quality of life of inhabitants of the metropolis: Key indicators of modern strategy of municipality  
**SVETLANA A. ILYNYKH, MICHAEL V. MELNIKOV,  
OKSANA U. TEVLUKOVA, PAVEL A. NOVGORODOV  
& MARIJA V. UDALTSOVA**
- 359** The Kyrgyz worldview in the story by Ch. Aitmatov’s “The White Steamship” (1988)  
**BURUL SAGYNBAYEVA, NURJAN K. SARTBEKOVA,  
ELMIRA T. TOLOKOVA & ZULFIYA P. AKZHLOVA**

## Contents

- 369** Word-formation opportunities of the concept “Adam”  
(Person) **MAKKAMBAY E. DARBANOV**  
& **BURKUTBAY E. DARBANOV**
- 377** Determinants of the development venture financing  
of the subjects of agrarian market of Ukraine  
**NATALIA V. TRUSOVA,**  
**NATALIYA S. TANKLEVSKA,**  
**OLEKSANDR S. PRYSTEMSKYI,**  
**OXSANA V. HRYVKIVSKA & NADIIA O. ADVOKATOVA**
- 399** Collaborative learning in academic English classroom:  
Preparation of PhD candidates **SERHII P. MYKHYDA,**  
**SVITLANA I. SHANDRUK,**  
**KAMILLA G. MAHRLAMOVA, LINA L. SMIRNOVA,**  
**LARYSSA O. YAROVA & GANNA V. POLISHCHUK**
- 411** Forecasting of the dynamics of catastrophic flooding by  
taking into account changes in the level of groundwater  
**ALEKSEY G. CHVERTKIN, ANDREY E. SOROKIN**  
& **SERGEY N. BULYCHEV**
- 423** Formalization of life cycle of construction object  
methods of artificial intelligence  
**FEDOR K. KLASHANOV**
- 433** Student academic freedom: The experience in Ukraine  
and the USA **NATALIYA O. DAVYDOVA,**  
**NINA A. MIALOVYTSKA, NINA E. ZLATINA,**  
**VOLODYMYR A. SHATILO & ROMAN V. VASKO**
- 445** Authority as a factor of formation of a leader’s  
personality and life position **VITALII I. BOCHELIUK,**  
**NIKITA S. PANOV, LIYBOMYRA S. PILETSKA,**  
**VITALIIA V. YAREMCHUK & ALLA S. BORYSIUK**

# Contents

**463** Terpenoid coumarins of *Ferula* L. (Family Apiaceae) and their classification

**BEKTEMIR M. MURZUBRAIMOV,  
ANARBAY U. BABEKOV & ALTYNAI M. ISMAILOVA**

**471** Environmental security management as a factor of ensuring public health

**DAHANEF D. KULOVA,  
URIET R. BZHECEVA, ELENA A. KUCHINSKAYA  
& SULIET KH. KIZDERMISHOVA**

**493** Public-law dimension of the right to expected life in Ukraine and Germany

**OLHA KOSILOVA,  
MYKHAILO KRAVCHENKO, OLESIA OTRADNOVA,  
KHRYSTYNA SOLODOVNIKOVA & HANNA FEDOTOVA**

**509** Legal frameworks and basic models of local guarantees: A comparative legal analysis

**NATALIYA YA. IAKYMCHUK,  
OKSANA VAITSEKHOVSKA, LIUBOV M. KASIANENKO,  
ANTON O. MONAIENKO & ANFISA KH. ILYASHENKO**

**527** Evaluation development method of production efficiency level

**MIKHAIL N. CHEKARDOVSKIY,  
SERGEY M. CHEKARDOVSKIY  
& IRINA A. CHEKARDOVSKAYA**

**539** Methodology for forming the demand for special vehicle services based on the change of performance indicators of oil and gas companies for the planning period

