sciendo

Ornis Hungarica 2019. 27(2): 86–99.
DOI: 10.2478/orhu-2019-0018

Migration and wintering of Fieldfare *(Turdus pilaris)* in southeastern Hungary

László Bozó

Received: 23 August, 2019 – Revised: September 10, 2019 – Accepted: September 12, 2019

Bozó, L. 2019. Migration and wintering of Fieldfare *(Turdus pilaris)* in southeastern Hungary. – Ornis Hungarica 27(2): 86–99. DOI: 10.2478/orhu-2019-0018

Abstract The Fieldfare is a bird species widely distributed in the Palearctic region. In Hungary, the species is considered as a rare breeder and common, sometimes abundant migrant in autumn and spring, and also as winter visitor. It is prone to invasion, since northern breeding populations leave the breeding sites in large numbers only when the available food is inadequate or inaccessible to the birds. Most populations follow a southern-southwestern migration pattern, and in the course of their movement they also migrating through the Carpathian Basin. In this study, we examined the migration and wintering of the species in an area of southeast Hungary between 2004 and 2019. Data were collected between the beginning of October and the middle of April and during that period we saw Fieldfares a total of 416 times. In addition to the description of migration, the effect of weather on bird numbers was also investigated. According to our results, the species appears in the area in October and disappears in late March and the first half of April. The individuals that migrate in October are likely belonging to the Central European breeding population, while from November the Scandinavian birds can be seen. The maximum number of birds observed during the different years showed significant differences, as did the patterns of movements within the seasons. The relationship between the local weather and the number of birds has been demonstrated over several seasons, which is typical of species with an escape migration.

Keywords: invasion, wintering, escape movements, introduced plants

Összefoglalás A fenyőrigó az északi területek elterjedt énekesmadara, amely Magyarországon kisszámú fészkelő és gyakori, olykor tömeges őszi és tavaszi átvonuló, illetve téli vendég. Egyike a tipikus inváziós madárfajoknak, ugyanis az északon fészkelő populációk csak abban az esetben hagyják el nagy számban a költőhelyeket, ha a rendelkezésre álló táplálék mennyisége nem elegendő, vagy az nem hozzáférhető a faj számára. A legtöbb populáció déli-délnyugati vonulási irányt követ, és ezen mozgásuk során érintik a Kárpát-medencét is. Jelen dolgozatban egy délkelet-magyarországi területen vizsgáltam a faj vonulását és telelését a 2004 és 2019 közötti időszakban. Az adatgyűjtés október eleje és április közepe között zajlott, és összesen 416 alkalommal láttam fenyőrigókat. A vonulás leírása mellett az időjárásnak a madarak mennyiségére gyakorolt hatását is vizsgáltam. Eredményeim szerint a faj ősszel, októberben jelenik meg a területen és március végén, április első felében tűnik el. Az októberben átvonuló egyedek minden bizonnyal a közép-európai költőállományhoz tartoznak, míg novembertől már a skandináv madarakat lehet látni. Az egyes vizsgálati évek során megfigyelt maximális példányszámok jelentős eltéréseket mutattak, mint ahogy a madarak szezonon belüli mozgási mintázata is különböző volt az évek között. A lokális időjárás és a madarak száma közötti összefüggést több szezonban is sikerült igazolni, ami tipikusan jellemző a szökő vonulást mutató fajokra.

Kulcsszavak: inváció, szökő vonulás, telelés, betelepített növények

Department of Systematic Zoology and Ecology, Eötvös Loránd University, 1117 Budapest, Pázmány Péter sétány 1/c, Hungary, e-mail: bozolaszlo91@gmail.com

Introduction

The Fieldfare *Turdus pilaris* has an extremely large breeding range with a total of 24,100,000 km^2 area (BirdLife International 2019). It breeds from North and Central Europe, East through Central Siberia, North Kazakhstan, Altai and Sayan Mountains to Aldan Basin and Transbaikalia (Collar 2019). It breeds in several European countries since the mid-20th century, including Serbia (Stanković 2018), Italy (Spina & Volponi 2009), Croatia (Budinski 2013) and the British Island (Wernham *et al.* 2002). Monotypic (Collar 2019), however, birds wintering in the Upper Volga region of West Russia, described as race *glacioborealis*, differ from local breeders in morphology and plumage, but further researches are needed (Lastukhin 2005). It winters in West and South Europe, North Africa and Southwest Asia (Collar 2019), but some breeding areas (i.e. South Scandinavia, Germany, Czech Republic and Hungary) have a considerable overlap with autumn/winter areas (Milwright 1994). Vagrants have occurred in Arabia, China (Kansu), Japan, North America and India (Clement & Hathway 2000, Banerjee & Inskipp 2013).

Fieldfares typically breed in birch, alder and pine forests mostly near rivers, marshes and creeks, but at lower widths they can be found in mixed forests too (Collar 2019). The Fieldfare's preferred diet, in summer at least, is invertebrates, particularly earthworms. In autumn they switch to fruits, and in severe winter weather, when the ground is frozen, a considerable number of Fieldfares may enter orchards to feed on apples (Norman 1994, 1995).

