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# NEW DATA ON HELMINTHS OF THE WOODCOCK *SCOLOPAX RUSTICOLA* (AVES, CHARADRIIFORMES) IN THE MIDDLE VOLGA REGION (EUROPEAN RUSSIA)

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The helminth fauna of the Eurasian woodcock *Scolopax rusticola* was studied in the territory of Mordovia (European Russia) for the first time. Twenty-five specimens of waders were examined using the incomplete helminthological necropsy in April 2019, 2020, 2022. Nine helminth species were found in woodcocks: *Lyperosomum alaudae*, *Scolopacitrema cubrensis*, *Anomotaenia clavigera*, *Fuhrmannolepis scolopacina*, *Aploparaksis pseudofilum*, *Dispharynx nasuta*, *Hadjelia truncata*, *Tetrameres dubia* and *Agamospirura macracanthis*, juv. Among them the trematode *L. alaudae*, nematodes *D. nasuta*, *H. truncata* and *A. macracanthis*, juv. were recorded in *S. rusticola* for the first time. We provide morphological descriptions and photos of these parasites.

**Keywords:** Scolopacidae, parasites, Mordovia

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The Eurasian woodcock *Scolopax rusticola* (Linnaeus, 1758) (Charadriiformes, Scolopacidae) is a numerous migratory wader, widespread in the boreal zone of the Palearctic and inhabiting the forest and forest-steppe zones of Eurasia (Koblik et al., 2014; Birdlife International, 2024). In Mordovia, damb forests are one of the most common breeding grounds for birds of this species and floodplain meadows are their favorite feeding areas (Spiridonov, Grishutkin, 2017).

Despite the extensive range of *S. rusticola* in the world, its helminth fauna has been studied rather poorly and sporadically, not in all parts of the wader range (Lopez-Neyra, 1947; Shorten, 1974; Smogorzhevskaya, 1976; Rysavy, Farkas, 1982; Stepanyan, 1990; Tucker, Heath, 1995; Bondarenko, Kontrimavichus, 2006a, 2006b; Macko et al., 2008a, 2008b; Yoshino et al., 2009; Koblik et al., 2014; Okulewicz, 2014; Paoletti et al., 2016; Sanchez-Garcia et al., 2018; Birdlife International, 2024). On the territory of Russia, woodcock parasites have been studied in the Republic of Karelia; Kaliningrad, Nizhny Novgorod, Yaroslavl Regions; Urals, Buryatia, Yakutia, Primorsky Krai and Sakhalin Island (Bykhovskaya-Pavlovskaya, 1962, 1974; Skrjabin, Sobolev, 1963; Jogis, 1974; Spasskaya, Spassky, 1978; Bondarenko, Kontrimavichus, 2006b; Kostyunin, 2010; Yakovleva et al., 2015; Dorzhiev et al., 2021).

In the territory of the Republic of Mordovia, *S. rusticola* helminths have not been examined; therefore, the purpose of our work was to study the intestinal helminths of the Eurasian woodcock *S. rusticola* in Mordovia.

## MATERIALS AND METHODS

The study of woodcock helminths was conducted in the vicinity of two villages – Degilevka (54°9′25″ N, 45°40′48″ E) and Nerley (54°4′40′ N, 45°42′7″ E), located in the Bolsheberesnikovskiy district of the Republic of Mordovia. Twenty-five waders were examined by the incomplete helminthological necropsy (Dubinina, 1971). Frozen entrails (mainly the gastrointestinal tract) of woodcocks were kindly provided by local hunters in April 2019, 2020, 2022. Parasitic worms were recovered and preserved in 70% ethanol. Flukes and tapeworms were stained with aceto-carmine, cleared with clove oil, and then mounted in Canada balsam. Nematodes were cleared with lactic acid and mounted in Glycerin-Jelly (Dubinina, 1971; Anikanova et al., 2007; Zander, 2014).

