

Original Research

**SOUTHEASTERN EUROPEAN BLACKBIRD *Turdus merula aterrimus*
(MADARÁSZ, 1903) IN THE BALKAN PENINSULA**

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Abstract

*The present study data on ecology and evolution of Eurasian Blackbird subspecies - Southeastern European Blackbird (*Turdus merula aterrimus*) in the Balkan Peninsula. As would be expected for a widespread passerine bird species in the world, a total of 16 geographical Common Blackbird subspecies are recognized within the *Turdus merula* species complex denoting a typical example where bird populations show signs of evolutionary differentiation and regional adaptation, but not enough isolation to form completely separate species. Southeastern European Blackbird breeds in Hungary, southeastern Europe to Crete, Rhodes, northern Turkey, Caucasus, Transcaucasia and northern Iran, and its distribution range overlaps with a nominal subspecies (*Turdus merula merula*), and most probably with another subspecies, *T. merula syriacus* (Greek islands and Mediterranean coast of southern Turkey). This study stated it is very difficult to distinguish the traits by field observations of nominal Eurasian Blackbird subspecies, *Turdus merula merula*, and Southeastern European Blackbird subspecies, *Turdus merula aterrimus* with confidence as well as in the Balkan Peninsula Eurasian Blackbird showed clinal variability and extensive intergradation rather than “clear” subspecies’ distinction. Also for the studied Blackbird subspecies, the data on intraspecific variability, autecology and evolution are provided.*

Keywords: Southeastern European Blackbird, subspecies, distribution, clinal variability, Balkan Peninsula.

INTRODUCTION

The Common Blackbird *Turdus merula* Linnaeus, 1758, is a species of true thrush (family Turdidae; order Passeriformes). It is also called Eurasian Blackbird (especially in North America, to distinguish it from the unrelated New World blackbirds), or simply Blackbird, where this does not lead to confusion with a similar-looking local species. It breeds in Europe, Asia, and North Africa, and has been introduced to Australia and New Zealand. Depending on latitude, the Common Blackbird may be resident, partially migratory or fully migratory. As

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would be expected for a widespread passerine bird species, 16 geographical subspecies are recognized within *Turdus merula* species complex [1]. The Blackbird species complex illustrates a typical example where bird populations show signs of evolutionary differentiation and regional adaptation, but not enough isolation to form completely separate species. In Europe and adjacent areas, a five Blackbird subspecies are distributed: *T. m. merula*, the nominal subspecies widely distributed throughout most of Europe; *T. m. aterrimus* (southeastern Europe to Crete, Rhodes, northern Turkey, Caucasus, Transcaucasia); *T. m. syriacus* (Mediterranean coast of southern Turkey); *T. m. azorensis* (endemic to the Azores archipelago) and *T. m. cabreræ* (Madeira archipelago, western and central Canary Islands). Also, three of previously known Asian Blackbird subspecies, are now identified as full species, such as Chinese Blackbird (*Turdus mandarinus*), Indian Blackbird (*Turdus simillimus*) and Tibetan Blackbird (*Turdus maximus*) [2].

Southeastern European Blackbird, *Turdus merula aterrimus* (Madarász, 1903) differs from the nominal subspecies (*Turdus merula merula*) in several morphological traits. It is generally smaller in body size and shows more subdued plumage coloration. Adult males of *T. m. aterrimus* typically have duller black plumage with reduced gloss compared to the deep, glossy black of *T. m. merula* males. Females are usually paler and browner, often with less pronounced dark mottling on the underparts. It breeds in Hungary, southeastern Europe to Crete, Rhodes, northern Turkey, Caucasus, Transcaucasia and northern Iran, and its distribution range overlaps with a nominal subspecies, and most probably with one more Blackbird subspecies, *T. m. syriacus*, distributed on the Mediterranean coast of southern Turkey south to Jordan, Israel and the northern Sinai [2].

The present study pointed out that the occurrence of three subspecies of Blackbird distributed in the same areas – range overlapping (*merula*, *aterrimus*, *syriacus*) revealed the possibility of the subspecies' hybridization and clinal variation, with some features gradient variation in the subspecies' traits, but on the other hand, the possibility of the species ecological vicariance due to habitat discontinuity (i.e. habitat fragmentation and deterioration).

MATERIALS AND METHODS

Based on literature data as well as newly data obtained in the field (2022–2025 period), Blackbirds were observed throughout Serbia. The birds have been visually (by using 10 and 12x binoculars magnification) and acoustically identified. Also, the bird censuses were carried out with main goal to record infrequent and discontinuous species singing in terms of subspecies' song variability evaluation and the Blackbird subspecies' distinction.

RESULTS AND DISCUSSION

Based on literature data [2], two Blackbird subspecies are distributed in Serbia, nominal (*Turdus merula merula*), and the studied subspecies, Southeastern European Blackbird (*Turdus merula aterrimus*).