The species migrates from the northern breeding areas to south-southwest, however, there are differences among breeding populations. Compared to the closely related Song Thrush *T. philomelos* and Common Blackbird *T. merula*, the connectivity between the breeding and wintering grounds is very small (Huttunen 2004, Csörgő *et al.* 2017a, b). In the case of Redwing *T. iliacus* that breeds also in the northern areas, there is also very small connectivity (Huttunen 2004). Birds breeding in Finland have mostly southwestern migration direction and winter almost in Italy and France, but there are data from 30 different countries (Valkama *et al.* 2015). Similar pattern can be observed in Sweden and Denmark, but a part of the Swedish local breeding birds moves first to Norway, and then turns to south. They winter in a very broad area from Spain to Azerbaijan (Bønløkke *et al.* 2006, Fransson & Hall-Karlsson 2008). The birds re-captured in Germany originate almost from North Fennoscandia and winter in South-Southwest Europe, but some individuals are from Russia to the 87° longitude and there are recoveries from the eastern Mediterranean too (Bairlein *et al.* 2014). The foreign recoveries in Italy, which is one of the most important wintering countries of the species, originating particularly from Finland, Germany and Russia. The Baltic accounts for a large part of the overall sample, together with Central-eastern Europe and there is a connectivity of Italy with the United Kingdom too (Spina & Volponi 2009). The Siberian and the central Russian birds go to the Po, Rhone and Gironde rivers, so these populations have a southwestern migratory direction. This migration route passes the Carpathian Basin, which can be used for a refuelling stop if necessary, and enters the Po from the east. This is the only direction (other than via the Adriatic Sea), which avoids crossing the Alps (Milwright 1994). This was considered by a bird that has been ringed in Hungary and later has recovered in Siberia (Csörgő & Gyurácz 2009a). Their migration speed is fast, most likely depending on the favourable winds (Milwright 1994).

The Scandinavian birds leave the breeding areas from October, then the recoveries in November are already concentrated in Central Europe (Fransson & Hall-Karlsson 2008, Bairlein *et al.* 2014, Valkama *et al.* 2015). The earliest foreign ringed Fieldfares reach Italy in mid-September and increase in frequency in October, while the highest numbers are reached between the second decade of November and the first of December (Spina & Volponi 2009). The first individuals reach the Central European breeding grounds from early-March (Schröpfer 2008), while the Scandinavian birds arrive in April (Fransson & Hall-Karlsson 2008, Valkama *et al.* 2015).

The species is not faithful to its wintering sites year after year (Ashmole 1962, Norman 1994), and, additionally, has no fidelity to an area, even within a winter season. For example, birds ringed during winter in the United Kingdom, Belgium and The Netherlands have been found in Croatia in subsequent winters (Budinski 2013). Furthermore, birds from the same brood, in subsequent winters may occur in entirely different areas (Simms 1978). Some individuals have been found in successive winters at areas up to several thousand kilometres (Ashmole 1962, Bairlein *et al.* 2014). Studies in Germany show that the individual wintering sites can be spread over 3000 kilometres over the years (Bairlein *et al.* 2014). These irregularities can be explained by drifting during migration (Alerstam 1975), movements during hard weather (Lack 1960), or intense nomadic behaviour to exploit variable berry crops (Norman 1994). Wintering birds from Britain, Denmark and Germany move to the southeast during a winter season (Milwright 1994). However, the examination of the ringing record shows that some individuals, and possibly some populations, are faithful to winter sites (Milwright 1994). At one ringing site in eastern England, out of 910 birds, 11 (1.2%) were trapped again in later winters, also, of the 278 British and Irish ringed birds which have been recovered anywhere during a winter subsequent to that of their ringing, 15 (5.4%) were recovered within 20 km from their ringing site (Milwright 1994). Besides, Thy (1986) found that Fieldfares wintering in eastern England have a flexible social structure ranging from highly gregarious to near-territorial according to their food supply. In experiments using apples, previously-gregarious Fieldfares established large exclusive territories and spent more time on aggression and eating experimental apples and less time on hunting invertebrates than non-territorial birds did. However, important to note, that the birds wintering in Britain might show a different habit due to the temperate, mild climate is different from the Central European conditions.

The Fieldfare is a typical irruptive species. The results of Tyrväinen (1970) in Finland shows, that a significant part of the breeding population did not migrate in the autumn when the berry crop of the mountain ash was exceptionally good and, moreover, when the autumn was very mild, and the snow cover delayed. Emigration only started when the food supply was exhausted. The species shows marked invasion tendencies in relation to the supply of rowanberries (Alerstam 1993). Svärdson (1957) found that every third or fourth winter, Scandinavia is invaded by huge masses of Fieldfares originating from the northern breeding grounds. Irruption species seem to have an extra ability of locating food. In this way, Fieldfares, which move along fairly high in the air, could direct their further flight according to sign-stimuli reaching them from perhaps almost as far as the horizon. Their search would thus be a random one, but not a search like that of a foraging party of tits, working its way

through the trees; instead, it would be an optical search over a really wide range (Svärdson 1957). Birds are often capable of staying during a period of harsh winter conditions in rowanberry or apple trees and to maintain themselves on remaining berries or rotten fruits (Berthold 1996).

In Hungary, the species breeds in small number, but it is a common, sometimes abundant migrant in autumn (September-October) and spring (March-early March), and visitor in winter (October-March) (Hadarics & Zalai 2008). Although occasional breeding is known from the early 20th century (Hadarics & Zalai 2008), the number of breeding pairs increased from the 1980's (Béres & Béres 1983, Béres & Petrovics 1984), possibly due to the extension of the species' distribution area (Tiainen *et al.* 1997, Schmidt 1998). The knowledge related to the movements of the local population is insufficient (Csörgő & Gyurácz 2009a).

Based on the Hungarian ringing records, most of the birds that migrate through and winter in the Carpathian Basin are from Scandinavia (mostly Finland). However, there are recaptures from Belgium and Russia too, and birds that had been ringed in Hungary have been recovered from southern France to Turkey (Csörgő & Gyurácz 2009a).

In this study, the migration and wintering of Fieldfare were examined in Southeast Hungary. The main goal was to describe the autumn and spring migration of the species in the study area and to examine the connections between weather and the movements of the Fieldfares.

Material and methods

The study was carried out in the area of Kevermes and Lőkösháza in the southeastern part of Hungary *(Figure 1)*. I considered the administrative boundaries of the two villages with an 80 km^2 total area as the boundaries of the territory of my research (Hevesi 2005). The landscape is dominated by agricultural lands with some planted forests, artificial lakes, canals and steppes (for details see Bozó 2017). The core area was the surroundings of Fenyves-forest, with an approximate 50 ha total area. This area included the lake gravel pit (open water surface with dense lakeside vegetation), the forest of the former pheasant station (oleaster *Elaeagnus angustifolia* plantation), the Fenyves-forest (common hackberry *Celtis occidentalis*, common oak *Quercus robur*, acacia *Robinia pseudoacacia*) and a poplar (*Populus* spp.) plantation.

