Ukrainian Journal of Ecology

Ukrainian Journal of Ecology, 2021, 11(9), 88-94, doi: 10.15421/2021_300

ORIGINAL ARTICLE

Distribution and management of the zoophilous flies

V.N. Domatskiy, E.I. Sivkova

All-Russian Scientific Research Institute of Veterinary Entomology and Arachnology, Branch of Tyumen Scientific Centre SB RAS. Institutskaya 2, Tyumen, 625041, Russia

**Corresponding author E-mail: sivkovaei@mail.ru*

Received: 29.10.2021. Accepted: 18.11.2021.

Zoophilous flies are a serious problem in animal husbandry and the source for pathogens of many infectious and invasive diseases, and their larval phase itself causes their own disease. The species specificity of flies is poorly expressed, but they give the greatest preference to cattle. More than 120 species of these insects come into contact with animals. Of these, 92 species are found in pastures, 57 in cowsheds, 48 in pigsties, and 27 in stables. The most harmful are 30 species of flies (5 species of stable flies, 4 bloodsuckers, 16 licking and 5 species of flies that cause myiasis in animals), which can be divided into 4 families: stable flies (*Muscidae*), blue bottle (carrion) flies (*Calliphoridae*), fleshflies (*Sarcophagidae*) and bloodsuckers (*Hippoboscidae)*.

Keywords: Zoophilous flies, Species composition, Tissue myiasis, Disease carriers, Harmfulness, Pest control.

Introduction

On the territory of Russia, 15 species of zoophilous flies have been documented, which can cause obligate and facultative tissue myiasis in domestic vertebrates and invertebrates. This is a *Wohlfahrtia magnifica* Schin., Senotainia-*Senatainia tricushis* Mg. fam. Sarcophagidae (Porchinsky, 1916; Olenev, 1931; Pavlovsky, 1934, 1935; Gan, 1953; Rodendorf, 1956; Ternovoi, 1960, 1971; Boyko, 1967); Booponus-*Booponus borealis* Rohd. (Rodendorf, 1959; Razmakhnin, 1963; Zolotarev, 1968; Sadovnikova, 1968), green blowfly-*Lucilia sericata* Mg., L.illstris Mg., L. *caesar* L., protoformia-*Protophormia terraenovae* R.-D., *Calliphora vicina* R.-D. (Veselkin, 1966; Kolomiets andGomoyunova, 1971; Veselkin and Zagrebin, 1980; Domatsky, 1984), *Chrysomya albiceps* Wd. (Stackelberg, 1956), *Phormia regina* Mg. (Dobreanu et al., 1962) fam. *Calliphoridae*; *Physocephala vittata* F., *Ph. Pusilla* Mg., *Zodion cinereum* Mg., *Z. notatum* Mg., *Z. asiaticum* Nor. fam. *Conopidae* (Myshkin, 1938; Sychevskaya, 1956; Zimina, 1970; Stolbov et al., 1985). Miasis of domestic animals can be caused mainly by flies of three families.’

Methodology

Green blowfly (*Lucilia sericata)* (*Calliphoridae)*

This name was given to the species by I.A. Porchinsky (1916). This is a worldwide widespread thermophilic species. In Russia, it is found in deciduous forests of the Far East, in the steppe zone of the European part of Russia, Crimea, Central Asia, and the Caucasus. It is dangerous as a carrier of many pathogenic microorganisms, helminths, and sheep myiasis pathogens. In some areas, it damages fisheries, populating fresh and fresh-salted fish with larvae (Shtakelberg, 1956). There are numerous cases of cutaneous and cavity myiasis in humans caused by this species. For example, mature larvae were found on the gangrenous surface of the leg of a patient in Germany (Bauch et al., 1984), in the human nasal cavity, United States (Greenberg, 1984). A case of human myiasis caused by larvae of *Lucilia illstris* was described in Finland (Luisto and Nuorteva, 1978).

The green blowfly causes great damage to sheep breeding, being the causative agent of myiasis and annually affecting a large number of animals. For example, in Germany in the summer of 1981, the damage in sheep farms reached 10% (Liebisch et al., 1983). It strongly affects sheep in Norway, England, Scotland, and north India (Seddon, 1967). It attacks together with *Calliphora stugia* sheep in New Zealand (Wright, 1976), and in Bulgaria-it is found together with *C.vicina R.-D.* (Milushev, 1977). The closely related species *Lucilia cuprina* causes myiasis in sheep in Australia and West Africa (Seddon, 1967; Ciola and Zarzâr, 1979), causing annual damage of $ 30-40 million (Rundle, 1984).

Green blowfly larvae are capable of parasitizing not only sheep. Thus, in Austria, cases of her myiasis have been described in dogs, cats, hedgehogs, white storks, and kestrels (Hinaidy andFrey, 1984).