The data obtained from field surveys in Serbia (2022–2025 period) revealed both subspecies are very hard to distinct in the field based on visual observations as well as acoustical identification.

Our predictions are that Southeastern Blackbird (*T. merula aterrimus*) is widely distributed than it expected. Bearing in mind Serbia is also part of an important transition and intergradation area between western-central European *T. m. merula* populations and Southeastern Balkan *aterrimus* populations, it is more likely many blackbirds in northern and northwestern Serbia (particularly in the Pannonian Plain, Vojvodina) may show more *merula*-like characteristics or intermediate traits. These regions are biogeographically connected to the Carpathian Basin and Central Europe, where *merula* is predominantly distributed Blackbird subspecies.

Also, it is most probably typical *aterrimus* taxonomic characters tend to become stronger toward mountainous, southern, and southeastern regions of Serbia, while northern lowland (Pannonian Plain, Vojvodina) populations are most probably intermediate (this is possible “scenario”). Our predictions are the clinal variation in the Common Blackbird is expected due to its vast range involving differences in plumage, size and other features correlated with environmental gradients, such as, at the first place, humidity and understory coverage at site. Also, we suppose that the species’ clinal variation is linked with latitudinal/altitudinal, predominantly forest and shrubland habitat typology, with regard to different terrestrial ecoregions distributed in the Balkan Peninsula.

In fact, the most Serbian blackbirds are most likely to be regarded as belonging to a clinal *merula–aterrimus* population continuum rather than representing completely “pure” subspecies, i.e. the subspecies transition showed continuous morphological and genetic shifts rather than “clear” subspecies separation based on diagnostic subspecies characters from the literature sources [1]. Due to the gene flow between populations is extensive, there is no sharp boundary between the two subspecies. Thus, Serbia represents part of a broad clinal transition zone where many individuals combine characteristics of both *merula* and *aterrimus*, including urban areas where “urban race” of Blackbird is determined, and it is characterized by shorter telomeres compared with birds occurred in natural habitats [3]. This makes telomere length a promising candidate for examining the effects of urbanization on the health status of individuals.

Why does the European Blackbird’s dark coloration match the ground color of the less widespread of its breeding habitats, the riparian forest, although its main European population occurs in the pale-litter woodland? It is argued that crypsis of all the age stages was more necessary in riparian stands, as this habitat is more risky for the species owing to a high ground vegetation surrounding a foraging bird. Poorer crypsis of Blackbird plumage in pale-litter habitats may be a neutral feature, being compensated by easier scanning of the surroundings over the lower and sparser herb vegetation and by a tendency to remain in dark sites. The black plumage of the Blackbird male, perhaps reinforced by sexual selection in pristine forest conditions may also retain its cryptic function [4].

On the other hand, the Common Blackbird colouration could be explained partly in line with Gloger’s rule because its dark feathers contain high amounts of melanin. In warmer and more humid environments, darker plumage may provide advantages such as stronger feather

durability, better resistance to feather-degrading bacteria, and improved crypsis in shaded forests and dense vegetation.

Also, environmental exposure to sulfur can affect intracellular thiol levels in organisms [5]. Pheomelanin synthesis in melanocytes is promoted by high thiol levels [6]. Accordingly, the results of study [7] showed that birds with phenotypes profusely pigmented by pheomelanin breeding in Iceland develop their plumage in sites with soils with higher sulfur contents than sites of birds with phenotypes produced by lower amounts of pheomelanin. This is observed considering both intraspecific and interspecific covariation between pheomelanin content of feathers and soil sulfur content, at least across the 13 species of birds included in this study suggesting that exposure to high sulfur soil levels in Iceland has favored the expression of pheomelanin-based plumage phenotypes, likely through an increase in thiol levels during development, which is supported by the results of this study [7], indicating that the plumage pigmentation phenotype of Icelandic birds is a phylogenetically conserved trait strongly favored by natural selection. The soil characteristics represent an additional environmental factor affecting the expression of melanin-based pigmentation in birds, likely by influencing exposure to sulfur and intracellular thiol levels, meaning that soil arises as a novel source of vertebrate phenotypic diversity [7]. Regarding the species from the present study, Common Blackbird is a ground-foraging and semi-arboreal songbird exposed to sulfur from soil.

The Common Blackbird is one of the principal avian hosts of Usutu virus (USUV) in Europe [10]. In the Balkans, the impact probably varies geographically depending on mosquito abundance, climate, habitat fragmentation, and urbanization. Potentially, southeastern and southern Blackbird populations (*aterrimus* and *syriacus* subspecies) have stronger viral exposure in warmer regions where mosquito vectors remain active longer. Urban populations could also be vulnerable due to high bird density and artificial water sources favor mosquito transmission. However, blackbirds reproduce efficiently and populations often recover after outbreaks through immigration and successful breeding. Consequently, Usutu virus probably could act as an additional ecological pressure affect the different subspecies' (*merula* and *aterrimus*) population density in the Balkan Peninsula.

