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COMPARISON OF THE AUTUMN MIGRATION DYNAMICS OF FIVE REED WARBLERS IN A SOUTH HUNGARIAN REED BED

József Gyurácz – László Bank

Abstract

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This paper analyses the annual variation in the number of Savi's Warbler (*Locustella luscinioides*), Great Reed Warbler (*Acrocephalus arundinaceus*), Reed Warbler (*A. scirpaceus*), Sedge Warbler (*A. schoenobaenus*) and Marsh Warbler (*A. palustris*), caught during the autumn migration periods between 1983–1997. The study was carried out at the Sumony Bird Observatory (Lake Sumony: 45°58' N, 17°56' E) where a large reed bed is situated around a fishpond. In total, 1564 Savi's Warblers, 2983 Great Reed Wrablers, 9 805 Reed Warblers, 12 652 Sedge Warblers and 1125 Marsh Warblers were netted and ringed during the fifteen study years. Significant trends were detected in case of three species: decreasing trend in population indices of Savi's Warbler, Sedge Warbler and Marsh Warbler from 1983 to 1991, and increasing trend in population indices of Savi's Warbler in 1991–1997 and Sedge Warbler between 1991–1998. Population changes of the different species were similar except for Great Reed Warbler. The majority of the species had the lowest population indices in the late 1980s and early 1990s. This may indicate the presence of a strong factor that simultaneously affected population levels of many insectivorous reed passerines save for Great Reed Warbler that may have been more resistant due to its bigger body mass.

Key words: population dynamics, migration, *Acrocephalus, Locustella*, Hungary.

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Introduction

Monitoring of population changes is very important for determining conservation priorities. Birds are particularly good subjects for population monitoring because they are sensitive indicators of habitat changes (*Furness et al., 1993*). Bird ringing and standardised mist-netting are invaluable techniques for measuring changes for bird populations in numerous European bird monitoring projects (*Jenni et al., 1994*). The Acrocephalus Project of EURING (*European Union for Bird Ringing*) was started in 1981. *BirdLife Hungary* joined this international research program, which started to assess the breeding areas, population dynamics, migratory routes and stopover sites of different migrating populations of *Acrocephalus* warblers. This work is important to the research of alternative evolutionary strategies of related species as well as to practical nature *conservation (Koskimies & Saurola, 1985, Gyurácz & Csörgő, 1994*).

Many species of trans-Saharan migrant passerines are currently undergoing rapid decline (*Tucker & Heath, 1994*). Some analyses have shown that breeding population number change of birds were correlated positively with the amount rainfall in the preceding West African wet season, for instance Sedge Warbler (*Acrocephalus schoenobaenus*) (*Peach & Baillie, 1991*) and Sand Martin (*Riparia riparia*) (*Szép, 1993*). As populations which breed in the north-western part of Europe have no direct contact with those of North-East and Central Europe, any statement in connection with these populations may only be regarded as a basis of comparison. Hungarian important bird areas (IBAs) – designated by *BirdLife Hungary* – are predominantly wetlands. The size of these territories has decreased during the last decades and conditions have also deteriorated. The changes which have occurred in the structure and sources are indicated by the alterations of the number of breeding bird populations or populations which take nourishment in this territory during migration (*Greenwood et al., 1993*). Those Sedge Warblers that are netted in southern Hungarian reed beds during the autumn migration breed in southern Scandinavia and the Baltic area (*Gyurácz & Bank, 1995*).

This paper analyses the annual variation in the number of Savi's Warbler (*Locustella luscinioides*), Great Reed Warbler (*A. arundinaceus*), Reed Warbler (*A. scirpaceus*), Sedge Warbler and Marsh Warbler (*A. palustris*), netted in the autumn migration in period 1983–1997.

Methods

The study was carried out at Sumony Bird Observatory (Lake Sumony: 45°58'N, 17°56'E) situated near a large reed bed surrounding a fishpond. *Scirpeto-Phragmitetum* with *Thypha* is the dominant plant association. The data were collected during post-breeding and autumn migration, from 1983 to 1998 (31 July – 28 Aug, 1983; 28 July – 26 Aug, 1984; 27 July – 25 Aug, 1985; 27 July – 31 Aug, 1986; 27 July – 30 Aug, 1987; 31 July – 4 September, 1988; 30 July – 10 September, 1989; 28 July – 9 September, 1990; 27 July – 8 September, 1991; 26 July – 13 September, 1992; 17 July – 19 September, 1993; 16 July – 17 September, 1994; 17 July – 17 September, 1995; 14 July – 22 September, 1996; 13 July – 21 September, 1997; 12 July – 20 September, 1998). The birds were caught in the reed bed, using 18 12-metres-long mist-nets with four 50 cm high shelves each (mounted with a clearance of 20-30 cm between the water level and the first shelf). Four lines of mist-nets were on a raised path in a homogenous area of *Phragmitetum*. All birds were ringed, sexed and aged according to *Svensson* (*1984*).

