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## **ABOUT SUBSPECIES AFFINITY OF THE CRIMEAN RED-BACKED SHRIKE, *LANIUS COLLURIO* (PASSERIFORMES, LANIIDAE)**

The conducted comparative morphological analysis (in particular comparative measurements of adult birds and coloration of adult males) allow distinguishing of the Crimean endemic subspecies *Lanius collurio tauricus* Moltschanov, 1917 from the widespread *L. c. collurio*. *L. c. tauricus* is characterized by the smaller size and narrower (in average) brown mantle of adult males, if compared to *L. c. collurio*. It also differs by shorter wings and bills from the subspecies *L. c. kobylini*, which is widespread in the Caucasus and Asia Minor. Also, from both these subspecies *L. c. tauricus* is distinguishable by the wider base of the bill.

Key words: Crimean Shrike, *Lanius collurio tauricus*, geographical races, subspecies, Crimea.

### **Introduction**

The purpose of our research was to verify the subspecific affinity of the Crimean populations of The Red-backed Shrike in view of controversial statements that:

1) it is the same as the southern subspecies of *L. c. kobylini* (Дементьев, 1937, 1954; Vaurie, 1959; Dickinson, 2003);

2) it notably differs from it by comparative measurements and feather plumage (Портенко, 1960; Волчанецкий, 1960, 1962; Волчанецкий и др., 1962).

The smaller general size, the notably larger bill and the saturated shades of coloring of the head and a back were listed among the most notable characters distinguishing *L. c. tauricus* from other subspecies (Молчанов, 1917; Портенко, 1960; Волчанецкий, 1962; Панов, 2008).

### **Material and methods**

This work is based on the collections of the National Museum of Natural History National Ukrainian Academy of Sciences, Kyiv, Ukraine (NMNH), V.N. Karazin Museum of Natural History, Kharkiv National

University, Kharkiv, Ukraine (MNKHNU), Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia (ZISP), Zoological Museum of M.V. Lomonosov State University, Moscow, Russia (ZMSU), State Darwin Museum, Moscow, Russia (SDM), Zhytomyr Regional Museum, Zhytomyr, Ukraine (ZRM). The male paratype of *L. c. kobylini* from ZMSU collection was measured.

Also, the collections of S.A. Buturlin, I.B. Volchanetsky, A.M. Kobylin, Y.V. Kostin, S.I. Ognev, L.A. Portenko, N.N. Somov, V.A. Hahlov's were studied.

In total, 672 collection specimens were analyzed. These included 162 Red-backed Shrikes from the Crimea, 422 individuals from various regions of Europe and the western part of Siberia, and 177 birds from the Caucasus and from the Transcaucasia.

The visual observations of the plumage coloration were conducted at day light based on series of collection materials. Only the coloration only of adult males collected during the spring and summer period (in a breeding plumage) was the subject to the comparative analysis. Width of brown "mantle" (or "saddle") on a back of males was statistically estimated. The measurements of this area was taken in its narrowest part: the longitudinal measure in the central part of a back and from the border of continuous gray coloring on hind neck to the back edge of a continuous chestnut-brown field at the border with gray plumage of the back (fig. 1, *a*; tab. 1). It should be emphasized that the dimensions of the stuffed birds does not usually depend on the nature of the preparation, because the skin on the back is always maximally stretched in the longitudinal direction, regardless of the density of packing while stuffed. Therefore there are no creases which would noticeably distort the color distribution. Coloring of plumage of females and young birds was not analyzed due to widest individual variability of these characters in this species.

For the comparative analysis and statistical processing, only specimens of adult birds (122 males and 44 females) collected during the nesting period (after the end of spring migration in June–July) were used.

