NAT. CROAT. | VOL. 9 | No 3 | 169–177 | ZAGREB | September 30, 2000

ISSN 1330-0520
UDK 598.842:581.35(497.5)

original scientific paper / izvorni znanstveni rad

HABITAT CHARACTERISTICS AND THE IMPORTANCE OF SOME PLANT SPECIES AS SINGING PLACES FOR MARSH WARBLERS *(ACROCEPHALUS PALUSTRIS, AVES)* IN CROATIAN NEOPHYTE STRUCTURES

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Lukač, G. & Vujčić-Karlo, S.: Habitat characteristics and the importance of some plant species as singing places for Marsh Warblers (*Acrocephalus palustris, Aves)* in Croatian neophyte structures. Nat. Croat., Vol. 9, No. 3., 169–177, 2000, Zagreb.

Over five years (1987–1991), 238 neophyte stands in north-west Croatia (190 ha) with a total of 390 Marsh Warbler (*Acrocephalus palustris)* territories were investigated during the nesting season. As neophyte vegetation consisting of *Solidago gigantea* and *Helianthus tuberosus* are predominantly present near streams in north-west Croatia, Marsh Warblers usually choose these plant communities for nesting. The nest usually can be found near higher plants like bushes, solitary two-year old and perennial plants, which males also use as singing places. The main woody plant species of these singing places were found to be *Salix alba, S. cinerea, S. purpurea, Alnus glutinosa* and others. Males also sing on old, withered previous year's herbaceous plants distinguished by their greater height than the surrounding vegetation *(Solidago gigantea, Helianthus tuberosus, Urtica dioica, Artemisia vulgaris* etc.).

Key words: Marsh Warbler, singing place, woody plant species, herbaceous neophyte structures, habitat

Lukač, G. & Vujčić-Karlo, S.: Obilježja staništa i značaj pojedinih biljnih vrsta kao pjevališta trstenjaka mlakara (*Acrocephalus palustris, Aves*) u neofitskim sastojinama Hrvatske. Nat. Croat., Vol. 9, No. 3., 169–177, 2000, Zagreb.

Tijekom pet godina (1987–1991) istraženo je u sezoni gniježđenja 238 neofitskih sastojina i 390 teritorija trstenjaka mlakara (*Acrocephalus palustris*) na četiri lokaliteta u kontinentalnim područjima Hrvatske. Ukupno je istraženo 190 ha sastojina neofita. Uz riječne obale sjeverne Hrvatske, ta ptica je zabilježena najvećim dijelom u neofitskim sastojinama vrsta *Solidago gigantea* i *Helianthus tuberosus* u kojima i gnijezdi. Teritorij raspjevanih mužjaka obično je smješten u blizini grmova ili

niskog drveća vrsta *Salix alba, S. cinerea, S. purpurea, Alnus glutinosa* koje mužjaci koriste kao pjevališta. U prilogu se prikazuje uloga i značaj pjevališta pri odabiru biljnih sastojina *(Solidago gigantea, Helianthus tuberosus, Urtica dioica, Artemisia vulgaris* i dr.) tijekom sezone gniježđenja.

Ključne riječi: trstenjak mlakar, pjevališta, odabir biljnih sastojina, drvenaste i zeljaste biljne vrste, neofitske sastojine, habitat

