SEASONAL PATTERN OF THE BLACKCAP (*SYLVIA ATRICAPILLA*) AUTUMN MIGRATION AT THE POLISH BALTIC COAST

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ABSTRACT

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The study is based on autumn catching results in years 1961-1990 at the three Operation Baltic bird ringing stations (Bukowo, Hel, Mierzeja Wiślana) localised at the Polish Baltic coast. The basic method used was catching birds in mist-nets. In the study pooled migration dynamics were compared between stations. Also the analyse of a wave structure of migration was conducted. The study was focused on the terms of passage and migration intensity of subsequent groups of Blackcaps. The wave pattern of migration with the similar terms of occurrence of waves and the significant increase of the number of birds caught in period 14–22 Sept. were considered as the main common features of the passage at all three stations. The difference in migration dynamics at the station Bukowo (localised at the western part of the Polish coast) from the other two stations was stated. It was connected with different terms of the main concentrations of the passage and higher number of waves defined, as compared with other stations.

The correspondence of the terms of migration at all stations was connected with passage of population probably of Scandinavian origin. The remarkable complication of the migration dynamics at station Bukowo was considered as the result of possible high proportion of the populations heading to south and south-south-west among the birds crossing the Baltic, which probably pass the other stations around. The differences in relative numbers of caught birds are probably the effect of the inland course of migration of the eastern populations.

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Key words: Blackcap, *Sylvia atricapilla*, autumn migration, southern Baltic, migration waves.

INTRODUCTION

In the literature the descriptions of migration dynamics of different bird species are frequent (e.g. Glück 1982, Bauer and Keiser 1991, Csörgo and Lövei 1995, Hudde and Vohwinkel 1997). For the very general migration characteristics the presentation of terms of beginning, end and the highest intensity of passage was sufficient (e.g. Csörgo and Lövei 1995). Sometimes in such presentations also the median value was given (e.g. Kasparek 1990, Bauer and Keiser 1991). More detailed approach requires the focus on the migration structure and can be based on the analyse of the phenomenon of occurring alternately increases and decreases of the bird numbers. They were defined as the migration waves and interpreted on different ways (Busse 1990). At the present stage of studies on bird migration we do not know the reasons of their formations sufficiently. Despite that, constancy of the waviness phenomenon in the many-year approach (Busse 1996) can be the basis for defining the groups of birds which differ probably in the origin or chosen migration routes (Remisiewicz and Baumanis 1996). According to that assumption,

the migration of several species, as Redstart *Phoenicurus phoenicurus* (Busse 1972), Meadow Pipit *Anthus pratensis* (Petryna 1976), Song Thrush *Turdus philomelos* (Maksalon 1983), through the Polish Baltic coast had been already analysed. However, a similar study on the Blackcap was so far lacking.

Populations of Blackcap from Northern and Central Europe migrate in autumn towards three main wintering areas (Busse 1986): South-Western Europe, Italy and the Balkans, and also further to Africa where they winter north and south to Sahara (Baker 1997). At the area localised along the 12°E meridian the division of migration directions chosen by European populations of Blackcap takes place (Zink 1973).

Especially interesting for studies on Blackcap migration is the area of the southern Baltic coast. Potentially, the migration flyways to the Scandinavian populations flying over the Baltic Sea and heading in southern and south-eastern directions (Klein *et al.* 1973) can meet here the migration routes of populations moving over inland. Blackcap is a species of interest for researchers also with respect to a very high percent of individuals choosing the migration direction opposite to the normal one (Berthold and Terril 1986, Busse 1992, Fransson and Stolt 1990).

The comprehensive study of the migration pattern of the species requires multilateral analyse, based also on the comparison of the data referring to the migration dynamics at different bird stations, biometric data and also use of the recoveries. In solving the problem of directions chosen by birds also the results of the orientation experiments can be helpful.

The aim of the paper is the general description of the autumn migration dynamics of Blackcap through the Polish Baltic coast. This may be the starting point for the further research on passage of this species.

MATERIALS AND METHODS

In the study I used autumn catching data from the three stations of the Operation Baltic, localised at the Polish coast (Fig. 1): Bukowo-Kopań (54°21'N,16°17'E / 54°28'N,16°25'E), Hel(54°21'N,16.17'E) and Mierzeja Wiślana (54°21'N,19°19'E). Station Bukowo-Kopań included two ringing points localised close to each other, for which the data were summed up. Further in the text for both of them one common name "Bukowo" is used. Fieldwork at stations Mierzeja Wiślana and Bukowo was conducted in years 1961-1990 and at Hel in 1961-1986, excluding year 1982.

Terms of the fieldwork in each year and the number of birds ringed are presented in Table 1. I established the standard period comparable for all stations at the term 30 Aug. – 21 Oct. The data from the stations of longer period of work – Bukowo and Mierzeja Wiślana I compared also in period 14 Aug. – 1 Nov. Additionally, for the comparative purpose, I also used the data from years 1994-1996 at Mierzeja Wiślana, when the fieldwork was started earlier – from 27 July.

Birds were caught using mist-nets of a stable number and placement throughout whole period of work. Catching was conducted constantly with controls of mist-nets performed

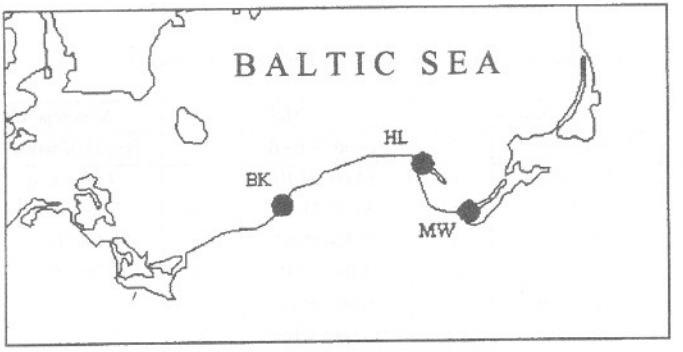

Fig. 1. Localisation of the stations at the Polish Baltic coast. BK – Bukowo, HL – Hel, MW – Mierzeja Wiślana

every hour from dawn to dusk. In details the methods of work of the Operation Baltic were described in paper of Busse and Kania (1970).

