

ЧИСЛЕННОСТЬ МЕЛКИХ МЛЕКОПИТАЮЩИХ НА ПОЛЯХ

NUMBERS OF SMALL MAMMALS IN FIELDS, STACKS AND RICKS IN THE SOUTH OF THE CENTRAL BLACK-EARTH REGION

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The results of studies conducted by the sanitary and epidemiological service in the Voronezh region from 1959 till 2013 were analyzed. Records of small mammals (SM) were carried out by snap traps with wire hooks for baiting. Standard bait (black bread pieces flavored with sunflower oil) was used. Traps were placed in lines. The numbers of SM were calculated as a percentage of animals fallen into 100 traps per day. The data obtained were analyzed using conventional statistical methods, including the method of standard deviations. The results were considered in the territory of two regions: the Oka-Don lowland plain and the Central Russian upland in fields from May till September (the “warm” period) and in stacks and ricks from August till March (the “cold” period). It is shown that the situation in fields in the warm period and that in ricks and stacks in the cold one allow judging the future abundance of SM in these localities. It is assumed that the described trends can be used for short-term forecasting of the abundance of SM and as a justification at planning of antiepidemic, epidemiological and phytosanitary measures. One should take into account the degree of synanthropy of certain SM species and their epidemic significance. In addition, for this purpose, it is necessary to constantly carry out seasonal counts of SM in the analyzed habitats. Despite the reduction of the numbers of ricks and omets in recent years, data on the numbers of SM in these habitats are still of particular interest for analysis of the situation.

Key words: small mammals, abundance, stacks, ricks, open meadow-field stations, natural and focal infections, forecasting, prevention.

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REFERENCES

- Bashenina N. V. Dynamics of the Numbers of Small Rodents in the USSR During the Period 1936 – 1943. *The Fauna and Ecology of the Rodents*, 1947, iss. 2, pp. 149–214 (in Russian).
- Blagoveshchenskaia N. M., Makarov S. V., Zarubina L. V., Martino V. E. Leptospirozy v stepnykh landshaftakh [Leptospirosis in a steppe landscape]. *Leptospirozy: trudy 3-y Vsesoyuznoy konferentsii po leptospirozam cheloveka i zhivotnykh* [Leptospirosis. Proceedings of the 3rd All-

Union Conference on Human and Animal Leptospirosis]. Moscow, 1962, pp. 208–212 (in Russian).

Verzhutski D. B. The present situation of zoological service in providing epidemiological welfare of Russia. *Baikalskij zoologiceskij zhurnal*, 2013, vol. 12, no. 1, pp. 109–112 (in Russian).

Gulev S. K., Kattsov V. M., Solomina O. N. Global warming continues. *Herald of the Russian Academy of Sciences*, 2008, vol. 78, no. 1, pp. 44–50 (in Russian).

Danilov-Danil'yan V. I., Gel'fan A. N. On the rostrum of the RAS presidium. *Herald of the Russian Academy of Sciences*, 2014, vol. 84, no. 9, pp. 817–825 (in Russian).

Dobrohotov E. P., Zukov V. I., Mossolov L. P. The prognosis of small rodents numbers and rabbit-fever epizootic in 1966. *Bulletin of Moscow Society of Naturalists, Biological Ser.*, 1966, vol. 71, iss. 3, pp. 50–59 (in Russian).

Dobrokhotov B. P., Kovalevsky Yu. V., Zhukov V. I., Mosolov L. P. The numerical abundance of small rodents in the autumn 1969; prognosis for 1970 of their epizootic status as vectors of tularemia in the RSFSR. *Bulletin of Moscow Society of Naturalists, Biological Ser.*, 1970, vol. 75, iss. 6, pp. 46–55 (in Russian).

Duvanova I. A. *Ekologija melkikh mlekopitajuščikh izvestniakovogo Severa srednerusskoj vozyshennosti* [Ecology of small mammals of the limestone North of the Central Russian upland]. Thesis Diss. Cand. Sci. (Biol.). Voronezh, 2009. 23 p. (in Russian).

