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Migration and wintering of Finches (Fringillidae) in the Carpathian Basin based on ringing recoveries

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The study is based on the foreign related recoveries (longer than 100 km) of the Databank of the Hungarian Ornithological and Nature Conservation Society – BirdLife Hungary Ringing Centre until the end of 1997. The most common finch species with more than 10 foreign recoveries were included in the study: Linnet (*Acanthis cannabina*), Goldfinch (*Carduelis carduelis*), Greenfinch (*C. chloris*), Siskin (*C. spinus*), Hawfinch (*Coccothraustes coccothraustes*), Chaffinch (*Fringilla coelebs*), Brambling (*F. montifringilla*), and Bullfinch (*Pyrrhula pyrrhula*). All of these species are partial migrants with different irruptive tendencies. The Hungarian - related recoveries of the Brambling and Siskin, which are the most irruptive species, connect these birds to those wintering in W Europe, but the other species use different, more eastern wintering areas. While those spend the winter in western parts of the Mediterranean area, particularly on the Iberian Peninsula, the Hungarian related Chaffinch, Bullfinch, Linnet and Hawfinch populations spend the winter on the Apennine Peninsula, while the Greenfinch and Goldfinch on the Balkan Peninsula. The three large Mediterranean peninsulas served as refuges for the finch populations in the glacial period. According to the observable pattern today, the role of the peninsulas were not significantly different, as finches use all three areas for wintering. The differences are on the population level, which possibly means that the populations survived on the different peninsulas, and when expanded to north occupied different breeding areas in Europe.

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1. Introduction

Thirty-five species of finches (Fringillidae) occur in the Western Palearctic (Cramp & Perrins 1994, Beaman 1996). In Hungary, nine of these breed regularly, and 8 are present only during migration /wintering or as rare visitors (Keve 1984, Magyar *et al.* 1998). Finches can be classified as residents, partial migrants, or irruptive species. The distinction between these categories is not

entirely sharp, and different populations of the same species can have different migratory behaviour.

For the species studied, the most important wintering sites are in the British Isles, the Atlantic zone, and in the Mediterranean. Some species can stay north to the 70° in winter (Cramp & Perrins 1994).

In the present study the data of birds recovered in Hungary or ringed in Hungary and recovered abroad are used to find out the origin of birds migrating

Tab. 1. Summary of the ringing and recovery statistics for finches in Hungary. The totals ringed is from Varga & Simon (1997).

Species	Total numbers ringed in Hungary	Recovered		Total
		same season	after >1 year	
Linnet	11159	21	3	24
Goldfinch	31105	37	13	50
Greenfinch	78866	50	7	57
Siskin	51748	191	27	218
Hawfinch	19486	112	10	122
Chaffinch	28938	87		87
Brambling	16568	18	8	26
Bullfinch	11490	9	10	19
All	249360	525	78	603

through or wintering in, and the wintering sites of the birds breeding in or migrating through Hungary.

2. Material and methods

We used data available in the Databank of the Hungarian Ornithological and Nature Conservation Society - BirdLife Hungary at the end of 1997 (Tab. 1), but only species with more than 10 foreign recoveries were analysed. These foreign recover-



Fig. 1. Hungarian related recoveries of the Linnet in Europe. Solid squares: foreign location, either of ringing or recovery, when recovery was from the same migration season. Solid circle: foreign location, either of ringing or of recovery, when recovery was from a different migration season or one year or more passed between the ringing and the recovery. The Hungarian site is not marked.

ies span the period between 1908 and 1997 and are summarised in the Appendix. Where possible, we distinguished between same-year recoveries and those found later than the year of ringing. We could not separate by age or sex, because these categories have been distinguished in the last decades only.

Two different recovery groups were separated:

- (A) The ringed specimen was recovered in the same migration period as ringed.
- (B) One year or more passed between the ringing and the recovery.