Species of helminths were identified according to Bondarenko, Kontrimavichus (2006b), Skrjabin (1952), Skrjabin, Sobolev (1963), Bykhovskaya-Pavlovskaya (1962), Skrjabin et al., (1965), Sharpilo (1976), Spasskaya, Spassky (1978). A morphological and morphometric descriptions are given for the parasite species first recorded in *S. rusticola*. The measurements of parasites are given in millimeters. The taxonomy of helminths is given according to the Global Cestode Database (http://tapewormdb.uconn.edu) and Fauna Europaea (https://fauna-eu.org). To characterize the infection of birds with helminths, the following indices were used: prevalence of infection (P, %), intensity range (IR, min-max, specimens) and mean abundance (MA).

## RESULTS AND DISCUSSION

A total of nine helminth species were found in *S. rusticola*: three species of Cestoda, two of Digenea and four species of Nematoda (Table 1). The majority of helminths found in waders were adult forms (eight species). Only one nematode, *Agamospirura macracanthis* was represented by a larval stage. The overall infection rate of woodcocks with

helminths was 100%; MA = 609.The most abundant parasites of woodcocks are cestodes (Table 1). All identified cestode species parasitized the small intestine of *S. rusticola*. The most common and numerous cestode species was *Fuhrmannolepis scolopacina* (Table 1).

Eight specimens of the trematode *Lyperosomum alaudae* were found in the gallbladder of two woodcocks. The trematode *Scolopacitrema cubrensis* was found in the cloaca of three out of 25 waders examined (Table 1).

Nematodes are rare woodcock's parasites in Mordovia (Table 1). The specimens of *Tetrameres dubia* were found in the proventriculus of only one woodcock. Six males and seven females of *Dispharynx nasuta* were collected from the proventriculus of two woodcocks. Twelve specimens of *Hadjelia truncata* were found under the gizzard cuticle in five *S. rusticola*. Eleven spiruroid larvae of the nematode *Agamospirura macracanthis* were found in the walls of the small intestine of two waders (Table 1).

**Table 1.** Helminths of *Scolopax rusticola* in Mordovia

| Helminth species | P, % | IR, spec. | MA |
|---|---|---|---|
| *Anomotaenia clavigera* (Krabbe, 1869) | 24.0 ± 8.5 | 1–14 | 1.6 ± 0.7 |
| *Fuhrmannolepis scolopacina* (Lopes-Neyra, 1944) | 100.0 | 40–2430 | 563.6 ± 118.6 |
| *Aploparaksis pseudofilum* (Clerc, 1902) | 68.0 ± 9.3 | 15–100 | 36.8 ± 7.0 |
| *Lyperosomum alaudae* (Shtrom et Sondak, 1935) | 8.0 ± 5.4 | 1–7 | 0.3 ± 0.3 |
| *Scolopacitrema cubrensis* Sudarikov et Rykovsky, 1958 | 12.0 ± 6.5 | 1–105 | 4.8 ± 4.2 |
| *Dispharynx nasuta* (Rudolphi, 1819) | 4.0 ± 4.0 | 13 | 0.5 ± 0.5 |
| *Hadjelia truncata* (Creplin, 1825) | 20.0 ± 8.0 | 1–7 | 0.5 ± 0.3 |
| *Tetrameres dubia* Travassos, 1917 | 4.0 ± 4.0 | 16 | 0.6 ± 0.6 |
| *Agamospirura macracanthis* Sharpilo, 1963, juv. | 8.0 ± 5.4 | 2–9 | 0.4 ± 0.4 |

The cestodes *Aploparaksis pseudofilum* and *Fuhrmannolepis scolopacina*, as well as the trematode *Scolopacitrema cubrensis*, are host-specific parasites of birds from the family Scolopacidae. *Anomotaenia clavigera* and *Tetrameres dubia* are common parasites of various species of waders. The trematode *Lyperosomum alaudae* appears to be a facultative parasite of the Eurasian woodcock. Since this fluke is a host-specific parasite of larks. The nematode *Dispharynx nasuta* is a common parasite of birds mainly from the orders Passeriformes and Galliformes. The nematode *Hadjelia truncata* can also parasitize birds of different orders. Juvenile of *A. macracanthis* is apparently a casual parasite of woodcocks. Similar larvae were previously recorded in reptiles in Dagestan and Ukraine (Sharpilo, 1976).