Duvanova I. A., Khitsova L. N., Nedosekin V. Yu., Drozdova V. F. On population analysis of the abundance dynamics mechanisms in *Apodemus agrarius* in the Lipetsk region. *Povolzhskiy J. of Ecology*, 2009, no. 1, pp. 26–34 (in Russian).

Duvanova I. A., Khitsova L. N., Nedosekin V. Yu., Drozdova V. F. Factors of population dynamics of pygmy wood mouse (*Apodemus uralensis* Pall.) in the limestone north of the central Russian upland. *Bulletin of Lobachevsky state university of Nizhniy Novgorod*, 2010, no. 3, pp. 112–116 (in Russian).

Zhilgalsky O. A. Seasonal dynamics of bank vole population in Udmurtiya. *Bulletin of Udmurt University*, 2012, iss. 4, pp. 64–70 (in Russian).

Zarytovskaja A. I. Dinamika pogolovija ovets i koz v khozyaystvakh vsekh kategorij [Dynamics of sheep and goats in farms of all categories]. In: V. I. Fedotov, ed. *Ekologo-geograficheskiy Atlas-kniga Voronezhskoy oblasti* [Ecological-geographical Atlas-book of the Voronezh region]. Voronezh, Izdatelstvo Voronezhskogo universiteta, 2013, pp. 350–351 (in Russian).

Zarytovskaja A. I., Spivakov A. A. Dinamika pogolovija krupnogo rogatogo skota v khozyaystvakh vsekh kategorij [Dynamics of the number of cattle in farms of all categories]. In: V. I. Fedotov, ed. *Ekologo-geograficheskiy Atlas-kniga Voronezhskoy oblasti* [Ecological-geographical Atlas-book of the Voronezh region]. Voronezh, Izdatelstvo Voronezhskogo universiteta, 2013, pp. 326–327 (in Russian).

Ivanter E. V. *Theriology: textbook*. Petrozavodsk, Izdatelstvo Petrozavodskogo gosudarstvennogo universiteta, 2014. 703 p. (in Russian).

Kayser G. A. Results of observations on the number of rodents in the South-Eastern regions of the USSR in 1939. In: *Gryzuny i borba s nimi* [Rodents and rodent control collected essays]. Alma-Ata, Alma-Ata Anti-Plague Station, 1941, pp. 225–234 (in Russian).

Karaseva E. V., Telitsyna A. Yu. *The Methods of Studying rodents in the Wild Nature: Number Assessment and Marking*. Moscow, Nauka Publ., 1996. 227 p. (in Russian).

Karaseva E. V., Telitsyna A. Yu., Zhilgalsky O. A. *The Methods of Studying Rodents in the Wild Nature*. Moscow, LKI Publ., 2008. 416 p. (in Russian).

Kulik I. L. Rodents of stacks and ricks. *Questions of Regional, General and Experimental Parasitology and Medical Zoology*, 1951, vol. 7, pp. 284–317 (in Russian).

Kulik I. L. Opyt sostavleniya obzora sostoyaniya chislennosti myshevidnykh gryzunov na bolshoy territorii [Experience in compiling a review of the state of the number of murine rodents

ЧИСЛЕННОСТЬ МЕЛКИХ МЛЕКОПИТАЮЩИХ НА ПОЛЯХ

in a large area]. In: *Organizatsiya i metody ucheta ptits i vrednykh gryzunov* [Organization and methods of accounting for birds and harmful rodents]. Moscow, Leningrad, Izdatelstvo AN SSSR, 1963, pp. 244–247 (in Russian).

Kucheruk V. V. Mlekopitayushchiye – nositeli bolezney opasnykh dlya cheloveka [Wild mammals as carriers of diseases dangerous to man]. In: *Uspekhi sovremennoy teriologii* [Advances in modern theriology]. Moscow, Nauka Publ., 1977, pp. 75–92 (in Russian).