All materials were analysed for 11 dimensional characters and index of bill. (tab. 2, 3). These included: the wing length (measured without straightening it on the plane), the wing width (the distance from the carpal bend to the top first secondaries (S1)), the length of the first and second primaries (from carpal bend to the tip of the feather), the total tail length and the total length of the first tail feather (measured from the base of the central tail feather), the length of bill (measured from the rear edge of the rhamphotheca ridge), the length of the bill from the anterior margin of nostril, depth and width of bill (measured near the anterior margin of the nostril), the width of the bill at the base rhamphotheca (at about the level of 3–4 bristles at the upper mandible), the length of the tarsus (the length of hind toe and its claw). Index of bill (ratio: width of the bill at the base rhamphotheca / length of bill). The terminology of plumage coloration and morphometry characters follows Koblik, Mosalov (Коблик, Мосалов 2006). All measurements were done by a digital caliper. Statistical data were processed using the software packages MS Excel 2000 and StatSoft Statistica 7.0.

The species identification was confirmed by the use of the discriminant function analysis, which allows an artificial minimization of the intragroup diversity.

The accuracy of the inter-group differences, as well as the "distance" between them, were assessed during the discriminant function analysis. When the groups were already divided during the analysis, an affiliation of the studied object to one of them was determined. The degree of similarity between the groups was evaluated by the calculation of the distances between their centroids. The Mahalanobis distance was used as a measure of similarity (Тюрин и др., 2003).

Table 1. Width of the “mantle” in the four forms of Red-backed Shrike (*Lanius collurio tauricus*, *L. collurio kobylini*, *L. collurio collurio*, “*L. collurio loudoni*”).

Таблица 1. Ширина «мантин» у четырёх форм жулана (*Lanius collurio tauricus*, *L. collurio kobylini*, *L. collurio collurio*, «*L. collurio loudoni*»).

Species / Подвид	Locations/ Регион	Individual variability of the width of the “mantle” is subdivided into four groups / Индивидуальная изменчивость ширины «мантин» условно разделенная на четыре группы, %				The measurement results / Результаты измерений		
		До / to 20 mm	до / to 30 mm	до / to 40 mm	до / to 50 mm	n	Lim (min – max), mm	(M ± m), mm
<i>L. c.</i> <i>tauricus</i>	Crimea / Крым	24,20	60,60	15,20	–	33	15,5 – 39,2	24,8 ± 0,98
<i>L. c.</i> <i>kobylini</i>	North Caucasus, South Caucasus / Северный Кавказ, Закавказье	22,50	67,50	10,00	–	40	16,6 – 33,9	24,6 ± 0,75
<i>L. c.</i> <i>collurio</i>	Sweden, Ukraine, Russia (Moscow and Ivanovo region) / Швеция, Украина, Россия (Московская и Ивановская обл.)	9,60	46,10	38,50	5,80	52	16,8 – 48,9	29,7 ± 0,97
“ <i>L. c.</i> <i>loudoni</i> ”	Russia (Altai territory and Kemerovo region) / Россия (Алтайский край и Кемеровская область)	3,20	67,80	25,80	3,20	31	17,3 – 49,9	28,3 ± 1,21

## Results and discussion

The red-backed shrike *Lanius collurio* Linnaeus, 1758 (sensu stricto) is distributed over the most part of Europe and Western Siberia to the East to a valley of Yenisei, to the South to the Mediterranean coast, Asia Minor, Zagros and Elbrus mountains. The background of its geographical variability and number of geographical races are still under debates. According to some studies the red-backed shrike represents a monotypical species (Степанян, 1978, 1990, 2003). However the vast majority of authors recognize several geographical races (subspecies). Apart from the nominative subspecies, the following subspecies have been recognized: *L. c. loudoni* Buturlin, 1907 (= by *L. c. pallidifrons* Johansen, 1952) widespread in the Western and Central Siberia (Vaurie, 1959; Портенко, 1960; Волчанецкий, 1962; Панов, 2008), *L. c. juxtus* Clancey, 1951 from the British Isles (Vaurie, 1959; Панов, 2008), West Asian-Caucasian *L. c. kobylini* (Buturlin, 1906) (Дементьев, 1937, 1954; Vaurie, 1959; Портенко, 1960; Волчанецкий, 1962; Dickinson, 2003; Коблик и др., 2006; Панов, 2008), and also the Crimean subspecies of *L. c. tauricus* Moltchanov, 1917<sup>1</sup> (Портенко, 1960; Волчанецкий, 1960, 1962; Волчанецкий, et. al., 1962; Панов, 2008). Recent studies (Oleksas, 2012) revealed that apart from the above mentioned geographical races (subspecies), there are 4 more subspecies occurring in East Europe.