The study seasons covered the period between 1 October and 15 April in every year from 2004 to 2019 with a total of 416 observation records. The data collection was based on field observations with binocular. During the 2006/07 and 2009/10 seasons, the data collection was started later and finished earlier, therefore from these periods the earliest and latest observations cannot be published. The situation was the same in the cases of the latest records during the 2008/09, 2010/11 and 2015/16 seasons. For the description of migration periods and winter movements, I only considered the data from 2012 to 2019, when the intensity of data collection was similar. During this period, we visited the study site on 501 different days and we have seen the species on 344 different days. Detailed information of weather

Figure 1. The location of the study area in Hungary
1. ábra A vizsgálati terület elhelyezkedése Magyarország területén

(minimum and maximum temperature values, snow thickness values) is available only from 2012, therefore to analyse the impact of temperature and snow coverage on the number of birds, I used data set from 1 October 2012 to 15 April 2018. To analyse the relationship between the number of birds and the temperature data of the current week, I used Pearson's product correlation test with the software R version 3.2.4 (R Development Core Team 2016). I also analysed the impact of the temperature values of the previous week on the number of birds in every season. To test the impact on the number of birds in the study area, the peak values of the different seasons were compared to the monthly temperature values of Helsinki, South-Finland. Microsoft Excel 2013 was used to create graphs and tables. The temperature data are from the website of the World Weather Online (www.worldweatheronline.com).

Results

The average movement pattern for 2012–2019 is characterized by three major peaks (mid-December, early-February, and late February to early March). The number of birds increases in October and the first half of November, high between late-November and early-March, and decreases from the second half of March *(Figure 2)*.

Taking the complete database into account, the earliest autumn data are from 4 October 2012, while the latest spring observation was on 15 April 2017. Based on data from 10

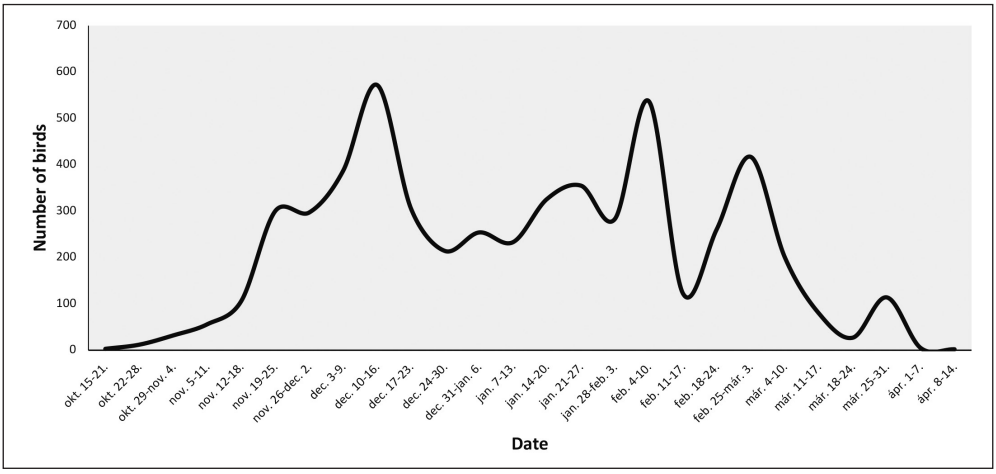

Figure 2. Seasonal distribution of Fieldfare's data between 2012–2019. Number of birds was averaged based on weekly averages over the seven seasons

2. ábra A fenyőrigó adatok szezonon belüli (október 15. – április 14.) eloszlása 2012–2019 között. A példányszámok a hét szezon hetenkénti átlagai alapján lettek számítva

Table 1. The earliest and latest observation data, the dates of the seasonal peaks and the number of birds observed at that time, and the number of days elapsed between the earliest and latest observation data per season

1. táblázat A legkorábbi és legkésőbbi megfigyelési adatok, a szezonális csúcsok időpontjai és az abban az időpontban megfigyelt példányszám, valamint a szezononkénti legkorábbi és legkésőbbi megfigyelési adatok között eltelt napok száma

Season	Earliest data	Latest data	Peak day	Number of birds on peak day	Days spent in the area
2004/05	2 Nov.	12 Mar.	09 Jan.	n.a.	131
2005/06	12 Nov.	18 Mar.	29 Dec.	600	127
2006/07	n.a.	n.a.	10 Feb.	150	n.a.
2007/08	23 Oct.	21 Mar.	01 Dec.	600	150
2008/09	23 Oct.	n.a.	23 Jan.	400	n.a.
2009/10	n.a.	n.a.	17 Dec.	300	n.a.
2010/11	02 Nov.	n.a.	23 Dec.	1500	n.a.
2011/12	14 Oct.	26 Mar.	04 Dec.	400	164
2012/13	04 Oct.	9 Apr.	04 Feb.	2000	188
2013/14	02 Nov.	23 Mar.	23 Jan.	200	142
2014/15	26 Oct.	1 Apr.	14 Dec.	500	158
2015/16	22 Oct.	n.a.	12 Dec.	400	n.a.
2016/17	15 Oct.	15 Apr.	16 Jan.	1000	183
2017/18	16 Oct.	29 Mar.	27 Nov.; 16 Dec.	400	164
2018/19	17 Oct	7 Apr	24 Feb	1200	172