The green blowfly is known as the causative agent of sheep myiasis in Ukraine (Goncharov, 1972, 1975; Zaskind and Doletsky, 1983), in Central Asia, southern Siberia (Veselkin, 1966; Domatsky, 1984).

Fleshflies (*Sarcophagidae*)

The most significant representative of the family is the genus *Wohlfahrtia magnifica Schin.,* which consists of 23 species of flies found in Asia, Africa, and Europe (Derbeneva-Ukhova, 1974).

Wohlfahrtia magnifica Schin.

The species is known both in Russia and abroad-Mongolia, China, Afghanistan, Iraq, Israel, North Africa, the southeastern part of Western Europe: Romania, Austria, northern Morocco (Yasuda, 1940; Rodendorf, 1956; Supperer and Hinaidy, 1975; Ciola and Zarzârâ, 1979; Abul-Hab, 1980; Farkas et al., 2009).

It is widespread in Central Asia, Kazakhstan, the North Caucasus, Ukraine, Transcaucasia, Belarus, the Baltic states (Gan, 1953; Sychevskaya, 1953; Rodendorf, 1956). In Siberia, it is most often found in the steppe and forest-steppe regions of Altai, Omsk, Tyumen, Kurgan regions, Khakassia, Tuva, and Transbaikalia (Veselkin, 1966, 1983; Domatsky, 1984). Its natural habitat enters the southern taiga subzone (Tobolsk). The natural habitat of Wohlfahrtia magnifica occupies the southern part of the Palaearctic.

Among myiasis fly, Wohlfahrtia magnifica has the greatest economic importance as a massive obligate pathogen of animal myiasis. So, in the south of Kazakhstan, the incidence of wolfarthiosis in sheep reached 75% (Olenev, 1931), and in the Alma-Ata and Chimkent regions, the incidence of breeder rams is 26-30% (Kunichkin and Rabochaya, 1979), in the Semipalatinsk Irtysh region it is 15-20% (Isimbekov, 1983). In the Stavropol Territory, at least 50% of sheep suffer wolfarthiosis (Pokidov, 1971). In Western Siberia, the affection of sheep in some years in the forest-steppe zone reached 60%. Wolfarthiosis causes a significant loss of live weight in animals. Thus, the average daily loss of live weight by sick sheep is 250-570 g (Ternovoy, 1971; Ternovoy and Mikhailenko, 1973), and during the period of illness, sheep lose from 1.2 to 4.4 kg (Pokidov, 1971; Isimbekov, 1983).

Stable flies (*Muscidae*)

The family of stable flies, or Muscidae, includes a large number of species. In the world fauna, 3650 species from 100 genera are described. In the Palaearctic, about 850 species from 52 genera and 5 subfamilies are known. The fauna of Russia contains about 400 species (Narchuk, 2003). Stable flies are of great interest, as some species contribute to the transfer of various bacteria and viruses. The family under study includes the well-known houseflies (*Musca domestica L.*), which carry diseases such as dysentery, typhoid fever, tuberculosis, and cholera (Zimin and Teterovskaya, 1943; Zimin, 1944a, 1944b, Zmeev, 1944a, 1944b). In addition to the housefly, the family includes a large number of not only synanthropic species, but also those living outside of settlements. In addition to the diseases listed above, stable flies carry the poliomyelitis virus, paratyphoid bacteria, tularemia, brucellosis, botulism, staphylococcal and micrococcal infections, as well as the eggs of parasitic worms: ascaris, pinworms, and broad tapeworm (Klesov, 1949; Krastin, 1949; Sychevskaya and Petrovskaya, 1949; 1958; Sychevskaya et al., 1959; Shura-Bura, 1950, 1952; Lamborn, 1936, 1937; Fisher et al., 2001; Grûbel et al., 1997; Moriya et al., 1999; Tan et al., 1997).

Some species of *Muscidae* lay larvae on the body and in wounds of domestic animals, others parasitize in the body of chicks (flies of the genus *Philornis sp.* (Aldrich, 1923; Arend, 1985; Couri, 1999; Teixeira, 1999; Fessl et al., 2001; Fessl andTebbich, 2002; Nihei and Bencke, 2003). Stock flies (*Stomoxys Geuff., Lyperosia Rood.*), species of the genus *Hydrotaea R.-D.* pierce or scratch the skin of animals and drink blood, which causes enormous damage to livestock, reducing the milk yield of cows by 15-30%, reducing the weight gain of young cattle by 25-40%, worsening the sanitary quality of livestock products (Zimin, 1951; Pavlov, 1970; Jonson and Mayer, 1999; Jonson and Matschoss, 1998, Aubakirov et al., 2015).