Kucheruk V. V. Synanthropic Rodents and Forms of Synanthropy. *Disinfection affairs*, 2000, no. 2, pp. 61–65 (in Russian).

Kucheruk V. V., Rubina M. A. Reasons determining the species composition and number of rodents in stacks and ricks of the southern districts of the Moscow region. *Zoologicheskii zhurnal*, 1953, vol. 32, no. 3, pp. 495–505 (in Russian).

Levchenko B. I., Degtyareva L. V., Zaitsev A. A., Grigor'ev M. P. Osnovnyye faktory, vliyayushchiye na epizooticheskiy potentsial prirodnogo ochaga tulyaremii Stavropol'skogo kraya [The main factors influencing the epizootic potential of the natural focus of tularemia of the Stavropol Territory]. In: *Aktualnyye voprosy obespecheniya sanitarno-epidemiologicheskogo blagopoluchiya v Prichernomorskom regione: materialy regionalnoy nauch.-prakt. konf. s mezhdunarodnym uchastiyem* [Current issues of ensuring sanitary and epidemiological well-being in the Black Sea region. Materials of the regional scientific-practical conference with international participation]. Stavropol, Stavropol'skiy protivochumnyy institut Rospotrebnadzora, 2013, pp. 24–26 (in Russian).

Levchenko B. I., Degtyareva L. V., Zaitsev A. A., Grigor'ev M. P., Ostapovich V. V. The Role of Certain Species of Small Mammals in the Persistence of Natural Focality in the Territory of Forest-Steppe Zone of the Natural Tularemia Focus of the Stavropol Region. *Problems of Particularly Dangerous Infections*, 2014, iss. 3, pp. 30–33 (in Russian).

Litvin V. Iu., Karulin B. E., Vodomorin N. A., Okhotsky Yu. V. Radioisotope simulation of epizootic situations and stochastic model of tularemia epizootic in straw stacks. *The Fauna and Ecology of the Rodents*, 1980, iss. 14, pp. 63–84 (in Russian).

Mazin L. N., Kashtankin M. N., Rumyantseva L. N. Theriological and parasitological monitoring over small mammals populations within undeveloped areas of Moscow. Message 1. Theriological monitoring in 2002 – 2011. *Disinfection affairs*, 2013, no. 2, pp. 39–52 (in Russian).

Matishov G. G. Effect of Changeability of Climatic and Ice Conditions on Shipping. *Herald of the Russian Academy of Sciences*, 2008, vol. 78, no. 10, pp. 896–902 (in Russian).

Milkov F. N. *Fiziko-geograficheskoye rayonirovaniye tsentralnykh Chernozemnykh oblastey* [Physico-geographical zoning of the Central black earth region]. Voronezh, Izdatelstvo Voronezhskogo universiteta, 1961. 263 p. (in Russian).

Milkov F. N. *Prirodnyye zony SSSR* [Natural Zones of the USSR]. Moscow, Mysl Publ., 1977. 293 p. (in Russian).

Mikhailova T. V., Bernshtein A. D., Balakirev A. E., Apekina N. S., Al'bov S. A., Novokhatka A. D., Dorofeev E. M. Some features of *Microtus arvalis* and *Microtus rossiaeemeridionalis* (Rodentia, Cricetidae) biology and their relationships with the hantavirus Tula. *Zoologicheskii zhurnal*, 2008, vol. 87, no. 2, pp. 239–247 (in Russian).

Mikhno V. B., Gorbunov A. S. *Fiziko-geograficheskoye rayonirovaniye* [Physico-geographical zoning]. In: V. I. Fedotov, ed. *Ekologo-geograficheskiy Atlas-kniga Voronezhskoy oblasti* [Ecological-geographical Atlas-book of the Voronezh region]. Voronezh, Izdatelstvo Voronezhskogo universiteta, 2013, pp. 199–200 (in Russian).

Nikitina N. A. On permanency in the use of territories by rodents. *The Fauna and Ecology of the Rodents*, 1970, iss. 9, pp. 110–133 (in Russian).

