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ASSESSMENT OF THE IMPACT OF ECOLOGICAL FACTORS ON THE POPULATION OF SMALL MAMMALS OF THE LOWER AMU DARYA REGION

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Abstract
In the article, the influence of environmental factors on the population of small mammals (Microtus Ilaeus) in the lower reaches of the Amu Darya River was determined. According to the obtained results, the quantitative dynamics of the Microtus Ilaeus population is controlled by the following parameters: the structure and size of the previous population, b) the current state of the population, weather conditions, food availability, humidity of the territory, and the hydrological regime of the Amu Darya River. It has been proven that the effectiveness of the influence of weather and density factors on population dynamics has seasonal characteristics.

Keywords: Environment, ecological factors, dynamics, population, hydrological regime, temperature

Introduction

The dynamics of population size reflects the history and entire course of the population's contradictory relationships with the environment. Both the external

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environment and the adaptive compensatory mechanisms of the studied population participate equally in these relationships. Based on the conducted research, we did not oppose them to each other or, moreover, ignore one of the aspects of the dynamic interaction between the environment and the population, but rather conducted a comprehensive quantitative analysis of all ecological factors explaining changes in the number of one of the representatives of the rare species of the Aral Sea mammal fauna - the Ili field vole. Similar work on the fieldweed population has not been conducted before.

In recent years, due to the regulation of the Amu Darya flow and the increasing desertification and aridization processes in the delta, the habitat conditions of the fieldweed have deteriorated, and its population has sharply decreased. According to experts, this species is becoming rare. Currently, it is accepted that in optimal habitat conditions, intrapopulation factors play one of the main roles in population regulation, and in pessimal conditions, the role of external factors increases. We also conducted a quantitative assessment of the main parameters of the fieldworm population dynamics for two periods: spring (beginning of the breeding season) and autumn (end of the reproductive cycle).

During the analysis, the following were used: population size and structure at present and past times, meteorological conditions (air temperature, wind speed, precipitation amount, snow cover thickness, etc.), forage capacity of lands, hydrological regime of the Amu Darya and moisture content of the habitat territory. Moisture content refers to the totality of abiotic factors taken as 100% as of 1970. The following breeding parameters were analyzed: the proportion of breeding females; the total spring and autumn numbers (percentage of animals arriving); the number of overwintered individuals; the number of pregnant females (counting all females regardless of age); fertility (average number of embryos per 1 female). The survival rate of individuals over the winter was also used.

The analysis showed that the share of the explained dispersion of all ecological factors in the dynamics of the fieldworm population population is quite high and ranges from 88% to 98% (table. 1).

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Table 1 Distribution of effects determining quantity and structure population of the Ili field vole in spring (in %)

Population characteristics	Endogenous factors		Exogenous factors			
	Pre-existing number	Number at the present moment	Climatic conditions	Feed security	Amudarya's hydraulic regime	Territory moisture content
Quantity	23,2	0	20,5	12,14	17,4	15,2
Fraction of pregnant females	54,8	0	10,4	8,53	9,7	6,3
Number of overwintered	36,6	0	18,7	6,45	11,7	20,3
Winter survival	25,8	0	28,3	17,5	7,16	13,3

The remaining dispersion is due to factors not taken into account (disease, predators, cyclicity of solar activity, etc.). The main contribution to the overall variability of the spring population is made by abiotic factors - 65.24%. The contribution of endogenous factors to the explained variance is somewhat less - 23.2%. Climatic conditions are the most influential among exogenous factors. It was also established that at the beginning of the breeding season, the number of overwintered individuals is also determined by abiotic factors, their contribution to the total explained dispersion is 57.0%. Exogenous factors contribute to an effect of up to 34%. In spring, the breeding intensity is mainly determined by the demographics of field falcons in the autumn of the previous year - 54.8%, as well as meteorological conditions (10.4%) in October-November, i.e., during the period when a group of animals entering winter is formed in the population and serves as the basis for a new breeding cycle. The mechanism that implements these interrelationships is still unclear. Probably, one of the permissible explanations is the restructuring of the sex, age, and genetic structure of the population under the influence of high weather conditions, aimed at the selective selection of animals (during the winter period), which can have any advantages in breeding and survival [5,7,11]. The effect of high density, on the one hand, is expressed in a decrease in reproductive activity and an increase in the mortality of adult animals, and on the other hand, in a subsequent decrease in the viability and reproduction intensity of field flies that were in high numbers during the embryonic and early post-embryonic stages of development [8,9,10]. The

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contribution of such exogenous factors as fodder availability, the hydrological regime of the Amu Darya, and the moisture content of the territory was distributed in almost the same ratio from 6.3% to 9.7%. The contribution of fieldworm population density and structure at the present time is negligibly small, and almost no effect on winter survival has been found. The population's history had a more significant influence (up to 25.8%). The total proportion of exogenous factors is very high and amounted to 66%. Of these: climatic factors up to 28%, forage conditions up to 17.5%, and the territory's moisture content also contributes sufficiently - up to 13.3%. The research results showed that the distribution of effects affecting population dynamics in the autumn period differs sharply from their distribution in the spring period. From Table. 2 shows that the impact of external and intra-population factors on the total autumn population was distributed in almost equal proportions (respectively 47.7% and 49.27%). The proportion of pregnant and breeding females is closely related to the population density and reproduction intensity in previous periods, as well as to the population level during this period. The contribution of intrapopulation factors to the proportion of pregnant and breeding females is very high and ranges from 68% to 70%, respectively. The remaining share of the total variance is explained by exogenous factors. As for fertility, the main contribution here is also made by internal factors - 53%. Of the exogenous factors, the greatest contribution is made by the moisture content of the habitat - 12.5% and the hydrological regime of the Amu Darya - 11.73%. The obtained data indicate significant variability in breeding indicators under the influence of living conditions and animal numbers. Studying the age structure of the field whale population allows us to assess the biological uniqueness and specific role of individual generations in the reproduction of species. A correlation was revealed between the proportion of immature females born in spring and early summer (3-6 months) and the population level in April and the reproductive activity of females in the younger age group (1-2 months).