Based on data related to molecular methods and DNA barcoding and the data obtained by using universal standard marker – region of mitochondrial COI (Cytochrome c oxidase subunit I) gene, there are no available DNA confirmation for the subspecies of Blackbird in genetic databases – BOLD [8] and NCBI [9], but only for a species level (*Turdus merula*).

In the Balkan Peninsula, the majority of blackbirds are probably best to be considered not as “pure” *merula* or *aterrimus*, but as part of a continuous clinal population with predominantly *aterrimus* characters toward the southeast and more *merula*-like tendency toward the north and northwest (this is possible “scenario”). Possibly, in the southeastern Balkans and especially in the East Thrace (European part of Turkey), the ranges of *aterrimus* and *syriacus* are overlapped.

CONCLUSION

As conclusion, it is very difficult to distinguish the characters of nominal Blackbird subspecies, *Turdus merula merula*, and Southeastern European Blackbird subspecies, *Turdus*

merula aterrimus with confidence, especially in the Balkans where the Eurasian Blackbird showed broad clinal variability and extensive intergradation, which is corroborated by the data provided in present study. The differences between these two subspecies are subtle rather than sharply diagnostic, involving slight variability in body size, plumage tone and glossiness.

Also, it is very difficult and often impossible to distinguish the nominate European blackbird (*Turdus merula merula*) from the Southeastern European subspecies (*T. m. aterrimus*) in the field based on visual observations. Distinguishing each subspecies required a bird in the hand and precise biometrics, and it is more likely that many local clines have “intermediate” characteristics. Due to both subspecies interbreed randomly in secondary contact zones, many birds display “intermediate” combinations of characters that do not fit precisely into either subspecies description. For example, a bird may show a *merula*-like body size, but *aterrimus*-like plumage tone, or *vice versa*.

Besides, based on bird vocalization and song patterns, it is very hard to differentiate *Turdus merula merula* from *Turdus merula aterrimus*. Consequently, subspecies (*merula* and *aterrimus*) could not be acoustically identified in the field during our surveys.

Apparently, it is more likely that the difference of two Blackbird subspecies, between nominal (*merula*) and Southeastern (*aterrimus*) to be gradual and somewhat artificial rather than discrete. In practice, assigning individual blackbirds to one subspecies or the other in southeastern Europe is often tentative unless the bird originates from a population near the “core” of one subspecies’ range. However, because the region is a broad zone of intergradation, “pure” or typical *aterrimus* individuals are not easy to separate from *merula*-like birds.

Within the Common Blackbird complex, the relationship among nominal *Turdus merula merula*, *T. m. aterrimus* and *T. m. syriacus* could be interpreted as an example of weak or incomplete incipient speciation. These subspecies likely diverged during periods of geographic isolation in different Pleistocene refugia, where local adaptation and genetic drift produced gradual differences in plumage, body size, migration and species autecology in general. However, when populations re-expanded after glaciations, they came back into secondary contact and continued interbreeding extensively across the Balkans and eastern Mediterranean regions.

The genetic differences that do exist likely originated during Pleistocene isolation in separate glacial refugia. During these periods, populations in western Europe, the Balkans, and the eastern Mediterranean became partially isolated and accumulated small differences in mitochondrial DNA, allele frequencies, and locally adaptive genes through drift and natural selection. After postglacial expansion, secondary contact allowed extensive hybridization, which “blurred” many of these distinctions.

The results of our study revealed recent Blackbird populations in the Balkans usually form gradual genetic clines rather than sharply separated lineages.

Among the three Blackbird subspecies (*merula*, *aterrimus* and *syriacus*), *merula* and *aterrimus* are probably genetically very close because of continuous contact across Central Europe and the Balkans. *Syriacus* may show somewhat higher differentiation due its “core” distribution lies farther southeast in Anatolia and the Near East, where partial geographic and

ecological separation persisted longer. Even so, the species divergence is still shallow compared with true species-level splits. For all the three Blackbird subspecies (*merula*, *aterrimus*, *syriacus*) feature variability “scenario”, a several interacting processes are expected: allopatric divergence in glacial refugia, secondary contact and hybridization, ecological vicariance and clinal adaptation along environmental gradients. Despite this variability, reproductive isolation between most populations remains weak or absent. Thus, all subspecies are still classified within a single species connected by varying degrees of gene flow.

In this sense, Common Blackbird represents a continuum between geographic variation and incipient speciation rather than fully discrete evolutionary population model. Some peripheral or isolated populations may eventually diverge further, but recently the species complex remains unified by extensive interbreeding across wide area of its range.

verall, the Balkan Peninsula act as a major biogeographic crossroad where Central European, Pontic, Mediterranean, and Middle East faunal influences intersect. This fact explains why Blackbird populations in the Balkans show broad clinal variability and complex intergradation rather than sharply separated subspecies boundaries.

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