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**LONG-TERM DYNAMICS OF THE COMMUNITY STRUCTURE OF LARKS  
(ALAUDIDAE, AVES) IN THE NORTH-WESTERN CASPIAN LOWLAND**

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We studied the population structure and the number of larks in the steppe and semi-desert zones of the Caspian Lowland (within the territories of Alexandrov-Gay district of the Saratov region, Russian Federation, Dzhanlybek and Bokey-Ordyn districts of the Western-Kazakhstan region, Republic of Kazakhstan) in six key areas in 2011 – 2018. From the data obtained, dynamic series of the density dynamics were calculated for each lark species ( $T_{gr}$ , growth rate), the group statistical indicators:  $R$  is the fluctuation magnitude of larks,  $u$  the coefficient of variation, etc., using Pearson's  $\chi^2$ , the normal type of lark distribution was checked in their habitats. A correlation analysis between the density of larks and the vegetation index ( $NDVI$ ) values was done. It has been established that four lark species (the steppe, white-winged, black and gray larks) show a tendency of decreasing their density in Alexandrov-Gay district. The maximum abundance decrease was observed for the White-winged Lark ( $T_{gr} = -28.4\%$ ,  $R^2 = 0.785$ ). In the Western Kazakhstan part of the habitat, the highest negative growth rate ( $T_{gr} = -99.9\%$ ) was recorded for the field lark, while the maximum positive one was for the white-winged lark ( $T_{gr} = +25.2$ ). It has been revealed that the lark density dynamics and the structure of their nesting population are influenced by the vegetation level in the previous year, and the vegetation structure associated with the soil and ground conditions of this mosaic landscape and the anthropogenic press such as cattle pasture.

*Key words:* lark community, abundance dynamics, vegetation index, Saratov region, Western-Kazakhstan region, Caspian Lowland.