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Table 2. Ranking of effects affecting the structure and number of Ilya fieldworm in autumn, in %

Population characteristics	Эндогенные факторы		Экзогенные факторы			
	Пред-шеству-ющая числен-ность	Числен-ность в настоя-щий момент времени	Клима-тичес-кие условия	Кормо-вая обеспе-чен-ность	Гидро-режим Аму-дарьи	Увлажненн ость территории
Quantity	17,3	30,4	7,54	8,63	12,3	20,8
Proportion of breeding females	36,0	33,41	4,38	6,41	7,4	9,6
Fraction of pregnant females	32,3	35,5	6,06	3,17	4,26	4,7
Fertility	34,6	18,48	4,51	4,33	11,73	12,5
Proportion of females aged 1-2 months	51,42	9,74	4,35	2,62	5,65	8,31
Proportion of females aged 3-6 months	47,36	3,46	2,61	7,08	10,3	15,4
Proportion of females aged 7-16 months	43,08	3,81	1,18	4,93	12,45	26,31

Intra-population factors also have the greatest impact on the youngest animals (1-2 months old). (61.16%). Exogenous factors significantly contribute to the moisture content of the territory - 8.3%, and the hydrological regime of the Amu Darya - 5.65%. The proportion of females in the older age group (7-16 months) is also significantly influenced by intrapopulation factors. We would like to highlight that among exogenous factors, the share of moisture in the habitat area is 26.3%. This is likely due to the fact that with the increasing aridization and desertification of the Amu Darya delta, the humidity of the habitat area is likely a limiting factor. Thus, based on the analysis conducted, it can be concluded that a combination of abiotic and biotic factors significantly influences the dynamics of the field blight population. It has been established that the dynamics of field falcon population are controlled by the following parameters: a) population structure and number at previous times, b) current population situation, c) weather conditions, d) feed availability, e) territory moisture content, and f) Amudarya's hydrological regime. The effectiveness of the influence of density and weather factors on population dynamics has a clearly expressed seasonal specificity. The conducted research confirms the scientists' opinion that the age structure of the fieldworm population is closely related to the peculiarities of reproduction - the rate of sexual maturation, the frequency of brood birth, etc. The wide variability

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of the age structure and its orientation towards a certain level of population size have been established.

References

1. Абдинасырова, Н. А. (2023). Роль Факторов В Формирование Динамики Численности И Структуры Популяции Microtus Ilaeus. *Central Asian Journal of Theoretical and Applied Science*, *4*(10), 5-9.
2. Ешчанова, С. Ш., & Рзаев, Р. М. (2024). ИЗМЕНЕНИЕ ФАУНЫ МЛЕКОПИТАЮЩИХ В УСЛОВИЯХ ТРАНСФОРМАЦИИ ПРИРОДНОЙ БИОТЫ ПРИАРАЛЬЯ. *Экономика и социум*, (4-2 (119)), 679-683.
3. Ешчанова, С. Ш. К. (2022). ОЦЕНКА ВЛИЯНИЯ ВНЕШНИХ И ВНУТРИПОПУЛЯЦИОННЫХ ФАКТОРОВ В ФОРМИРОВАНИЕ ДИНАМИКИ ЧИСЛЕННОСТИ И СТРУКТУРЫ ПОПУЛЯЦИИ MICROTUS ILAEUS. *Universum: химия и биология*, (5-1 (95)), 37-41.
4. Ешчанова, С. Ш. К. (2022). Экологические особенности популяций мелких млекопитающих тугайных экосистем Южного Приаралья. *Universum: химия и биология*, (3-1 (93)), 16-20.
5. Mirzamuratovna, M. S., Najimatdinovna, U. G., Kalibekovna, K. U., Mirzabaevich, B. B., & Abdrasulievna, A. N. (2023). Analysis of The Dynamics of The Number of Mammalian Populations in The Conditions of The Southern Aral Sea. *Journal of Advanced Zoology*, *44*.
6. Mambetullaeva, S. M., Utemuratova, G. N., & Yeshchanova, S. S. (2021). ECOLOGICAL TRANSFORMATIONS IN THE SOUTHERN ARAL SEA REGION AS A FACTOR OF POPULATION DYNAMICS (ON THE EXAMPLE OF RHOMBOMYS OPIMUS AND ONDATRA ZIBETHICA). *Annals of the Romanian Society for Cell Biology*, *25*(4), 13428-13436.
7. Мейер М.Н. Закаспийская (Microtus transcaspicus Satunin, 1905) и киргизская (Microtus kirgisorum Ognev, 1950) полевки Средней Азии и Казахстана // Тр. ЗИН АН СССР.-1980.- Т. 99.- С. 84-89.

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https://worldbulletin.org/index.php/1

8. Tleumeratova B.S., Mambetullaeva S.M. Modeling of the influence of the Priaralie ecosystem transformations on the environment // «European Applied Sciences» № 7 -1, 2013, Stuttgart, Germany.-P.55-58.
9. Yeshchanova1 S. SH., Mambetullaeva S. M. Dynamics of Demographic Indicators during the Population Cycle Microtus Ilaeus in the Low of the Amudarya // International Journal of Science and Research (IJSR).- Volume 8 Issue 12, December 2019.- p. 911-912. www.ijsr.net.