| | | | |
|---|---|---|---|
| LARUS<br>Hrvatska akademija znanosti i umjetnosti | 51<br>(2016) | 25-32 str.<br>2 tablice, 1 slika | Zagreb 2016 |
| | Primljeno 17. 8. 2016.<br>Prihvaćeno na sjednici Razreda za prirodne znanosti HAZU 24.10.2016. | | |

UDK 598.288.7

Original scientific paper
*Izvorni znanstveni članak*
DOI: http://doi.org/10.21857/y6zolb3eom


# COLOURATION AND BIOMETRY OF THE BLACK-EARED WHEATEAR *Oenanthe hispanica* FROM THE EASTERN ADRIATIC COAST

## *Obojenost i biometrija istočnojadranske populacije primorske bjeloguze Oenante hispanica*


**Jelena Kralj, Sanja Barišić, Davor Ćiković, Vesna Tutiš**

Institute of Ornithology, Croatia Academy of Sciences and Arts, Gundulićeva 24, HR-10000 Zagreb



**ABSTRACT**

Museum skins of the Black-eared Wheatear *Oenante hispanica* from the eastern Adriatic coast were examined in order to identify subspecies. All 91 examined skins belong to *O. h. melanoleuca*. Wing lengths (88-96 mm in adult males, 87-93.5 mm in 2nd year males and 84-92 mm in females) are among the longest for this species. The proportion of the black-throated morph was 56.5% in males and 40.9% in females. Biometric measures and variability in tail pattern are described.



**Keywords:** Black-eared Wheatear *Oenante hispanica melanoleuca*, ornithological collections, Croatia


## INTRODUCTION

The Black-eared Wheatear *Oenante hispanica* inhabits stony and scrubby habitats in the Mediterranean Europe, north-western Africa and western Asia. Two subspecies are described, *O. h. hispanica* and *O. h. melanoleuca* (BirdLife International 2014, Collar 2005, Dickinson 2003). These two taxa are sometimes considered as two species (Sangster *et al*. 1999), and recent molecular phylogenetic analysis has shown a greater divergence between these two taxa than between *O. h. melanoleuca* and Pied Wheatear *O. pleschanka* (Aliabadian *et al.* 2012). How-


e-mail: jkralj@hazu.hr; sbarisic@hazu.hr; cikovicd@hazu.hr; vtutis@hazu.hr

ever, assessment of the taxonomical status of these taxa is beyond the scope of this paper.

The difference in plumage between the two subspecies is apparent, although they sometimes intergrades (del Hoyo *et al.* 2005). Both sexes of both taxa occur as two morphs: white-throated and black-throated. The proportion of black-throated males increases towards the East. On the other hand, no clear geographical difference exists in tail pattern despite existing variability (Cramp 1988).

The European range limits between the two taxa is not clear. Dickinson (2003), Ullman (2003), del Hoyo *et al.* 2005 and Collar (2005) listed Croatia among the range states of *hispanica*. According to Ullman (2003), *melanoleuca* breeds over most of the Balkans south of Croatia. On the contrary, Clement & Vatev (1997) stated that Croatia is inhabited by *melanoleuca*. Matvejev & Vasić (1973) listed *hispanica* for Istra, Kvarner archipelago and North Dalmatia and *melanoleuca* for South Dalmatia and Montenegro. Following that, Lukač (1998) included both subspecies in the list of Croatian birds.

In order to determine which taxa are present in the eastern Adriatic, we analysed bird skins from three scientific ornithological collections. Birds were collected between 1888 and 1966 along the eastern Adriatic coast. Colour morphs, wing and tail lengths, wing shape and tail pattern are described to enable comparison with other populations.

## METHODS

We have analysed 91 bird skins from ornithological collections of the Institute of Ornithology of the Croatian Academy of Sciences and Arts, Croatian Natural History Museum in Zagreb and Natural Science Museum in Dubrovnik, originating from Croatia (N= 70), Bosnia and Herzegovina (N = 1) and Montenegro (N = 20) (Figure 1). Taxa were determined according to the features listed in Ullman (2003). The most important differences between males of two taxa are: 1) amount of black on the forehead and above the eyes, 2) size of ear-coverts and throat patch (in black-throated birds), 3) uniformity or difference between the hue of crown and mantle. General colouration of upperparts, although helpful, was not used for the separation of the taxa, as untypical birds exist. Age was determined based on the presence of white fringes on the primary coverts and the difference between fresh scapulars and worn coverts. Females of *melanoleuca* are typically rather dark or dull brown above with a slight greyish touch, while females of nominate subspecies are light brown with a warm buffish tinge (Cramp 1988, Ullman 2003). It was not possible to differ between second-year females and older birds.