Regarding different length of catching period in subsequent years, I found the index of number of caught birds for each day in the season. I calculated it by summing up the data from all years and dividing the result by the number of years in which the fieldwork was conducted in that date. With this approach the years with the most numerous migration affect remarkably the general pattern of the migration dynamics. To make the result independent from this effect and to give the same weight to the data from each year I applied the second method of their presentation. For each year I recalculated the data from subsequent days on percent values in relation to the average daily number of birds caught in a given season at the station. Similarly as in the previous case, also this time on the basis of the transformed data I calculated the indices of numbers for each day of the study period.

To obtain the general pattern of the migration dynamics I smoothed the resulted distribution of the above indices (further in the text described as pooled migration dynamics) twice, applying the method described by Busse (1996). I used the normal distribution coefficients, according to the formula:

$$C = 0.06a + 0.24b + 0.4c + 0.24d + 0.06e$$

where:
a, b, c, d, e – indices of number for the subsequent days,
C – smoothed value for the day "c".

To distinguish between smoothed and non-smoothed data, the latter are called in paper as "raw data".

Table 1

Periods of work of the stations and numbers of caught birds

	Bukowo		Hel		Mierzeja Wiślana	
Years	Period of work	N	Period of work	N	Period of work	N
1961	14.09-15.10	17	14.09-14.10	16	14.09-13.10	1
1962	9.09-14.10	47	30.08-31.10	114	21.08-1.10	46
1963	6.09-16.10	108	31.08-16.10	55	10.08-30.10	59
1964	3.09-15.10	175	5.09-22.10	79	17.08-25.10	96
1965	7.09-15.10	89	6.09-15.10	91	17.08-25.10	91
1966	5.09-14.10	76	3.09-15.10	50	17.08-26.10	41
1967	16.08-26.10	172	6.09-13.10	81	17.08-27.10	103
1968	16.08-25.10	239	5.09-16.10	96	17.08-25.10	115
1969	17.08-25.10	172	4.09-15.10	37	17.08-25.10	159
1970	5.09-11.10	102	6.09-30.09	28	16.08-1.11	192
1971	17.08-22.10	93	6.09-15.10	47	17.08-1.11	142
1972	14.08-28.10	82	3.09-17.10	17	14.08-1.11	99
1973	14.08-28.10	124	3.09-17.10	42	14.08-1.11	153
1974	14.08-27.10	209	2.09-17.10	78	14.08-1.11	193
1975	16.08-27.10	130	15.09-17.10	38	15.08-1.11	154
1976	14.08-1.11	70	1.09-18.10	17	14.08-1.11	113
1977	14.08-1.11	146	13.09-18.10	44	16.08-1.11	108
1978	14.08-1.11	120	2.09-17.10	69	14.08-1.11	112
1979	16.08-1.11	56	3.09-17.10	20	14.08-1.11	71
1980	14.08-1.11	64	2.09-17.10	39	14.08-1.11	147
1981	14.08-1.11	178	2.09-17.10	17	14.08-1.11	159
1982	14.08-1.11	56	–	–	14.08-1.11	130
1983	14.08-1.11	120	1.09-17.10	24	14.08-1.11	63
1984	14.08-1.11	189	1.09-17.10	28	14.08-1.11	11
1985	14.08-1.11	162	2.09-17.10	11	14.08-1.11	96
1986	14.08-1.11	42	2.09-19.10	5	14.08-1.11	164
1987	14.08-1.11	39	–	–	14.08-1.11	66
1988	14.08-1.11	21	–	–	14.08-1.11	30
1989	14.08-1.11	18	–	–	14.08-1.11	130
1990	14.08-1.11	118	–	–	14.08-1.11	102
1994					8.08-31.10	107
1995					29.07-2.11	228
1996					28.07-18.10	226

Considering a very similar course of the migration dynamics curves drawn on the basis of the data recalculated on two ways (Figs. 2, 3) I based the main part of the analyse on the percent data as the more objective one.