In *Scolopax rusticola*, the trematode *L. alaudae*, nematodes *D. nasuta*, *H. truncata* and *A. macracanthis* were recorded for the first time. Below we provide descriptions of these parasites.

Morphological description of *Lyperosomum alaudae* (based on 8 specimens) (Fig. 1*a*). Body elongate, tapered at anterior extremity and slightly rounded at posterior end. Body length 3.39–4.77 (4.06), maximum width 0.462–0.560 (0.498). Tegument unarmed. Oral sucker subterminal, 0.185–0.244×0.163–0.222 (0.217×0.204). Ventral sucker, 0.326–0.504×0.308–0.467 (0.437×0.383), located in forebody. Prepharynx usually not observed. Pharynx 0.078–0.089×0.078–0.093 (0.085×0.087). Oesophagus short. Testes, oval, 0.274–0.333×0.182–0.296 (0.300–0.243), lie directly behind ventral sucker, slightly diagonal to each other. Cirrus sac, 0.130–0.158×0.059–0.079 (0.146×0.071), located in front of ventral sucker. Ovary transversely oval, 0.133–0.152×0.148–0.178 (0.145×0.165), is located behind posterior testis. Vitellarium follicular, in two long lateral fields, 0.926–1.407 (1.245), consist of numerous small follicles, in middle third of body. Uterus forms numerous loops, occupies all space in hindbody below the ovary level. Eggs numerous, 0.033–0.039×0.0016–0.022 (0.036×0.020).

Morphological description of *Dispharynx nasuta* (based on 6 males and 7 females) (Fig. 1*b*, 1*c*). Body yellowish-white. Cuticle transversely striated. Mouth with two triangular lips. Four convoluted prominent cordons extend from lips base, two on ventral side and two on dorsal side, at distal ends curve back toward anterior extremity. Oesophagus consists of two parts: anterior muscular and posterior glandular.

Male (Fig. 1*b*). Body length 4.46–6.15 (5.31), width 0.274–0.308 (0.290). Pharynx length 0.067–0.082 (0.075). Total oesophagus length 2.185–2.385 (2.273). Length of muscular part of oesophagus 0.400–0.519 (0.463). Prominent cordons extend from anterior body end to posterior extremity at a distance of 0.280–0.413 (0.345). Spicules of unequal length. Large spicule thin, 0.378–0.430 (0.408) long, arched with a slightly expanded base and a sharp tip. Smaller spicule short club-shaped, 0.149–0.182 (0.168) long, placed at angle to larger one. Tale strongly bent ventrally, 0.296–0.400 (0.359) long, with nine pedunculate papillae pairs (four preanal and five postanal pairs).

Female (Fig. 1*c*). Body length 6.62–7.70 (7.05), width 0.482–0.615 (0.557). Pharynx length 0.089–0.133 (0.112). Glandular stomach not fully observed. Eggs occupy entire space from anterior end of glandular stomach to posterior body end. Total oesophagus length undetectable. Muscular part of oesophagus 0.593–0.837 (0.713) long. Cordons extend to a distance of 0.453–0.733 (0.560) from anterior end. Tail with rounded tip, 0.126–0.141 (0.133) long. Eggs 0.031–0.035 (0.033)×0.019–0.022 (0.020).

Morphological description of *Hadjelia truncata* (based on two males and six females) (Fig. 2). Body thin, red in females, light yellow in males. Mouth with two well-developed three-lobed lips, extends into cylindrical pharynx. Each lip with two submedial papillae. Cuticle transversely striated.

Male. Body length 6.00–7.38 (6.69), maximum width 0.145–0.178 (0.162). Pharynx length 0.044–0.053 (0.049). Total length of oesophagus 2.084–2.323 (2.204). Tail long,

0.134–0.153 (0.144), with two lateral alae. Tail with six caudal papillae (four preanal pairs and two postanal pairs). Spicules dissimilar, of unequal length. Large spicule 2.076–2.554 (2.315) long; smaller spicule 0.248–0.286 (0.267) long.