The recovery numbers of these categories are referred in the text as A, B respectively, between brackets after the name of the country or area (where it is not mentioned other way in the text).



Fig. 2. Hungarian related recoveries of the Goldfinch in Europe. See the legend of Fig. 1.



Fig. 3. Hungarian related recoveries of the Greenfinch in Europe. See the legend of Fig. 1.



Fig. 4. Hungarian related recoveries of the Siskin in Europe. See the legend of Fig. 1.

3. Results

3.1. Linnet (Fig. 1)

The recoveries fall in a very narrow stripe. One bird ringed in Poland was recovered in Hungary during autumn migration. One bird each, ringed during winter in Hungary was recovered in Finland, Poland and Lithuanian spring and in later years birds were recovered in Poland (0,2). The southern recoveries were mainly from Northern and Central Italy (0,4) and Malta (6,6). This migration direction was also supported by two additional recoveries ringed in Italy and subsequently found in Hungary.

3.2. Goldfinch (Fig. 2)

The recoveries show a narrow migration passage in northwest-southeast direction. The birds arrived from the Northwest, mainly from Germany, Poland, Slovakia and the Czech Republic. The main destinations of the birds migrating from and through Hungary are on the Balkan Peninsula: Croatia (4,6), Yugoslavia (2,8), Albania (1,0), Greece (4,0), and Bulgaria (1,1). A few specimens were recovered in

winter in Italy (1,2). One bird ringed in Croatia was recovered in Hungary, and 1-1 bird ringed in Hungary moved to the Czech Republic and Poland on spring migration. Specimens ringed in Croatia (2), Yugoslavia (1), Bulgaria (1), Czech Republic (2), Slovakia (1) and Poland (1) were recovered in other years in Hungary.

3.3. Greenfinch (Fig. 3)

All recoveries of birds from the north were ringed in Hungary and recovered later in countries to the north-northeast. The most northerly of these countries was Lithuania (0,1); others were recovered in Poland (0,8), Czech Republic (0,1) and Slovakia (0,4). The main wintering area of this species seemed to be in Greece (9,7). Recoveries along this route were from the former Yugoslavia (2,2), Albania (0,1), Bulgaria (0,1) and Turkey (0,1). A smaller number of birds migrated to the SW, demonstrated by recoveries from the Croatian seashore (5,1), northern and southern Italy (2,2), and Malta (0,2). One bird ringed in Italy was recovered on spring migration, and birds ringed in Yugoslavia (1), the Czech Republic (1) and Slovakia (3) were recovered in other years in Hungary.



Fig. 5. Hungarian related recoveries of the Hawfinch in Europe. See the legend of Fig. 1.



Fig. 6. Hungarian related recoveries of the Chaffinch in Europe. See the legend of Fig. 1.

3.4. Siskin (Fig. 4)

The large number of recoveries showed very diffuse migratory directions. The birds arriving from north originate mainly from the Baltic States: Lithuania (3,1), Latvia (1,0) and Estonia (0,1), Finland (1,1), Sweden (0,1) and Russia (3,2). Birds ringed in Hungary move to wintering grounds principally in Northern Italy (86,26), and during the winter they reach southern parts of Italy. A few specimens were recovered on the northern parts of the Balkan Peninsula in Slovenia (4,1), Croatia (4,0), Yugoslavia (2,1), and Bosnia (0,3) on their way to Italy. Some birds tended to move to different parts of the Mediterranean, from Greece (3,0), Bulgaria (5,0) and Cyprus (0,1) on the east to France (2,0) and Spain (1,1) in the west. A smaller number seem to have changed migratory direction: either ringed in Hungary and recovered in Austria (2,7), Germany (0,6), and Belgium (1,4), or viceversa: ringed in Austria (0,2), Germany (2,0), the Netherlands (0,1) and recovered in Hungary.