Muscidae are widespread in the Urals (Zagrebin, 1987, 1989, 1992, 1998; Malozyomov, 1989, 1992, 1997; Malozemov and Stepanov, 1990), Altai (Drobischenko and Shol, 1975; Sychevskaya, 1978), In Primorsky Krai (Gavrilova, 1962; Zhurba, 1963; Petrova, 1968; Soboleva andGavrilova, 1963), Yakutia (Sychevskaya, 1978), Tyva (Pridantseva, 1967; Tamarina andKhromova, 1980). In Siberia, it is most often found in the Tyumen, Kurgan, Novosibirsk, Omsk, Tomsk regions (Veselkin, 1966, 1989; Domatsky, 1987, 1992; Domatsky andVeselkin, 1989; Kutuzova, 1989, 1993) (Sorokina, 2006).

Limitation of flies abundance

Traditional fly control methods include preventive and extermination measures. The essence of the first is to exclude potential breeding conditions for flies by following sanitary and hygienic norms. The advantage of preventive measures is their environmental friendliness; however, they are not able to provide a significant reduction in the number of flies. A good result is obtained only by fighting flies using available methods-physical, chemical, biological and their combination (Sivkova, 2021).

The physical methods include various traps (sticky tape in rolls, plates, screens, elektro-feromonnye traps, CDC-type light traps with light, light with octenol, light with carbon dioxide (dry ice), light octenol and carbon dioxide). They are appropriate in small farm buildings with relatively few flies. These agents can be used in the presence of animals (Burkett, 2001; Russell, 2004; Cilek, 2011; Hapairai, 2013).

Entomophagous insects actively exterminate larvae of flies. These are parasitic hymenoptera and beetles of the Staphylinidae family. However, the number of entomophages is highly dependent on human activity. The chemicals used for pest control and delarvation are harmful to entomophages. Currently, experts involved in the extermination of flies prefer the chemical control method as the most economically justified. One of the main disadvantages of using the chemical method is the formation of insecticide-resistant arthropod populations. The development of resistance is the most important problem, since it leads to an increase in the consumption rates of agents, the number of treatment cycles, which contributes to environmental pollution (Levchenko and Silivanova, 2018; Domatsky et al., 2018).

A.N. Mashkei et al. (2011) studied the effectiveness of treatment with the "Diptocid" bait against zoophilous flies on livestock farms in Ukraine. The efficiency ranged from 93.8 to 98.4%, and with the summer camp keeping animals, it is from 87.9 to 95.6%.

According to O.A. Savelieva et al. (2016), granular baits such as "Quick-Bite", "Fly-Bite", "Karakurt" are highly effective. These baits contain imidacloprid [1-(6-chloro-3-pyredylmethyl) -N-nitro-imidazolidine-2] and methomyl as active ingredients. As an auxiliary substance, the products contain a sex pheromone that attracts insects to the granules. In studies carried out in a pig farm in the Moscow region, it was found that the use of granular bait "QuickBite" kills up to 71% of adult flies and 99.27% of fly larvae.

The studies carried out by R.T. Safiullin et al. (2016) in the pig breeding complex of the Moscow region showed that the use of the complex product Solfak Duo SK 7.5% and the larvicidal preparation Baicidal VP 2.5% kills 98.84% of imago flies and 100% of larvae.

Results and Discussion

Research by Gadaeva et al. (2016) on the effectiveness of Agita showed its insufficient effectiveness against adults (39-89%) and greater against larvae (97.6%). The advantages of the drug were reduced to its low toxicity in relation to animals, low cost, and convenience of diluting the granules of the drug in water.

A.I. Yatusevich and E.V. Miklashevskaya (2018) provide data on the determination of the insecticidal properties of Farmastomazan in 0.1-3% concentrations for the eradication of eggs, larvae and winged stages of zoophilous flies in poultry farms.

Engashev SV (2019, 2020) studied the effectiveness of the insecticidal bait FLYBLOK® granules against adult stages and larvae of zoophilous flies in a livestock complex, pig farms in the Central Region of the Russian Federation.

Levchenko M.A. and Silivanova E.A. (2020) conducted a study on an insecticidal bait containing a mixture of ivermectin and fipronil, which has a high insecticidal efficacy against the adult housefly *M. domestica L.* under laboratory and industrial conditions. The study was carried out to evaluate the insecticidal efficacy under industrial conditions of baits containing the following active ingredients: neonicotinoidacetamiprid and phenylpyrazolfipronil against housefly (*Musca domestica* L.). Three self-developed insecticidal baits Mukhnet A (acetamiprid 1.5%), Mukhnet F (fipronil 0.15%) and Mukhnet FA (acetamiprid 0.15% and fipronil 0.015%) were compared with Agita (thiamethoxam 10%) under conditions of calves and a cowshed. The insecticidal efficacy of single component baits containing an active ingredient (fipronil or acetamiprid) was 93.7% and 94.3%, respectively, on the first day after the treatment of the premises. A bicomponent bait containing a mixture of the indicated active ingredients showed a 92% insecticidal effect.

