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BREEDING BIOLOGY OF BLACKHEADED WAGTAIL *MOTACILLA FELDEGG* (PASSERIFORMES, MOTACILLIDAE, MOTACILLINAE) IN ROSTOV OBLAST OF RUSSIA

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Breeding Biology of Blackheaded Wagtail, *Motacilla feldegg* (Passeriformes, Motacillidae, Motacillinae), in Rostov Oblast of Russia. Muraviev I. V., Artemieva E. A. — Species-specific features of blackheaded wagtail, *Motacilla feldegg* Michahelles, 1830, breeding biology were identified in the Rostov oblast of Russia. A tendency to current species range shift is traced.

Key words: population, species, nests, layings, nestlings, nesting biotope, birds, “yellow” wagtails, Rostov oblast of Russia.

Гнездовая биология черноголовой трясогузки, *Motacilla feldegg* (Passeriformes, Motacillidae, Motacillinae), в Ростовской области России. Муравьев И. В., Артемьева Е. А. — Выявлены видоспецифические особенности гнездовой биологии черноголовой трясогузки, *Motacilla feldegg* Michahelles, 1830, в Ростовской области России. Прослежены тенденции в изменении современных границ ареала вида.

Ключевые слова: популяция, вид, гнезда, кладки, птенцы, гнездовой биотоп, птицы, «жёлтые» трясогузки, Ростовская область России.

Introduction

Blackheaded wagtail *Motacilla feldegg* Michahelles, 1830, that is referred to the group of “yellow” polytypic complex of wagtails *Motacilla flava* s. l., just to its west forms (Red'kin, 2001), is regarded as a separate species in this study. This bird is treated like a strictly protected species within Europe according to the Appendix II of the Convention on the Conservation of European Wildlife and Natural Habitats (adopted in Berne, 1979). At present, data on possible nesting of the blackheaded wagtail in many habitats of its range are not available. Moreover, limiting factors of this species populations decline and impairment are unknown.

The objective of the work is to identify species-specific characteristics of nesting biotopes and breeding limitations; to study nesting phenology, nidiology, oology, nestlings of *M. feldegg* under environment conditions of Rostov oblast.

Material and methods

Field studies were carried out during seasons 2011–2012 in Rostov oblast of Russia: in Aksay district, in the vicinity of Bolshoe Mishkino station, Don-Aksay water-meadow, from the 4th to 11th of June, 2011; and in Azov district, in the vicinity of the settlement of Kagalnik, maritime meadows of bottomland and mouth of the Kagalnik river, from the 13th to 18th of June, 2012. Nidicolous material (nests): $n = 3$. Oological material (layings, eggs): $n_1 = 3$, $n_2 = 13$. The material on nestlings: $n = 4$. The work was done using the following methods: mapping of nesting settlements and meetings, survey of plots according to traditional techniques, ringing, the study of the diet of adults and nestlings.

Results

The range of *M. feldegg* extends by a broad band in steppe and desert zones of the Northern Palaearctic: from southern Europe (Balkan Peninsula) to the river Volga delta

(Gladkov, 1954; Dolgushin et al., 1970; Abdusalyamov, 1973; Stepanian, 1990; Gavris', 2003) and further to the east up to the south-east of Kazakhstan. The species occurs on the territory of Russia in Rostov oblast, Stavropol' and the Krasnodar kray, the Northern Caucasus, comes up over the steppes to Orenburg oblast, the Krasnoyarsk kray and Irkutsk oblast. It is found outside of Russia in the southern Ukraine, Crimea and Moldova. Two subspecies forms, *Motacilla feldegg* f. *feldegg* Michahelles, 1830 and *Motacilla feldegg* f. *melanogrisea* Homeyer, 1878, are represented on the territory of Russia and CIS. The blackheaded wagtail subspecies *M. feldegg* f. *melanogrisea* inhabits the delta of the Volga river, the Caspian Sea coast, Orenburg oblast (Zarudny, 1897), the Krasnoyarsk kray and Irkutsk oblast (Stepanian, 1990; Koblik et al., 2006) in Volga Region (eastern part of the range); the nominative subspecies *M. feldegg* f. *feldegg* lives in Rostov oblast, on the Black Sea coast, in the Crimea and in the Caucasus (the western part of the range). It hybridizes with *Motacilla flava* f. *flava* L., 1758 on the southern boundaries of the distribution (Bakhtadze, 1987; Gavris', 2003) (fig. 1).