3.5. Hawfinch (Fig. 5)

The small number of northern birds recovered in Hungary originated from Sweden (0,1), Slovakia (1,1) and Germany. Northern recoveries of Hungarian-ringed birds were from Estonia (0,2), the Ukraine (0,1), Slovakia (0,1), and Poland (0,1). Birds ringed in Hungary were recovered in high numbers on the wintering sites, mostly in Northern Italy (27,63), a few birds on the Croatian seashore (1,6), Bosnia (2,0) and in South France (3,1), and 1-1 in Sicily, Sardinia and Tunisia. The birds recovered on autumn migration and on wintering showed migration along a nar-



Fig. 7. Hungarian related recoveries of the Brambling in Europe. See the legend of Fig. 1.



Fig. 8. Hungarian related recoveries of the Bullfinch in Europe. See the legend of Fig. 1.

row line. One bird ringed in Yugoslavia was recovered in Hungary, and 1-1 Hungarian ringed bird was recovered in Poland and Slovakia during spring migration.

3.6. Chaffinch (Fig. 6)

According to recoveries, there were no birds arriving from the north to Hungary. Only 2 birds ringed in Hungary were recovered after more than a year in Ukraine and Belarus. The wintering sites of birds ringed in Hungary migrated almost exclusively to the Apennine Peninsula (34 recovered in Italy on autumn migration and 46 as captured). Three specimens were recovered at the Dalmatian seashore on migration. The most important wintering areas within the Apennine Peninsula are North and Central Italy, but a few birds were recovered in southern Italy. A few birds covered longer distances: 2 were recovered in Sicily, 2 in Sardinia and one in South France. One bird crossed the Mediterranean Sea and was recovered in Algeria (not indicated on the map).

3.7. Brambling (Fig. 7)

Most of the birds were recovered after more than one year west of Hungary: in Germany (0,1), southern France (0,2) Spain (0,1) and the greatest number in northern Italy (1,8). Two birds were recovered to south direction in Yugoslavia (0,2) and 1-1 to far east in the Caucasus Mountains in Georgia and in the Ural Mountains in Russia (3223 km). Birds ringed in Germany (0,2), France (0,1), Italy (0,1) and Yugoslavia (0,1) were recovered in Hungary. One bird each was recovered within the same migration period in Italy on autumn migration and in Norway on spring migration.

3.8. Bullfinch (Fig. 8)

The few birds recovered in Hungary were ringed in Sweden (2,0), Finland (1,2), Estonia (1,0), Poland (0,1) and Slovakia (1,2). Birds ringed in Hungary were recovered in later years in Russia (0,3), Ukraine (0,1), Latvia (0,1), Norway (0,1), and Poland (0,1). Birds migrating through Hungary to southern wintering areas were recovered in Croatia (2,0) and North-Italy (1,0).

4. Discussion

The formation of migration patterns relates to geographical and evolutionary causes. The formation of migration routes was determined by the in- and/or back settlement after the last glacial period. The recent wintering areas correspond to the breeding areas under the glacial period. If a species survived in a small area during the glacial period today can be wide-

spread, but all populations spend the winter at the ancient areas. Those species, which survived the glacial period in a bigger area, can have different migration routes and wintering areas today. These migration routes evolved according to the geographical barriers, which make migration more difficult. The high mountains lying in a West-East direction played this role in Europe (Busse 1987, Csörgô & Ujhelyi 1991). These principles appear most clearly in the migration routes of long-distance migrants.

In case of partial migrants and irruptive species the picture is more difficult. The migration routes are not well defined and the migration speed is very slow (Hilden & Saurola 1982, Ellegren 1993). These species change from animal to plant diet for the winter. This change results in the possibility to survive at northern latitudes and in worse weather conditions. The movement of these species is almost entirely controlled by the quantity of available food (Svårdson 1957, Berthold 1984, Jenni 1987, Alerstam 1990). In the continental areas of the temperate zone the characteristics of winters can not be predicted, thus it is not possible to predict the quantity of accessible food. Wintering site fidelity would be senseless for species adapted to these fluctuating conditions (Schlenker 1976, Yunick 1983, Csörgô & Molnár 1991).