Miklashevskaya E.V. (2020) considered the insecticidal properties of EM1- "Konkur"-a biological additive, the active substance of which is a complex of natural microorganisms, lactic acid bacteria, and yeast. They are used to rehabilitate objects of the external environment and industrial premises from various stages of development of fly.

Conclusion

This article provides information on the distribution of zoophilous flies, their harmful value, and considers the means and methods that can be used to control the number of insects.

Acknowledgment

The article was prepared with the financial support of FNI 296-2021-0018-«Study and analysis of the epizootic state of invasive etiology diseases of agricultural and unproductive animals, bees and birds, changes in the species composition and bioecological patterns of the parasite development cycle under conditions of displacement of the boundaries of their ranges».

References

Abul-Hab, J.K. (1980). A list of arthropods of medical and veterinary importance recorded in Iran. Bulletin Biological Research Center, 12:9-39.

Aldrich, J.M. (1923). The genus *Philornis* is a bird-infesting group of Anthomyiidae. Annals of the Entomological Society of America, 16:304-309.

Arendt, W.J. (1985). *Philornix* ectoparasitism of pearly-eyed hrashers. Effects on dults and reproduction. The Auk, 102:281-292.

Aubakirov, M.Z., Tagaev, O.O., Domatsky, V.N., Brel-Kisseleva, I.M., Mustafin, M.K., Erenko, E.N., Marinenko, T.G., Tegza, A.A. Economic efficiency of new insecticides used to protect cattle from zoophilous flies in Northern Kazakhstan. Biology and Medicine, 7(5):5.

Bauch, R., Ziesenhen, K., Groskopff, C. (1984). Lucilia sericata-Myiasis (Diptera, Calliphoridae) and einer Vorfub-Gangran. Angew Parasitology, 25:167-169.

Boyko, A.K. (1967). Bee cenoteinosis. Kiev.

Burkett, D.A., Lee, W.J., Lee, K.W., Kim, H.C., Lee, H.I., Lee, J.S., Shin, E.E., Wirtz, R.A., Cho, H.W., Claborn, D.M., Coleman, R.E., Klein, T.A. (2001). Light, carbon dioxide, and octenol-baited mosquito trap and host-seeking activity evaluations for mosquitoes in a malarious area of the Republic of Korea. Journal of the American Mosquito Control Association, 17:196-205.

Ciola, Al., Zarzârâ, C. (1979). Miaza cutanata a ovinelor. Revista de Cresterea Animalelor, 29:55-59.

Cilek, J.E., Hallmon, C.F., Johnson, R. (2011). Semi-field comparison of BG Lure, nonanal, and 1-octen-3-ol to attract adult mosquitoes in northwestern Florida. Journal of the American Mosquito Control Association, 27:393-397.

Couri, M.S. (1999). Myiasis caused by obligatory parasites. *Philornis* Meinert (Muscidae). Myiasis in man and animals in the Neotropical Region. Säo Paulo.

Derbeneva-Ukhova, V.P. (1974). Guide to medical entomology. Moscow, Medicine.

Dobreanu, E., Berteanu, A., Dumitreasa, A. (1962). Determinator al mustelor sinantrope din R.P.R. Bucuresti.

Domatsky, V.N. (1987). Fauna and ecology of zoophilic flies in sheep-breeding complexes and trans-Ural farms. Ecology and Geography of Arthropods in Siberia.

Domatsky, V.N. (1992). Features of the ecology of zoophilic flies in rabbit breeding complexes in the Trans-Urals and measures to combat them. Insects in natural and anthropogenic biogeocenoses of the Urals. Yekaterinburg.

Domatsky, A.N., Veselkin, G.A. (1989). Composition and ecology of zoophilic dipterans (Diptera-Brachycera-Orthorhapha-Cyclorrharha) that inhabit rabbit-breeding complexes in the Trans-Urals. Insects in biogeocenoses of the Urals. Sverdlovsk.

Domatsky, V.N. (1984). On the ecology of the green sheepfly (Lucilia sericata Mg.)-the causative agent of sheep myiasis in the Trans-Urals.trans-Urals. Kiev, 1:148.

Domatsky, V.N., Nikonov, A.A., Beletskay, N.I., Siben, A.N. (2018). Efficiency of the insecticide composition «bifipr» in sheep melofagosis. On-line Journal of Biological Sciences, 18:95-100.

Drobischenko, N.I., Shol, V.A. (1975). Development cycle of the stink fly Heamatobia stimulans Mg. (Diptera, Muscidae)-the intermediate host of the nematode Setaria cervi Rud. in the Southern Altai. Entomological Review, 54:342-445.

