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TWO SPECIES OF ORPHEAN WARBLERS *Sylvia hortensis*, *S. crassirostris* IN CROATIA: DATA OVERVIEW AND IMPLICATIONS FOR FUTURE RESEARCH

*Velike grmuše Sylvia hortensis, S. crassirostris u Hrvatskoj: pregled
podataka i implikacije za buduća istraživanja*

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ABSTRACT

Orphean Warblers *Sylvia hortensis* and *S. crassirostris* are two similar species that have recently been split from a single species complex. It is considered that only *S. crassirostris* breeds in Croatia. The data collected on this species in Croatia, however, is inconsistent as some ornithologists still use either name. In order to discern whether both species occur in Croatia, I conducted a study of citizen science data and a review of skins in three museum collections. There was a specimen of *S. hortensis* in the collection of the Institute of Ornithology, collected on the island of Brač in 1964. Citizen science data yielded no verifiable observations of *S. hortensis* in Croatia. Bill length was an unreliable distinction characteristic between the two species, while plumage characteristics proved useful only for adult birds. Reliable distinction characteristics are thus song, tail and moult pattern and mt-DNA. Detailed studies of Orphean Warblers' distribution and characteristics in Croatia and Italy are recommended.

Keywords: Western Orphean Warbler, Eastern Orphean Warbler, distribution, museum collections, skin review, citizen science, Brač

INTRODUCTION

The Orphean Warblers are two very similar species of *Sylvia* warblers: The Western Orphean Warbler *Sylvia hortensis* and the Eastern Orphean Warbler *Sylvia crassirostris*. *S. hortensis* breed from the Iberian Peninsula and Morocco along the Mediterranean region in southern France and northern Africa to Italy and northern Algeria, while *S. crassirostris* breeds from southern Slovenia and coastal Croatia, across the southern Balkan Peninsula, the Middle East and Transcaucasia to Pakistan. In the Mediterranean, both prefer richly structured maquis, patches of tall bushes in agricultural land, olive groves or open woodlands with bushy undergrowth (SHIRIHAI *et al.* 2001). They winter in the Sahel belt of Africa, while many *S. crassirostris* also winter around the Gulfs of Persia and Oman, as well as throughout India. Two subspecies of *S. hortensis* and three subspecies of *S. crassirostris* are currently recognised (DEL HOYO *et al.* 2019).

The two were regarded as subspecies of *S. [hortensis]* until SHIRIHAI *et al.* (2001) proposed to split them into two species. The International Ornithological Congress added *S. crassirostris* as a separate species in 2008 (GILL *et al.* 2019). Critical differences include plumage, biometrics, song, mt-DNA and moult differences (SHIRIHAI *et al.* 2001). SVENSSON (2012) further tested the plumage and biometric differences, giving detailed instructions on discerning between them according to tail pattern. All sources agree that distinguishing between the two based on song is straightforward (SHIRIHAI *et al.* 2001).

Historically, ornithologists in Croatia have generally adhered to official taxonomies when dealing with Orphean Warblers. Most historical data refer only to *S. hortensis* and among rare historical sources that considered subspecies, only *S. h. crassirostris* is listed for Croatia (MATVEJEV & VASIĆ 1973). After the split, most ornithologists and surveys have continued using the single-species system (BARIŠIĆ *et al.* 2016, MIKULIĆ *et al.* 2016), while others document only *S. crassirostris* (LUKAČ & STELKO 2016). This potentially leads to much confusion when reviewing the data. At any rate, all agree and accept that only the Eastern Orphean Warbler is present in Croatia, be it *S. h. crassirostris* or *S. crassirostris* (KRALJ *et al.* 2013, TUTIŠ *et al.* 2013). However, while conducting fieldwork on the island Brač in June 2015, I encountered an individual that unmistakably sang the Western variant of the song. That event inspired me to conduct this study.

The aim of this study was to establish whether both *S. hortensis* and *S. crassirostris* are present in Croatia, and to determine the quality of citizen science data on these species.

METHODS

Citizen science data review

I collected available *S. hortensis* and *S. crassirostris* records in Croatia from online citizen science platforms. These offer a valuable base of bird observations, so I contacted *fauna.hr* (BIOM 2019), eBird (EBIRD 2019) and *observation.org* (DE VRIES 2019) for access to their data, as well as that of the Global Biodiversity Information Facility (GBIF 2019). The xeno-canto website was also checked because it offers a valuable source of direct inspection of sound recordings, thus verifying the species of observations. Bird images were identified according to plumage characteristics described in SVENSSON (2012), while sound recordings were identified according to song recordings in BIRDCGUIDES LTD. (2006). Any non-verifiable data was discarded due to the likelihood of mixing the species up and consequential uncertainty of records.