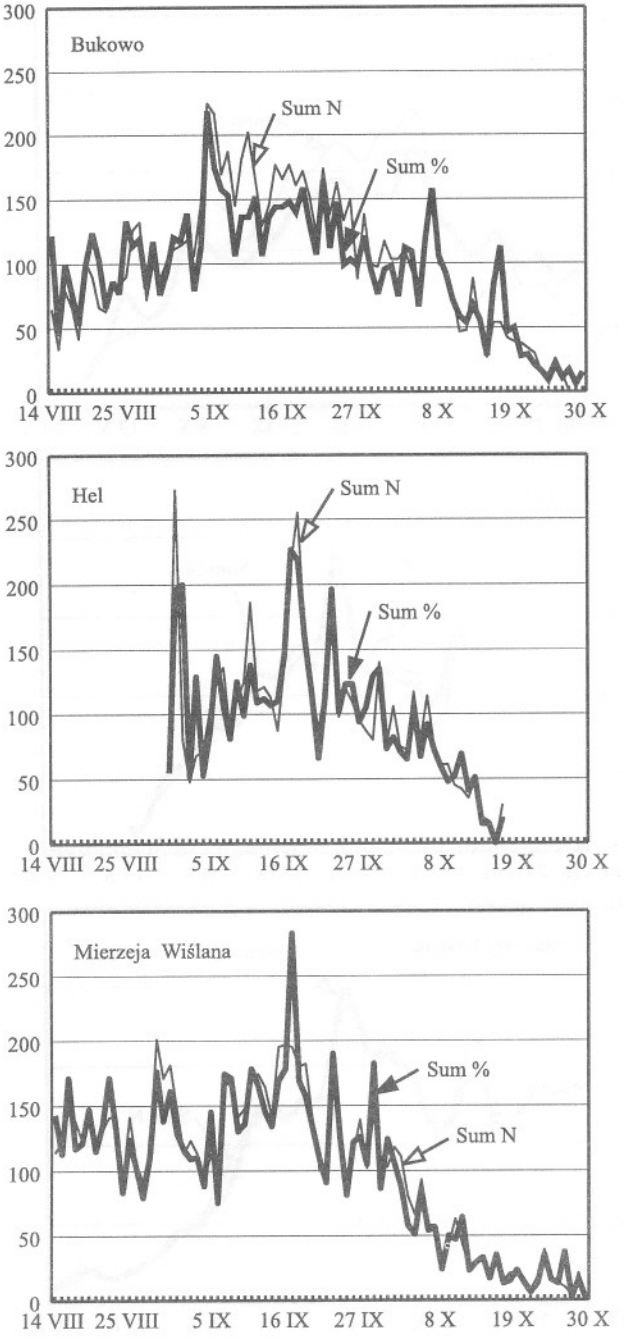

Fig. 2. Comparison of the two methods of presentation of migration dynamics – raw data. Sum N – pooled source data, Sum% – pooled percent data.

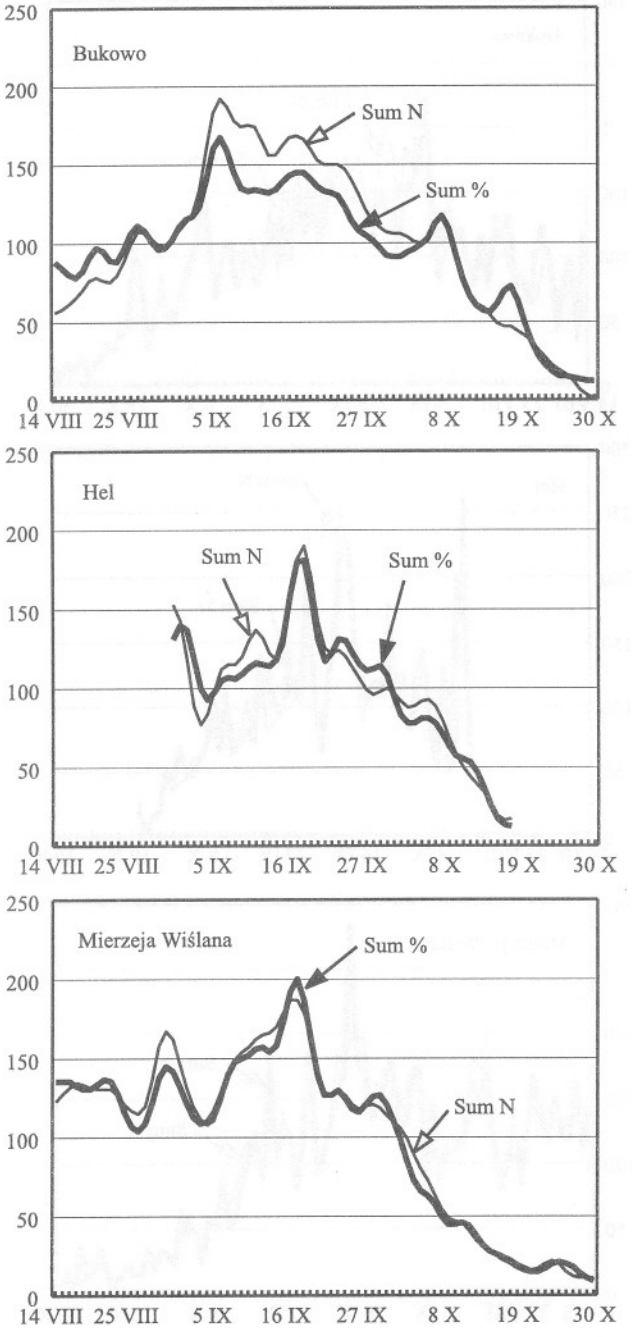

Fig. 3. Comparison of the two methods of presentation of migration dynamics – smoothed. Sum N – pooled source data, Sum% – pooled percent data.

For the analyse of the migration pattern at three stations I used the method described by Busse (1996). The first stage was the definition of terms of migration peaks of the subsequent waves occurrence by: (1) pointing out all maximas at the pooled smoothed curves of migration dynamics both from source data and percent one. (2) The procedure was repeated afterwards for each year for the source and percent data. The number of peaks falling in a given day of the study period throughout all years I divided by the number of years in which the fieldwork was done in that day. The results obtained on this way I smoothed twice and on that basis I defined days in which the migration peaks fell the most frequently. According to the terms defined with all described methods I calculated mean days of migration peaks. (3) The procedure described in points (1) and (2) I repeated for days of the lowest intensity of passage, defining on that way the border days between subsequent waves. I used them to divide the study period into fragments corresponding theoretically to the terms of passage of subsequent waves (see Fig. 5). By two-time smoothing the data from these fragments I reconstructed the hypothetical curves of migration for each wave. On this way I obtained several distributions similar to the normal curve (see Fig. 6). The data from border days I divided by two and used during the reconstruction of the migration curve of both neighbouring waves.