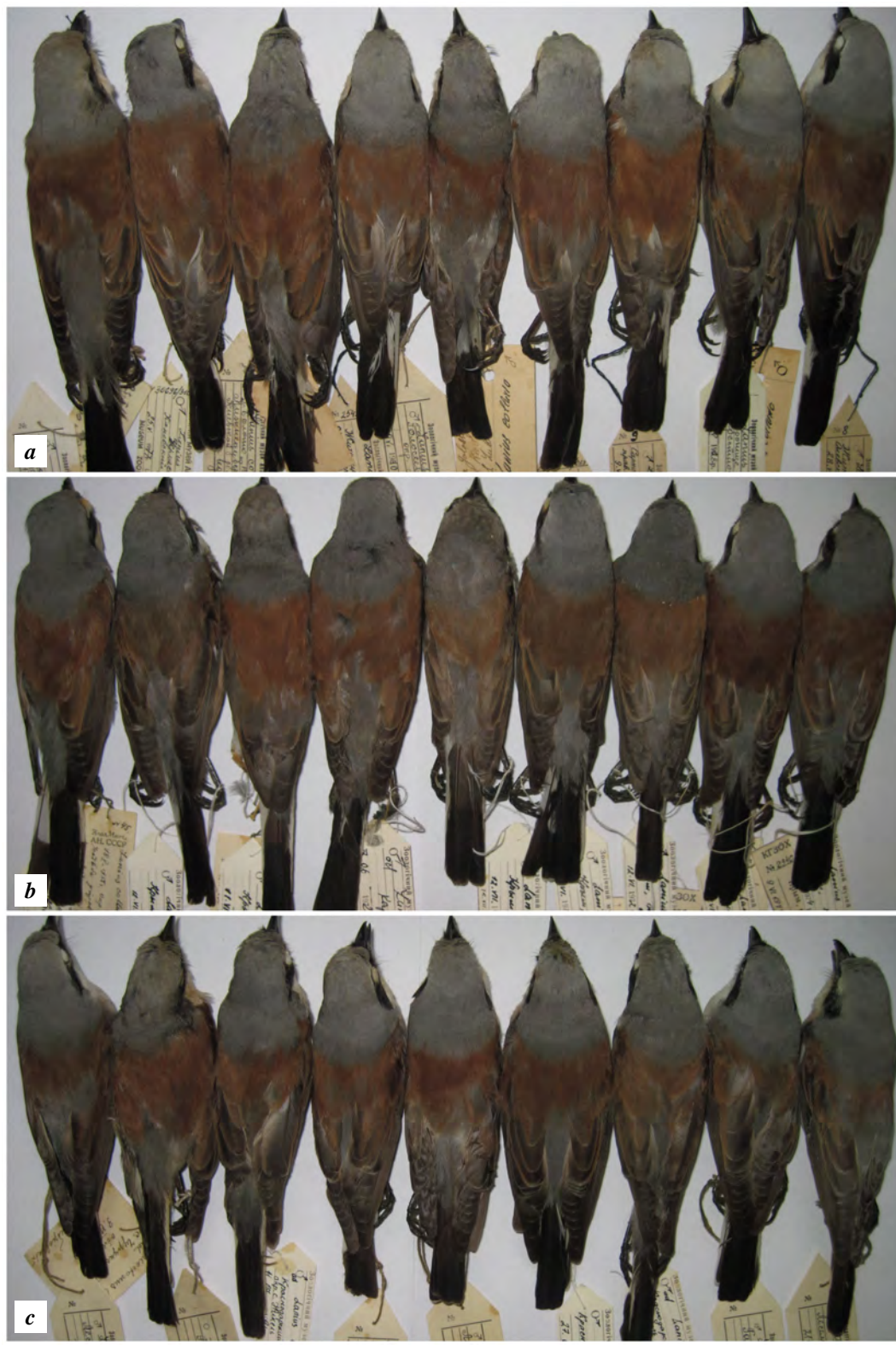
<sup>1</sup> — In this paper we refer to 1917, not 1916 (as it had been recorded by many previous authors), as the year of description of *Lanius collurio tauricus*, since 1917 is the actual year of publication (Степанян, 2003).