All examined skins were measured by one of the authors (J.K.). We measured wing length, the length of the second and third primary (p2 and p3, numbered

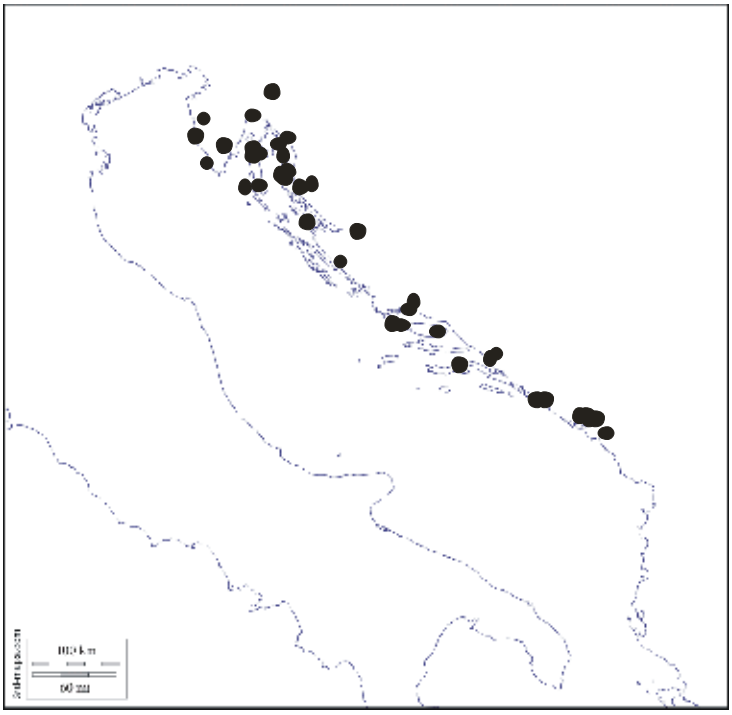

**Figure 1.** Localities of origin of examined Black-eared Wheatears
***Slika 1.*** *Mjesta porijekla izmjerenih primorskih bjeloguza*

ascendantly), distance between wingtip and the first secondary (1s), primary projection (distance between wingtip and the longest tertiary), tail length and extent of black colour on median and outermost tail feathers (t1 and t6). The extent of black colour was measured along the shaft on central tail feather, and along the outer vane on the outermost feather. The procedure given by Svensson (1992) was followed, while feather-lengths were measured according to Jenni & Winkler (1989). Bill and tarsus lengths were not measured as they were shown to be less reliable than feather measurements due to the shrinkage of bird skins (Kuczynski *et al*. 2003).

We have compared biometric measures for black- and white-throated birds, as well as for birds from northern Adriatic (including Istria, Kvarner archipelago and Northern Dalmatia) and southern Adriatic (southern Dalmatia, Bosnia and Herzegovina and Montenegro). All variables were normally distributed (Shapiro-Wilk's W test), so that parametric tests were used (ANOVA and Tukey HSD post hoc test). The proportions of colour morphs were compared using Yates corrected Chi-square test and t-test. All statistical analyses were performed using STATISTICA 8.0 (StatSoft 2007).

## RESULTS

From 91 examined specimens, 69 were males and 22 females. Only a small number of individuals (4 from each sex) was in the first year (after the post-juvenile moult); therefore, they were included only in the analysis of colour morphs. We have measured 33 males in the second year and 32 adult males (older than second year), as well as 18 females. All females older than the first year were pooled together. Based on coloration, all examined skins were determined as *O. h. melanoleuca*. We found no evidence for the presence of the *Oenanthe h. hispanica* in Croatia, Bosnia and Herzegovina or Montenegro.

Morphometric and colour characteristics are given in Table 1. Wing length ranged 88–96 mm in adult males, 87-93.5 mm in 2nd-year males and 84-92 mm in females. We found significant differences in almost all biometric variables among three groups (Table 1). Differences in wing length were the most prominent, and they significantly differ among all three groups. Adult males had significantly longer 3rd primary and the distance from the 1st secondary to wingtip, while females had shorter primary projection and tail, as well as a lower ratio of extent of black between t1 and t6 and lower ratio between tail length and extent of black on the outermost tail feather. The extent of black on t1 and t6 is given in Table 2.