Perennial dense nesting settlements of *M. feldegg* f. *feldegg* are observed in Rostov oblast, according to A. V. Zabashta (personal communication): in lowlands of the Don delta, floodplains of its tributaries (as the Aksay river) and the interfluvium of the Don and Manych rivers, up to the Manych-Gudilo lake. This area could be considered a real refuge of the species where it reaches enough high abundance and could be a background species; *M. feldegg* f. *feldegg* is registered sporadically and is quite rare on other territories within the range.

Joint nesting settlements of *M. feldegg* f. *feldegg* numbered up to 45 breeding pairs in Rostov oblast, Aksay district, in the Don-Aksay water-meadow, floodplain of the Aksay river (4–10.06.2011). *M. feldegg* f. *feldegg* density was on average 8.51 specimens/ha at $M = 8.51 \pm 0.21$ within this area of a floodplain of the Aksay river. Nesting sites of *M. feldegg* f. *feldegg* are sufficiently dispersed in the Don-Aksay water-meadow and the floodplain of the Aksay river.

Four nesting pairs and their first broods were registered over the study area of 0.75 ha in vicinity of the settlement of Kagalnik, Rostov oblast. From 6 to 7 males and 4 females of *M. feldegg* f. *feldegg* were observed and recorded during two counts on 15–16.06.2012.

According long-term survey of A. V. Zabashta (personal communication), population density of *M. feldegg* nesting settlements in the Kagalnik bottomland on the maritime meadows of the Sea of Azov might exceed 160 specimens/km².

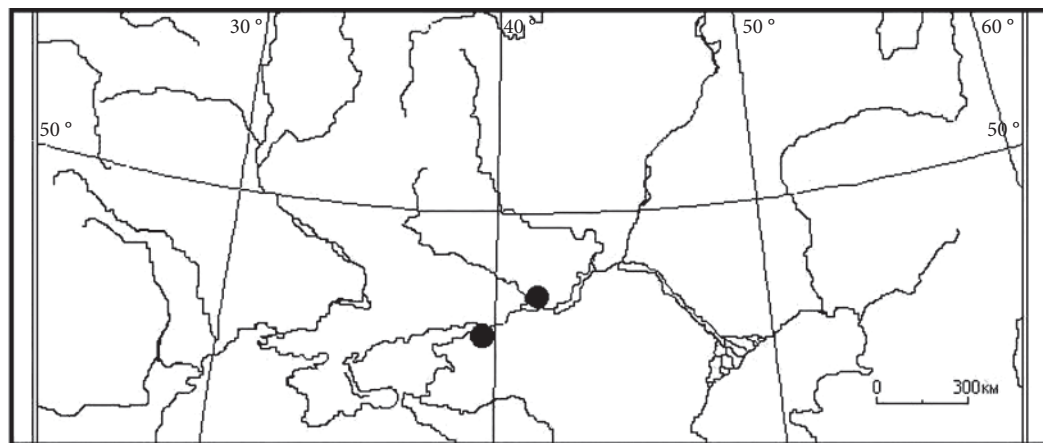


Fig. 1. Location of revealed *Motacilla feldegg* nesting sites in the Rostov oblast in 2011–2012.

Рис. 1. Места находок гнёзд *Motacilla feldegg* в Ростовской области в 2011–2012 гг.

Discussion

Nesting habitats

In Rostov oblast of Russia blackheaded wagtail *M. feldegg f. feldegg* prefers to nest in halophytic mesophilic habitats of river lowland floodplains. The nesting sites are usually removed at 100–300 m from the forage resources (shores of water reservoirs, reed beds, agrocoenoses). The nests are built in a sparse grass cover on the ground, forming small clustered settlements of 3–5, 8–9 breeding pairs or dense colonies on relatively small nesting sites (up to 100–500 m²).