**Fig. 1. a, b** — individual variety of the Red-backed Shrike: **a** — coloration of dorsal body sides (the “mantle”) in adult males of the Red-backed Shrike; coloration forms are subdivided into 4 main form: 1 — less than 20 мм, 2 — from 20 to 30 мм, 3 — from 30 to 40 мм, 4 — more than 40 мм; **b** — coloration of the body sides of breeding males Red-backed Shrikes from the Crimea; **c** — shape of the beak of the males of the Red-backed Shrike: left, *Lanius collurio tauricus* (Crimea); right, *Lanius collurio collurio* (Poltava region).

**Рис. 1. a, b** — индивидуальная изменчивость обыкновенного жулана: **a** — окраска верхней стороны тела («мантия») взрослых самцов обыкновенного жулана; по ширине коричневого поля в центральной части спины условно выделено 4 основных варианта окраски: 1 — менее 20 мм, 2 — от 20 до 30 мм, 3 — от 30 до 40 мм, 4 — более 40 мм; **b** — окраска боков тела у гнездовых экземпляров самцов жулана из Крыма; **c** — форма клюва самцов обыкновенного жулана: слева *Lanius collurio tauricus* (Крым), справа *Lanius collurio collurio* (Полтавская обл.).





**Fig. 2. a–c** — individual variability of the size and mantle coloration in males of Red-backed Shrikes from different regions: **a** — northern and central Ukraine; **b** — Crimea; **c** — Caucasus and Transcaucasia.

**Рис. 2. a–c** — индивидуальная изменчивость размеров и окраски мантии у самцов жулана из различных регионов: **a** — северная и центральная Украина; **b** — Крым; **c** — Кавказ и Закавказье.

Table 2. Dimensions (mm) of the adult males of the three discussed Red-backed Shrike forms (*Lanius collurio tauricus*, *L. collurio kobylini*, *L. collurio collurio*).  
 Таблица 2. Размеры (мм) взрослых самцов жулана трёх обсуждаемых форм (*Lanius collurio tauricus*, *L. collurio kobylini*, *L. collurio collurio*).

Characters / признаки	<i>Lanius collurio tauricus</i>			<i>Lanius collurio kobylini</i>			<i>Lanius collurio collurio</i>		
	n	(M ± m)	Lim (min – max)	n	(M ± m)	Lim (min – max)	n	(M ± m)	Lim (min – max)
Length of bill / Длина клюва от края лба	45	12,50 ± 0,12	10,20 – 13,80	40	13,72 ± 0,10	12,40 – 15,20	52	13,35 ± 0,09	12,10 – 14,70
Length of bill from nostril / Длина клюва от ноздри	45	9,75 ± 0,1	8,20 – 11,20	40	10,46 ± 0,10	9,10 – 11,90	52	10,41 ± 0,08	8,90 – 11,80
Depth of bill / Высота клюва у края ноздри	39	7,13 ± 0,08	5,90 – 8,30	38	7,20 ± 0,07	6,40 – 8,50	48	7,20 ± 0,06	6,60 – 8,30
Width of bill at base rhamphotheca / Ширина клюва у основания рамфотеки	36	10,07 ± 0,08	8,50 – 11,10	37	8,93 ± 0,11	8,30 – 9,80	52	8,26 ± 0,09	6,90 – 10,00
Wing length / Длина крыла	45	87,52 ± 0,41	80,00 – 91,20	40	90,39 ± 0,30	86,10 – 94,80	52	93,65 ± 0,28	89,30 – 99,30
Width of wing / Ширина крыла	45	59,66 ± 0,33	52,20 – 64,50	40	62,45 ± 0,30	57,90 – 65,80	52	63,07 ± 0,29	58,90 – 68,30
Length of the first primaries / Длина первого первостепенного махового	45	42,84 ± 0,30	39,20 – 47,20	40	44,70 ± 0,39	38,00 – 50,30	52	46,26 ± 0,30	40,80 – 50,90
Tail length / Длина хвоста	45	70,43 ± 0,53	62,10 – 76,80	40	71,35 ± 0,55	63,60 – 76,10	52	74,37 ± 0,39	67,60 – 80,70
Length of the first tail / Длина первого рулевого	47	60,40 ± 0,59	50,20 – 67,90	42	62,30 ± 0,49	53,80 – 67,50	52	63,90 ± 0,48	54,70 – 71,40
Length of tarsus / Длина цевки	45	23,15 ± 0,19	20,50 – 26,20	40	23,44 ± 0,15	20,20 – 27,30	52	23,71 ± 0,16	19,90 – 28,30
Length of hind claw / Длина заднего когтя	45	7,97 ± 0,08	6,90 – 9,50	40	8,13 ± 0,11	6,50 – 9,70	52	8,55 ± 0,89	6,50 – 10,70
Index of bill / Индекс клюва	36	0,80 ± 0,01	0,67 – 0,98	37	0,65 ± 0,01	0,57 – 0,72	49	0,62 ± 0,01	0,50 – 0,73