The captures were standardised to average number of birds caught by a net surface of 900 m^2 within 100 hours. The averaged numbers of individuals were used when calculating the population indices ("chain" index) (*Greenwood et al., 1993*):

$$I_X = \frac{N_X}{N_{X-1}} \times I_{X-1}$$

where I_x is the chain index of the specific year, I_{x-1} is the chain index of the previous year, N_x is the number of birds captured on 900 m^2 in 100 hours in year. N_{x-1} is the number on

900 m^2 in 100 hours in previous year. Annual changes of index rates were compared to each other in two consecutive years (χ^2-test). The trend in population indices was checked by linear or exponential regression. *Spearman* rank correlation was used to test the relationship between index changes of different species. The statistical analyses were computed with help of the STATGRAF and EXCEL 97 program packages.

Results

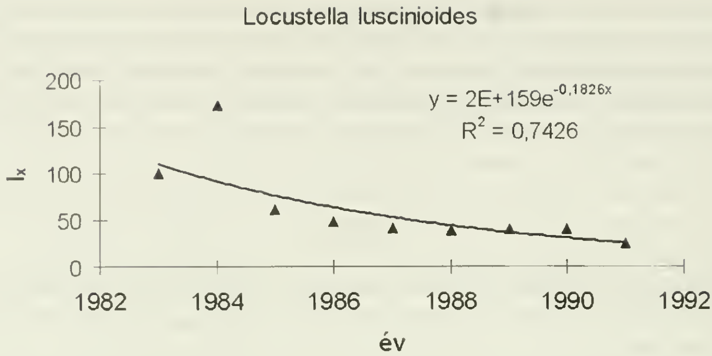
In total, 1564 Savi's Warblers, 2983 Great Reed Wrablers, 9 805 Reed Warblers, 12 652 Sedge Warblers and 1 125 Marsh Warblers were captured and ringed during the fifteen study years.

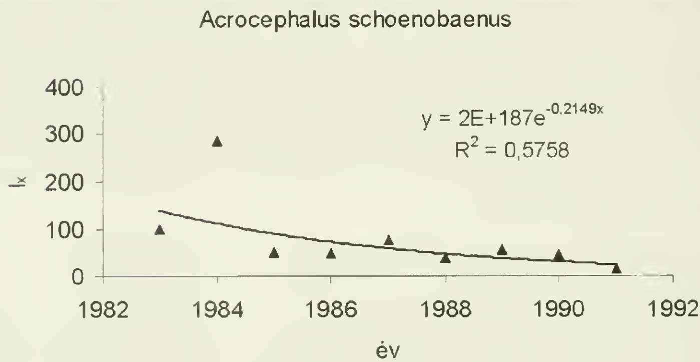
The increase was regarded as significant for the following species and in the following years: Savi's Warbler in 1983–1984 (χ^2=9.31, p<0.01) and 1992–1993 (χ^2=11.05, p<0.01), Great Reed Warbler in 1988–1989 (χ^2=5.18, p<0.05), 1993–1994 (χ^2=6.3, p<0.05), 1994–1995 (χ^2=8.01, p<0.01) and 1996–1997 (χ=4.75, p<0.05), Reed Warbler in 1983–1984 (χ2=45.7, p<0.01) and 1988–1989 (χ2=4.09, p<0.05), Sedge Warbler in 1983–1984 (χ^2=44.26, p<0.01), 1993–1994 (χ^2=6.61, p<0.05) and 1994–1995 (χ^2=14.4, p<0.01), Marsh Warbler in 1983–1984 (χ^2=5.86, p<0.05), 1993–1994 (χ^2=10.65, p<0.01) and 1996–1997 (χ^2=5.55, p<0.05) (Table 1, Fig. 1).