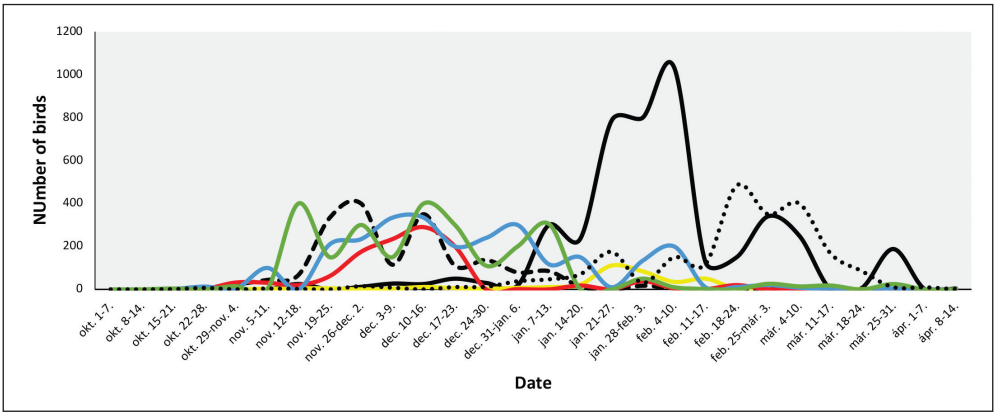

Figure 3. Seasonal distribution of Fieldfare's data (cumulative values). Different lines indicates the different study seasons (black solid line: 2012/13, yellow solid line: 2013/14, black dashed line: 2014/15, red solid line: 2015/16, blue solid line: 2016/17, green solid line: 2017/18, black dotted line: 2018/19)

3. ábra A fenyőrigó adatok szezononkénti eloszlása (kumulatív értékek). A különböző vonalak a különböző vizsgálati szezonokat jelzik (fekete folytonos vonal: 2012/13, sárga folytonos vonal: 2013/14, fekete szaggatott vonal: 2014/15, piros folytonos vonal: 2015/16, kék folytonos vonal: 2016/17, zöld folytonos vonal: 2017/18, fekete pontozott vonal: 2018/19)

seasons, Fieldfares spent an average of 157.8 days in the area (SD = 20.5). The shortest period (127 days) was spent in the 2005/06 season and the longest period (188 days) in the 2012/13 season *(Table 1)*.

Compared to the average pattern, seasonal migration curves show significant differences between 2012 and 2019 *(Figure 3)*. It had the highest number of birds in the 2012/13 season and the lowest number in the following season. In four seasons, the most birds were present between the beginning of November and the end of December, and after that period, their numbers decreased significantly. Conversely, during three seasons, there were few

Table 2. Correlations between the number of birds observed and the temperature data for the current week by season

2. táblázat A megfigyelt madarak száma és az aktuális hét hőmérsékleti adatai közti összefüggések szezononként

Season	Minimum temperature			Maximum temperature			Average temperature		
	t	p	R	t	p	R	t	p	R
2012/13	-1.7511	0.0917	-0.3248	-2.0253	0.0532	-0.3691	-1.9174	0.0662	-0.3520
2013/14	-2.9695	0.0063	-0.5033	-3.3775	0.0023	-0.5522	-3.2263	0.0034	-0.5347
2014/15	-1.4258	0.1658	-0.2693	-1.8956	0.0692	-0.3485	-1.6985	0.1014	-0.3160
2015/16	-1.4734	0.1526	-0.2776	-1.4247	0.1661	-0.2691	-1.4523	0.1584	-0.2739
2016/17	-3.3404	0.0025	-0.5480	-3.6993	0.001	-0.5872	-3.5408	0.0015	-0.5704
2017/18	-0.7193	0.4784	-0.1397	-1.2790	0.2122	-0.2433	-1.0135	0.3202	-0.1949
2018/19	-1.0072	0.3231	-0.1937	-0.5306	0.6001	0.1035	-0.7460	0.4623	-0.1448

Table 3. Correlations between the number of birds observed and the temperature data for the previous week by season
3. táblázat A megfigyelt madarak száma és az azt megelőző hét hőmérsékleti adatai közti összefüggések szezononként

Season	Minimum temperature			Maximum temperature			Average temperature		
	t	p	R	t	p	R	t	p	R
2012/13	-1.8145	0.0812	-0.3353	-2.2598	0.0324	-0.4052	-2.0680	0.0487	-0.3758
2013/14	-2.2224	0.0352	-0.3995	-2.6547	0.0134	-0.4618	-2.4873	0.0196	-0.4384
2014/15	-0.3887	0.7007	-0.0760	-0.7591	0.4546	-0.1473	-0.5982	0.5550	-0.1165
2015/16	-1.0875	0.2868	-0.2086	-1.0500	0.3034	-0.2017	-1.0724	0.2934	-0.2058
2016/17	-3.3320	0.0026	-0.5470	-3.5932	0.0013	-0.5760	-3.4718	0.0018	-0.5628
2017/18	-0.6446	0.5248	-0.1254	-0.9580	0.3469	-0.1847	-0.8006	0.4306	-0.1551
2018/19	-1.4366	0.1627	-0.2711	-1.0651	0.2966	-0.2044	-1.2390	0.2264	0.2361

Table 4. Correlations between the number of birds and the snow cover by season
4. táblázat A madarak száma és a hóborítottság közötti összefüggések szezononként

Season	t	df	p	R
2012/13	1.7105	65	0.0919	0.2075
2013/14	4.3919	80	<0.0001	0.4408
2014/15	-0.9929	73	0.3240	-0.1154
2015/16	-0.8253	104	0.4111	-0.0807
2016/17	3.6074	67	0.0006	0.4033
2017/18	-1.1060	57	0.2734	-0.1449
2018/19	-0.8020	73	0.4252	-0.0934

Fieldfares in the area in autumn and the first half of the winter and their number peaked between late-January and late-February.

In the 2013/14 and 2016/17 seasons, the number of birds is negatively correlated with both minimum, maximum, and average temperatures. There was also a negative correlation between maximum temperatures and the number of birds in the 2012/13 season *(Table 2)*.

Examining the relationship between the weekly average number of birds and the temperature one week earlier, there was a negative correlation between the maximum temperature data and number of birds in the 2013/14 and 2016/17 seasons, while a negative correlation between minimum and average weekly temperatures was found for 2012/13, 2013/14 and 2016/17 seasons *(Table 3)*.