RESULTS

The distribution of the raw and smoothed twice pooled data – from the three stations I compared in pairs using the Chi-square test (Table 2). The comparison was conducted within the accepted standard period. The migration dynamics at stations Bukowo and Mierzeja Wiślana I compared additionally in longer period. Because of the high sensitivity of the test I obtained high values of the χ^2 coefficient, especially for the raw data. However, I used the value of χ^2 divided by the number of days in compared periods for the graduation of differences between the distributions. The lowest differences were between the migration dynamics at stations Hel and Mierzeja Wiślana, the highest – between Bukowo and Mierzeja Wiślana. Extending the comparison on the whole period of work for the two latter stations resulted in a slight increase of the value of the index for the smoothed data.

Table 2

Differentiation of the seasonal migration dynamics at the birds stations, expressed as values of χ^2 divided by the number of days of the standard period. ()* – values for full period of work of the stations.

Stations	Bukowo	Hel	Mierzeja Wiślana	
Bukowo	x	11,4	10.9 (10.8)*	Raw
Hel	4,4	x	8,2	data
Mierzeja Wiślana	5.6 (5.8)*	1,8	x	
	Smoothed data			N =50 (79)*

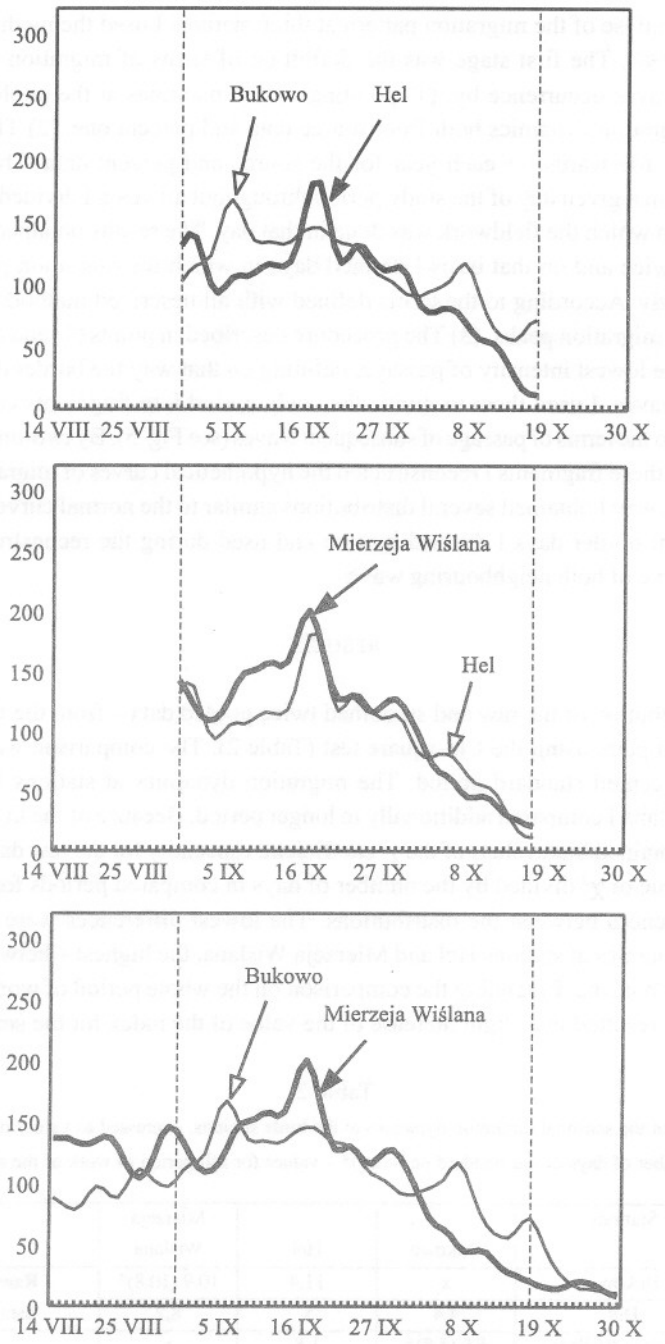

Fig. 4. Comparison of migration dynamics at the stations. Vertical dashed lines mark the standard period of work.

A comparison of the smoothed pooled percent curves for the pairs of stations is illustrated at Figure 4. The migration dynamics at Hel was different from the one at station Bukowo in highest numbers reached at the beginning of the season and in remarkable displacement (12 days) of the mean migration peak. In addition, the distinct peak after 3 Oct. occurring at Bukowo was lacking at Hel.

The differences in course of migration dynamics between stations Mierzeja Wiślana and Bukowo were more pronounced. Higher numbers at Mierzeja Wiślana at the beginning of season of work remained for about 12 days. The displacement of the mean migration peak at Mierzeja Wiślana was distinctive similarly as in the case of Hel. It fell in 11 days later than at station Bukowo. In the closing period of the fieldwork the intensity of migration at Mierzeja Wiślana decreased uniformly reaching very low values. At Bukowo two remarkable peaks occurred in that time.

Comparison of the migration dynamics for Mierzeja Wiślana and Hel allowed to notice their considerable similarity disturbed only by a slight displacement of the terms of peaks (maximally 3 days) and by some differences in numbers of caught birds.

Analyse of the wave structure of migration

The result of division of the passage on a hypothetical waves according to the described method (Busse 1996) is illustrated by Figure 5. The defined border days and dates of peaks of the subsequent waves are presented in Tables 3 and 4.