Engashev, S.V., Novak, M.D., Engasheva, E.S., Mironenko, A.V. (2019). Efficiency of FLAYBLOK® bait granules against zoophilic flies under the conditions of a livestock complex. International Veterinary Bulletin, 2:74-81.

Engashev, S.V., Vasilevich, F.I., Novak, M.D., Engasheva, E.S. (2020). The practical value of FLYBLOK® food bait granules to reduce the number of zoophilic flies in pig farms. International Veterinary Bulletin, 2:51-57.

Farkas, R., Hall, M.J.R., Bouzagou, K., Lhor, Y., Khallaayoune, K. (2009). Traumatic myiasis in dogs caused by *Wohlfahrtia magnifica* and its importance in the epidemiology of Wohlfahrtiosis in livestock. Medical and Veterinary Entomology.

Fisher, O., Mátlová, L., Dvorská, L., vástová, P., Bartl, J., Melichárek, L., Weston, R.T., Pavlik, I. (2001). Diptera as vectors of mycobacterial infections in cattle and pigs. Medical and Veterinary Entomology, 15:208-211.

Fessl, B., Couri, M.S., Tebbich, S. (2001). *Philornis downsi* Dodge and Aitken, new to the Galapagos Islands (Diptera, Muscidae). Studia Dipterologica, 8:317-322.

Fessl, B., Tebbich, S. (2002). *Philornis downsi,* a recently discovered parasite on the Galapagos archipelago-a thrcat for Darvin's finches. Journal of Avian Biology, 144:445.

Gadaeva, G.A., Safiullin, R.T., Kachanova, E.O. (2016). Efficacy of Agita against flies in a porcine. Theory and Practice of Animal Parasitic Diseases. Moscow.

Gavrilova, B.K. (1962). Materials on the fauna and ecology of fly in livestock farms in the south of Primorsky Krai. Problems of Ecological Research in Siberia. Gorno-Altaysk.

Gan, E.I. (1953). Wolfarth's fly Wohlfahrtia magnifica Schin, Tashkent.

Greenberg, B. (1984). Two cases of human myiasis caused by Phoenicia sericata (Diptera, Calliphoridae) in hospitals in the Chicago area. Journal of Medical Entomology, 21:615.

Goncharov, A.P. (1972). Sheep wolfarthiosis in the conditions of Ukraine and the organization of measures to combat it. Natural focus of diseases and issues of animal parasitology. Alma-Ata, 6:188-194.

Goncharov, A.P. (1975). Tissue myiasis of sheep and dogs caused by green fly larvae and their treatment. Problems of Parasitology. Kiev, 1:118-119.

Grûbel, P., Hoffman, J.S., Chong, F.K., Burstein, N.A., Mepani, C., Cave, D.R. (1997). Vector potential of houseflies (*Musca domestica*) for *Heliobacter pylori*. Journal of Clinical Microbiology, 35:1300-1330.

Hapairai, L.K., Joseph, H., Sang, M.A., Melrose, W., Ritchie, S.A., Burkot, T.R., Sinkins, S.S., Bossin, H.C.C. (2013). Field evaluation of selected traps and lures for monitoring the filarial and arbovirus vector, Aedes polynesiensis (Diptera: Culicidae), in French Polynesia. Journal of Medical Entomology, 50:731-739.

Hinaidy, N.K., Frey, H. (1984). Weitere fakultativmyiasis-Fä1le bei wirbeltieren in osterreich. Wien. tierärztl. Monatsschr, 71:237-238.

Isimbekov, Zh.M. (1983). On the ecology of wolfarthiosis in the Semipalatinsk Irtysh region. Vestnik S.-x. Science of Kazakhstan, 2:47-49.

Jonson, N.N., Mayer, D.G. (1999). Estimation of the effects of buffalo fly (Haematobia irritans exigua) on the milk production of dairy cattle based on a meta-analysis of data from the literature. Medical and Veterinary Entomology. 13:372-376.

Jonson, N.N., Matschoss, A.L. (1998). Attitudes and practices of queensland dairy farmers towards the control of cattle tick (*Boophilus microplus*). Australian Veterinary Journal, 76:746-751.

Klyosov, M.V. (1949). Study of the nematode Thelazia Rhodesi Desmarest, 1827. Reports of the Academy of Sciences of the USSR, 66:309-311.

Kolomiets, N.G., Gomoyunova, N.P. (1971). On the calliphorid myiasis of reindeer (Rangifer tarandus L. in Chukotka, caused by Protophormia terraenovae (R.-D) (Diptera, Calliphoridae). Izvestiya Siberian Branch of the Academy of Sciences of the USSR, 15:112-116.