Okulova N. M., Kalinkina E. V., Mironova T. A., Sapelnikov S. F., Yegorov S. V., Vlasov A. A., Mayorova A. D. On the ecology of Field Mouse (*Apodemus agrarius* Pall.) in the for-

est-steppe Black Earth region. II. Biotopes and nutrition. *Povolzhskiy J. of Ecology*, 2011, no. 3, pp. 370–377 (in Russian).

Pavlovsky Iu. S., Okhotsky Iu. V. A study of the process of colonization of straw stacks by mousseline rodents in the south of the Moscow oblast. *The Fauna and Ecology of the Rodents*, 1980, iss. 14, pp. 85–104 (in Russian).

Rubina M. A. *Gryzuny – obitateli skird i ometov i usloviia razvitiia sredi nikh epizootii tularemii* [Rodents – Inhabitants of ricks and stacks and conditions of development among them epizootic tularemia]. Thesis Diss. Cand. Sci. (Biol.). Moscow, 1964. 22 p. (in Russian).

Riabov S. V., Popov N. V. Evaluation of the epizootic activity of natural foci of hemorrhagic fever with renal syndrome and the prognosis of morbidity. *Epidemiology and Hygiene*, 2012, no. 3, pp. 7–12 (in Russian).

Savilov E. D., Mamontova L. M., Astaf'ev V. A., Zhdanova S. N. *Primeneniye statisticheskikh metodov v epidemiologicheskoy analize* [Application of statistical methods in epidemiological analysis]. Moscow, MEDpress-inform, 2004. 112 p. (in Russian).

Sidorov G. N., Nurmagonbetova S. S., Vakhrushev A. V., Sidorova D. G., Putin A. V., Deriglazov I. V. Field mouse (*Apodemus agrarius*) in 1974–2013: features of distribution and numbers dynamics. *Omsk Scientific Herald*, no. 1, pp. 144–148 (in Russian).

Snedekor D. U. *Statistical Methods Applied to Research in Agriculture and Biology*. Moscow, Selkhozizdat Publ., 1961. 503 p. (in Russian).

Sorokhtin O. G. That to us threatens: global warming or global cooling of a climate. *Bulletin of the Russian Academy of Natural Sciences*, 2010, no. 4, pp. 23–32 (in Russian).

Tarasov M. A., Sonin K. A., Tolokonnikova S. I., Yakovlev S. A., Bilko Ye. A., Popov N. V. Features of the manifestations of necrophagy in the populations of rodents carrying the virus of hemorrhagic fever with renal syndrome. *Medical Parasitology and Parasitic Diseases*, 2006, no. 1, pp. 49–51 (in Russian).

Trankvilevskiy D. V., Platonina T. N., Dzagurova T. K., Bakhmet'eva Iu. O., Korotina N. A., Gaponov S. P., Sedova N. S., Shkil' N. N., Sapel'nikov S. F., Marchenko N. F., Mamchik N. P., Chubirko M. I., Tkachenko E. A. Outbreak of hemorrhagic fever with renal syndrome in winter 2006–2007 in the Voronezh region. *Medical Virology*, 2007, vol. 24, pp. 145–156 (in Russian).

Trankvilevskii D. V., Bakhmet'eva Iu. O., Grigor'eva Iu. S., Shkil' N. N., Mukha T. A., Tre-gubov O. V., Bogatova I. S., Trufanova E. I., Prostakov N. I., Gaponov S. P., Manzhurina O. A., Iatsenko A. V., Marchenko N. F., Klepikov O. V., Sharipova L. F., Korotina N. A., Mamchik N. P., Chubirko M. I., Tkachenko E. A. On the results of monitoring of small mammals populations in the Novokhopersk district of the Voronezh region. *Proceedings of the Biological Educational and Scientific Center “Venevitinovo” Voronezh State University*, 2008, iss. 21, pp. 59–69 (in Russian).