INTRODUCTION

The Marsh Warbler is a bird that nests in the higher vegetation of *Urtica dioica, Solidago gigantea, Helianthus tuberosus, Lysimachia* sp., *Epilobium* sp., *Filipendula* sp., *Salix viminalis, Rosa* sp., *Prunus padus, Alnus glutinosa* etc. (LEISLER, 1977; SCHULZE–HAGEN, 1983; 1984a; ERLINGER, 1987; LUKAČ, 1988; CRAMP; 1992). In addition, the species uses higher plants as singing places and for propagating its territory. It has been proposed by JILKA & LEISLER (1974) that the choice of singing places is also used by females for mate selection. In other species of the genus *Acrocephalus* and *Locustella* higher vegetation structures are used as observation posts and feeding places, especially if they are situated in shrubby vegetation and lower trees (CATCHPOLE, 1974; DOWSETT-LEMAIRE, 1978; LEISLER, 1981; SCHULZE-HAGEN, 1983; 1984a; 1984b; MAYR, 1984; CODY, 1985). SCHULZE-HAGEN (1984a) states that the most frequently used singing places by Marsh Warblers are *Salix alba, Sambucus nigra, Polygonum cuspidatum, Cirsium arvense, C. vulgare* and *Petasites hybridus.* The species usually prefers young, woody or bushy plants. In habitats where bushes and trees are sparse or absent the males use herbaceous, old or withered plants that overtop surrounding structures.

This paper describes the vegetation types used for nesting by the Marsh Warbler in NW Croatia as well as the height from which males sing and the number of plant species that male Marsh Warblers use for singing.

MATERIALS AND METHODS

The singing places of males were systematically searched in neophyte vegetation along water courses on a total area of 190 ha around streams north-western Croatia and parts of the Lonja river (Fig. 1). For the plant communities where singing males were noticed, all the plant species were determined. Plant species were determined in the Department of Botany, Faculty of Science, University of Zagreb. The scientific names were adopted according to the FLORA EUROPAEA I–V (1964–1980).

The height of the plant above ground on which males were found singing (singing place) was measured. We took over 1000 data where males were found singing. The birds were observed with binoculars (8x30) twice during the day (early in the morning or in afternoon) from their arrival in spring from the first decade of May onwards to 5th July, the period of most intensive male song.

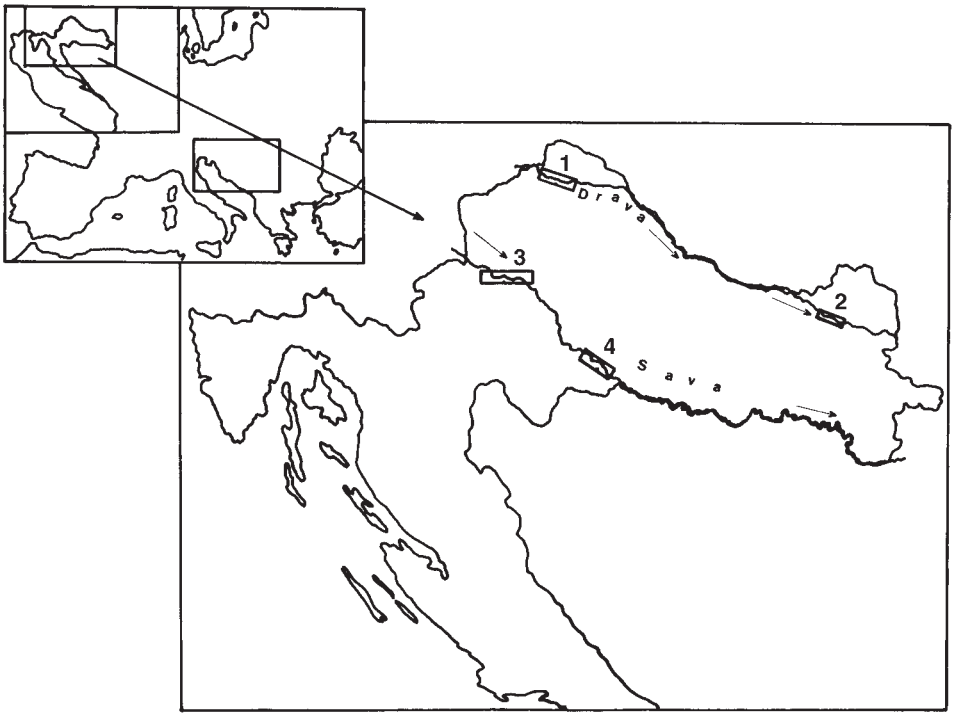

Fig. 1. The investigated area in Croatia.
1 – Drava River near Varaždin, 2 – Drava River near Osijek
3 – Sava River near Zagreb, 4 – Sava River near Lonjsko polje