Table 3

Dates of peaks of waves and groups

	Bukowo		Hel		Mierzeja Wiślana	
Groups	Waves	Peaks	Waves	Peaks	Waves	Peaks
1	I				I	16 Aug.
	II	20 Aug.			II	22 Aug.
	III	26 Aug.				
2	IV	2 Sept.	I	1 Sept.	III	30 Aug.
3	V	7 Sept.	II	7 Sept.	IV	9 Sept.
4	VI	12 Sept.	III	12 Sept.	V	13 Sept.
5	VII	17 Sept.	IV	19 Sept.	VI	18 Sept.
	VIII	20 Sept.				
6	IX	24 Sept.	V	24 Sept.	VII	24 Sept.
7	X	30 Sept.	VI	30 Sept.	VIII	1 Oct.
8	XI	4 Oct.	VII	7 Oct.	IX	7 Oct.
	XII	10 Oct.				
9	XIII	14 Oct.	VIII	13 Oct.	X	12 Oct.
10	XIV	20 Oct.			XI	18 Oct.
	XV	28 Oct.			XII	26 Oct.
					XIII	30 Oct.

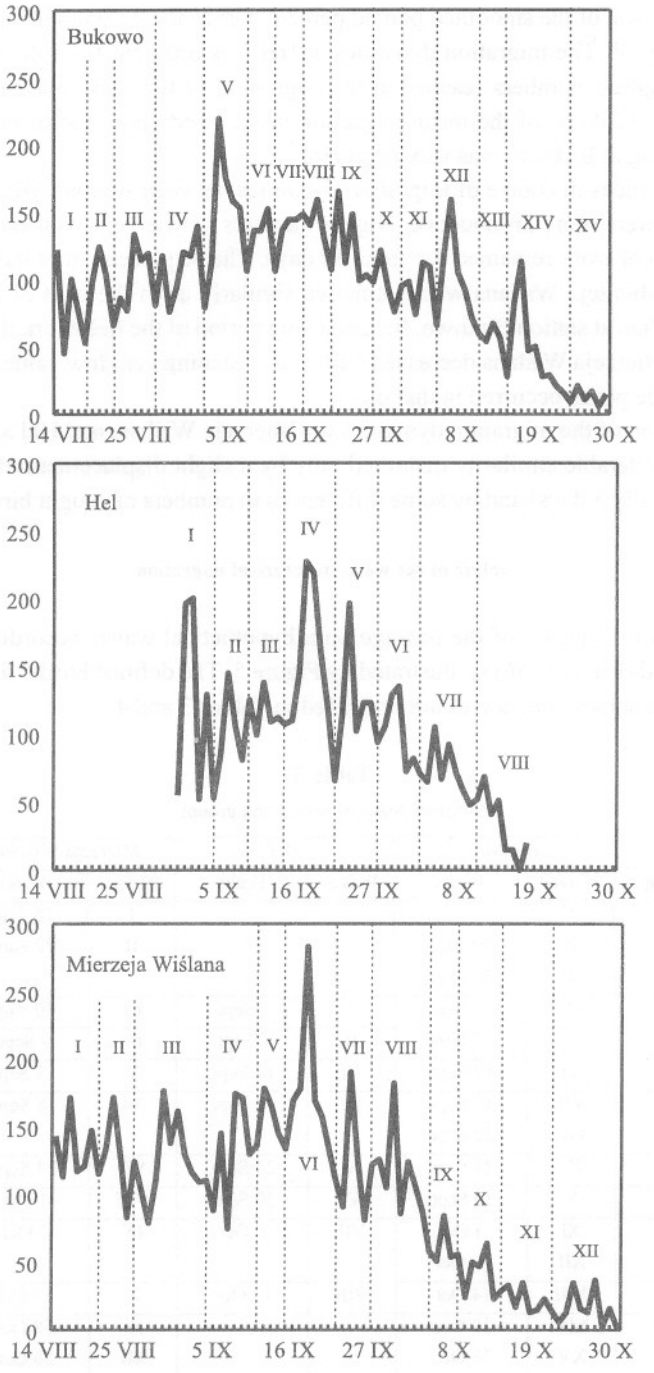

Fig. 5. Division of migration dynamics at studied stations onto hypothetical waves (explanation in the text).

Table 4

Dates of borders of waves and groups

Groups	Bukowo		Hel		Mierzeja Wiślana	
	Waves	Borders	Waves	Borders	Waves	Borders
	I					
	--------	18 Aug.				
1	II				I	
	--------	23 Aug.			--------	20 Aug.
	III				II	
----------	----------	29 Aug.			----------	26 Aug.
2	IV		I		III	
----------	----------	4 Sept.	----------	5 Sept.	----------	4 Sept.
3	V		II		IV	
----------	----------	10 Sept.	----------	10 Sept.	----------	11 Sept.
4	VI		III		V	
----------	----------	14 Sept.	----------	15 Sept.	----------	15 Sept.
	VII					
	--------	18 Sept.				
5	VIII		IV		VI	
----------	----------	22 Sept.	----------	22 Sept.	----------	22 Sept.
6	IX		V		VII	
----------	----------	28 Sept.	----------	28 Sept.	----------	27 Sept.
7	X		VI		VIII	
----------	----------	2 Oct.	----------	4 Oct.	----------	5 Oct.
	XI					
	--------	7 Oct.				
8	XII		VII		IX	
----------	----------	13 Oct.	----------	12 Oct.	----------	9 Oct.
9	XIII		VIII		X	
----------	----------	17 Oct.	----------	18 Oct.	----------	15 Oct.
10	XIV		IX		XI	
	--------	26 Oct.			--------	22 Oct.
	XV				XII	
					--------	29 Oct.
					XIII	

I stated a high correspondence of the mean terms of the defined waves between the compared stations. Maximal difference in the dates of peaks of the relevant waves was three days and for border days – four days. The mentioned highest deviations refer to the beginning or end of the season. In the middle part of the standard period (11 Sept. – 5 Oct.) the consistence is higher and the differences reach one day maximally. During the period of work of all three stations the number of waves at Bukowo was higher than at the remaining two stations for which I did not found such a difference. This was connected with the fact

that in the period 14-22 Sept. I defined two separate waves (VII and VIII) at Bukowo which together corresponded in the term to the wave IV at Hel and wave VI at Mierzeja Wiślana. Also in the period comparable only for stations Bukowo and Mierzeja Wiślana I found the difference in number of waves both at the beginning and at the end of the season.