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## REFERENCES

- Bibby C., Jones M., Marsden S. *Expedition Field Techniques. Bird Surveys*. Moscow, Soyuz okhrany ptits Rossii, 2000. 186 p. (in Russian).
- Doskach A. G. *Prirodnoye rayonirovaniye Prikaspiyskoy polupustyni* [Natural Zoning of the Cis-Caspian Semidesert]. Moscow, Nauka Publ., 1979. 141 p. (in Russian).
- Kopyl I. V., Nikolaev V. A. Physico-Geographical Regionalization of Caspian Lowland Based on Space Survey Materials. *Moscow University Bulletin. Ser. 5. Geography*, 1984, no. 1, pp. 65–70 (in Russian).
- Makarov V. Z., Pichugina N. V. *Polupustynnoye Saratovskoye Priuzenye: struktura pochvennogo pokrova. landshafty i problemy prirodopolzovaniya*. Saratov, ITs “Nauka” Publ., 2015. 193 p. (in Russian).
- Makarov V. Z., Pichugina N. V., Gusev V. A. K voprosu landshaftnogo i selskokozyaystvennogo rayonirovaniya Saratovskogo Zavolzhia. *Osnovy ratsionalnogo prirodopolzovaniya: Materialy IV Mezhdunar. nauch.-prakt. konf. Saratov, Izdatelstvo “Saratovskiy istochnik”*, 2013, pp. 157–161 (in Russian).
- Oparin M. L., Oparin O. S., Mamayev A. B., Ruban O. A. Population Structure of Ground-nesting Birds in the Saratov Trans-Volga Region and its Intracentury and Interannual Dynamics. *Povolzhskiy J. of Ecology*, 2013, no. 3, pp. 280–290 (in Russian).
- Oparin M. L., Konyushkova M. V., Oparina O. S., Mamayev A. B., Shadrina M. B., Ruban O. A. Structure of a Lark (Alaudidae, Aves) Breeding Population in Typical Semi-desert Habitats of the Caspian Lowland. *Povolzhskiy J. of Ecology*, 2014, no. 3, pp. 379–392 (in Russian).
- Oparin M. L., Kondratenkov I. A., Konyushkova M. V., Oparina O. S., Mamayev A. B., Trofimov I. A., Trofimova L. S. Structure Dynamics of the Breeding Population of Larks (Alaudidae, Aves) in a Semidesert of the Saratov Trans-Volga Region. *Povolzhskiy J. of Ecology*, 2015, no. 3, pp. 277–293 (in Russian).
- Oparin M. L., Nukhimovskaya Yu. D., Konyushkova M. V., Trofimova L. S., Oparina O. S., Mamayev A. B., Trofimov I. A. Analysis of Soil and Vegetation Cover from Satellite Imagery to Assess its Relation With Lark Habitats (Alaudidae, Aves) in the Trans-Volga Semidesert. *Povolzhskiy J. of Ecology*, 2017, no. 4, pp. 369–381 (in Russian).
- Pichugina N. V. Landscape structure and the functional use of the Uzen semideserts in the Saratov region. In: *Bioresources and Biodiversity of Volga Ecosystems: Their Past, Present, Future: Proceedings of the International Meeting*. Saratov, Saratov University Press, 2005, pp. 41–43 (in Russian).
- Pichugina N. V. Landscape structure of the semi-arid Cis- Uzen’ region of Saratov oblast. In: *Landscape Science: Theory, Methods, Regional Studies, and Practice: Proceedings of the International Landscape Conference*. Moscow, Izdatelstvo MGU, 2006, pp. 23–32 (in Russian).
- Pichugina N. V. *Geoekologicheskiye aspekty prirodopolzovaniya v polupustynnom saratovskom Priuzenye* [Geoenvironmental aspects of nature use in the semi-arid Cis-Uzen’ region of Saratov oblast]. Diss. Cand. Sci. (Geogr.). Astrakhan, 2012. 137 p. (in Russian).
- Ravkin E. S., Chelintsev N. G. *Metodicheskiye rekomendatsii po kompleksnomu marshrutnomu uchetu ptits* [Guidelines for Integrated Route Counts of Birds]. Moscow, VNII okhrany prirody i zapovednogo dela, 1990. 36 p. (in Russian).
- Fedorova N. L. *Struktura i dinamika estestvennykh ekosistem i ikh komponentov v Gosudarstvennom prirodnom biosfernom zapovednike “Chernyye Zemli”* [Structure and dynamics of natural ecosystems and their components in the “Chernyye Zemli” State Nature Biosphere Reserve]. Thesis Diss. Cand. Sci. (Biol.). Saratov, 2012. 19 p. (in Russian).
- Box E. O., Holben B. N., Kalb V. Accuracy of the AVHRR vegetation index as a predictor of biomass, primary productivity and net CO<sub>2</sub> flux. *Vegetatio*, 1989, vol. 80, iss. 2, pp. 71–89.

Kawamura K., Akiyama T., Yokota H., Tsutsumi M., Yasuda T., Watanabe O., Wang S. Comparing MODIS vegetation indices with AVHRR *NDVI* for monitoring the forage quantity and quality in Inner Mongolia grassland, China. *Grassland Science*, 2005, vol. 51, iss. 1, pp. 33–40.

Kruskal W. H., Wallis W. A. The use of ranks in one-criterion variance analysis. *J. of the American Statistical Association*, 1952, vol. 47, no. 260, pp. 583–621.

Paruelo J. M., Epstein H. E., Lauenroth W. K., Burke I. C. ANPP estimates from *NDVI* for the Central grassland region of the United States. *Ecology*, 1997, vol. 78, no. 3, pp. 953–958.

Pearson K. On the criterion that a given system of deviations from the probable in the case of a correlated system of variables is such that it can be reasonably supposed to have arisen from random sampling. *Philosophical Magazine Series*, 1900, vol. 5, iss. 50 (302), pp. 157–175.