Krastin, N.I. (1949). Deciphering the parasitizing developmental cycle of the nematode Thelazia Rhodesi (Desmarest) in the eyes of cattle. Reports of the USSR Academy of Sciences, 14:885-887.

Kunichkin, G.I., Rabochaya, L.M. (1979). Volfartiosis in rams, producers. Materials of the Republic.

Kutuzova, T.M. (1989). To study the fauna and ecology of zoophilic flies of the forest-steppe Trans-Urals. Insects in Biogeocenoses of the Urals. Sverdlovsk.

Kutuzova, T.M. (1993). Composition of species and dynamics of the Trans-Ural number of flies of the forest-steppe Trans-Urals associated with cattle. Fauna and Ecology of Insects in the Urals. Permian.

Lamborn, W.A. (1936). The experimental transmission to man of *Treponema pertenue* by the fly *Musca sorbens*. Journal of Tropical Medicine.

Lamborn, W.A. (1937). Hematophagous Fly *Musca sorbens* Wd. in relation to the transmission of leprosy. Journal of Tropical Medicine, 40:37-42.

Levchenko, M.A., Silivanova, E.A. (2018). Insecticidal efficacy of fly baits. Bulletin of Russian Agricultural Science, 5:71-73.
Levchenko M.A., Silivanova E.A. (2020). Insecticidal efficacy of binary bait against houseflies *Musca domestica* L. Veterinary Medicine of the Kuban, 3:23-25.
Liebisch, A., Froehner, H., Elger, D. (1983). Myiasis bei Schafen durch Lucilia sericata-ein kommendes Problem. Tierärztl Umsch, 38:747.
Luisto, M., Nuorteva, P. (1978). Larve of Lucilia illustris (Diptera, Calliphoridae) in an injured human foot in Finland. Annual Entomology Fenn, 44:31-32.
Malozyomov, A.Yu. (1989). To the study of dipterans in the highlands of the Southern Urals. Insects in biogeocenoses of the Urals. Sverdlovsk.
Malozyomov, A.Yu. (1992). On the fauna and ecology of true flies (Diptera, Muscidae) on the eastern macroslope of the Subpolar Urals mountains. Insects in natural and anthropogenic biogeocenoses of the Urals. Ekaterinburg.
Malozyomov, A.Yu. (1997). The dynamics of dipteran communities (diptera) in the mountains of the subpolar Urals. Success in Entomology in the Urals. Yekaterinburg.
Malozemov, A.Yu., Stepanov, L.N. (1990). Vertical structure of the communities of diptera insects in the mountains of the Ural Subarctic. Problems of Cadastre, Ecology, and Protection of the Animal World of Russia. Voronezh.
Milushev, I. (1977). Sheep myiasis caused by larvae of the Lucilia sericata flies. Wind Sat, 75:17-18.
Mashkei, A.N., Mishchenko, A.A., Ponomarenk, O.V., Sumakova, N.V. (2011). The "Diptocid" bait is an effective remedy for combating zoophilic dipterans. Veterinary Medicine, 95:373-375.
Miklashevskaya, E.V. (2020). Regularities of the formation of faunistic and ecological-biological parasitocenosis of zoophilic flies. Uchenye Zapiski UO VGAVM, 56:112-120.
Moriya, K., Fujibayashi, T., Yoshihara, T., Matsuda, A., Sumi, N., Umezaki, N., Kurahashi, H., Agui, N., Wada, A., Watanabe, H. (1999). Escherichia coli O157: H7 producing verotoxin carried by housefly in Japan. Medical and Veterinary Entomology, 13:214-216.
Myshkin, P.P. (1938). A new parasite of bees from round-head flies. Beekeeping, 10:41-43.