RESULTS

All investigated neophyte stands beside the streams of north-western Croatia, along roads, the margins of woods, in clearings and in cultivated fields were grouped into 8 types of stands in which Marsh Warblers could be found. Field investigations were carried out from 1987 to 1991 during which 238 neophyte stands with 390 Marsh Warbler's territories were investigated. For singing, the males used different plant species (Tab. 1).

1. Goldenrod stands *(Solidago gigantea)* are the most frequent type beside streams in north-western Croatia (LUKAČ, 1988). The Marsh Warbler was found in 52 out of 100 investigated stands. The mean number of singing males per 10 ha is highest in this vegetation type and in nettle vegetation. Marsh Warbler nesting was also registered in vegetation of the related species *Solidago canadensis*. The number of plant species used as singing places is highest in Goldenrod vegetation (n=17). This is a function of the rich floristic composition of this vegetation type. The height of singing places in Goldenrod ranges between 1.0–5.5. m (Fig. 2).

Tab. 1. Types of Marsh Warblers stands in NW Croatia.

Plant stands	Number of plant stands with Marsh Warbler	Number of plant stands without Marsh Warbler	Total number of stands investigated	Size of stands (ha) investigated	Number of males per 10 ha	Total numbers of males
1. Goldenrod	52	48	100	80	32	258
2. Jerusalem artichoke	33	30	63	40	16	63
3. Nettle	8	2	10	10	45	45
4. Mixed stands	5	10	15	10	12	12
5. Amorph stands	3	7	10	10	2	2
6. Wormwood	1	19	20	10	1	1
7. Elder tree	1	9	10	10	1	1
8. Cultivated stands	2	8	10	20	1	8
Total	105	133	238	190	110	390

2. Jerusalem artichoke stands *(Helianthus tuberosus)* are most frequent along the Sava River (LUKAČ, 1988). The Marsh Warbler was found in 33 of 63 investigated stands of this type. Jerusalem artichoke vegetation was described as a nesting place for the species by SCHULZE-HAGEN (1984a, b). The number of plant species used for singing places is slightly smaller (n=11) than in Goldenrod stands. The heights of singing places are from 0.5 to 5.0 metres (Fig. 2).

3. Nettle stands *(Urtica dioica)* are described as the most important nesting place of the Marsh Warbler in Central Europe (FRANZ, 1981; BEZZEL, 1982; SCHULZE-HAGEN, 1983; 1984a; 1984b). Along the streams of Croatia, in the territories researched, *U. dioica* is present only sporadically and in very small quantities. So Marsh Warblers were found in only a few locations (8 out of 10 investigated) of pure nettle stands. The number of plant species used for singing in nettle is small, while the height at which the males sing ranges between 1.5–6 metres (Fig. 2).

4. Mixed vegetation consists of neophyte species in different associations (*S. gigantea* and *Amorpha fruticosa*, *Erigeron annuus* and *A. fruticosa*, *H. tuberosus* and *S. gigantea*, *S. gigantea* and *H. tuberosus*). A smaller number (n=8) of such structures was found. The number of plant species used for singing is somewhat greater. The heights of singing places range from 1–4 m.

5. Amorpha vegetation *(Amorpha fruticosa)* grows in large numbers along the tributaries of the Sava River in the Jasenovac area. In pure stands of *A. fruticosa*, only three Marsh Warblers were found. The number of plant species used for singing is small. The heights at which the males sing range from 1–3 m.

6. Wormwood vegetation *(Artemisia vulgaris, A. verlotiorum)* is frequent on the ruderal ground near towns. Marsh Warblers could be registered in only one plot of 10 investigated (Tab. 1). Only two plant species were used as singing places.