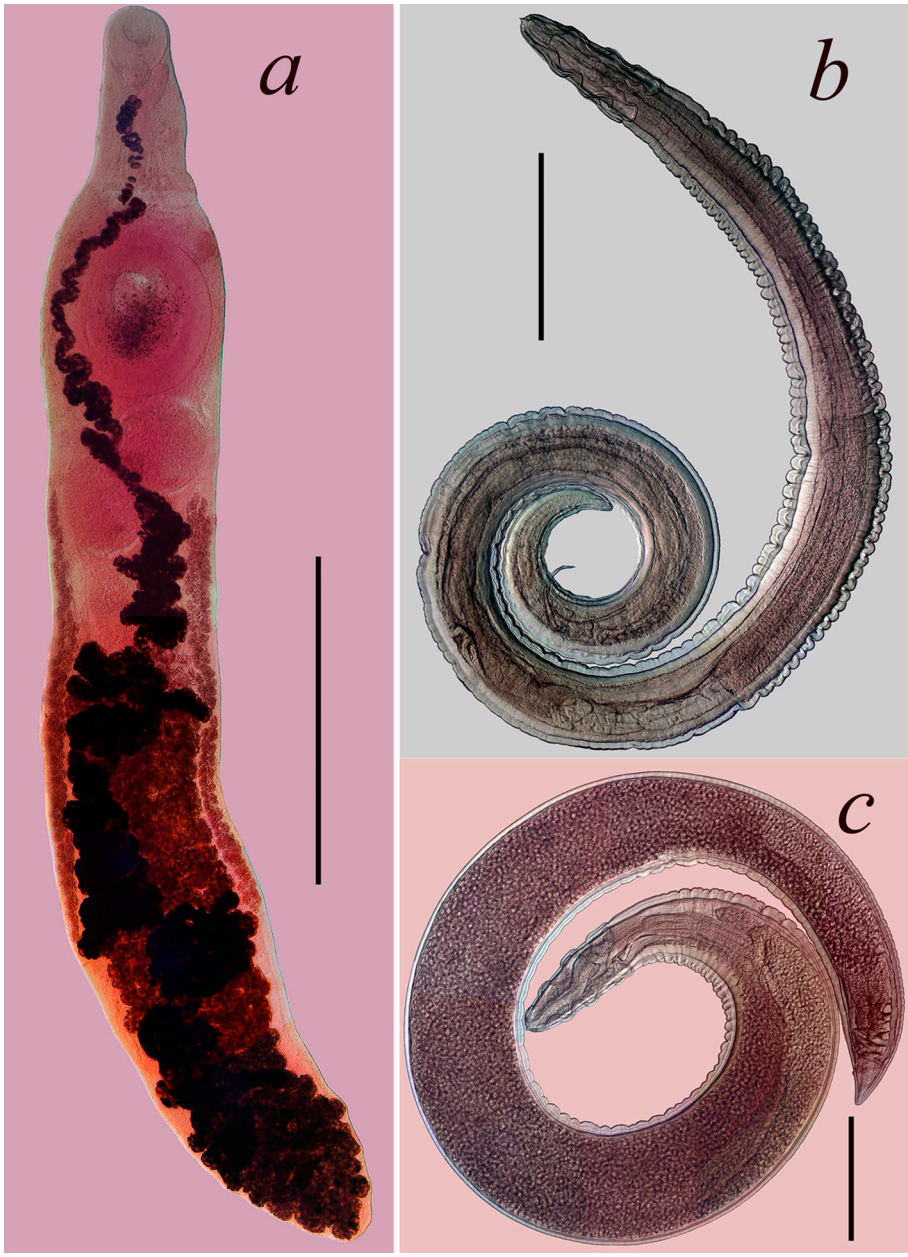


**Figure 1.** *Lyperosomum alaudae* and *Dispharynx nasuta* from *Scolopax rusticola*: *a* – *Lyperosomum alaudae*, whole view; *b* – *Dispharynx nasuta* male, whole view; *c* – *Dispharynx nasuta* female, whole view. Scale bars, mm: *a* – 1.0; *b*, *c* – 0.5.