The nesting settlement of *M. feldegg f. feldegg*, that we discovered and studied in Ak-say district, in the vicinity of Bolshoe Mishkino station, the Don-Aksay water-meadow, floodplain of the river Aksay on 4–10.06.2011, occupied the following plant formations: bottomland steppe-meadows, halophytic suffrutescent meadow-steppe with echinoid licorice, halophytic dry grass meadows with spurge, sedge-grass meadows. Adult birds feed in meadow parcels near water reservoirs, wetlands around eriks (creeks, channels). Males jointly patrol the nesting sites from possible occurrence of birds of prey: kestrel, red-footed falcon, harriers, etc. (Muraviev, Artemieva, 2012).

Inhabiting the Don-Aksay water-meadow (floodplain of the Aksay river, Rostov oblast) the blackheaded wagtail mostly prefers plant associations that are attributed to echinoid licorice — meadow brome, meadow brome — Seguier's spurge, Austrian wormwood — meadow brome, downy brome — common wormwood, Kentucky bluegrass — Austrian wormwood. Echinoid licorice (*Glycyrrhiza echinata* L., Fabaceae) is an important part of the *M. feldegg* nesting microbiotopes due to formation of typical microlandscapes in halophytic suffrutescent steppe and bottomland dry meadows. Birds tend to build nests at the base of the plant *G. echinata*, in the thick turf of grasses.

A large nesting colony of diffuse type was found near Kagalnik village, in the mouth of the river Kagalnik, the vicinity of Azov from Rostov oblast on 15–16.06.2012. This nesting settlement occupies the maritime halophytic mesophilic water meadows along the Sea of Azov coast and the Don Delta.

Nesting biotope of *M. feldegg f. feldegg* in the Kagalnik river bottomland and the Don Delta, in the vicinity of Azov, is a maritime halophytic mesophilic water meadow with marsh mallow (*Althaea officinalis* L.), Siberian statice (*Limonium gmelinii* (Willd.) O. Kuntze), high goniolimon (*Goniolimon elatum* (Fisch.) Boiss.), Tatar seakale (*Crambe tataria* Sebeók), tufted hair grass (*Deschampsia caespitosa* (L.) P. Beauv.) on meadow parcels, couch grass (*Elytrigia repens* (L.) Nevski), saltpeter wormwood (*Artemisia nitrosa* Weber) on alkaline lands, curly dock (*Rumex crispus* L.), etc. A nesting microstation (plant association) of *M. feldegg f. feldegg* composed of Siberian statice (*Limonium gmelinii*), high goniolimon (*Goniolimon elatum*), tufted hair grass (*Deschampsia caespitosa*) on meadow parcels, saltpeter wormwood (*Artemisia nitrosa*) on alkaline lands. Shrub forming sparse thickets in the Kagalnik bottomland and on the coast of the Sea of Azov is wolf-willow (*Elaeagnus commutata* L.). Marsh mallow is a key plant species of the nesting microstation, which is a dominant of the characteristic dwarf subshrub halophytic community. Unlike the yellow wagtail that is common in dry meadows and agrocoenoses in Rostov oblast, the blackheaded wagtail nests in lowland areas with relief depressions, preferring grasslands of floodplains and on the coast of the Sea of Azov.

Nesting communities of the birds from the Don-Aksay water-meadow and the Kagalnik bottomland composed of the next indicator species for the *M. feldegg f. feldegg* nesting settlements (N. — nesting bird): great cormorant (*Phalacrocorax carbo* L.) inhabits overflow lands, N.; great egret (*Egretta alba* L.) inhabits overflow lands, N.; little egret (small white heron, *Egretta garzetta* L.) inhabits overflow lands, N.; purple heron (*Ardea purpurea* L.) inhabits overflow lands, N.; glossy ibis (*Plegadis falcinellus* L.) inhabits overflow lands, N.; tawny eagle (*Aquila rapax* Temminck) inhabits steppe, N.; red-footed falcon (*Falco vespertinus* L.) inhabits floodplain, N.; common pheasant (*Phasianus colchicus* L.) inhabits

meadows, N.; lesser grey shrike (*Lanius minor* J. F. Gmelin) inhabits thickets in bottomland, N.; stonechats (*Saxicola torquata* f. *torquata* L., *S. t.* f. *maura* Pallas) inhabits meadows with echinoid licorice and marsh mallow, N.; corn bunting (*Emberiza calandra* L.) inhabits meadows with echinoid licorice and marsh mallow, N.