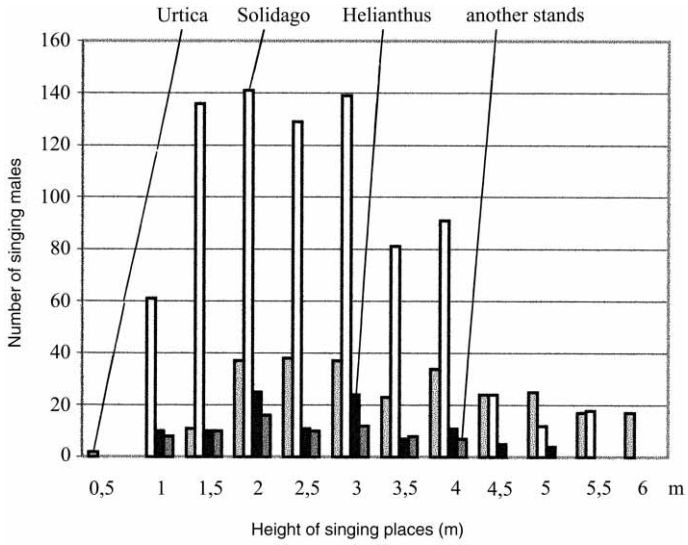

Fig. 2. The height of singing places of Marsh Warblers in different plant stands in NW Croatia.

7. Elder tree vegetation *(Sambucus ebulus)* is also frequent on ruderal grounds near towns. Marsh Warblers were found in only one plot of 10 investigated. Only two plant species used as singing places could be determined.

8. Cultivated fields of mustard *(Sinapis arvensis)* and cabbage (*Brassica napus*) are frequent along the Zagreb-Slavonski Brod highway. Two males were registered in a mustard field singing at 1–1.5 m above ground. The nesting in this vegetation was not determined. In one cabbage structure 6 singing males were registered, but nesting could not be proved. The number of plants used as singing places is small in the monocultural stands of cultivated fields.

According to the data presented two large groups of plants used as singing places can be distinguished: (1.) woody plants of young trees and bushes (12 species: *Salix alba, S. purpurea, S. cinerea, S. caprea, Alnus glutinosa, A. incana, Cornus sanguinea, Robinia pseudacacia, Populus nigra, P. tremula, Amorpha fruticosa, Sambucus nigra)* and (2.) herbaceous plants (15 species: *Solidago gigantea, S. canadensis, Helianthus tuberosus, Artemisia vulgaris, A. verlotiorum, Urtica dioica, Erigeron anuus, Sinapis arvensis, Phragmites australis, Brassica napus, B. nigra, Anthriscus sylvestris, Sambucus ebulus, Rumex crispus, Sisymbrium strictissimum)* (see Fig. 3).

The height of singing places in stands of *Urtica dioica, Solidago gigantea* and *Helianthus tuberosus* is shown in Fig. 2. The most frequent height used for singing by males lies between 1.5 and 4 m (Fig. 2). The importance of several families of woody and herbaceous plant species used as singing places is shown in Fig. 3.

An analysis of the pollinating mechanism of plants used as singing places shows that ambophilous species usually predominated over anemophilous and entomo-