There was a positive correlation between the number of birds and snow cover in the 2013/14 and 2016/17 seasons *(Table 4)*.

There was no significant relationship between the average monthly mean temperatures in southern Finland and the seasonal peaks in Kevermes ($r = –0.20728$, $p = 0.477$), but in two of the seasons when the seasonal peak was above 1000 specimens (2010/11 and 2012/13) were characterized by extremely low temperature values in the breeding area.

Discussion

Table 5. Average monthly mean temperatures in southern Finland in the months when we recorded seasonal maximum numbers in Kevermes

5. táblázat Az átlagos havi középhőmérsékleti értékek Dél-Finnországban azokban a hónapokban, amikor Kevermesen a szezonális maximum példányszámokat regisztráltuk

Season	Average monthly temperature (S-Finland)	Peak day
2005/06	-2.2	29 Dec.
2006/07	-7.9	10 Feb.
2007/08	2.3	01 Dec.
2008/09	-2.8	23 Jan.
2009/10	-3.6	17 Dec.
2010/11	-7.5	23 Dec.
2011/12	3.3	04 Dec.
2012/13	-1.8	04 Feb.
2013/14	-5.9	23 Jan.
2014/15	0.1	14 Dec.
2015/16	3.3	12 Dec.
2016/17	-1.9	16 Jan.
2017/18	1.8	27 Nov.; 16 Dec.
2018/19	-7.1	24 Feb.

In the case of partial migratory species nesting in northern Europe and Siberia, the breeding success (density) and the autumn-winter weather (amount and availability of food) determines the rate at which the birds remain at the breeding grounds or migrate to the south (Svärdson 1957, Jenni 1987). In case of Fieldfare, a good breeding season followed by poor late summer weather, would lead to large bird populations with a poor northern food supply. Such a case would bring forth years when very large influxes of Fieldfares appear in wintering areas early in the autumn (Milwright 1994). Fieldfare is one of the irruptive species, and while the migration direction is essentially southwest, some populations use different migration directions, routes, and wintering grounds. In addition, usually, even within a winter season, they travel considerable distances in search of food (Csörgő & Gyurácz 2009a). On the other hand, migration of closely related thrushes is much more regulated. The connectivity between nesting and wintering sites is much stronger, but there are also differences between populations. Different subspecies of Song Thrush *T. philomelos* and Common Blackbird *T. merula* exhibit various migratory strategies (resident, partial or obligate migrant) (Lundberg 1985, Csörgő *et al.* 2017a, b, Németh 2017). The general direction of autumn migration of Song Thrush is in a large angle from southwest to southeast, however, the migrants mainly winter in southwest Europe (Milwright 2006), while Common Blackbirds from Fennoscandia, British Isles, Denmark and Germany migrate to south-southwest and there is a clear tendency, that birds from more eastern origin migrate to the south (Ashmole 1962). Hungarian populations of Song Thrushes and Common Blackbirds winter in a relatively limited range in the Central Mediterranean (Csörgő *et al.* 2017a, b, Csörgő & Gyurácz 2009b, c). It seems that the Carpathians are some kind of a barrier for the northern Common Blackbirds and Song Thrushes (Csörgő *et al.* 2017a, b). This results in the migration flyways avoiding the Carpathian Basin. The populations of Redwings *T. iliacus* are obligate or partial migrants and overwinter in a wide area from Iceland to the Black Sea (Huttunen 2004). The migration and winter movement of the species is very similar to that of the Fieldfare: birds do not have strong wintering site fidelity and their movement is determined by the amount of available food (Andreotit *et al.* 2001,

Milwright 2002, 2003). Northern populations typically migrate southwest (Milwright 2002, 2003), similar to other thrush species discussed so far. The east-west movements for *Turdus* species seem to be important, also in an evolutionary sense. In a recent study, Nagy *et al.* (2019) found that the most likely ancestral area of genus Turdus located in East Asia, followed by colonization of the western Palearctic, Africa and emerged and repeated trans-Atlantic events. In addition, some species distributed in Siberia, like Naumann's Thrush *T. naumanni* and Black-throated Thrush *T. atrogularis* can be also occur in Western and Central Europe during their westward vagrancy (Hadarics 2014, 2016). The Fieldfare does not breed in the southeastern part of Hungary, however, it is a common migratory and wintering species (Bozó 2017). Breeding in Hungary takes place between April and July, mainly on wet meadows, pastures and floodplains (Haraszthy 2019). There are no extensive pastures, meadows and apple orchards in the area, which are essential foraging sites for the species. Feeding flocks appear every year on the Turai lawn and Tulkán lawn (which are wet lawns) in Lőkösháza, but they only stay there for a short time, presumably due to the lack of suitable resting trees (Bozó 2017). However, the Fenyves Forest and the surrounding forests provide an adequate food supply for the species (oleaster, common hackberry). Birds typically spend the night there, but in mild weather and on snow-free days, during the morning they divide into smaller groups and feed on the surrounding fields. In the absence of ringing-recapture data, it is not known whether these birds come back overnight or move to another area. Both options are likely to occur, as in some cases the number of birds is approximately the same at two morning outings, others are significantly different. In case of cold weather and thick snow cover, birds will not leave the food-rich forest during the day. In addition to the fruits available even with thicker snow cover, the watering places in the area are of great importance. For this purpose, in the case of long-lasting colds below –15 °C, birds use the close gravel pit and the puddles that are broken by traffic. The availability of water is likely to be a very important factor for the movement of birds during the season. In the winter of 2005/06, due to the extremely thick (sometimes 50–60 cm) snow cover, Fieldfares appeared in much larger numbers in the village than usual. At that time, their flocks appeared in the only apple orchard of the village and also in bird feeder sites.