Blackheaded wagtail specializes feeding mainly on representatives of Acridoidea, Sphaeriniinae, Histeridae (*Saprinus*), Chrysomelidae, Psylloidea, Curculionidae, Noctuidae, Ichneumonidae, species of *Messor* and *Cataglyphis*, Diptera and Arachnida (Aranei) (Gladkov, 1954; Dolgushin et al., 1970, Gavis', 2003). In the diet of these birds *Ligus pratensis* L. (7), *Helophorus griseus* (Herbst) (4), *Sphaeridium scarabaeoides* L. (1), *Phyllobius oblongus* L. (1), *Pachybrachis tessellatus* (G. A. Olivier) (2), *Philidrus* sp. (1), *Stenus* sp. (1) and various Arachnida (4), Ephydriidae, Cicadellidae (2), Muscidae (2), small Diptera (20) and pupae of Diptera (3), larvae of Aradidae (9) were observed (Gudina, 2009).

The differences in forage preferences for *M. feldegg* f. *feldegg* males and females were registered. Males mainly collect Mollusca (Gastropoda: Planorbidae — *Planorbis spirorbis* L.; Lymneidae — *Galba glabra* (O. F. Mueller)) — 19,1 %; Diptera (Chironomidae: *Chironomus* sp.) — 14,8 %; Homoptera (Aphirophoridae: *Lepyronia coleoptrata* L.; *Philaenus spumarius* L.) — 13,7 %; Odonata (Coenagrionidae) — 11,3 %; Aranea — 11,6 %; Hemiptera (Rhopalidae: *Corizus hyosciami* L.; Pentatomidae: *Aelia acuminata* L.) — 10,9 %; Coleoptera (Carabidae: *Amara* sp.) — 10,2 %; Hymenoptera (Formicidae) — 4,3 %; Neuroptera (Chrysopidae: *Chrysopa* sp.) — 4,1 %. Females forages by chasing various Lepidoptera — 32,2 %; Orthoptera — 27,8 %; Diptera — 15,4 %; Homoptera — 14,6 %; Hemiptera (Miridae) — 6,3 %; Aranea — 3,7 %. Adults of *M. feldegg* f. *feldegg* readily eat as a food supply the mosquito chironomids of *Chironomus* genus during mass breeding, collecting them in the maritime meadows of the Sea of Azov. Birds use warmed up by the sun shallow waters, ground roads, pathways as to collect insects attracted by the warmth of the soil and water surface, catching up them in flight.

Nesting phenology

According to A. V. Zabashta observations (personal communication) *M. feldegg* f. *feldegg* starts to arrive in early April, nidification is registered at the end of April and in May, juvenile birds are already flying in early June. Counts on the routes (the number of specimens per km²) during breeding period revealed gradual increase in density of birds along with arrival of wagtails and occupying nesting grounds, it grows from 3 to 174 specimens/km² in some years.

In Rostov oblast in late July — early August the broods of blackheaded wagtail migrate to the coast of the Taganrog Bay in the Black Sea along floodplains of the tributaries of the Don and Manych rivers. The first broods of *M. feldegg* f. *feldegg* from the Kagalnik bottomland on the Sea of Azov coast appear in mid-June, their number increases by migrating broods from other nesting sites in floodplains of the tributaries and delta of the Don River. Terms of this species nesting period are rather extended. Presence of the first broods could be simultaneously combined with the second laying of the same female. The second breeding cycle occurs when the weather conditions are favourable in early spring and the forage resources are available.

Characters of the species nests

M. feldegg builds nests on the ground, under the cover of low shrub or grass stand, sometimes low over the ground in the bush or on clean sand, but under the effuse tuft of grass (Gladkov, 1954; Dolgushin et al., 1970; Abdusalyamov, 1973; Gavis', 2003; Gudina, 2009; Muraviev, Artemieva, 2012).