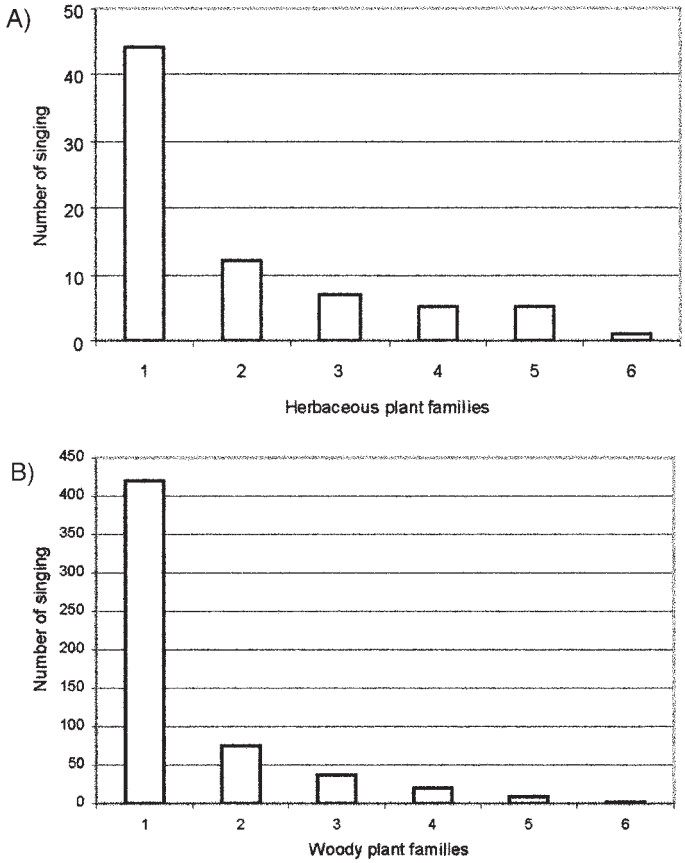

Fig. 3. Herbaceous (A) and woody (B) plant families used as singing places by Marsh Warblers (number of species per family).

A) **Herbaceous**

1 – *Compositae* - 62
2 – *Brassicaceae* - 15
3 – *Urticaceae* - 8
4 – *Poaceae* - 7
5 – *Apiaceae* - 7
6 – *Amaranthaceae* - *1*

B) **Woody**

1 – *Salicaceae* - 76
2 – herbaceous plants - 13
3 – *Cornaceae* - 7
4 – *Fabaceae* - 2
5 – *Betulaceae* - 1
6 – *Caprifoliaceae* - 0,5

philous species (Fig. 4). Phenological characteristics of woody plant species used as singing posts show that most of the woody plant species used as singing places flower before the arrival of Marsh Warblers from their wintering grounds. Herbaceous forms of vegetation mostly flower during the nesting season.

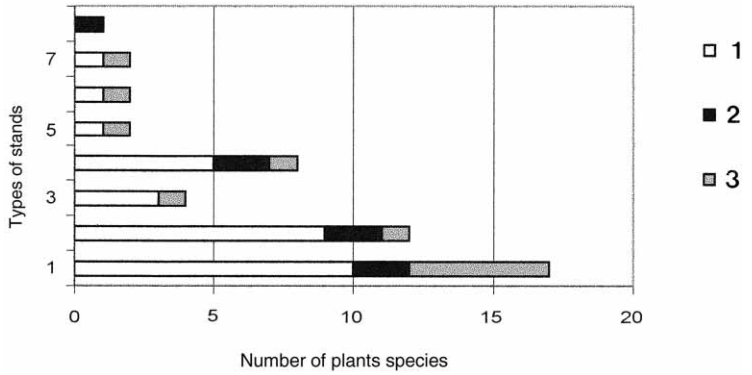

Fig. 4. The proportion of plant species used by Marsh Warblers as singing places according to their pollination mechanism.
1 – ambophilous, 2 – anemophilous, 3 – entomophilous

DISCUSSION

The selection of nesting sites by Marsh Warblers has been considerably discussed in literature (CATCHPOLE, 1974; JILKA & LEISLER, 1974; FRANZ, 1981; LEISLER, 1981; SCHULZE-HAGEN, 1983; 1984a; 1984b; LEY, 1988). Here the selection of plant species used as singing places is analysed. In north-western Croatia males of *Acrocephalus palustris* were found in 8 different types of vegetation in a total of 105 stands of the vegetation investigated. The highest numbers of singing males per 10 ha were found in Nettle stands *(U. dioica)*, Goldenrod (*S. gigantea*) and Jerusalem artichoke (*H. tuberosus*). Nettle, Goldenrod and Jerusalem artichoke are distributed through the whole of Europe (GUZIKOWA & MAYCOOK, 1986) so Marsh Warblers find many opportunities for nesting in this vegetation. The preference for this vegetation type is probably caused by the alimentary and structural characteristics of the plants, although neophyte vegetation with *S. gigantea* and *H. tuberosus*, and sporadically mixed vegetation, is the most frequent vegetation type in the investigated area. The height of singing places used in different vegetation types shows a different trend (Fig. 2). The highest numbers of different plant species used as singing places were registered in Goldenrod, Jerusalem artichoke and Nettle vegetation.