**Table 1.** Average ± SD values for biometric measures and extent of black coloration on tail feathers. t1 - 1st (central) tail feather, t6 - 6th (outermost) tail feather. Asterisk indicates groups for which values of given variable significantly differs from others (Tukey HSD post hoc test).

***Tablica 1*** *. Prosječna vrijednost i SD biometrijskih mjera i crne obojenosti na repnim perima. t1 – prvo (središnje) repno pero, t6 – šesto (vanjsko) repno pero. Zvjezdica označava grupu za koju se vrijednosti značajno razlikuju (Tukey HSD post hoc test).*

| | 2nd year male | Adult male | Female | ANOVA |
|---|---|---|---|---|
| Wing | 90.18 ± 1.63* | 91.53 ±1.77* | 87.89 ± 2.52* | 20.794, p<0.001 |
| 2nd primary | 62.06 ± 2.76 | 62.98 ± 3.23 | 61.11 ± 2.99 | 2.258, p =0.111 |
| 3rd primary | 66.09 ± 2.74 | 67.97 ±3.13* | 65.45 ± 3.08 | 5.873, p <0.005 |
| Wingtip-1st secondary | 24.63 ± 1.74 | 25.73 ± 1.44* | 23.89 ± 1.28 | 8.732, p<0.001 |
| Primary projection | 26.93 ± 2.80 | 27.67 ±3.04 | 24.72 ± 1.60* | 6.841, p<0.005 |
| Tail | 67.81 ± 3.13 | 68.38 ± 3.12 | 64.53 ± 2.72* | 9.392, p<0.001 |
| Black on t1/t6 | 1.49 ± 0.15 | 1.516 ± 0.16 | 1.31 ± 0.22* | 7.343, p<0.005 |
| Tail lenght/black on t1 | 1.61 ± 0.15 | 1.57 ± 0.10 | 1.45 ± 0.13* | 0.040, p<0.001 |

The proportion of black-throated morph in males was 56.5% for the whole study area, and did not significantly differ between the northern (58.1 %) and southern Adriatic (55.3%), ($\chi^2 = 0.01$, df = 1, p = 0.938). The proportion of black-throated morph in females was lower (40.9%), yet the difference between sexes was not significant ($\chi^2 = 0.27$, df = 1, p = 0.606).

**Table 2.** Extent of black colour (in mm) on central (t1) and outermost (t6) tail feathers.
***Tablica 2.*** *Duljina crnog obojenja (u mm) duž središnjeg (t1) i vanjskog (t6) repnog pera.*

| | 2nd year male | | Adult male | | Female | |
|---|---|---|---|---|---|---|
| | aver. ±SD | range | aver. ±SD | range | aver. ±SD | range |
| t1 | 42.2 ± 2.9 | 36 - 47 | 43.6 ± 2.6 | 38 - 48 | 44.8 ± 2.8 | 39 - 49 |
| t6 | 28.6 ± 3.1 | 23 – 37.5 | 29.2 ± 3.3 | 22 - 35 | 34.7 ± 5.8 | 27 - 47 |

We found no significant difference in wing length, wing formula, or extent of the black colour on the tail between white-throated and black-throated individuals. No significant difference in any of measured variables was found between birds from northern and those from southern Adriatic.

## DISCUSSION

Contrary to current statements about subspecies range limits (Dickinson 2003, Ullman 2003, Collar 2005, Panov 2005), we could not confirm the presence of *O. h. hispanica* along eastern Adriatic coast. Majority of examined males were whitish below, with a greyish hue on the crown and some ochre on the mantle. Two birds had warm ochre upperparts, but also greyish hue on the crown, as well as black colour on the forehead and above the eyes, which is typical for *melanoleuca*. Probably the presence of such warmer-coloured males leads to the erroneous conclusion about the taxon present in this area. In Slovenia, in the northernmost part of the eastern Adriatic, the Black-eared Wheatear is a rare species, but all recorded birds with determined subspecies belong to *melanoleuca* (Hanžel & Šere 2012).