We found two nests with complete layings in the floodplain of the river Aksay, the Don-Aksay water-meadow, Rostov oblast on 06.06.2011 and 09.06.2011. The nests were

in a joint nesting settlement of the model type and located on the site of the halophytic suffrutescent meadow-steppe with echinoid licorice. Registered nests were located at the base of the echinoid licorice low shrub, deep into the turf of dry plants of Volga fescue (*Festuca valesiaca* Schleich.). They were deeply embedded and hidden in the dry turf grasses. Entrance to the nest was carefully masked by hanging down and twisted stems of grasses. In the structure of the nests small dry stems of Volga fescue were incorporated, and in the trays horsehair and pet wool were identified. Small “niche” or a pit directly adjoined each of the nests and served for the males from each nesting pair to stay overnight.

The nest of *M. feldegg* f. *feldegg* was found with five strongly incubated eggs (stage 7) on 16.06.2012. The eggs were clearly related to the second laying of the season. This nest located on the meadow bleakness parcels with such low grasses as Siberian statice (*Limonium gmelinii*) and tufted hair grass (*Deschampsia caespitosa*), besides there were low shrubs of marsh mallow (*Althaea officinalis*). In the structure of the nest wall small dry stems of grasses were incorporated, the trays was evident and with a few small feathers of gulls (table 1).

Characters of the species oology (layings)

Full laying of *M. feldegg* includes six or, at least, five eggs. (Gladkov, 1954; Dolgushin et al., 1970; Gavris', 2003).

There were found two eggs and three newly hatched nestlings (chicks) in the nest N 1 on 06.06.2011. Coloration of eggshells is light yellowish-brown, ornamentation is in the form of dark, dense mottles that become thicker to the infundibular end. The laying of five eggs was found in the nest N 2 on 09.06.2011. Coloration of eggs is grayish-olive, brownish ornamentation is not clearly defined. The female from this nest with a laying had been already ringed and tagged during study of this species nesting in the Don-Aksay water-meadow (04–10.06.2011). One of the ringed females of blackheaded wagtail laid an egg when it was released from ornithological net (08.06.2011). Coloration of this egg differs visually from oological descriptions prepared on the basis of previously revealed two layings in the nests. Main background coloration of the egg is khaki-greenish-gray, ornamentation is not clearly defined on the eggshell. Size of the egg is 18.4 × 14.4 mm.

The laying of five eggs, that had been strongly incubated (stage 7) and had been the second laying of the season, was found in the nest of *M. feldegg* f. *feldegg* in the Kagalnik river bottomland of Rostov oblast, in maritime meadows of the Sea of Azov on 16.06.2012. Eggshell is slightly shiny. The background coloration of eggshells is milky yellowish-grey, ornamentation is in the form of dense mottles and strokes, yellowish-brown, becomes darker and thicker to the infundibular end (table 2).

For *M. feldegg* f. *feldegg* an assumption about existence of polymorphism was done after visual assessment of eggs coloration. The differences in coloration and ornamentation of eggs of this bird in the Don-Aksay water-meadow indicate possible existence in groups of blackheaded wagtails, at least, two environmental nesting (biological) races. Similar

Table 1. Size of the *Motacilla feldegg* nests (n = 3) observed in the Rostov oblast

Таблица 1. Параметры гнезд *Motacilla feldegg* (n = 3) в Ростовской области

Nest number	Date of observation	Nest diameter (D), mm	Tray diameter (d), mm	Nest height (H), mm	Tray height (h), mm
1	06.06.2011	85	60	–	55
2	09.06.2011	90	55	55	38
3	16.06.2012	80	60	–	40
Lim		80–90	55–60	55	38–55

Table 2. Parameters of the *Motacilla feldegg* eggs (n = 12) observed in the Rostov oblastТаблица 2. Параметры яиц *Motacilla feldegg* (n = 12) в Ростовской области

Number of laying	Date of observation	Eggs length, mm	Eggs diameter, mm	Lim	M
1	06.06.2011	18.9 19.1	14.1 14.1	18.9–19.1 × 14.1	19.0 × 14.1
2	09.06.2011	18.9 19.1 18.9 19.1 19.2	14.3 13.9 14.0 14.4 14.1	18.9–19.2 × 13.9–14.4	19.04 × 14.4
3	16.06.2012	19.1 19.0 18.1 18.0 18.2	14.9 14.0 14.1 13.1 13.0	18.0–19.1 × 13.0–14.9	18.5 × 13.8
Total		18.8	14.0	18.0–19.2 × 13.0–14.9	18.8 × 14.0

phenomenon was previously registered by the biochemical analysis for yellow-backed and citrine wagtails in the Penza oblast (Titov et al., 1997).