Skin collection review

I visited three bird skin collections known to have specimens of either *S. hortensis* or *S. crassirostris* from Croatia: (1) The Croatian Academy of Sciences and Arts' Institute of Ornithology (CASA), (2) The Croatian Natural History Museum in Zagreb (CNHM), and (3) The Natural History Museum Vienna (NHMV). In order to check the species, specimens were measured for length of bill from skull and inspected for plumage parameters: colouration of undertail coverts and outer tail feathers according to SVENSSON (2012), depicted in Figure 1. The specimens' sex, age and collection location were also noted.

RESULTS

Citizen science data review

The review yielded very little verifiable data. Among 296 collected observations of either species, none had sufficiently detailed photographs for identification. Four observations had audio recordings, all of them of *S. crassirostris*.

Skin collection review

I inspected 20 specimens in the CASA collection, 9 specimens at the CNHM and 7 at the NHMV (Appendix 1). One specimen (CASA no. 5973) was identified as *S. hortensis*, a bird collected near Nadsela, Brač in 1964 (Figure 2). Among the rest, 27 were *S. crassirostris* and 8 were unreliable for various reasons (mostly juveniles). The average bill size of *S. crassirostris* in collections was 18.98 mm (17-20 mm, SD 0.79), while the bill size of the analysed *S. hortensis* specimen was 17.5 mm (Brač). An additional specimen (CASA no. 2170), collected near Metković,

had a tail pattern similar to those in *S. hortensis*. However, that specimen did not have outer tail feathers on one side of its tail, which disabled verification, and its bill size (20 mm) was out of range previously observed for *S. hortensis*. It was therefore classified as “uncertain”.



Figure 1. Tail patterns of the Western Orphean Warbler *Sylvia hortensis*, a) and Eastern Orphean Warbler *S. crassirostris*, b). *S. hortensis* are characterised by a long and narrow white wedge along the inner web of the outermost tail feather (a). *S. crassirostris* has a shorter and wider white wedge (b).

Slika 1. Uzorci na repu zapadne velike grmuše *Sylvia hortensis*, a) i istočne velike grmuše *S. crassirostris*, b). *S. hortensis* ima dug i uzak bijeli potez duž unutarnje zastavice šestog repnog pera (a). *S. crassirostris* ima kraći i širi bijeli klin (b).

DISCUSSION

Considering the confirmed presence of *S. crassirostris* in Apulia, south-eastern Italy since 2010 (JANNI & FRACASSO 2012, TODISCO 2013) and how this study has confirmed the presence of *S. hortensis* in Croatia, it seems that the Adriatic Sea is not a definitive geographical barrier for Orphean Warblers. One possible explanation is that some *S. hortensis* that migrate to mainland Italy via Tunisia and Sicily might “overshoot” their destinations and end up on south-Adriatic islands. Another might be that some *S. hortensis* wintering in central Sahel with *S. crassirostris* join them on their northward migration, or vice versa. The latter might explain why individuals of *S. crassirostris* are observed in south-eastern Italy. At any rate, the current quality of data on the two species in Croatia is

insufficient for discerning any distribution patterns. It is therefore necessary to conduct a targeted study with the goal of establishing the extent of the presence of *S. hortensis* in Croatia.

Regarding identification characteristics, some adult specimens that seemed to be *S. crassirostris* showed tail patterns similar to *S. hortensis*. This might be an indication of a more gradual phenotypic change between Western and Eastern Orphean Warblers, as some might exhibit characteristics of both (e.g. tail pattern of *S. hortensis* and bill length and undertail coverts of *S. crassirostris*).

In conclusion, it seems that the most reliable characteristics for distinguishing between *S. hortensis* and *S. crassirostris* are song and mt-DNA (SHIRIHAI *et al.* 2001.), followed by tail pattern (SVENSSON 2012) and moult pattern. I recommend birdwatchers in Croatia to pay closer attention to these species, especially when on Dalmatian islands. Furthermore, a more detailed study, including song and mt-DNA analyses, is required in order to determine whether the two species of Orphean Warblers in Croatia have overlapping distributions. A study is also needed to test the reliability of plumage characteristics of both Orphean Warbler species in Croatia. These studies should include specimens from other regional collections as well, such as Ljubljana, Split, Metković, Belgrade etc. Studies with the same aims need to be conducted in southern Italy as well.