Table 3. Dimensions (mm) of the adult females of the three discussed Red-backed Shrike forms (*Lanius collurio tauricus*, *L. collurio kobylini*, *L. collurio collurio*).  
Таблица 3. Размеры (мм) взрослых самок жулана трёх обсуждаемых форм (*Lanius collurio tauricus*, *L. collurio kobylini*, *L. collurio collurio*).

Characters / признаки	<i>Lanius collurio tauricus</i>			<i>Lanius collurio kobylini</i>			<i>Lanius collurio collurio</i>		
	n	(M ± m)	Lim (min – max)	n	(M ± m)	Lim (min – max)	n	(M ± m)	Lim (min – max)
Length of bill / Длина клюва от края лба	13	12,46 ± 0,22	11,10 – 13,90	12	13,59 ± 0,18	12,60 – 14,70	19	13,62 ± 0,17	12,30 – 14,70
Length of bill from nostril / Длина клюва от ноздри	13	9,92 ± 0,15	9,00 – 11,10	12	10,30 ± 0,19	8,90 – 11,70	19	10,33 ± 0,15	9,00 – 11,50
Depth of bill / Высота клюва у края ноздри	12	6,86 ± 0,17	5,60 – 7,80	11	7,20 ± 0,09	6,80 – 7,50	16	7,10 ± 0,07	6,60 – 7,90
Width of bill at base rhamphotheca / Ширина клюва у основания рамфотеки	13	10,20 ± 0,12	9,30 – 11,10	8	8,83 ± 0,27	7,40 – 9,80	19	8,10 ± 0,13	7,30 – 8,90
Wing length / Длина крыла	13	87,10 ± 1,16	81,20 – 91,40	12	91,15 ± 0,73	86,40 – 94,50	19	93,15 ± 0,43	90,20 – 97,00
Width of wing / Ширина крыла	13	61,29 ± 0,68	57,90 – 65,50	12	63,04 ± 0,74	58,60 – 66,50	19	62,36 ± 0,34	59,70 – 65,10
Length of the first primaries / Длина первого первостепенного махового	13	42,66 ± 0,69	37,80 – 45,90	12	45,50 ± 0,45	42,60 – 48,60	19	45,98 ± 0,52	41,40 – 50,30
Tail length / Длина хвоста	13	70,48 ± 1,29	64,30 – 80,70	12	72,65 ± 1,32	62,20 – 79,50	19	73,24 ± 0,68	69,10 – 83,10
Length of the first tail / Длина первого рулевого	13	61,39 ± 1,25	55,60 – 71,40	12	62,80 ± 1,34	52,10 – 67,10	19	64,33 ± 0,57	59,70 – 70,00
Length of tarsus / Длина цевки	13	22,88 ± 0,58	16,60 – 25,30	12	24,99 ± 0,22	23,2 – 25,80	19	22,86 ± 0,29	20,30 – 25,80
Length of hind claw / Длина заднего когтя	13	7,85 ± 0,12	6,70 – 8,40	12	8,20 ± 0,15	7,60 – 9,40	19	8,20 ± 0,13	6,90 – 9,40
Index of bill / Индекс клюва	13	0,82 ± 0,02	0,74 – 0,92	8	0,65 ± 0,02	0,55 – 0,74	15	0,59 ± 0,01	0,51 – 0,67