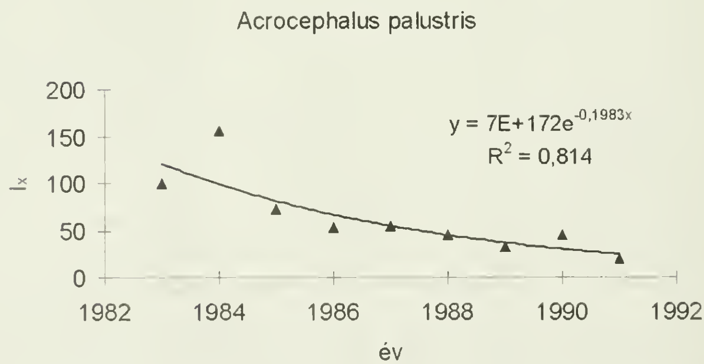
Year	*L. luscinioides*	*A. arundinaceus*	*A. scirpaceus*	*A. schoenobaenus*	*A. palustris*
1983	14.4	13.1	56.2	84.3	12.7
1984	24.8	16.0	163.0	240.0	19.8
1985	8.8	16.6	49.7	42.6	9.3
1986	6.9	23.0	52.0	41.8	6.8
1987	5.9	29.3	39.5	64.7	6.9
1988	5.5	14.0	25.6	31.8	5.8
1989	5.8	21.0	44.1	46.3	4.2
1990	5.8	13.0	31.5	37.1	5.9
1991	3.6	10.1	33.5	13.9	2.5
1992	2.5	13.2	36.3	30.0	3.2
1993	8.6	9.7	47.3	28.3	1.6
1994	7.4	13.6	58.0	60.8	6.4
1995	11.8	21.6	74.6	130.0	6.7
1996	7.3	10.6	41.7	72.3	3.4
1997	9.9	14.2	43.5	80.3	6.0
1998	6.1	10.5	42.8	53.6	5.1

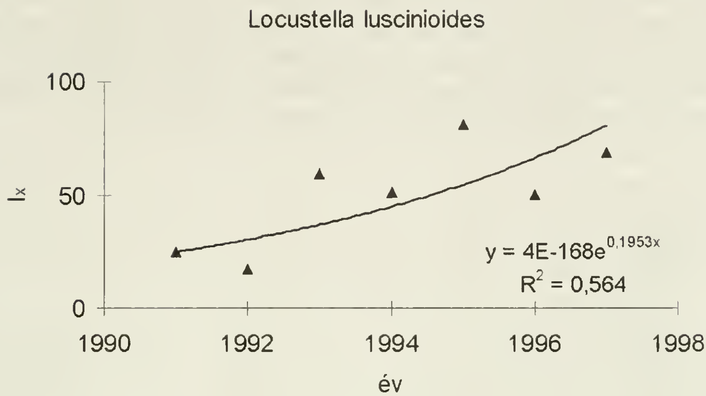
Table 1. Number of birds caught from 1983 to 1998. averaged for a net surface of 900 m^2 and 100 hours of netting time.

1. táblázat. A megfogott madarak mennyisége 900 m^2 hálófelületre, illetve 100 óra fogási időre vetítve 1983 és 1998 között.


Locustella luscinioides
y = 2E+159e^-0,1826x
R^2 = 0,7426
lx
200
150
100
50
0
1982
1984
1986
1988
1990
1992
év


Acrocephalus schoenobaenus
y = 2E+187e^-0.2149x
R^2 = 0,5758
lx
400
300
200
100
0
1982
1984
1986
1988
1990
1992
év


Acrocephalus palustris
y = 7E+172e^-0,1983x
R^2 = 0,814
lx
200
150
100
50
0
1982
1984
1986
1988
1990
1992
év



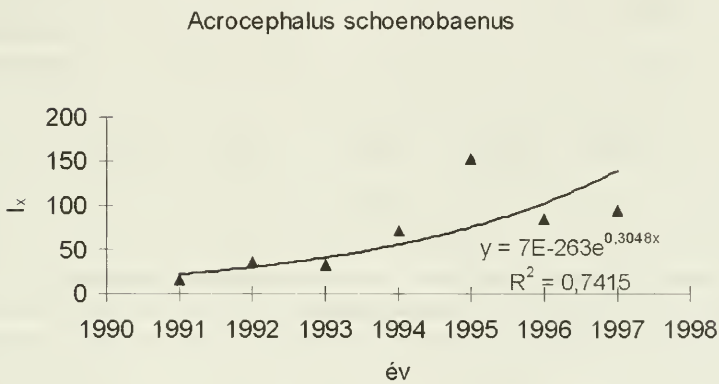


Figure 2. Trends in changes of population indices of *A. palustris* in 1983–1991 and for *L. luscinioides* and *A. schoenobaenus* between 1983–1991 and 1991–1997 (*év* means 'year').
2. ábra. Az *A. palustris* állományváltozási indexének változása 1983–1991 között, illetve a *L. luscinioides* és az *A. schoenobaenus* esetében 1983–1991, illetve 1991–1997 között.

A significant decline was detected for the following species and in the following years: Savi's Warbler in 1984–1985 (χ^2=29.9, p<0.01), 1995–1996 (χ^2=3.94, p<0.05) and 1997–1998 (χ^2=6.2, p<0.05), Great Reed Warbler in 1987–1988 (χ^2=21, p<0.01), 1989–1990 (χ^2=14.2, p<0.01), 1995–1996 (χ^2=17.7, p<0.01) and 1997–1998 (χ^2=5.1, p<0.05), Reed Warbler in 1984–1985 (χ^2=54.2, p<0.01) and 1995–1996 (χ^2=8.52, p<0.01), Sedge Warbler in 1984–1985 (χ^2=83, p<0.01), 1987–1988 (χ^2=6.98, p<0.01), 1990–1991 (χ^2=7.1, p<0.01), 1995–1996 (χ^2=9.95, p<0.01) and 1997–1998 (χ^2=6.12, p<0.05), Marsh Warbler in 1984–1985 (χ^2=15.27, p<0.01), 1990–1991 (χ^2=5.57, p<0.05) and 1995–1996 (χ^2=4.73, p<0.05) (Table 1., Fig. 1.).