According to the facts above, the studied species differ from each other. They can spend the winter in the Carpathian Basin according to the actual weather conditions on a scale varying by species. The species differ in the origin and destination of the birds passing through Hungary.

The Linnet is a partial migrant. The birds breeding in West Europe migrate to

the Iberian Peninsula on a narrow front, while from south Europe to North Africa (Cramp & Perrins 1994). From the areas between Finland through Poland to Hungary the birds migrate to the Apennine peninsula and Malta on a very narrow migration passage. The birds breeding in the more eastern parts of Europe spend the winter on the Balkan Peninsula and Asia Minor.

The Goldfinch is also a partial migrant. The European populations spend the winter at different parts of the Mediterranean area (Cramp & Perrins 1994). The birds breeding on the British Isles, in France and Germany migrate to the Iberian Peninsula. A minority of the western European birds crosses the Strait of Gibraltar and migrates to African wintering grounds (Asensio 1986). There is a migratory divide at 10° E (Zink 1995). Birds breeding east of this line migrate on a broad front in a S-SW direction to the Balkan where this species is very common in winter from the Dalmatian coast to the southern islands (Cramp & Perrins 1994, Zink 1995). This is the typical wintering area of the Hungarian birds as well. Only a small number of birds winter on the Apennine peninsula. There were a low number of captures compared to other finches in the Lombardian bird-capturing gardens (Schubert *et al.* 1986).

The Greenfinch is a partial migrant in most of its breeding range. There are resident individuals even in the northernmost Scandinavian populations, but only the southernmost populations are fully resident (Cramp & Perrins 1994). The migration is going on a broad front, and the species are wintering on all the three large Mediterranean peninsulas. The birds from Scandinavia and the Baltic states move

SW on fairly narrow front and spend the winter along the northern coasts of Europe to Iberia in the south. The western populations migrate in SW direction to the Iberian Peninsula. The birds breeding in Switzerland and Germany spread over a wide area from the Iberian Peninsula to Northern Italy during the winter, but the majority migrates to the Apennine Peninsula. The birds breeding in the northeast migrate to the Baltic areas, while from southern areas to the Balkan Peninsula (Cramp & Perrins 1994). Most of the birds ringed in Hungary were recovered on the Balkan Peninsula, with a few recoveries from the Apennine peninsula.

The northern populations of the Siskin are migratory while the southern ones are resident (Cramp & Perrins 1994). Individual birds can follow different wintering strategies: one part of the population shows nomadic behaviour throughout the winter, while others are faithful to the wintering site (Senar *et al.* 1990, 1992). Some individuals spend the subsequent winters in areas far from each other, while others show wintering site fidelity. The European migration routes of the species cannot be clearly defined, only some tendencies can be observed. The Norwegian birds usually spend the winter more to the west than the Finnish ones (Eriksson 1970b). The majority of the birds migrating through the Baltic areas arrive from South Finland and beside the west European wintering grounds in France, and the Iberian Peninsula (Asensio 1985) spend the winter in large numbers in Northern Italy (Payevsky 1994). The Hungarian recoveries fall in this migration group. A large number of these recoveries show connection with the SW directed migration route of Scandinavian birds

(Germany, Belgium, Switzerland, France), but there are no recoveries from the typical wintering grounds (Iberian Peninsula, British Isles) of these populations except one from Mallorca.

The Hawfinch is mostly resident in West Europe, only a small part of the population is migratory and even those cover only short distances. The North and Central European populations are partial migrants with a typical S-SW direction of migration (Cramp & Perrins 1994). Some of the Central European birds can reach North Africa during the winter, but the most important wintering areas are the Iberian Peninsula, southern France and northern Italy (Asensio 1990, Cramp & Perrins 1994). This is true for Hungarian breeders, as well. A few birds from the direction of Poland are passing through Hungary. The centre of wintering areas of the European populations is in the western basin of the Mediterranean region. More eastern populations spend the winter in Ukraine, Crimea and Caucasus (Dementiev & Gladkov 1954).