For the analyse of migration intensity I defined large groups of birds passing by all the stations in similar terms. As a criterion of defining the groups I accepted these border dates between the waves which were correspondent at all stations. The notion of "group" is thus wider than this of "wave" as in some cases one group can comprise different number of waves at each station. The defined groups are presented at Figure 6. For each group I regarded the fragment of the distribution of the indices of numbers (see chapter "Materials and methods") contained between the relevant border dates and out of these data I calculated the average. On this way I obtained the indices of migration intensity characteristic for each group of birds. The resulted values are presented in Table 5. The above comparison showed that at Bukowo the migration started with lower intensity than at Mierzeja Wiślana but it increased very quickly reaching the maximum in the first half of the standard period (group 3 – term: 4-10 Sept.), already. The following two concentrations of passage did not reach this level. First of them occurred in similar period as at the other stations (group 5 – term: 14-22 Sept.), the second one – close to the end of the

Table 5

Indices of the intensity of migration of groups of birds

Groups:	1	2	3	4	5	6	7	8	9	10
Bukowo	84	78	124	106	117	96	68	84	38	31
Hel		105	70	76	127	104	82	59	34	
Mierzeja Wiślana	116	113	113	125	145	92	113	49	34	17

migration – was characteristic only for station Bukowo. At Hel the migration intensity at the beginning of the standard period (group 2 – term: 30 Aug. – 5 Sept.) was at similarly high level as at Mierzeja Wiślana. The decrease of the mean number of caught birds following that was specific only for the first station. In the middle of the migration period at Hel, similarly as at Bukowo, a remarkable concentration of passage took place (group 5:15-22 Sept.). At Mierzeja Wiślana the passage in its first phase was characterised by the high intensity (groups 1 and 2:14 Aug. – 4 Sept.). Without any remarkable decreases it reached the maximum in the middle of the standard period, similarly as at Hel (group 5:15-22 Sept.). The second distinct increase of intensity of passage occurred earlier than at Bukowo and was typical only for this station (group 7:5 -9 Oct.). The fall of numbers in the second part of the standard period (from 9 Oct. – groups 8, 9, 10) resembled this observed at Hel.