Trends were statistically significant in the case of three species. The trend was decreasing in the population indices of Savi's Warbler, Sedge Warbler and Marsh Warbler from 1983 to 1991. The trend was increasing for the population indices of Savi's Warbler between 1991–1997 and for the Sedge Warbler between 1991–1998 (Fig. 2).

Tendencies for population changes were similar for different species except for Great Reed Warbler. The correlation coefficients are presented in Table 2.

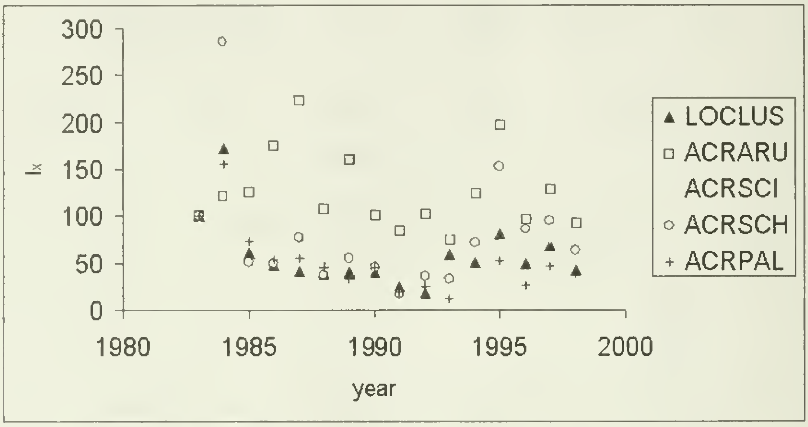


Figure 1. Changes of population indices of five species in 1983–1998 in Sumony.
1. ábra. Öt nádi énekesmadárfaj állományának változása 1983–1998 között Sumonyban.

Species	LOCLUS	ACRARU	ACRSCI	ACRSCH	ACRPAL
L. luscinioides	1.00	0.003	0.917*	0.922*	0.88*
A. arundinaceus		1.00	0.11	0.22	0.140
A. scirpaceus			1.00	0.937*	0.827*
A. schoenobaenus				1.00	0.825*
A. palustris					1.00

Table 2. Correlation coefficients between population change indices of the five species. *Statistically significant (p<0.01) values.
2. táblázat. Öt faj állományváltozási indexének korrelációs koefficiensei. * Szignifikáns értékek (P<0.01)

Discussion

The number of birds caught at stopover sites correlates with the total number of birds that can be observed at the same sites with different observation methods (*Taylor, 1984*) and this number mainly depends on the size of the population (*Hussel, 1991; Safriel & Lavee, 1991*). That is reason why the changes in the size of migrating populations can be used for monitoring, especially if we are familiar with the breeding and wintering sites of migrating population. *Hjort & Lindholm* (*1978*) proved that Wrens (*Troglodytes troglodytes*) and Whitethroats (*Sylvia communis*) ringed in autumn showed a dependency on weather conditions of the previous wintering season and there was an important connection between the weather conditions and the changes in their numbers. Changes in the number of Whitethroats were observed simultaneously in different parts of Europe.

The reason for the changes in the number of birds caught at stopover sites may be an alteration of migration strategy (*Langslow, 1978; Gatter & Steief, 1992*), or the succession of the actual habitat (*Karcza & Csörgő, 1994*). The winter survival rates of those Sedge Warblers breeding in Great Britain (*Peach at al., 1991*) and those Sand Martins breeding in East Hungary (*Szép, 1993*) mainly depend on the rainfall in the Southern Sahel. In years following severe African droughts fewer reed warblers were netted in Sumony than in years following normal rainfalls. Although the ringing figures include juveniles of the same year and also non-breeding adults, our data are in palrallel to population change trends of trans-Saharan migrants detected by other monitoring methods. The majority of the species had the lowest population indices in the late 80s and early 90s (*Bőhm & Szinai, 1993; Szép, 1993*). This may have been caused by a common factor that negatively affected population levels of many insectivorous wetland passerines. Great Reed Warblers may have been more resistant to this negative effect by their larger body mass.

We suppose that the reasons for a population decline in Eastern and Central Europe is similar to those in Western Europe. In these areas a decline in wetland habitats has occurred quite recently. This situation turned just more severe by droughty years in the late 1980s – early 1990s in Hungary.

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