The comparative study of the plumage of males of the Red-backed Shrike from different parts of the breeding range has shown that many plumage characters are subject to the broadest individual variability and can not be used to evaluate the geographic variability of this species. This also concerns the series of collection materials pre-selected while taking into account the degree of exhausting of feathers and their prolonged storage in collections. Such characters as the width of paler area on the forehead, the intensity of the brown coloration of the mantle, and the degree of distribution and intensity of the pink (isabella) tint on the lower side of the body (fig. 1, **b**) vary approximately similarly in all populations ranged from Western Europe to the Altai and central Siberia, as well as from Scandinavia to the South Caucasus. The width of the black “mask”, sometimes also used as a diagnostic character (Oleksas, 2012), unfortunately largely depends on the methods of preparation of the stuffed specimens and thus also seems to be unsuitable for diagnoses.

We have found that more or less gradual getting pale of the gray color of the top and hind neck, as well as the back and rump in the geographical direction from the west to the east, when large series of male specimens are studied in geographical order. In this regard, the specimens from Scandinavia and Western and Central Europe look on average darker, whereas birds from the European part of Russia and Siberia seem on average slightly lighter. Thus, these differences can be regarded only as an example of weak clinal variation, reflected in the gradual lightening of the gray tone plumage from west to east. Also, the validity of the eastern subspecies “*loudoni*”, as well as “*balticus*”, “*pripjaticus*” and “*domaniewskii*” on the basis of the plumage color (Oleksas, 2012) is not possible due to the considerable variety degree and a number of intermediate forms between these and the nominative subspecies.

The area of the brown “mantle” on the back of adult males is also the subject to the broadest individual variability in all populations (fig. 1, **c**). However, the number of individuals with the most narrow brown sash in the central part of the back, the width of which does not exceed 20 mm, is significantly higher among the Crimean and Caucasian birds. The part of the Red-backed shrikes, which share a narrow “mantle”, does not exceed 10% within northern populations, whereas in the Crimean and Caucasian such males possess more than 20%, and there are no individuals, in which the width “mantle” reaches up to 50 mm (tab. 1). Average width of brown fields in birds from the Crimea, the Caucasus and Transcaucasia are less than 25 mm, whereas the Red-backed shrikes occurring in north have it of about 30 mm broad (tab. 1). Some authors (Белик, 2009) stated that the specimens from the Crimea, as well as the similar ones from the foothills of the North Caucasus, are characterized by the possession of the narrow dark mantle, whereas the shrikes from Dagestan and Eastern Transcaucasia have a broad dull colored mantle (fig. 2, **a–c**). However, these observations are not supported by our data: chiefly due to significant variations in the width and color of the mantle in birds originating from these regions.

The intensities of the gray color of the head and back in the Crimean and Caucasian individuals are generally similar, and the majority of specimens these areas are nearly as a dark as in the Western European and Scandinavian birds. Such a diagnostic character of *L. c. tauricus* as pure ashen color back (Молчанов, 1917), has not been confirmed based on studied materials, since the intensity of color of this part of plumage varies individually. The intensity of pink coloration on body underside of the Red-backed Shrikes from Crimea varies widely (fig. 1, **b**), to the same extent as in as those in other regions.

Results of the analysis of the size parameters (tab. 2, 3) revealed a very unique feature of the Red-backed shrikes from Crimea: the width of the base of the bill in these birds is the largest if compared to the individuals of all other populations of this species. The average values of this character in birds of both sexes from the Crimea are more