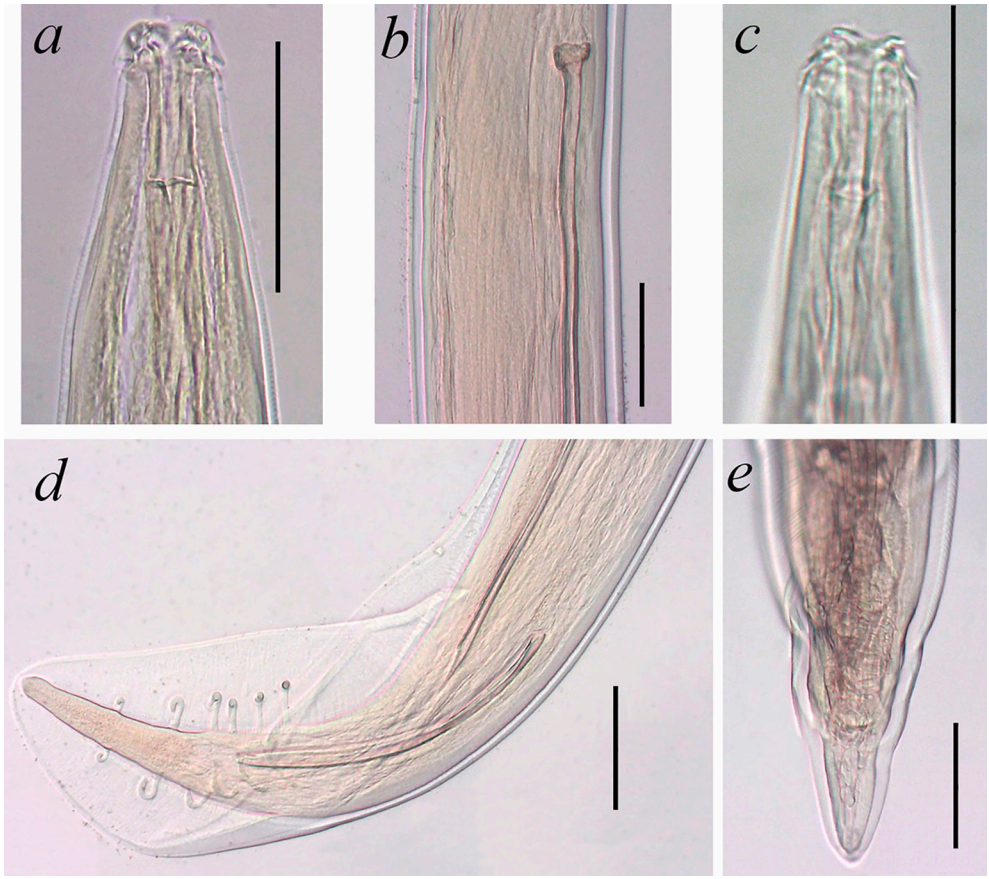


**Figure 2.** *Hadjelia truncata* from *Scolopax rusticola*:
*a* – anterior end of male, *b* – anterior end of large spicule, *c* – anterior end of female, *d* – posterior end of male, *e* – posterior end of female. Scale bars 0.1 mm.

Female. Body length 6.62–9.64 (8.31), maximum width 0.230–0.296 (0.271). Pharynx length 0.031–0.045 (0.039). Total length of oesophagus 2.274–3.202 (2.796). Distance from anterior extremity to vulva 1.096–1.596 (1.377). Tale conical and rounded, 0.118–0.172 (0.148).

Morphological description of *Agamospirura macracanthis* larva (based on 11 specimens) (Fig. 3). The description fully corresponds to the description by Sharpilo (1976). Larvae spirally twisted, in connective-tissue capsules in mesentery on the intestine surface. Body length 2.11–2.23 (2.16), maximum width 0.067–0.080 (0.074). Cuticle transversely striated. Mouth with two lips, with ear-shaped outgrowths at the tips. Each lip with two papillae at base. Funnel-shaped mouth turns into short pharynx, 0.026–0.031 (0.028) long. Oesophagus length 0.871–1.045 (0.967). Length of muscular part 0.130–0.179 (0.156); glandular part

0.741–0.867 (0.816). Tail conical, 0.050–0.059 (0.054) long, ending in 6–8 large spines that form a corolla.