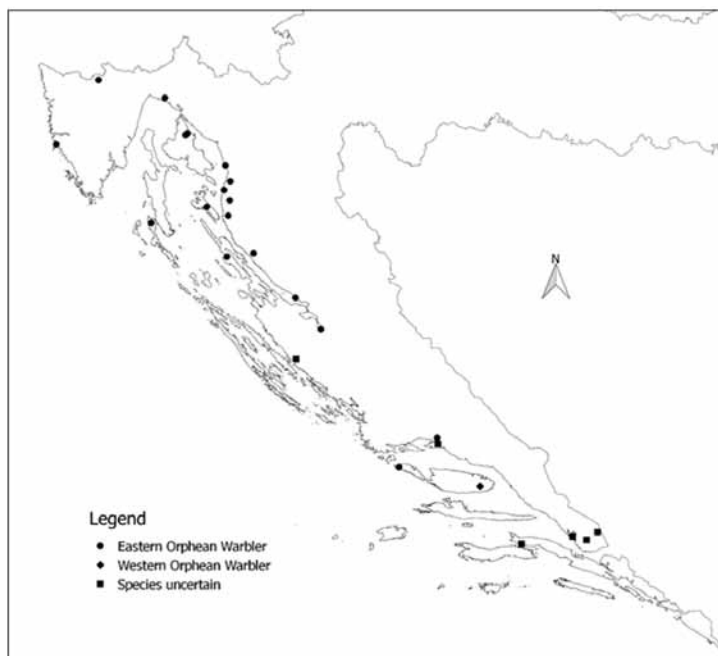


Figure 2. Locations where skins and voice recordings of analysed Orphean Warblers were collected. Sampling locations were approximated from locality names.

Slika 2. Lokacije prikupljanja preparata ili snimaka pjeva analiziranih velikih grmuša. Lokacije uzoraka procijenjene su iz naziva lokaliteta.

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SAŽETAK

Velike grmuše *Sylvia hortensis* i *S. crassirostris* dvije su slične vrste koje su tek nedavno razdvojene iz jedinstvenog kompleksa vrsta. Razlikovanje dviju vrsta na terenu vrlo je teško ako se ne čuje pjev, a za raspoznavanje u ruci najkorisniji su obojenje perja repa i podrepka. Smatra se da se u Hrvatskoj gnijezdi samo istočna velika grmuša *S. crassirostris*. Međutim, dosad prikupljena opažanja ovih dviju vrsta u Hrvatskoj nedosljedna su jer neki ornitolozi koriste „stari“ znanstveni naziv *S. hortensis* dok drugi koriste „novi“ *S. crassirostris*. Prikupljena su provjerljiva opažanja ovih vrsta s portala građanske znanosti te su pregledani primjerci u trima znanstvenim zbirkama. Ustanovljena je jedna jedinka zapadne velike grmuše *S. hortensis* u zbirci Zavoda za ornitologiju, prikupljena 1964. g. na Braču. S portala građanske znanosti prikupljena su četiri provjerljiva opažanja istočne velike grmuše u Hrvatskoj i nijedno opažanje zapadne velike grmuše, no ustanovljeno je opažanje jedinke istočne velike grmuše u jugoistočnoj Italiji. Rezultati potvrđuju prisutnost zapadne velike grmuše u Hrvatskoj te upućuju na mogućnost da jedinke obiju vrsta prijeđu na suprotnu stranu Jadrana. Pouzdane karakteristike za raspoznavanje su pjev, uzorak na repu, uzorak mitarenja te mitohondrijska DNA. Preporučena su detaljnija istraživanja rasprostranjenosti i značajki velikih grmuša u Hrvatskoj.

Appendix 1. Data on examined museum specimens of Orphean Warblers (*Sylvia hortensis*, *S. crassirostris*). Collections: CASA – Croatian Academy of Sciences and Arts, Institute of ornithology; CNHM – Croatian Natural History Museum in Zagreb; NHMV – Nature History Museum Vienna.