Narchuk, E.P. (2003). Keys to the families of Diptera insects (Insecta, Diptera) of the fauna of Russia and the near-outlying (with a brief overview of the families of the world fauna). SPb Zoological Institute RAS.
Nihei, S.S., Bencke, G.A. (2003). New geographic and host record for the bird parasitic fly *Philornis masoni* Couri (Diptera, Muscidae). Studia Dipterologica, 10:328-329.
Olenev, N.O. (1931). Parasites of domestic animals in Kazakhstan (arachnids and insects). Leningrad.
Pavlov, S.D. (1970). The gnus of the West Siberian Plain and the possibility of using different methods of dealing with it in order to protect animals. Materials in vet. arachno-entomology and vet. sanitation. Scientific and technical bulletin. VNIIVS. Tyumen, 2:74-80.
Pavlovskii, E.N. (1934). About migrations in Turkmenistan. Tr Council for Scientific Manufacture Forces of Turkmenistan, 6:129-140.
Pavlovskii, E.N. (1935). To the fauna of ectoparasites of domestic animals of the Zaravshan district of the Uzbek SSR. Animal Pests. Moscow-Leningrad, pp:343-345.
Petrova, B.K. (1968). Faunistic and ecological survey of synanthropic dipterans (Diptera) in the south of Primorsky Krai. Entomological Review, 47:95-105.
Pokidov, I.I. (1971). Issues of fighting sheep wolfarthiosis. Veterinary Medicine, 7:25-29.
Porchinsky, I.A. (1916). Wolfarth's fly (Wohlfahrtia magnifica Schin.) and its Russian relatives. Turkmenistan Bureau Entomology Agriculture, 11:108.
Pridantseva, E.A. (1967). The fauna of pasture flies (Diptera) of South Tuva associated with the camel. Entomological Review, 46:827-834.
Razmakhnin, V.E. (1963). Antler fly, a pest of antler reindeer breeding. Dokl TLCA, 90:277-281.
Rodendorf, B.B. (1956). Palaearctic species of the genus Wohlfahrtia B.B. (Diptera, Sarcophagidae). Entomological Review, 35:201-229.
Rodendorf, B.B. (1959). Antler fly Booponus borealis, Diptera, Calliphoridae, a new maral parasite in southern Siberia. Entomological Review, 38:583-589.
Rundle, J.C. (1982). Control of the sheep hoop fly. ICJ Australia.
Russell, R.C. (2004). The relative attractiveness of carbon dioxide and octenol in CDC and EVS-type light traps for sampling the mosquitoes Aedes aegypti (L.), Aedes polynesiensis Marks and Culex quinquefasciatus say in Moorea, French Polynesi. Journal of Vector Ecology, 29:309-14.
Savelyeva, O.A., Ageev, I.S., Oleinikova, V.A., Safiullin, R.T. (2016). Kvik Bayt granules against flies in a pig house. Theory and Practice of Animal Parasitic Diseases, Moscow, 17:399-402.
Sadovnikova, T.P. (1969). Some data on the biology of the antler fly. Satistic Scientific Works on the Research Laboratory of Antler Reindeer Breeding. Gorno-Altaysk, 2:188-191.
Safiullin, R.T., Ageev, I.S. (2016). Combined use of Solfak and Baytsidal against flies in a pigshed. Theory and Practice of Parasitic Diseases of Animals. Moscow.
Seddon, H.R. (1967). Diseases of domestic animals in Australia. Pt.2:Arthropod Infestations.
Sivkova, E.I. (2021). Some data on zoophilic flies from Siberia and the Russian Far East. Ukrainian Journal of Ecology, 11:100-104.