The average wing-length of adult males from the eastern Adriatic is in the upper range for this subspecies. Panov (2005) noted that the average wing-length of males increases towards the East for both *hispanica* and *melanoleuca*, but ranges of average values almost completely overlapp: 89.0-92.0 for *hispanica* and 89.9-92.2 for *melanoleuca*. According to his data, the shortest wings for *melanoleuca* were found in Greece and Turkey (89.9 mm, n = 9), and the longest for *hispanica* in "former Yugoslavia" (92.0 mm, n=21), but following the data present in this paper, the latter birds should belong to the subspecies *melanoleuca*. Cramp (1988) showed increased wing lengths in *hispanica* from Iberia and southern France to Tunisia and Italy, but for *melanoleuca* wing lengths from Dalmatia (92.0 ± 1.89, n = 21, range 88 – 95) were greater than those from Greece, Turkey and Levant (averages 89.9 and 88.8, range 84 – 94, data combined). Kaboli *et al.* (2007) give different average wing lengths for two taxa (89.65 mm for *hispanica* and 91.35 for *melanoleuca*), but the geographic origin of examined specimens (ten per taxon) was not mentioned. As Matvejev & Vasić (1973) assigned birds from northern and southern Adriatic coast to different subspecies, we compared birds from

these two regions. The lack of significant difference in any of measured variables further confirmed that there is no taxonomical difference between birds from northern and southern Adriatic coast.

Adult males were found to have longer wings, longer p3 and longer distance to the first secondary than the 2nd-year males and females. Longer wing in adults are common in different songbird species, especially among migratory populations (Arizaga *et al.* 2006, Peiró *et al.* 2006, Pérez-Tris & Tellería 2001).

The range of extent of black on tail feathers in our study corresponds with literature data for *O. h. melanoleuca*, but with larger average values for t1 (being 41.6 for all sexes combined in Cramp 1988). Some birds (in our study females) had extremely long extent of black colour along the outer vane of t6; in one specimen it was of the same length as black on t1. According to Panov (2005), the black terminal portions of the retrices are broader in first-winter than in older individuals of several wheatear species. This was not confirmed in our study. On the contrary, in our study, adult males had more black on both central and outermost tail feathers than first-year males. The ratio between black portions of central and outermost feathers was lower in adult males, but the difference was not significant.

The proportion of black-throated males increases across the species' range towards the East, but local variations are common (Cramp 1988, Panov 2005). In our sample, the proportion of black-throated males was between 50 and 60%, which was in accordance with 52% reported by Cramp (1988), with no significant differences in this ratio between birds from northern and southern Adriatic. Panov (2005) disputed the existence of true polymorphism in females, as the pronounced variation in female head coloration might be the result of the age-related variations. However, other authors (Ullman 2003, Collar 2005) clearly distinguish two morphs in both sexes of both races. In our set of specimens, it was easy to distinguish dark-throated from white-throated females.

Colour polymorphism is more common among non-passerines, while it was recorded among only 0.6% of Passerines (Galeotti *et al.* 2003). It was shown to be used as a criterion in mate-choice decisions and dominance interactions (Roulin 2004). Colour polymorphism frequently covaries with different morphological traits including wing, tail, tarsus and bill lengths, as well as body mass (Roulin 2004). However, such correlations were not found among Black-eared Wheatears and were not confirmed in the present study.

Based on morphological characteristics, all Black-eared Wheatears from eastern Adriatic coast were assigned to subspecies *O. h. melanoleuca*. Their wings lengths are among the longest for the species, while differences in wing lengths between age and sex groups are in line with those found in other migratory passerines. The ratio of colour morphs and variability in tail pattern are described to enable future comparison with other populations.

**Acknowledgements**

We thank to the curators of ornithological collections: dr. Irena Grbac from Croatian Natural History Museum in Zagreb and Jadranka Sulić Šprem from Natural Science Museum in Dubrovnik for enabling the study of bird skins from their respective museum collections.

**References**

Aliabadian, M., Kaboli, M., Förschler, M.I., Nijman, V., Chamani, A., Tillier, A., Prodon, R., Pasquet, E., Ericson, P.G.P., Zuccon, D. (2012): Convergent evolution of morphological and ecological traits in the open-habitat chat complex (Aves, Muscicapidae: Saxicolinae). Mol. Phylogenet. Evol. 65: 35-45.

Arizaga, J., Campos, F., Alonso, D. (2006): Variations in wing morphology among subspecies might reflect different migration distances in Bluethroat. Ornis Fennica 83: 162-169.

BirdLife International (2014): The BirdLife checklist of the birds of the world: Version 7. 3-Kralj et al - Oe hisp.dochttp://www.birdlife.org/datazone/userfiles/file/Species/Taxonomy/BirdLife_Checklist_Version_70.zip

Clement,P., Vatev, I. (1997): Black-eared Wheatear. pg 534 in Hagermeier, W. J. M & Blair, M. J. (eds). The EBCC Atlas of European Breeding Birds: Their Distribution and Abundance. T. & A.D. Poyser, London.