Prilog 1. Podaci o pregledanim primjercima velikih grmuša (*Sylvia hortensis*, *S. crassirostris*). Zbirke: CASA – Hrvatska akademija znanosti i umjetnosti, Zavod za ornitologiju; CNHM – Hrvatski prirodoslovni muzej Zagreb; NHMV – Prirodoslovni muzej Beč.

Collection	Inventary number	Species	Locality	Date of collection	Notes	Bill to skull (mm)
CASA	271	<i>Sylvia hortensis/crassirostris</i>	Split	14/07/1940	juvenile	19.5
CASA	272	<i>Sylvia hortensis/crassirostris</i>	Viganj, Pelješac	12/07/1941	juvenile	19
CASA	273	<i>Sylvia crassirostris</i>	Viganj, Pelješac	14/07/1941		18.5
CASA	453	<i>Sylvia crassirostris</i>	Viganj, Pelješac	15/07/1941		17
CASA	454	<i>Sylvia crassirostris</i>	Viganj, Pelješac	15/07/1941		19
CASA	1683	<i>Sylvia crassirostris</i>	Soline, Krk	17/07/1947		19.5
CASA	2169	<i>Sylvia crassirostris</i>	Metković	11/05/1948		20
CASA	2170	<i>Sylvia hortensis/crassirostris</i>	Metković	29/04/1948	mixed characteristics	20
CASA	2933	<i>Sylvia crassirostris</i>	Metković	20/05/1949	no maxilla	
CASA	3455	<i>Sylvia crassirostris</i>	Klimno, Krk	08/05/1950		17
CASA	3651	<i>Sylvia hortensis/crassirostris</i>	ušće Neretve	22/07/1950	juvenile	20
CASA	4275	<i>Sylvia crassirostris</i>	Rovinj	09/06/1954		19
CASA	4398	<i>Sylvia crassirostris</i>	Štrped, Buzet	07/06/1955		19.5
CASA	5046	<i>Sylvia crassirostris</i>	Split	07/06/1958		18.5
CASA	5379	<i>Sylvia crassirostris</i>	Šćrbak, Rab	02/06/1960		20
CASA	5402	<i>Sylvia crassirostris</i>	Lukovo, Jurjevo	03/07/1960		18.5
CASA	5574	<i>Sylvia crassirostris</i>	Lopci, Jurjevo	26/05/1961		19

CASA	5586	<i>Sylvia crassirostris</i>	Velebit, Šušanj, Kar- lobag	30/05/1961		18.5
CASA	5589	<i>Sylvia crassirostris</i>	Velebit, Dundovića, Podi, Jabla- nac	31/05/1961		20
CASA	5973	<i>Sylvia hortensis</i>	Nadsela, Brač	02/05/1964		17.5
CNHM	241	<i>Sylvia crassirostris</i>	Rijeka	09/08/1888		19
CNHM	242	<i>Sylvia crassirostris</i>	Split	21/07/1899		19
CNHM	243	<i>Sylvia crassirostris</i>	Split	19/07/1899		19
CNHM	244	<i>Sylvia crassirostris</i>	Spljet	05/04		19
CNHM	247	<i>Sylvia crassirostris</i>	Maslinica	26/07/1899		19.5
CNHM	251	<i>Sylvia crassirostris</i>	Senj	03/05/1901		19.5
CNHM	252	<i>Sylvia hortensis/ crassirostris</i>	Sv. Filip i Jakov	13/07/1900	juvenile	18.5
CNHM	254	<i>Sylvia crassirostris</i>	Solin	28/04/1900		19.5
CNHM	399	<i>Sylvia crassirostris</i>	Rijeka	13/04/1888		18.5
NHNV	59754	<i>Sylvia crassirostris</i>	Karin	02/05/1901		19.5
NHNV	59749	<i>Sylvia crassirostris</i>	Karin	23/05/1901		20
NHNV	59750	<i>Sylvia crassirostris</i>	Lošinj	04/05/1905		18
NHNV	12864	<i>Sylvia hortensis/ crassirostris</i>	Metković	14/07/1894	uncer- tain	20
NHNV	12863	<i>Sylvia hortensis/ crassirostris</i>	Dalmatien	07/1894	uncer- tain	18.5
NHNV	12865	<i>Sylvia hortensis/ crassirostris</i>	Opuzen	29/05/1894	uncer- tain	18.5
NHNV	270	<i>Sylvia crassirostris</i>	Split			19