**VLADIMIR I. BAUER, ARTEM V. BAZANOV,  
EVGENIY S. KOZIN, VERA D. IL'INYKH  
& ALEKSANDR A. MUKHORTOV**



# Contents

- 565** Changes in strength of polymer composite panels with interlayer defects under the action of unsteady load  
**ALEKSANDR L. MEDVEDSKIY, LEV N. RABINSKIY,  
MIKHAIL I. MARTIROSOV, ALENA YU. ERSHOVA  
& ANTON V. KHOMCHENKO**
- 577** Adaptation of the establishment method to solve problems of non-linear deformation of shells by the finite element method  
**OLGA V. EGOROVA,  
SERGEY I. ZHAVORONOK, ALEXEY S. KURBATOV  
& LEV N. RABINSKIY**
- 591** Condition and forecast of composite carbon development and cermet heat-shielding materials with improved catalytic and radiative properties  
**PETR V. NIKITIN, LEV N. RABINSKIY,  
ANNA A. SHKURATENKO & OLGA V. TUSHAVINA**
- 601** Modeling the effects of buckling arising in production of thin-walled parts using selective laser melting (SLM) technology  
**EKATERINA L. KUZNETSOVA  
& LEV N. RABINSKIY**
- 613** A method for synthesizing the structure of active loaded block reservation of subsystems using the graph-analytical model and a wave optimization algorithm  
**VYACHESLAV M. GRISHIN**
- 629** Nonlinear vibrations and galloping of transmission lines' conductors  
**ALEXANDER N. DANILIN  
& SERGEY I. ZHAVORONOK**
- 645** Estimation of noise immunity of procedure for joint processing of a subset of  $M$ -sequences  
**VLADIMIR YU. MIKHAYLOV & ROMAN B. MAZEPA**





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## Modern condition of coenopopulation of *Eremurus robustus* Regel (Xanthorrhoeaceae) in Kashkadarya Basin, Uzbekistan

UKTAM E. KHUJANAZAROV<sup>1\*</sup>, HABIBULLO SHOMURADOV<sup>2</sup>  
and ELENA A. AFONINA<sup>3</sup>

*Eremurus robustus* Regel (Xanthorrhoeaceae) is endemic to the Tyan-Shan and Pamir-Alay mountain ranges. Of 900-1,200 m outcrops of gypseous rocks in the low hills. Single specimens, seldom 2-3 plants can be found. The studied coenopopulation of *E. robustus* is normal, incomplete. The presence or absence of certain ontogenetic groups in coenopopulation is associated with the ecological-phytocenotic growth condition and the degree of cattle grazing. The aim of the research was to describe the coenopopulation of *E. robustus* and the scientific justification of the ways of ecological improvement of coenopopulation. In the implementation of scientific work, the methods of traditional geobotanical and cartographic remote study of plant formations were applied. When identifying plant species – 6 volumes of “Flora of Uzbekistan” and 10 volume “Key to plants of Central Asia” were used and GIS technology was used in mapping. The factors that influence the vegetative processes of plant formations were identified in this study so that the ontogenetic structure of coenopopulation of *E. robustus* was developed. The practical significance of the research results shows in the fact that monitoring of mountain pastures of the Kashkadarya Basin and ways of improvement were analyzed, tasks and practical recommendations to prevent anthropogenic factors were developed.

**Keywords:** *Eremurus robustus*, Xanthorrhoeaceae pastures, population, community, coenopopulation, ecological-phytocenotic conditions, Kashkadarya Basin, Uzbekistan

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## **INTRODUCTION**

Kashkadarya region includes the Karshi depression in southern Uzbekistan, bordered in the north by the mountains of Koratepa, Zirabulok, and Ziyevuddin; in the east – by the foothills of the southwestern part of the Gisar ridge (Kashkadarya Region 1959). As a result of the study, we analyzed the plant species of mountain pastures and determined the current state of pastures in the Kashkadarya Basin (Dias & Barreiros 2018, Lebedev et al. 2018).

One of the leading branches of agriculture is animal husbandry, and it is important to conduct a scientific, practical study, assessment of the material source of its development – natural food (source of hay) – pasture types (Galnaityte & Krisciukaitiene 2017). This work was arisen in the process of implementation and the requirements of economic development; subsequently, the requirements of the national economy, and is one of the urgent tasks of modern science and technology. The types of pastures – natural territorial complexes with similar climate, soil, productivity (fertility), the time of year, when cattle are grazed and types are determined by the edificatory types of plant families. There is a need to determine their ecological status: structure, composition, productivity (fertility), and degree of damage (degradation, transformation), types of damage factors (damage), and other quantitative and qualitative indicators (Sukhova et al. 2018). The foothill pastures of the Kashkadarya Basin are one of the main bases for the development of animal husbandry, in recent years the productivity (fertility) of which is reduced under the influence of metrological factors (Khuzhanazarov 2012, Poškus et al. 2018).