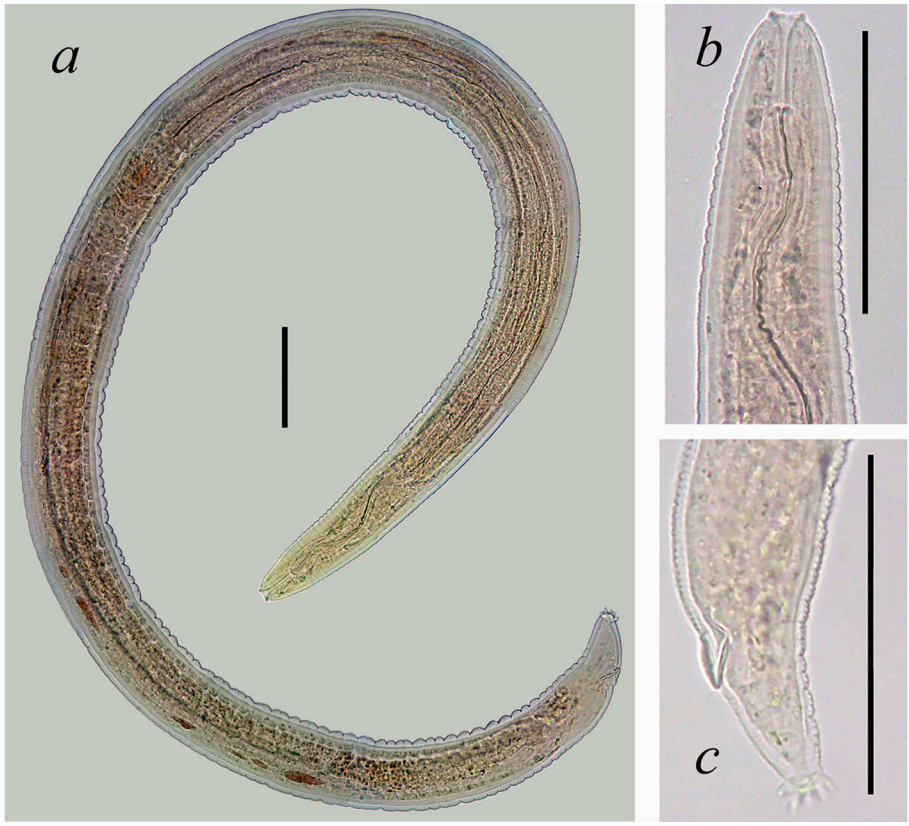


**Figure 3.** *Agamospirura macracanthis*, juvenile from *Scolopax rusticola*:
*a* – whole view, *b* – anterior end of larva, *c* – posterior end of larva. Scale bar 0.1 mm.

The lifestyle and diet of woodcock affect the species composition of its helminths. All of parasites were acquired by *S. rusticola* through trophic chains. The Eurasian woodcock feeds on earthworms, arthropods and their larvae (mainly beetles, spiders, harvestmen and dipterans) from the forest litter and soil surface (Hoodless, Hirons, 2007; Koblik et al., 2014). These invertebrates may be intermediate hosts for the parasites found in woodcocks in this study (Skrjabin, Sobolev, 1963; Skrjabin et al., 1965; Spasskaya, Spassky, 1978; Bondarenko, Kontrimavichus, 2006b). The development of *L. alaudae*, like other dicrocoeliids, apparently occurs with the involvement of terrestrial gastropods, through which woodcocks become infected with this trematode (Skrjabin, 1952).