Characters of nestling biology and ecology

Female *M. feldegg f. feldegg* incubates laying for 12 days and the chicks are in the nest up to 14–15 days in Ukraine, according to data of G. G. Gavris' (2003).

There were noted two eggs and three newly hatched chicks in the nest of *M. feldegg f. feldegg* studied in the area of floodplain of the river Aksay, in the Don-Aksay water-meadow, in Rostov oblast on 06.06.2011. One new nestling (chick) appeared the next day, on 07.06.2011. There were registered totally four chicks in the same nest when we examined it on 09.06.2011.

For the first time in the Rostov oblast it was recorded bigamy phenomenon for blackheaded wagtail. Active courtship display and coupling of males with other females of the same species, when they already had at that time own nesting territories with nests (layings and chicks) were observed in the Don-Aksay water-meadow in June 2011.

During observations on the behaviour of *M. feldegg f. feldegg* at the time of nesting in the Kagalnik river bottomland and maritime meadows of the Sea of Azov (June 2012) courtship display and coupling of males with two different females of their species was indicated. One of those females had a nest with second laying and even so was finishing feed of flying chicks from the first brood. Different females of the same bigamy family had distinctive morphological characters (female N 1 was grey-headed, female N 2 was dark-headed). Females of the same male were presented by different ecological (biological) races (morphs). Incubation was carried out by females only in all registered layings.

Conclusions

Limiting factors of species reproduction

Trends and patterns in the choice of the *M. feldegg* nesting conditions within studied territory of Rostov oblast are conditioned by mesophilic communities, halophytes and topography, which define the nature of plant associations and food supply in the nesting biotopes. Blackheaded wagtail is very sensitive to the choice of nesting habitats and disappears when they are strongly waterlogging, or under the presence of steep shores and hilly terrain (mineral salts washout). Therefore, this species can be used as an indicator one for floodplain, mesophilic, halophytic, meadows and steppe coenoses in river valleys, saline clay steppes on gently sloping shores (Muraviev, Artemieva, 2012).

Basic trends in the modern boundaries shift of the *M. feldegg* distribution in Rostov oblast of Russia is the sharp reduction of the range boundaries as a whole caused by human activities, and forced concentration of the species in lowland areas with relief depressions along floodplains of the rivers Don and its tributaries, in the delta of the Don and the coast of the Sea of Azov. Saving the groups of species in this area became possible thanks to the preservation of halophilic herbaceous and shrubby grasslands and halophytic suffrutescent meadow-steppe with echinoid licorice in the floodplains of the tributaries of the river Don (the river Aksay), maritime halophytic mesophilic water meadow with marsh mallow in the delta of the Don and the Sea of Azov coast, and the preservation in those biotopes the key facilities of fodder base. Following the widespread reduction in population size and boundaries of the range of *M. feldegg*, the choice of food and nesting biotopes in the south of the European part of Russia was changed. Here the blackheaded wagtail uses the shores of ponds and eriks, farmlands (corn fields), the treatment industrial plants of large settlements (Rostov-on-Don city).

Reduction of distribution boundaries and abundance of the species under the human economical activity, its accumulation in floodplains reflects vulnerability and relatively low tolerance of the species to the combined effect of environmental factors.

Identified species-specific features of the nesting biology and ecology of *M. feldegg* in Rostov oblast include definite degree of moisture, salinity and topography of the nesting biotopes for development of specific plant associations, two types of nested structures (open and covered) that depends on micro-relief; marked limits of the nests and eggs parameters; certain composition of the building material for the construction of nests, characteristic set of prey insects for adults and chicks feeding; bigamy structure of families and associated eggs polymorphism of; presence of the second cycle of reproduction.

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