Researchers from developed countries, in particular, American scientists M.W. Williams and V.G. Konovalov (2008) studied temperature phenomena and humidity in Central Asia, and brought scientific results on vegetative processes of plants. Research in the direction of monitoring and environmental improvement of the foothill pastures of the Kashkadarya Basin has current scientific and practical importance (Hobohm et al. 2016, Poor & Thorpe 2017, Johnstone et al. 2017, Halimatussadiah et al. 2017, Strydom 2017, Mironova et al. 2018, Belonozhko et al. 2018, Krechetov et al. 2018).

## **MATERIALS AND METHODS**

The area of research is situated in the western spurs of the Hissar ridge located in the south of Guzar town and Dehkanabad village, on the left bank of the Kichik-Uradarya River and in Tarkapchigay River basin. This territory has been defined as the Tarkapchigay phytogeographical region of the Western Hissar district of the Central Asian Mountain Province (Tojibaev et al. 2016). The territory belongs to the temperate climatic zone. The climate is dry, continental with long, hot and dry summer season; the winter season is short with mild frosts and little snow. The average annual temperature is 13–14°C, the average temperature of January is 0 –2°C, average temperature of the July is 26 –28°C, the annual precipitation is 400 – 600 mm (Kashkadarya Region 1959, Williams & Konovalov 2008).

Field research was performed during June 2016 by traditional phytosociological methods with description of plant associations, collection of herbarium specimens and photographing of surveyed plots (Mirkin et al. 2000). Demographic structure

## Modern condition of coenopopulation of...

of populations was studied in accordance with T.A. Rabotnov (1950), A.A. Uranov (1975), L.A. Zhukova and E.V. Shestakova (1997). The age indexes were studied by A.A. Uranov (1975). The ontogenetic structure of coenopopulations in the different ecological and phytocenotical conditions was determined by the transect method (Glotov 1998, Silbernagel 2018).

## RESULTS AND DISCUSSION

As part of the study in the Zeravshan mountain ranges (upper part of the Kashkadarya Basin), two coenotic populations of *E. robustus* were studied under different ecological and phytocenotic conditions (Figure 1). The first coenopopulation of the species is distinguished on the northwestern slopes of the Zeravshan mountain ranges (Takhta-Karacha Pass) along the bourn as part of the different herbaceous-wormwood-hawthorn community on typical serozem (Figure 2). The geographic coordinates of the coenopopulation are: N. 39.30125°E.066.89365°. The total projective cover of the grass stand is 70%. At the same time, the density of individuals of the studied species is low and barely reaches to 2%. We should note that this coenopopulation was studied approximately 100–150 m down to the west of the first coenopopulation of *Dianthus uzbekistanicus* in the enclosed area. The floristic composition of the community is composed of 25 species of vascular plants (Table 1). Perennials prevail in the herbage is about 72%, it is followed by shrubs and youngsters (on 12%), and trees are represented by a single species – *Crataegus turkestanica*.



Figure 1. *Eremurus robustus* Regel (Xanthorrhoeaceae) in the Zeravshan mountain ranges (upper part of the Kashkadarya Basin), Uzbekistan. (Photo by Uktam E. Khujanazarov, 18 July 2018)

Table 1. Species composition and their abundance of the mixed grassy-wormwood-hawk community.

No.	Name of plants	Life form	Projective cover, %
1	<i>Crataegus turkestanica</i>	Tree	20
2	<i>Artemisia tenuisecta</i>	half -shrub	15
3	<i>Thymus serawschanicus</i>	half –shrub	3
4	<i>Ziziphora clinopodioides</i>	half -shrub	4
5	<i>Elytrigia trichophora</i>	perennial	10
6	<i>Stipa</i> sp.	perennial	4
7	<i>Hypericum perforatum</i>	perennial	5
8	<i>H. scabrum</i>	perennial	5
9	<i>Allium</i> sp.	perennial	+
10	<i>Helichrysum mussae</i>	perennial	+
11	<i>Tulipa fosteriana</i>	perennial	+
12	<i>Plantago lanceolata</i>	perennial	2
13	<i>Tragopogon</i> sp.	perennial	+
14	<i>Astragalus sewerzowii</i>	perennial	1
15	<i>Convolvulus lineatus</i>	perennial	2
16	<i>Astragalus eximus</i>	perennial	1
17	<i>Ferula kuhistanica</i>	perennial	+
18	<i>Galagania fragrantissima</i>	perennial	2
19	<i>Dianthus uzbekistanicus</i>	perennial	1
20	<i>Eremurus robustus</i>	perennial	2
21	<i>Delphinium semibarbatum</i>	perennial	+
22	<i>Poa bulbosa</i>	perennial	4
23	<i>Verbascum songaricum</i>	biennial	+
24	<i>Bromus macrostachys</i>	annual	2
25	<i>Veronica stylophora</i>	annual	+