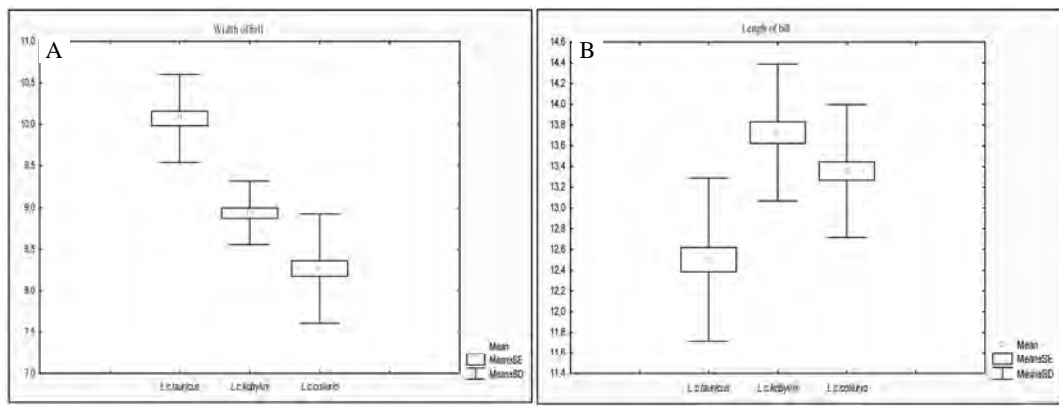
than 10 mm, while in the specimens from other areas the width of the bill almost never reaches such a value (fig. 3, **a**). The length of the bill of the specimens from the Crimean population is less on average, than that of the birds from the North Caucasus (fig. 3, **b**). Due to these features, the shape of the contour of the upper mandible of the Crimean red-backed shrike looks very characteristic (fig. 1, **c**). With such small length and the broad base, the bill of Crimean birds is less narrowed in the median part compared to the individuals from other regions. Despite the shape of the bill (mainly the degree of narrowing at the sides) also varies individually, these differences are noticeable quite clearly in many cases. Wing length in both sexes of the Red-backed shrikes from Crimea is less than that of any other individuals from other populations, possessing rarely more than 90 mm. The tail length is also a little less on average. However, the ranges of values of this index are largely overlapped.

The other established differences concern the wing width, the length of the first primaries, as well as the length of the first tail are found to correlate with the differences in the size of the wing and tail, correspondingly (tab. 1, 2). Any noticeable differences in the height of the bill and tarsus length were not found in these three groups.

### Conclusion

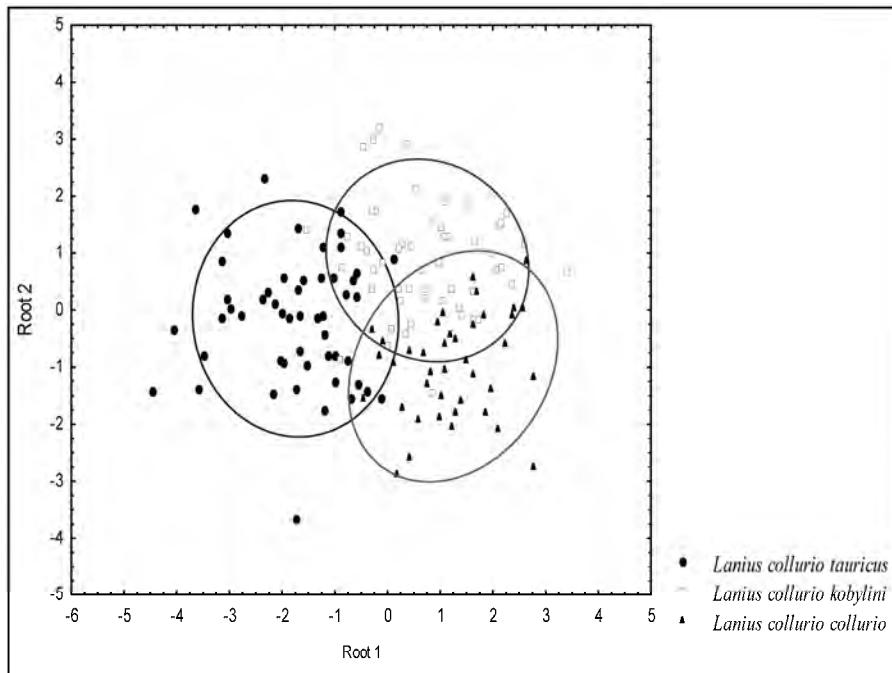
Our study allows concluding that the Crimean population of the Red-backed Shrike appears morphologically quite distinguishable to be regarded as a separate subspecies, *L. c. tauricus* Moltchanov, 1917. It differs from the subspecies inhabiting the neighboring areas in having the broader on average base of the bill and the shorter wings. From the widespread nominative subspecies it differs in general smaller dimensions (in particular, on average shorter wing, tail and bill), and on average narrower brown mantle of adult males. From the subspecies *L. c. kobylini*, widespread in the Caucasus and Asia Minor, it also differs, apart from the broad base of the bill, by the shorter wing and bill.