Collar, N. (2005): Black-eared Wheatear (*Oenanthe hispanica*). In: del Hoyo, J., Elliott, A., Sargatal, J., Christie, D.A. & de Juana, E. (eds.) (2013). *Handbook of the Birds of the World Alive*. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/node/58545 on 20 August 2014).

Cramp, S. (ed.) (1988): The Birds of the Western Palearctic, Vol. 5. Oxford: Oxford University Press.

del Hoyo, J., Elliott, A., Christie, D. A. (2005): Handbook of the Birds of the World. Vol.10. Lynx Edicions, Barcelona

Dickinson, E. (2003): The Howard and Moore Complete checklist of the birds of the world. 3rd Edition. Princeton University Press, Princeton.

Galeotti, P., Rubolini, D., Dunn, P. O., Fasola, M. (2003): Colour polymorphism in birds: causes and functions. J. Evol. Biol. 16: 635-646.

Hanžel, J., Šere, D. (2012): The list of birds of Slovenia with an overview of rare species. Acrocephalus 32(150/151): 143-203.

Jenni, L., Winkler, R. (1989): The feather-length of small passerines: a measurement for wing-length in live birds and museum skins. Bird Study 36: 1-15.

Kaboli, M., Aliabadian, M., Guillaumet, A., Roselaar, C.S., Prodon, R. (2007): Ecomorphology of the wheatears (genus *Oenanthe*). Ibis 149: 792-805

Kuczynski L., Tryjanowski P., Antczak M., Skoracki M., Hromada, M. (2003): Repeatability of measurements and shrinkage after skinning: the case of the Great Grey Shrike *Lanius excubitor*. Bonner Zool. Beitr. 51: 127-130.

Lukač, G. (1998): List of Croatian birds. Nat. Croat. 7, Suppl. 3: 1-160.

Matvejev, S. D., Vasić, V.F. (1973): Catalogus faunae Jugoslaviae. Aves. SAZU, Ljubljana.

Panov, E. N. (2005): Wheatears of Palearctic. Ecology, Behaviour and Evolution of the genus *Oenanthe*. Pensoft Sofia-Moscow.

Peiró , I.G., Robledano, F., Esteve, M.A. (2006): The effect of age and sex on wing morphology and body size of the Bearded Tit *Panurus biarmicus* in relation to complete moult. Ringing & Migration 23: 101-106.

Pérez-Tris, J., Tellería, J.L. (2001): Age-related variations in wing shape of migratory and sedentary Blackcaps *Sylvia atricapilla*. J. Avian. Biol. 32:2017-213.

Roulin , A. (2004): The evolution, maintenance and adaptive function of genetic colour polymorphism in birds. Biol. Rev. 79: 815-848.

Sangster, G., Hazevoet, C. J., van den Berg, A. B., Roselaar, C. S., Sluys, R. (1999): Dutch avifaunal list: species concepts, taxonomic instability, and taxonomic changes in 1977-98. Ardea 87: 139-165.

StatSoft (2007): STATISTICA version8.0 for Windows. Tulsa, USA.

Svensson, L. (1992): Identification guide to European passerines. Stockholm.

Ullman, M. (2003): Separation of Western and Eastern Black-eared Wheatear. Dutch Birding 25: 77-97.

**SAŽETAK**

Literaturni izvori razlikuju se u određivanju granica areala dviju podvrsta primorske bjeloguze *Oenante hispanica* na području istočnog Jadrana. Radi ustanovljavanja zastupljenosti pojedinih podvrsta, pregledan je i izmjeren 91 svlak te vrste iz zbirki Zavoda za ornitologiju, Hrvatskog prirodoslovnog muzeja u Zagrebu i Prirodoslovnog muzeja u Dubrovniku. Ptice su bile prikupljene između 1888. i 1966. godine duž istočne obale Jadrana: u Hrvatskoj, Bosni i Hercegovini i Crnoj Gori. ). Sve ptice pripadaju podvrsti *O. h. melanoleuca*. Duljine krila (88 – 96 mm u odraslih mužjaka, 87 – 93.5 mm u mladih mužjaka i 84 – 92 mm u ženki) među najvećim su zabilježenim za ovu vrstu. Udio crnogrle forme je 56.5% u mužjaka i 40.9% u ženki. Opisane su mjere krila i repa te varijabilnost u obojenosti repa.