Summarizing the data from the past 16 years, the first birds arrive in the second half of October in autumn, but in one case they arrived in the area at the beginning of the month. Because individuals of northern European populations typically reach the northern areas of Central Europe only by November (Fransson & Hall-Karlsson 2008, Valkama *et al.* 2015), these birds are likely to be members of the Central European breeding population. Following sporadic occurrences in October, migration will intensify in November, which is likely to indicate the arrival of Scandinavian birds. The movement pattern observed thereafter changes from year to year. Although the dates of the seasonal peaks do not coincide with the coldest winter temperatures in the North, two out of the four coldest winters in Finland overlapped with the highest numbers of Fieldfares observed in Kevermes. The data show a peak in mid-December and then a peak in late January/early February, supported by the time distributions of the maximum number of birds observed in the 16 study years.

Significant differences between years can be explained by species-specific invasion patterns and low wintering site fidelity. In the more southern areas, they appear more abundantly

when food in the northern areas is scarce and/or inaccessible, e.g. because of a heavy snowfall. This can be especially significant if the breeding success was high in that year. This is true not only for the Fieldfare but also for the closely related species, the Redwing and the Common Blackbird (Snow 1966, Andreotit *et al.* 2001, Milwright 2002, 2003, Bairlein *et al.* 2014), but also in other species with similar migration habits, e.g. Two-barred Crossbill *Loxia leucoptera* (Svärdson (1957) and Brambling *Fringilla montifringilla* (Jenni 1987)).

While Blackbirds are unlikely to perform hard-weather movements in Britain (Snow 1966), some individuals may exhibit weather escape movements in Germany (Bairlein *et al.* 2014) and also in Hungary, where the males show hard-weather escape equalising the sex ratio on lower altitudes (Csörgő & Kiss 1986, Ludvig *et al.* 1991). The Song Thrush (Ashmole 1962) and the Common Blackbird (Ioalè & Benvenuti 1983) are also characterized by strong wintering site fidelity.

Only two invasions occurred during the study period, when the maximum numbers of birds were over 1500 individuals. It shows very well the seasonal variability in the number of wintering individuals, that after the invasion in the season of 2012/13, we observed the least birds in the following season.

Fieldfares have low wintering site fidelity. They are characterized by an escape movement, which occurs when the weather conditions become unfavourable or when food sources are exhausted. In our study, the correlation between the local weather and the number of birds shows that with the decrease in temperature, the number of birds has increased statistically significantly in certain seasons. It was the strongest among the current weekly numbers and the previous week's weather values. Three out of the six seasons showed significant correlation. There was a significant positive correlation between the snow cover and the number of birds in two seasons. All in all, this indicates that the local movement of birds is mainly influenced by the weather of the previous week. It encourages birds to seek new food sources in adverse weather conditions. Because of the thickening of the snow cover, birds cannot feed on the soil. In this case, the role of woody vegetation increases, as the berries and fruits are still available.

The fact that the birds spend 127–188 days in the study site, raises conservation issues. The species is extensively hunted in southern Europe (Spina & Volponi 2009), while in most parts of the continent, due to specific human activities and climate change, the extent of pastures and wetlands is decreasing. As a result, changes may occur in species overwintering in the continental Mediterranean. For example, Németh (2017) found that the Common Blackbird is wintering even more northward. According to ringing-recapture data, the bird bycatch distance has decreased significantly (5.9 km/year) over the years. The migration of Fieldfare is much less regulated than the Common Blackbird's, and it is able to react to changes much easier. It is therefore likely that the Carpathian Basin will become an increasingly important wintering area for the species. Since, like many other bird species, it consumes mainly crops (oleaster, common hackberry) in the winter, their role may also increase. This is especially true in the woodless plains of the Great Plain, where forests consisting of native tree species have been almost completely eliminated (Bozó 2018), so bushes and wooded areas of alien species can be appreciated from a nature conservation point of view.

Acknowledgements

I am grateful to Tibor Csörgő for his helpful comments on the early versions of the manuscript. I would like to thank to Nikolett Olajos for her work on the English language check.

References

Alerstam, T. 1975. Redwing *(Turdus iliacus)* migration towards southeast over southern Sweden. – Die Vogelwarte 28: 2–17.

Alerstam, T. 1993. Bird Migration. – Cambridge University Press

Andreotit, A., Bendini, L., Piacentini, D. & Spina, F. 2001. Redwing *Turdus iliacus* migration in Italy: an analysis of ringing recoveries. – Ringing & Migration 20(4): 312–319. DOI: 10.1080/03078698.2001.9674257

Ashmole, M. J. 1962. The migration of European thrushes: a comparative study based on ringing recoveries. – Ibis 104(4): 522–559. DOI: 10.1111/j.1474-919X.1962.tb08684.x

Bairlein, F., Dierschke, J., Dierschke, V., Salewski, V., Geiter, O., Hüppop, K., Köppen, U. & Fiedler, W. 2014. Atlas des Vogelzugs [Bird Migration Atlas]. – AULA-Verlag GmbH, pp. 450–454.

Banerjee, M. & Inskipp, T. 2013. First photographic record of Fieldfare *Turdus pilaris* from the Indian Subcontinent. – Indian Birds 8(3): 77.

Berthold, P. 1996. Control of Bird Migration. – Chapman & Hall, London - Glasgow - Weinheim - New York - Tokyo - Melbourne - Madras

Béres, I. & Béres, L. 1983. Fenyőrigó *(Turdus pilaris)* fészkelése Felsőzsolcán [Breeding of the Fieldfare *(Turdus pilaris)*]. – Madártani Tájékoztató 7: 38. (in Hungarian)

Béres, L. & Petrovics, Z. 1984. Fészkelő madarunk, a fenyőrigó *(Turdus pilaris)* [Our breeding bird species, the Fieldfare *(Turdus pilaris)*]. – Madártani Tájékoztató 7: 38. (in Hungarian)

BirdLife International 2019. Species factsheet: *Turdus pilaris*. – Downloaded from http://www.birdlife.org on 23/04/2019.

Bønløkke, J., Madsen, J. J., Thorup, K., Pedersen, K. T., Bjerrum, M. & Rahbek, C. 2006. Dansk Trækfugleatlas [The Danish Bird Migration Atlas]. – Rhodos, Humlebæk, Denmark, pp. 623–625.