Trankvilevsky D. V., Dzagurova T. K., Tkachenko E. A. Bolezni s prirodnoy ochagovostyu (Gemorragicheskaya likhoradka s pochechnym sindromom) [Diseases with natural foci (hemorrhagic fever with renal syndrome)]. In: *Mediko-ekologicheskiy atlas Voronezhskoy oblasti* [The Medical-Ecological Atlas of the Voronezh Region]. Voronezh, Istoki Publ., 2010, pp. 141–147 (in Russian).

Trankvilevskii D. V., Strygina S. O., Kutuzov A. V., Bahmet'eva Yu. O., Tregubov O. V., Rodina I. V., Bernshtein A. D., Korotina N. A., Dzagurova T. K., Stepkin Yu. I., Chubirko M. I., Tkachenko E. A. Many years dynamic of quantity and species composition of small-sized mammals in open pasture lands of Voronezh region and change of epizootic and epidemic situation in locations of zoonosis. *Disinfection Affairs*, 2011, no. 1, pp. 48–57 (in Russian).

Trankvilevskiy D. V., Bahmet'eva Yu. O., Dzagurova T. K., Chubirko M. I., Tkachenko E. A. On the centers activity of hemorrhagic fever with renal syndrome in the Voronezh region and predict the incidence of this infection before the last outbreak in 2006. *Population Health and Life Environment*, 2012, no. 5 (230), pp. 35–38 (in Russian).

ЧИСЛЕННОСТЬ МЕЛКИХ МЛЕКОПИТАЮЩИХ НА ПОЛЯХ

Trankvilevskiy D. V., Kvasov D. A., Platonina T. N., Dzagurova T. K., Stepkin Iu. I. Diseases with natural foci (hemorrhagic fever with renal syndrome). In: V. I. Fedotov, ed. *Ekologo-geograficheskiy Atlas-kniga Voronezhskoy oblasti* [Ecological-geographical Atlas-book of the Voronezh region]. Voronezh, Izdatelstvo Voronezhskogo universiteta, 2013 a, pp. 499–502 (in Russian).

Trankvilevskiy D. V., Kvasov D. A., Surkov A. V., Kutuzov A. V., Zhukov V. I. The analysis of the micromammals population structure in closed meadow-field stations Oka-Don lowland plain and the Central Russian upland. *Population Health and Life Environment*, 2013, no. 5 (242), pp. 36–39 (in Russian).

Trankvilevskiy D. V., Borisov S. A., Kiseleva E. Yu., Matrosov A. N., Udovikov A. I., Zakharov K. S., Surkov A. V., Kutuzov A. V., Zhukov V. I., Korsak M. N., Berezhnaja T. V., Berezhnoy A. V., Tregubov O. V., Sheftel B. I. About the results of observation of water vole (*Arvicola amphibius* Linnaeus, 1758) in the territory of the Russian Federation in 2011–2014 according to institutions of Rospotrebnadzor. *Pest Management*, 2014 a, no. 4 (92), no. 4, pp. 14–26 (in Russian).

Trankvilevskiy D. V., Kvasov D. A., Klepikov O. V., Prostakov N. I., Kurolap S. A., Surkov A. V., Kutuzov A. V., Tsarenko V. A., Korsak M. N., Zhukov V. I. Features seasonal abundance of micromammals in enclosed meadow-field stations on the Oka-Don lowland plains, central Russian upland and steppe in terms of epidemiological significance. *Population Health and Life Environment*, 2014 b, no. 5 (254), pp. 31–35 (in Russian).

Trankvilevskiy D. V., Kvasov D. A., Mescheryakova I. S., Mikhaylova T. V., Kormilitsyna M. I., Demidova T. N., Ananyina Yu. V., Savelyeva O. V., Malkin G. A., Mutnykh E. S., Korotina N. A., Dzagurova T. K., Prostakov N. I., Surkov A. V., Kurolap S. A., Klepikov O. V., Stepkin Yu. I., Chubirko M. I., Zhukov V. I. Questions organization monitoring the natural foci of infections are dangerous to humans. Planning, conducting and analyzing the results of field observations. *Population Health and Life Environment*, 2014 c, no. 8 (257), pp. 38–43 (in Russian).