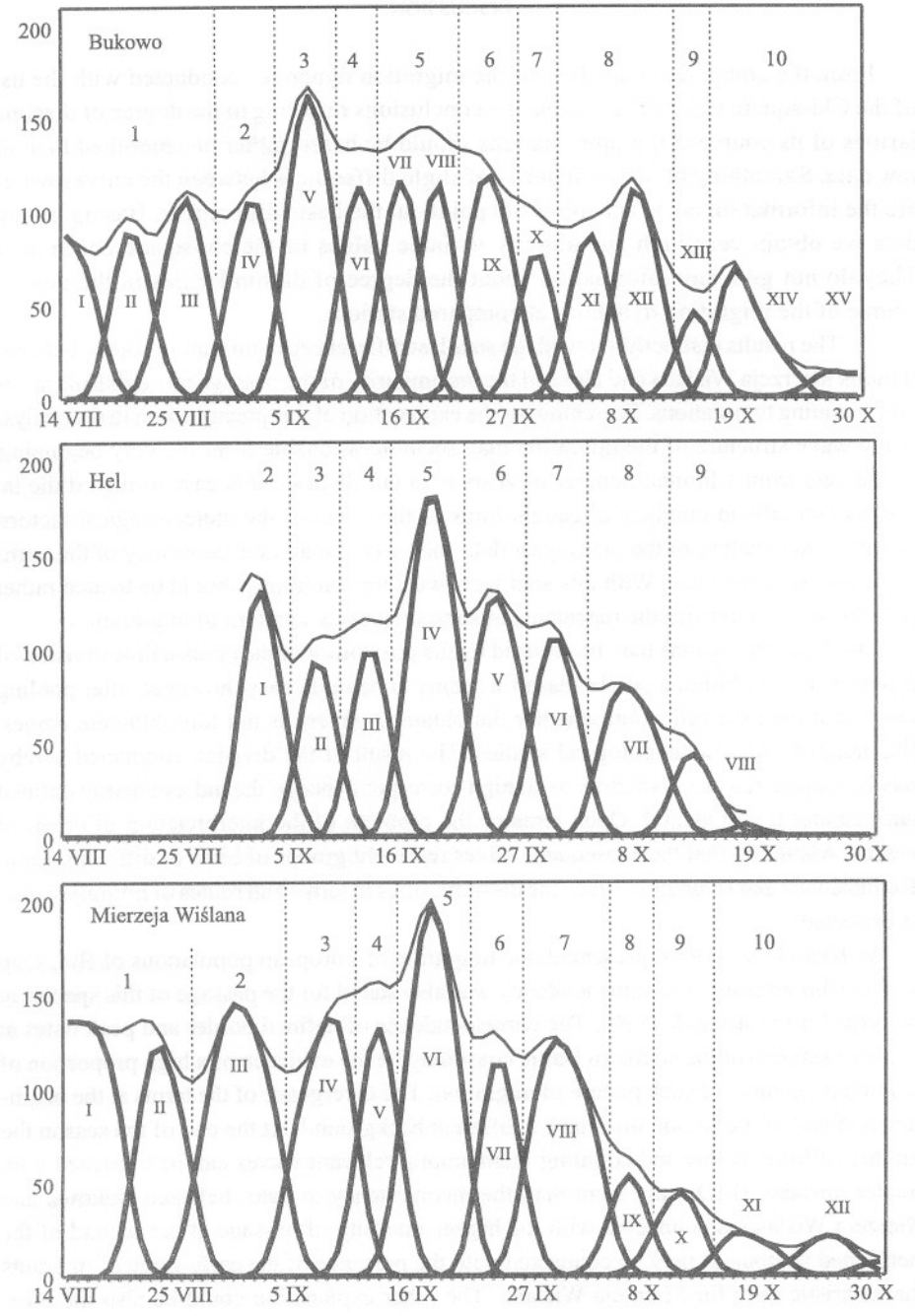

Fig. 6. Hypothetical migration curves of subsequent waves. Reconstruction according to the method of Busse (1996). Vertical lines separate groups of birds.

DISCUSSION

From the comparative analyse of the migration dynamics conducted with the use of the Chi-square test it resulted that the conclusions referring to the degree of dissimilarities of its course at the three stations should be based rather on smoothed than on raw data. Smoothing blurs the majority of slight differences between the curves which are the information noise and allows to point out the basic differences. Basing on raw data we obtain very high and slightly variable values of the chi-square coefficient. They do not give any information about the degree of dissimilarities in the general course of the migration dynamics at compared stations.

The results distinctly showed the smallest differences in migration course between stations Mierzeja Wiślana and Hel and the dissimilarity of the passage through Bukowo to the remaining two stations. Searching for the explanation of this phenomenon in the analyse of the wave structure of the migration may seem questionable from the very beginning. If the data from a limited number of years is to our disposal it is easy to regard the increases and falls in numbers of caught birds as the effect of the meteorological factors. However, the analyse of the many-year data showed a remarkable constancy of the terms of the waves occurrence. With this approach, weather conditions should be treated rather as factor which modifies the repeatable in subsequent years pattern of migration.

Justified reservations may be aroused by the possibility of the precise time division of groups of birds. Within a single season it seems to be quite easy, however, after pooling many-year data the reflection whether the obtained pattern is not too obliterate comes. This needs further methodological studies. The result of the division conducted hereby may be considered as satisfactory as so high correspondence of the independently defined dates cannot be accidental. Open remains the problem of the interpretation of obtained pattern. Assuming that the subsequent waves represent groups of birds of different origin (Remisiewicz and Baumanis 1996) the dissimilarities in terms and routes of migration may be expected.

As Klein *et al.* (1973) presented, the migration of European populations of Blackcap goes in a broad front. The same tendency was also stated for the passage of this species at the Near East (Kasparek 1990). The correspondence of defined border and peak dates at the three stations of the southern Baltic coast may be the evidence of a high proportion of Scandinavian birds of such pattern of migration. The divergence of the terms at the beginning and end of the season may have a different background. At the end of the season the number of birds is low and counting them among relevant waves can be burdened with greater mistake. Differently from that, the inconsistency in dates between Bukowo and Mierzeja Wiślana is connected with the higher intensity of passage at the second of the mentioned stations. It may be connected with the presence of the early wave of migrants characteristic only for Mierzeja Wiślana. The other explanation could be also the post-breeding dispersal if juveniles. However, after the analyse of the course of migration at Mierzeja Wiślana in years 1994-1996 when the fieldwork at this station started earlier,

this interpretation was rejected. The curve of pooled migration dynamics showed the departure of local birds before the beginning of the standard period used in the paper (Fig. 7).

If we assume that through the Polish Baltic coast migrate mainly Scandinavian birds in a broad front the different intensity of migration at similar terms at the three stations is striking. It is especially distinct at Bukowo and Mierzeja Wiślana. However, if the main group of migrants meets in time populations coming from east, the raises in numbers falling in different terms can be explained. According to Klein *et al.* (1973) populations breeding at east start the migration earlier which would explain the early wave of migrants at Mierzeja Wiślana. It is not known how their migration continues. It seems that two strategies elucidating the obtained migration pattern are possible. After the first of them birds belonging to these populations after passing Mierzeja Wiślana would spread at the inland heading towards wintering areas in Western Europe and Italy (Busse 1986). Late wave of migrants (2 - 13 Oct.) would be typical only for this station. According to the second idea a part of Blackcaps from the populations of eastern origin could carry on the passage along the coast reaching station Bukowo with some delay in comparison with Mierzeja Wiślana. It is approved by the sporadic controls documenting the westward migration (i.e. Blackcap ringed at Mierzeja Wiślana on 18 Sept. 1974 and controlled at Bukowo on 8 Oct. 1974). In both cases birds would pass by station Hel where I found only one increase of numbers in the middle of the season and it can be connected with the Scandinavian populations. It remains unknown how to interpret the high short-term intensity at this station at the beginning of the standard period. It is possible that we deal with the concentration of birds