Similarly to most other dimensions, all the mentioned above morphological characters overlap to some extent (fig. 4), which is undoubtedly due to the secondary intergradations between the three discussed forms. The zone, in which the three discussed forms contact during the breeding period, covers an area of the lower reaches of the Don Basin and the northern coast of the Azov and Black Seas. Also, the territories of the Crimea and the Caucasus, inhabited by the native subspecies, are the migratory path-



**Fig. 3.** *Lanius collurio tauricus*, *Lanius collurio kobylini* and *Lanius collurio collurio*, variability limits. Males. **a** — width of bill at base rhamphotheca; **b** — length of bill.

**Рис. 3.** Пределы изменчивости у трех подвидов жулана *Lanius collurio tauricus*, *Lanius collurio kobylini*, *Lanius collurio collurio*. Самцы. **a** — ширины клюва в основании рамфотеки; **b** — длина клюва.



**Fig. 4.** *Lanius collurio tauricus*, *Lanius collurio kobylini* and *Lanius collurio collurio*: specimen distribution in the value space of the first and second canonical variables (11 morphometric characters). Males.

**Рис. 4.** Распределение экземпляров *Lanius collurio tauricus*, *Lanius collurio kobylini*, *Lanius collurio collurio* в пространстве значений первой и второй канонических переменных (по 11 морфометрическим признакам). Самцы.

ways of the nominative subspecies that may also affect the gene flow, and correspondingly the phenotypic composition of these populations. The real representation of the species belonging to *L. c. tauricus* and *L. c. kobylini* in these areas, should be tested in future with rigorous morphological and molecular genetic studies.

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#### О ПОДВИДОВОЙ ПРИНАДЛЕЖНОСТИ КРЫМСКОГО СОРОКОПУТА-ЖУЛАНА, *LANIUS COLLURIO* (PASSERIFORMES, LANIIDAE)

Изучение размерных признаков взрослых птиц и окраски взрослых самцов позволило найти особенности крымского эндемичного подвида, *Lanius collurio tauricus* Moltschanov, 1917. От широко распространенного *L. c. collurio* он отличается мелкими размерами и в среднем более узкой коричневой мантией у взрослых самцов. От кавказско-малоазийского подвида, *L. c. kobylini* крымская форма отличается более коротким крылом и клювом. От обоих упомянутых подвигов *L. c. tauricus* хорошо отличается более широким основанием клюва.

Ключевые слова: крымский жулан, *Lanius collurio tauricus*, географические расы, подвиды, Крым.

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#### ПРО ПІДВИДОВУ ПРИНАЛЕЖНІСТЬ КРИМСЬКОГО ТЕРНОВОГО СОРОКОПУДА, *LANIUS COLLURIO* (PASSERIFORMES, LANIIDAE)

Вивчення розмірних ознак дорослих птахів та забарвлення дорослих самців дозволило визначити особливості кримського ендемічного підвиду, *Lanius collurio tauricus* Moltschanov, 1917. Від широко розповсюдженого *L. c. collurio* він відрізняється дрібними розмірами і в середньому більш вузькою коричневою мантиєю у дорослих самців. Від кавказько-малоазійського підвиду, *L. c. kobylini*, кримська форма відрізняється коротшими крилами та дзьобом. Від обох згаданих підвидів *L. c. tauricus* добре відрізняється ширшою основою дзьоба.

Ключові слова: кримський терновий сорокопуд, *Lanius collurio tauricus*, географічні раси, підвиди, Крым.