Woody forms of vegetation (trees and bushes) are frequently present in singing places, while herbaceous plants generally occur in smaller quantities (Fig. 3, 4; cf. SCHULZE-HAGEN, 1991; STELTE & SOSSINKA, 1996). Trees and bushes in the nesting territories are frequently higher than the surrounding vegetation that the birds prefer for nesting. Males normally sing in the higher structures for a better view of the territory, for attracting females and may be also for better song propagation in higher vegetation (intraspecific territoriality; CATCHPOLE, 1974; CATCHPOLE & LEISLER, 1986). In the bushes and lower trees the male is also hardly visible and better hidden from potential predators. Higher types of vegetation can often be used for orientation for finding and settling down on nests.

The most frequent woody plants used for singing belong to the family *Salicaceae* especially *Salix alba*. This species of willow is widely distributed in the researched structures, which is why the Marsh Warbler uses it for singing most frequently. Possibly birds also use its ramifications for catching various insects. STRONG (1974) found 266 species of insects that visit willows of the genus *Salix* in contrast to 90 species using plants of the genus *Alnus* in Great Britain.

CONCLUSION

The males were registered while singing on 12 woody and 15 herbaceous plant species. Among woody species, the most frequently chosen for singing was *Salix alba*. This is usually the most abundant species on the riverbanks of Croatia. The most common herbaceous species are *Solidago gigantea* and *Helianthus tuberosus.*

The advantages of willows as singing places are discussed. The most frequent height of male singing places in the area researched is in the range between 1–4 metres. The lowest height of singing place in nesting structures was registered at 0.5 metres, and the greatest at 6 metres (in Nettle vegetation).

Received October 15, 1999

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SAŽETAK

Obilježja staništa i značaj pojedinih biljnih vrsta kao pjevališta trstenjaka mlakara (*Acrocephalus palustris – Aves*) u neofitskim sastojinama Hrvatske

G. Lukač & S. Vujčić-Karlo

Trstenjak mlakar (*Acrocephalus palustris*) je tijekom pet godišnjih istraživanja (1987–1991) zabilježen u 105 neofitskih sastojina od ukupno istraženih 238, odnosno u 8 tipova sastojina kontinentalnih dijelova Hrvatske. Mužjaci uglavnom u neofitskim sastojinama kao pjevališta odabiru drvenaste biljne vrste (grmlje i nisko drveće). Pri tome je zabilježen pjev mužjaka na 12 vrsta. Od zeljastih biljnih vrsta mužjaci su promatrani na 15 vrsta biljaka koje su koristili kao pjevališta. Za čitavo razdoblje istraživanja mužjaci su koristili 27 biljnih vrsta – pjevališta.

Od drvenastih vrsta najčešće je kao pjevalište korištena vrba (*Salix alba*). Razlog tome je i u njenoj najčešćoj rasprostranjenosti u neofitskim sastojinama riječnih obala kontinentalne Hrvatske, a nikako u sklonosti trstenjaka prema toj vrsti. Od zeljastih biljaka mužjaci najčešće koriste čičoku (*Helianthus tuberosus*) i zlatnicu (*Solidago gigantea*). Visina pjevališta na istraženim lokalitetima Hrvatske se kreće u rasponu od 2–4 m. Najniža visina je zabilježena na 0,5, a najviša na 6 m.