The identified helminth fauna of woodcocks from Mordovia is unique in comparison with the structure of the helminth composition in *S. rusticola* from other regions of Russia. The originality is due to the presence of 4 species of parasites, for which the wader turned out to be the new host (*L. alaudae*, *D. nasuta*, *H. truncata*, *A. macracanthis*, juv.) (Table 1). Previously we identified *L. alaudae* from *Anthus trivialis* (Linnaeus, 1758) in the Samara region and from *Turdus philomelos* (Brehm, 1831) and *Ficedula hypoleuca* (Pallas, 1764) in Mordovia (Kirillov, Kirillova, 2013, 2017; Kirillov et al., 2023). Findings of this trematode are also known from *Alauda arvensis* Linnaeus, 1758 in the Stavropol Krai and Nizhny Novgorod region (Skrjabin, 1952; Bykhovskaya-Pavlovskaya, 1962; Kirillov, Kirillova, 2013). Trematodes of the genus *Lyperosomum* Looss, 1899, not identified to the species level, were previously recorded in woodcocks in Karelia (Yakovleva et al., 2015). In our earlier study, we recorded the nematode *D. nasuta* in passerine birds from the Samara region (Kirillov, Kirillova, 2017). *Hadjelia* nematodes were first recorded in waders by Jogis (1974) in the Kaliningrad region. We also found the nematode *H. truncata* in *Merops apiaster* Linnaeus, 1758, *Turdus philomelos* (Brehm, 1831) and *Lanius collurio* Linnaeus, 1758 in the Middle Volga region (Kirillov, Kirillova, 2017).

The remaining 5 species of parasites that we recorded in woodcocks of Mordovia are also characteristic of *S. rusticola* in other parts of its range (Bykhovskaya-Pavlovskaya, 1962; Smogorzhevskaya, 1976; Spasskaya, Spassky, 1978; Bondarenko, Kontrimavichus, 2006b; Okulewicz, 2014; Yakovleva et al., 2015; Dorzhiev et al., 2021).

## CONCLUSION

As a result of the first study of woodcock helminths on the territory of Mordovia, we registered nine species of parasitic worms in *S. rusticola* (three cestodes, two trematodes and four nematodes). The lifestyle and diet of the Eurasian woodcock affect its helminth fauna. All helminth species were acquired by *S. rusticola* through trophic chains. The trematode *L. alaudae*, nematodes *D. nasuta*, *H. truncata* and *A. macracanthis* were recorded in the European woodcock for the first time. Thus, *S. rusticola* is a new host for these helminth species. Further studies of woodcock's helminths on the territory of Mordovia require both an increase of the number of birds studied and an expansion of research sites, which will allow a better understanding of the epidemiological processes occurring in wild bird populations.

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functioning of communities against the background of natural and anthropogenic changes" of the Institute of Ecology of the Volga River Basin – a branch of Samara Federal Research Centre of the Russian Academy of Sciences.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Bioethics Committee of the Institute of Ecology of the Volga River Basin of RAS (№ 4/24; 31 July 2024). Our research was conducted in compliance with the recommended standards described in the Directive of the European Parliament and of the Council of the European Union of September 22, 2010, "On the protection of animals used for scientific purposes" (EU Directive 2010/63/EU).

## CONFLICT OF INTEREST

The authors of this work declare that they have no conflicts of interest.

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# НОВЫЕ ДАННЫЕ О ГЕЛЬМИНТАХ ВАЛЬДШНЕПА *SCOLOPAX RUSTICOLA* (AVES, CHARADRIIFORMES) СРЕДНЕГО ПОВОЛЖЬЯ (ЕВРОПЕЙСКАЯ РОССИЯ)

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**Ключевые слова:** Scolopacidae, паразитические черви, Мордовия

РЕЗЮМЕ

Впервые изучена гельминтофауна вальдшнепа *Scolopax rusticola* на территории Мордовии. Двадцать пять особей куликов были изучены методом неполного гельминтологического вскрытия в апреле 2019, 2020, 2022 гг. Всего у вальдшнепов было отмечено 9 видов гельминтов: *Lyperosomum alaudae*, *Scolopacitrema cubrensis*, *Anomotaenia clavigera*, *Fuhrmannolepis scolopacina*, *Aploparaksis pseudofilum*, *Dispharynx nasuta*, *Hadjelia truncata*, *Tetrameres dubia* и *Agamospirura macracanthis*, juv. Из них трематода *L. alaudae*, нематоды *D. nasuta*, *H. truncata* и *A. macracanthis*, juv. были зарегистрированы впервые у *S. rusticola*. Приведены морфологические описания и фото этих паразитов.