Bozó, L. 2017. Kevermes madárvilága [Birds of Kevermes]. – Dél-békési Természetvédelmi és Madártani Egyesület, Kevermes (in Hungarian with English Summary)

Bozó, L. 2018. Dél-Békés természeti értékei [Nature assets of South-Békés]. – Dél-békési Természetvédelmi és Madártani Egyesület, Kevermes (in Hungarian)

Budinski, I. 2013. Drozd bravenjak *(Turdis pilaris)* [Fieldfare *(Turdus pilaris)*]. – In: Kralj, J., Barišić, S., Ćiković, D. & Tutiš, V. (eds.) Atlas Selibde Ptica Hrvatske [Croatian Bird Migration Atlas]. – Croatian Academy of Sciences and Arts, Zagreb, pp. 156–157. (in Croatian with English Summary)

Clement, P. & Hathway, R. 2000. Thrushes. 1st ed. – Christopher Helm, A & C Black, London

Collar, N. 2019. Fieldfare *(Turdus pilaris)*. – In: del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E. (eds.) Handbook of the Birds of the World Alive. – Lynx Edicions, Barcelona. Retrieved from https://www.hbw.com/node/58255 on 23 April 2019.

Csörgő, T. & Gyurácz, J. 2009a Fenyőrigó [Fieldfare]. – In: Csörgő, T., Karcza, Zs., Halmos, G., Magyar, G., Gyurácz, J., Szép, T., Bankovics, A., Schmidt, A. & Schmidt, E. (eds.) Magyar madárvonulási atlasz [Hungarian Bird Migration Atlas]. – Kossuth Kiadó Zrt., Budapest, pp. 464–465. (in Hungarian with English Summary)

Csörgő, T. & Gyurácz, J. 2009b Énekes rigó [Song Trush]. – In: Csörgő, T., Karcza, Zs., Halmos,G., Magyar, G., Gyurácz, J., Szép, T., Bankovics, A., Schmidt, A. & Schmidt, E. (eds.) Magyar madárvonulási atlasz [Hungarian Bird Migration Atlas]. – Kossuth Kiadó Zrt., Budapest, pp. 466–469. (in Hungarian with English Summary)

Csörgő, T. & Gyurácz, J. 2009c Fekete rigó [Common Blackbird]. – In: Csörgő, T., Karcza, Zs., Halmos, G., Magyar, G., Gyurácz, J., Szép, T., Bankovics, A., Schmidt, A. & Schmidt, E. (eds.) Magyar madárvonulási atlasz [Hungarian Bird Migration Atlas]. – Kossuth Kiadó Zrt., Budapest, pp. 459–463. (in Hungarian with English Summary)

Csörgő, T. & Kiss, P. 1986. Urbanizált fekete rigók *(Turdus merula)* túlélés vizsgálata [Study of overwintering urban Blackbirds *(Turdus merula)*]. – 2nd Scientific Meeting of the Hungarian Ornithological Society, Hungarian Ornithological Society, Szeged, Hungary, pp. 312–316. (in Hungarian with English Summary)

Csörgő, T., Fehérvári, P., Karcza, Zs. & Harnos, A. 2017a Exploratory analyses of migration timing and morphometrics of the Song Thrush *(Turdus philomelos)*. – Ornis Hungarica 25(1): 120–146. DOI: 10.1515/orhu-2018-0010

Csörgő, T., Fehérvári, P., Karcza, Zs. & Harnos, A. 2017b Exploratory analyses of migration timing and morphometrics of the Common Blackbird *(Turdus merula)*. – Ornis Hungarica 25(1): 147–176. DOI: 10.1515/orhu-2017-0019

Fransson, F. & Hall-Karlsson, S. 2008. Svensk ringmärkningsatlas (Volym 3 Tättingar) [Swedish Bird Ringing Atlas (Vol. 3. Passerines)]. – Stockholm, pp. 79–84. (in Swedish with English Summary)

Hadarics, T. 2014. New species in the Hungarian avifauna in 2013. – Ornis Hungarica 22(2): 130–134. DOI: 10.2478/orhu-2014-0021

Hadarics, T. 2016. New species in the Hungarian avifauna in 2015. – Ornis Hungarica 24(2): 78–83. DOI: 10.1515/orhu-2016-0016

Hadarics, T. & Zalai, T. 2008. Magyarország madarainak névjegyzék - Nomenclator avium Hungariae - An annonated list of the birds of Hungary. – Magyar Madártani és Természetvédelmi Egyesület, Budapest, p. 184. (in Hungarian with English Summary)

Haraszthy, L. 2019. Magyarország fészkelő madarainak költésbiológiája. 2. kötet, Sárgarigóféléktől a sármányfélékig [Breeding biology of Hungarian nesting birds. Vol. 2. Passeriformes]. – Pro Vértes Nonprofit Kft., Csákvár, pp. 448–453. (in Hungarian)

Hevesi, J. 2005. Határ mentén [Along the border]. – Békés Megyei Önkormányzat, Typografika Kft., Békéscsaba (in Hungarian)

Huttunen, M. J. 2004. Autumn migration of thrushes over eastern Finland: a comparison of visible migration and ringing recovery patterns. – Ringing & Migration 22(1): 13–23. DOI: 10.1080/03078698.2004.9674306

Ioalè, P. & Benvenuti, S. 1983. Site attachment and homing ability in passerine birds. Monitore Zoologico Italiano. – Italian Journal of Zoology 17(3): 279–294.

Jenni, L. 1987. Mass concentrations of Bramblings *Fringilla montifringilla* in Europe 1900–1983: Their dependence upon beech mast and effect of snow-cover. – Ornis Scandinavica 14: 84–94.

Lack, D. 1960. The influence of weather on passerine migration. A review. – The Auk 77(2): 171–209.