Trankvilevsky D. V., Udovikov A. I., Popov V. P., Zakharov K. S., Popov N. V., Bezsmertny V. E. Situation on Rodents Abundance and Epidemiological Situation on Tularemia in the Territory of the Russian Federation in the Second Half of 2014, and Prognosis for 2015. *Problems of Particularly Dangerous Infections*, 2015, iss. 1, pp. 30–35 (in Russian).

Trankvilevsky D. V., Tsarenko V. A., Zhukov V. I. The present state of epizootiological monitoring of natural infection foci in the Russian Federation. *Medical Parasitology and Parasitic Diseases*, 2016, no. 2, pp. 19–24 (in Russian).

Fedotov V. A., Kadyrov S. V., Shchedrina D. I. *Agrotehnologii polevykh kultur v Tsentralnom Chernozemye* [Agricultural Technologies of Field Crops in the Central Chernozem Region]. Voronezh, Istoki Publ., 2011. 260 p. (in Russian).

Feniuk B. K., Pastukhov B. N., Semenov N. M. Organizatsiya i metodicheskiye printsipy ucheta chislennosti gryzunov protivochumnymi uchrezhdeniyami [Organization and methodical principles of accounting numbers of rodents-plague institutions]. In: *Organizatsiya i metody ucheta ptits i vrednykh gryzunov* [Organization and Methods of Accounting of Birds and Harmful Rodents]. Moscow, Izdatelstvo AN SSSR, 1963, pp. 152 – 158 (in Russian).

Khain V. E. About the main directions in modern earth Sciences. *Herald of the Russian Academy of Sciences*, 2009, vol. 79, no. 1, pp. 50–56 (in Russian).

Hanski I. *The Shrinking World: Ecological Consequences of Habitat Loss*. Moscow, KMK Scientific Press Ltd., 2015. 340 p. (in Russian).

Kharchenko N. N. Rodents in the Middle Don. *Zashchita i karantin rasteniy*, 2004, no. 11, pp. 46–47 (in Russian).

Cherkasskiy B. L., Simonova E. G. Modern views on the epidemic process control system. *Epidemiology and Infectious Diseases*, 2006, no. 5, pp. 4–7 (in Russian).

Shemiatikhina G. B. *Myshevidhye gryzuny na territorii Ulianovskoy oblasti (dinamika chislennosti, sootnosheniye vidov v soobshchestve, rol v peredache prirodno-ochagovykh infektsiy)* [Mouse-like Rodents in the Ulyanovsk Region (the Dynamics of the Population, the Ratio of Species in the Community, a Role in the Transmission of Natural Focal Infections)]. Thesis Diss. Cand. Sci. (Biol.). Ulyanovsk, 2012. 20 p. (in Russian).

Sheftel B. I. Methods for estimating the abundance of small mammals. *Russian J. of Ecosystem Ecology*, 2018, vol. 3, no. 3, pp. 1–21 (in Russian).

Diffenbaugh N. S., Field C. B. Changes in Ecologically Critical Terrestrial Climate Conditions. *Science*, 2013, vol. 341, iss. 6145, pp. 486–492.

Kosoy M. Deepening the Conception of Functional Information in the Description of Zoonotic Infectious Diseases. *Entropy*, 2013, vol. 15, pp. 1929–1962.

Krebs C. J. *Ecological Methodology*. 2nd ed. Menlo Park, California, Benjamin Cummings, 1999. 620 p.

Kucheruk V. V. Synanthropic Rodents and their Significance in the Transmission of Infections. *Theoretical questions of natural foci of diseases: Proceedings of a Symposium held in Prague*. Prague, 1965, pp. 353–366.

Wu X., Lu Y., Zhou S., Chen L., Xu B. Impact of climate change on human infectious diseases: empirical evidence and human adaptation. *Environment International*, 2016, vol. 86, pp. 14–23.