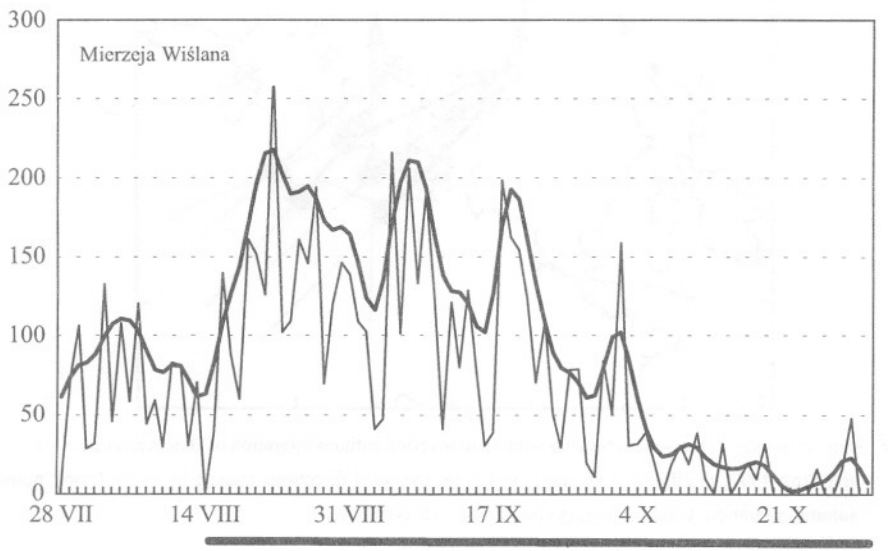

Fig. 7. Pooled migration dynamics for years 1994-1996 at Mierzeja Wiślana (raw and smoothed data). Line below the X-axis shows the usual period of work at Mierzeja Wiślana.

specific only for this station. However, we cannot reject the hypothesis that they may belong to populations of eastern origin which cross the Gulf of Gdańsk. Also explaining the relatively highest similarity of the migration at Mierzeja Wiślana and Hel is complicated. Perhaps the basis of it is the complication of the structure of migration through Bukowo. Large is the chance that amongst Scandinavian birds landing at the southern coast of Baltic there are Blackcaps heading both to south-south-east and south-east as well as to south-south-west and south (Zink 1973). The latter mentioned would pass by stations Hel and Mierzeja Wiślana. Fransson and Stolt (1993) analysing the cases of the direction of autumn migration of Blackcaps reversed by 180° produced the hypothesis that they may be a mirror reflection of this normally chosen by birds. Several of the lines drawn by authors between the places of ringing and recapture I lengthen in the direction corresponding with the normal autumn migration (Fig. 8). If the cited hypothesis is right the resulted picture would support the distribution of the migration directions among the stations of the southern Baltic coast described above.

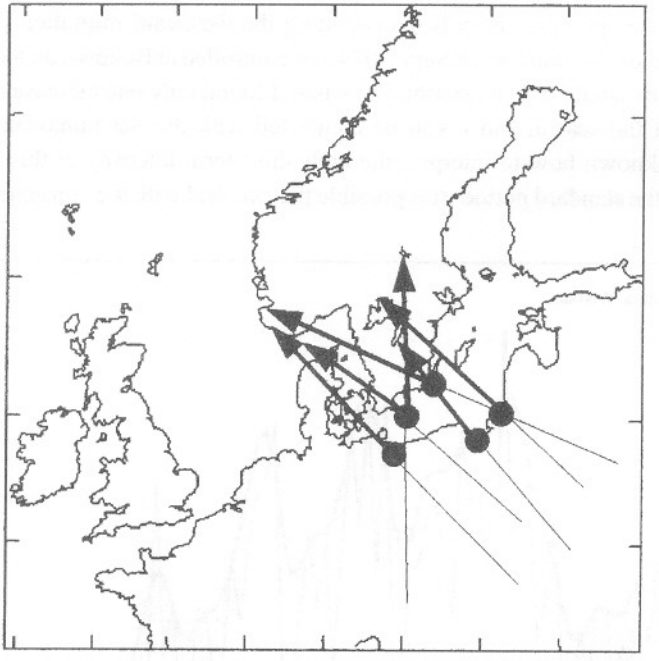

Fig. 8. Some examples of recoveries bearing witness to inverted autumn migration of Blackcaps (after Fransson and Stolt 1993, modified). Extended lines point expected directions chosen by birds during normal autumn migration. Circle – ringing site, arrow – recovery site.

Drawing a hypothetical border between subpopulations which differ in migration routes requires a high caution. Basing on the correlations of the year-to-year changes in

numbers Busse (1973) suggested that the boundary can be localised between Hel and Mierzeja Wiślana. The analyse of the migration dynamics conducted in this work showed that it can run between station Bukowo and Hel.

The above reflections will remain at the stage of hypotheses if they would not be supported by the analyse of the recoveries and migration dynamics at the higher number of stations. Moreover, the approval or rejection of homology of the groups of birds at different stations requires conducting a comparative studies on the course of migration of relevant waves.

CONCLUSIONS

Migration of the Blackcap through the Polish Baltic coast had a similar course at stations Mierzeja Wiślana and Hel and at Bukowo it was different from the one observed at these stations. This was confirmed by the comparative analyse with application of the Chi-square test. The common features of the migration at all three stations were its wave structure based on a very close corresponding border and peak dates and the remarkable increase of the number of caught birds falling in the term 14-22 Sept. Basic differences in migration dynamics from this pattern regarded station Bukowo. The main concentration of the passage was pronounced there in period 4-10 Sept. That was earlier than at stations Mierzeja Wiślana and Hel where it occurred in term 15-22 Sept. Also the structure of migration at Bukowo is more complicated – consisting of higher number of waves.

Constancy of terms of waves passage at all the stations may be explained by the broad-front migration of the Scandinavian populations crossing the Baltic Sea. The differences in relative number of birds caught at the same time at different stations may be caused by the inland passage of populations of western origin.

Higher complication of migration dynamics at Bukowo, as compared with the other stations, may be the result of the high proportion of Scandinavian populations heading in southern and south-south-western directions among birds migrating through this part of the southern Baltic coast. They probably pass by stations Hel and Mierzeja Wiślana.

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