Soboleva, R.G., Gavrilova, B.K. (1963). Study of synanthropic flies in one of the livestock farms in the south of Primorsky Krai and the experience of combating them. Communication from the Far East Branch of the Siberian Branch of the USSR Academy of Sciences, 18:107-112.
Sorokina, V.S. (2006). Information on the distribution and ecology of true flies (Diptera, Muscidae) in Western Siberia. Eurasian Entomological Journal, 5:221-233.
Stolbov, N.M., Veselkin, G.A., Veselovsky, V.G. (1985). About zoodinosis of bees. Beekeeping, 9:14-15.
Shura-Bura, B.L. (1950). Epidemiological importance of synanthropic flies. Entomological Review, 31:95-106.
Shura-Bura, B.L. (1952). Contamination of fruits with synanthropic flies. Entomological Review, 32:117-125.
Shtakelberg, A.A. (1956). Synanthropic Diptera of the USSR fauna. Moscow-Leningrad.
Supperer, R., Hinaidy, H.K. (1975). Myiasis bei mensch und tier in sterreich. Wien Tierärztl Monatsschr, 62:255-258.
Sychevskaya, V.I. (1953). Myases of sheep and the fight against them in Tajikistan. Karakul Breeding and Fur Farming, 2:67-70.
Sychevskaya, V.I., Petrova, T.A. (1958). On the role of flies in the spread of helminth eggs in Uzbekistan. Zoological Journal, 37:563-569.
Sychevskaya, V.I., Grudtsina, M.V., Vyrvikhvost, L.A. (1959). Epidemiological study of synanthropic flies in Bukhara. Entomological Review, 38:568-578.
Sychevskaya, V.I. (1978). Synanthropic flies (Diptera) of Altai. Entomological Review, 57:81-85.
Sychevskaya, V.I. (1956). About myiasis of bees in Tajikistan. Izv. natures. Sciences of the Academy of Sciences of the Tajik SSR, 13:159-165.
Tan, S.W., Yap, K.L., Lee, H.L. (1997). Mechanical transport of rotavirus by the legs and wings of *Musca domestica* (Diptera, Muscidae). Journal of Medical Entomology, 34:527-531.
Tamarina, N.A., Khromova, L.A. (1980). Fauna and ecology of pasture flies (Diptera), intermediate hosts of parasitic nematodes of the Tuva ASSR. Entomological Review, 59:79-85.
Teixeira, D.M. (1999). Myiasis caused by obligatory parasites. General observations on the biology of species of the genus *Philornis* Meinert, 1890 (Diptera, Muscidae). Säo Paulo.
Ternovoy, V.I. (1960). Myases of sheep in the Kalmyk ASSR caused by a wolfarth fly. Trudy VNIIVS. Moscow, 16:15-21.
Ternovoy, V.I. (1971). Wolfarth fly. Ectoparasites of animals and their control. Stavropol.
Veselkin, G.A. (1966). Fly control in animal husbandry. Moscow.
Veselkin, G.A., Zagrebin, A.A. (1980). Domestic animal myiasis caused by zoophilic flies. Questions are a breeze. arachno-entomology. Scientific and Technical Bulletin VNIIVEA. Tyumen, 20:29-35.
Veselkin, G.A. (1983). On the relationship of zoophilic flies with domestic animals. Veterinary Entomology and Acarology Vaskhnil, Moscow.
Veselkin, G.A. (1966). Fly (Diptera) is a companion of domestic animals and humans in the southern part of the Tyumen region. Entomological Review, 45:779-792.
Veselkin, G.A. (1989). Composition of species and ecology of flies (Diptera, Cyclorrharha) parasitizing domestic animals of the Kurgan region. Insects in the biogeocenoses of the Urals. Sverdlovsk.
Wright, D. (1976). The distribution, prevalence, and economic importance of blowfly strike in sheep. New Zealand Journal of Experimental Agriculture, 4:291-295.
Yatusevich, A.I., Miklashevskaya, E.V. (2018). The effectiveness of pharmaceuticals in limiting the number of zoophilic flies in poultry farms. Animal Husbandry and Veterinary Medicine, 1:54-57.
Yasuda, M. (1940). Morphology of the Larva of *Wohlfahrtia magnifica* Schin. Fauna in a Wourd on a Camel in Inner Mongolia. Journal of the Chosen Naturae History Society, 7:27-36.
Zagrebin, A.I. (1989). Features of the ecology of zoophilic flies (Diptera) of the Urals. Insects in biogeocenoses of the Urals. Sverdlovsk.
Zagrebin, A.I. (1987). About the fauna of pasture flies of the family Muscidae (Diptera) of the Urals. Ecology and Geography of Arthropods of Siberia. Novosibirsk.
Zagrebin, A.I. (1992). Zonal distribution in pasture flies (Diptera) of the Middle and Southern Urals. Insects in Natural and Anthropogenic Biogeocenoses of the Urals. Ekaterinburg.
Zagrebin, A.I. (1998). Features of the fauna and ecology of fly of the genus Hydrotaea R-D (Diptera, Muscidae) attacking animals in the middle urals. Diptera and their Importance in Agriculture. Leningrad.
Zaskind, L.N., Doletskiy, S.N. (1983). Sheep tissue myiasis caused by the simultaneous parasitization of wolfarth and green flies. Kiev.
Zimin, L.S., Terenovskaya, T.O. (1943). Seasonal variation in the number of house flies in relation to the development of dysentery diseases in Tajikistan. Medical Parasitology, 12:44-53.
Zimin, L.S. (1944a). Seasonal and daily fluctuations in the number of flies in residential buildings due to temperature and humidity. Problems of Intestinal Infections. Stalinabad.
Zimin, L.S. (1944). Synanthropic fly of southern Tajikistan. Problems of Intestinal Infections. Stalinabad.
Zimin, L.S. (1951). Sem Muscidae. Real flies. Fauna of the USSR. Diptera insects. Moscow-Leningrad: Science, 18:286.
Zimina, L.V. (1970). Key to the European part of Sem. Conopidae-Large heads. Leningrad.
Zmeev, G.Ya. (1944a) Experience in assessing the role of the fly factor in the spread of dysentery in southern Tajikistan. Problems of Intestinal Infections. Stalinabad.

Zmeev, G.Ya. (1944б). Experience in the bacteriological examination of various types of flies in order to assess their epidemiological significance. Problems of Intestinal Infections. Stalinabad.
Zolotarev, E.Kh. (1968). Entomoparasites of marals of the Usinsk maral sovkhoz. Collective Scientific Works on the Research Laboratory of Antler Reindeer Breeding. Gorno-Altaysk, 2:192-197.
Zhurba, S.S. (1963). To the study of synanthropic flies of the Far East. Questions of the geography of the Far East. Khabarovsk, 5:118-131.

Citation:
Domatskiy, V.N., Sivkova, E.I. (2021). Distribution and management of the zoophilous flies. *Ukrainian Journal of Ecology* 11 (9), 88-94.