Lastukhin, A. A. 2005. A new subspecies of the Fieldfare (*Turdus pilaris glacioborealis* ssp. *nova*) from East Europe. – Ekologicheskiy Vestnik Chuvashskoi Respubliki 52: 75–78.

Ludvig, É., Csörgő, T., Török, J. & Vanicsek, L. 1991. Urbanizált fekete rigók *(Turdus merula)* telelése [Wintering of urban Blackbirds *(Turdus merula)*]. – 3th Scientific Meeting of the Hungarian Ornithological and Nature Conservation Society, Szombathely, Hungary, pp. 84–98.

Lundberg, P. 1985. Dominance behaviour, body weight and fat variations, and partial migration in European Blackbirds *Turdus merula*. – Behavioral Ecology and Sociobiology 17(2): 185–189.

Milwright, R. D. P. 1994. Fieldfare *Turdus pilaris* ringing recoveries during autumn, winter and spring, analysed in relation to river basins and watersheds in Europe and the Near East. – Ringing & Migration 15(3): 129–189. DOI: 10.1080/03078698.1994.9674088

Milwright, R. D. P. 2002. Redwing *Turdus iliacus* migration and wintering areas as shown by recoveries of birds ringed in the breeding season in Fennoscandia, Poland, the Baltic Republics, Russia, Siberia and Iceland. – Ringing & Migration 21(1): 5–15. DOI: 10.1080/03078698.2002.9674271

Milwright, R. D. P. 2003. Migration routes, breeding areas and between winter recurrence of nominate Redwings *Turdus iliacus iliacus* revealed by recoveries of winter ringed birds. – Ringing & Migration 21(3): 183–192. DOI: 10.1080/03078698.2003.9674290

Milwright, R. D. P. 2006. Postbreeding dispersal, breeding site fidelity and migration/wintering areas of migratory populations of Song Thrush *Turdus philomelos* in the Western Palearctic. – Ringing & Migration 23(1): 21–32. DOI: 10.1080/03078698.2006.9674340

Nagy, J., Végvári, Z. & Varga, Z. 2019. Phylogeny, migration and life history: filling the gaps in the origin and biogeography of the Turdus thrushes. – Journal of Ornithology 160(2): 529–543.

Németh, Z. 2017. Partial migration and decreasing migration distance in the Hungarian population of the Common Blackbird (*Turdus merula* Linnaeus, 1758): Analysis of 85 years of ring recovery data. – Ornis Hungarica 25(1): 101–108. DOI: 10.1515/orhu-2017-0007

Norman, D. 1994. The Fieldfare. – Hamlyn, London

Norman, D. 1995. Flock composition and biometrics of Fieldfares *Turdus pilaris* wintering in a Cheshire Orchard. – Ringing & Migration 16(1): 1–13. DOI: 10.1080/03078698.1995.9674091

R Development Core Team 2016. R: A language and environment for statistical computing. – R Foundation for Statistical Computing, Vienna, Austria

Schmidt, E. 1998. Fenyőrigó *(Turdus pilaris)* [Fieldfare *(Turdus pilaris)*]. – In: Haraszthy, L. (ed.) Magyarország madarai [Birds of Hungary]. – Mezőgazda Kiadó, Budapest, pp. 290–292. (in Hungarian)

Schröpfer, L. 2008. Droz kvíčala *Turdus pilaris* Fieldfare. – In: Cepák, J., Klvaňa, P., Škopek, L., Schröpfer, L., Jelínek, M., Hořák, D., Formánek, J. & Zárybnický, J. (eds.) 2008. Atlas migrace ptáku Ceské a Slovenské Republiky [Czech and Slovak Bird Migration Atlas]. – Aventinum, pp. 397–399. (in Czech and Slovakian with English Summary)

Simms, E. 1978. British thrushes Vol. 63. – Harper Collins

Snow, D. W. 1966. Population dynamics of the Blackbird. – Nature 211(5055): 1231.

Spina, F. & Volponi, S. 2009. Atlante della Migrazione degli Uccelli in Italia, Vol. 2. Passeriformi [Italian Bird Migration Atlas. Vol. 2.]. – ISPRA – MATTM, Roma, pp. 220–227. (in Italian with English Summary)

Stanković, D. 2018. Drozd borovnjak *Turdus pilaris* Linnaeus, 1758 Fielfare. – In: Stanković, D., Paulović, M. & Raković, M. 2018. Atlas migratornih ptica i slepih miševa Srbije [Atlas of migratory birds and bats of Serbia]. – Natural History Museum, Belgrade, pp. 309–310. (in Serbian with English Summary)

Svärdson, G. 1957. The "invasion" type of bird migration. – British Birds 50(8): 314–343.

Tiainen, J., Šťastny, K. & Bejcek, V. 1997. *Turdus pilaris* - Fieldfare. – In: Hagemeijer, W. J. M. & Blair, M. J. (eds.) 1997. The EBCC Atlas of European Breeding Birds: Their Distribution and Abundance. – T & AD Poyser, London, pp. 546–547.

Thy, A. 1986. Economics of experimentally-induced territorial defense in a gregarious bird, the Fieldfare *Turdus pilaris*. – Ornis Scandinavica 17(2): 151–164. DOI: 10.2307/3676864

Tyrväinen, H. 1970. The mass occurrence of the Fieldfare (*Turdus pilaris* L.) in the winter of 1964/65 in Finland. – Annales Zoologici Fennici 7(4): 349–357.

Valkama, J., Saurola, P., Lehikoinen, A., Lehikoinen, E., Piha, M., Sola, P. & Velmala, W. 2015. Suomen Rengastusatlas 2. [The Finnish Bird Ringing Atlas, Vol. 2.]. – Finnish Museum of Natural History LUOMUS & Ministry of Environment, pp. 438–444. (in Finnish with English Summary)

Wernham, C. V., Toms, M. P., Marchant, J. H., Clark, J. A., Siriwardena, G. M. & Baillie, S. R. (eds.) 2002. The Migration Atlas: movements of the birds of Britain and Ireland. – Poyser, London

www.worldweatheronline.com