The second coenopopulation of *E. robustus* grows on the southwestern slope of the Zarafshan Ridge. The soil of the described plot is fine-milled, in some places with large rocky. The coenopopulation of *E.robustus* was distinguished along dry sai, where ten of cattle paths were noted. Pastures where this coenopopulation grows are exhausted, grassy forage plants are eaten. But the community has the following uneaten apparently poisonous plants such as *Astragalus eximus*, *Verbascum songaricum*, *Onosma maracandicum*, *Scrophularia* sp. and *Diarthron vesiculosum*. The total projective cover of the grass stand is about 30%. The botanical composition of the community consists of 24 species of flowering plants. Of these are 17 perennials, 7 annual-biennials, 2 half-shrubs and 1 shrub (Table 2).



## Modern condition of coenopopulation of...



Figure 2. Mixed grassy-wormwood-hawthorn community on the northwestern slopes of the Zarafshan Ridge, Uzbekistan. (Photo by Uktam E.Khujanazarov, 25 July 2018)

Ontogenetic structure of *E. robustus* has not been previously studied by anyone. To assess the state of coenopopulations on the basis of demographic indicators of coenopopulations, data were used that collected in the current year during the field research. According to the classification of Uranov (1975) and Smirnova et al. (1979), the studied coenopopulations are normal, incomplete (Figure 3). In the first coenopopulation there are no senile individuals, and in the second as senile, so and mature generative and young (juvenile and immature) individuals.

Table 2. Species composition and abundance of mixed grassy-wormwood-lonicer community.

No.	Name of the plants	Life form	Projective cover, %
1	<i>Lonicera stanantha</i>	shrub	15
2	<i>Artemisia tenuisecta</i>	half-shrub	6
3	<i>Ziziphora clinopodioides</i>	half-shrub	+
4	<i>Elytrigia trichophora</i>	perennial	+
5	<i>Achillea</i> sp.	perennial	1
6	<i>Hypericum perforatum</i>	perennial	1
7	<i>Iris sogdiana</i>	perennial	+
8	<i>Centaurea squarrosa</i>	perennial	2



9	<i>Salvia serawschanica</i>	perennial	+
10	<i>Plantago lanceolata</i>	perennial	+
11	<i>Onosma maracandica</i>	perennial	+
12	<i>Astragalus</i> sp.	perennial	+
13	<i>Ferula kuhistanica</i>	perennial	+
14	<i>Silene</i> sp.	perennial	+
15	<i>Scrophularia</i> sp.	perennial	1
16	<i>Dianthus uzbekistanicus</i>	perennial	+
17	<i>Eremurus robustus</i>	perennial	1
18	<i>Delphinium semibarbatum</i>	perennial	+
19	<i>Convolvulus lineatus</i>	perennial	+
20	<i>Poa bulbosa</i>	perennial	+
21	<i>Verbascum songaricum</i>	two-year-old	+
22	<i>Bromus macrostachys</i>	annual	+
23	<i>Diarthron vesiculosum</i>	annual	2
24	<i>Veronica stylophora</i>	annual	+

Based on the characteristics of the biology of the species (high seed productivity, high germination of seeds, the slowest rate of development of individuals in a generative state), the characteristic spectrum of coenopopulations of this species will be a left-sided type with a peak in juvenile individuals. At the time of the research, the ontogenetic spectrum of the first coenopopulation does not coincide with the characteristic one (Schwendemann 2017).

It is left-sided with an absolute maximum on individuals of the young generative state (24.0%). The insignificant low value of the number of juvenile individuals is probably due to, on the one hand with a flush of young, not mature seedlings by spring flooding, and, on the other hand, it is a young growth due to phytocenotic pressure. As noted above, this CP grows on the fine-grained soils of the northwestern slopes of the mountains along the river, where the projective cover of the grass stand reaches to 68%. The accumulation of individuals of the young generative state occurs due to the prolonged continuation of this ontogenetic state in comparison with other age groups in the left part of the spectrum. The decrease of the number of individuals in mature and old generative states is most likely due to the death of a large number of individuals after abundant fruiting. The absence of old fractions of plants is directly related to the death of individuals in previous age states. This is probably one of the biological features of the species.

The ontogenetic structure of the second coenopopulation is also characterized by left-handedness. The peak in the spectrum occurs in virginals. Their share is about 50%. In this coenopopulation, in the left part of the spectrum there are no juvenile and immature individuals, old generative and senile individuals are in the right part of the spectrum. The absence of a young fraction of plants is explained by two reasons: the first belongs to vegetation; the second is with a degree of

## Modern condition of coenopopulation of...

anthropogenic impact. This coenopopulation grows on dry slopes of the steep slope. Even a small water influx, which often happens, especially in spring due to the rapid flow easily washes away young individuals, which they are good not rooted plants. In addition, this coenopopulation was allocated by us in an area where pastures are used almost daily. The high pasture load naturally had a negative impact on the structure of coenopopulation.

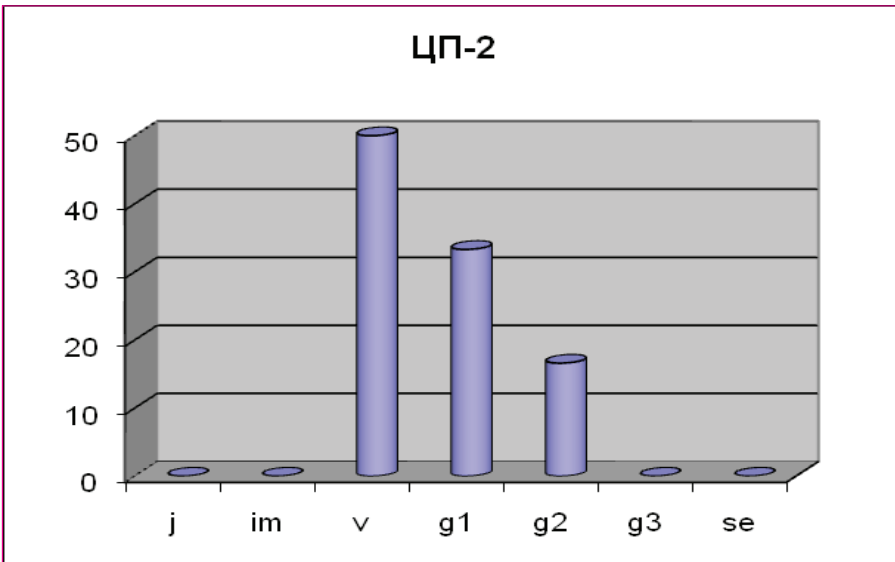
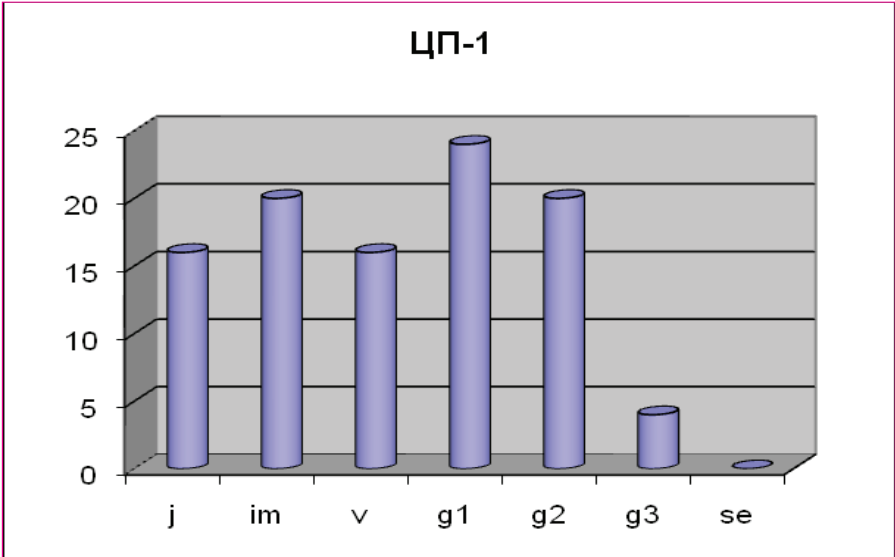


Figure 3. Ontogenetic structures of *Eremurus robustus* coenopopulations.

## **CONCLUSION**

Thus, the studied coenopopulations of *E.robustus* is normal, incomplete. The presence or absence of certain ontogenetic groups in coenopopulations is associated with the ecological-phytocenotic condition of growth and the degree of cattle grazing. In the optimal condition of growth is the first coenopopulation, where the ontogenetic structure is full-run (the absence of the senile individuals may be one of the biological features of the species) and the young fractions predominate in the coenopopulation. The second coenopopulation, which grows on the large-rocky soil of a steep slope in an unguarded territory, is in the worst demographic condition.

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