The southern populations of the Chaffinch are residents; the different populations northward and eastward become more migratory (Cramp & Perrins 1994). The direction of migration changes between west and south. The standard direction of north and west European populations is SW (Pedreck 1970, Hecke & Verstuyft 1972) The Scandinavian birds spend the winter in an area spanning from Denmark and Germany to the British Isles. The southernmost occurrence in winter is at the Iberian Peninsula. The Russian population is wintering on the Baltic Coast. Birds breeding in Germany and Switzerland migrate to the western Mediterranean area, while east-European

birds spend the winter in northern-Italy (Cramp & Perrins 1994, Zink 1995). The wintering areas possibly differ between very close breeding populations. The breeding population of the Czech Basin winters in the south of France, while the Slovakian population spends the winter in northern Italy (Hajek & Basová 1960, Cramp & Perrins 1994). This is the typical wintering area of the Hungarian population too, so the Slovakian and Hungarian birds may use the same wintering area. However, according to Savigni & Massa (1983) and the data presented here. The birds from Slovakia and the Baltic States arrive to the wintering grounds via the Alps and the Po lowland in northern Italy, while Hungarian birds migrated through the northern Adriatic.

The Brambling is breeding only in the northernmost areas of Europe. Every population is migratory and their wintering areas lie between the British Isles and the Caucasus (Cramp & Perrins 1994). The wintering strategies can be different. Part of the population spends the winter as north as the weather permits, other birds migrate to wintering areas separated by the origin of birds. In France, the Norwegian birds spend the winter in the western, the Swedish in the middle while the Finnish and Russian birds in the eastern areas (Yeatman-Berthelot 1991). Another migration route starts from north Europe, the birds migrate on this one to wintering areas in Northern Italy (Eriksson 1970a). There is no clear separation between the two groups. Other birds following a third strategy have no favoured migration route, the same bird can change wintering areas year by year, can spend subsequent winters on the British Isles and in the Caucasus

(Alerstam 1990). The irruptive tendency of the Brambling is the highest among the studied species, which is in direct relation with the winter food, first of all with the beech mast (Jenni 1987). The males spend the winter farther north than the females, which is a typical pattern of partial migration (Eriksson 1970a, Jenni 1982). The migration route in spring can differ from the one in autumn. The few Hungarian related recoveries belong to those migrating from north Europe to North-Italy, but a part probably changed wintering areas to west Europe or spent the subsequent winter far east in the Caucasus.

The populations of the Bullfinch are usually partial migrants, although in some areas they are residents. There are resident individuals in the northernmost populations also. The migratory specimens cover only short distances, and the wintering areas are inside the breeding area of the species (Cramp & Perrins 1994). The Scandinavian birds reach the latitude of Belgium-Switzerland-Romania dispersing SSW-SSE direction (Saurola 1979 in Cramp & Perrins 1994). Birds migrating through Southern Germany typically move to SW direction to Southern France (Barlein 1979). The direction of migration of the more eastern breeding populations is SW (Cramp & Perrins 1994), a part of the birds recovered in Hungary are related to them. The recoveries show a migration route from Scandinavia and the Baltic states through Poland and Hungary to Northern Italy and the Dalmatian seashore.

The role and importance of the Carpathian Basin for European finches is very different among species. The lack of recoveries and the well-known migration route of the north-eastern population of

the chaffinch indicate that this species is not migrating through Hungary in significant numbers. The Greenfinch and Goldfinch populations breeding north of Hungary in the region of Poland partly wintering, partly migrating through Hungary to southern areas. Other species migrate to and through Hungary from Scandinavia and NE Europe as well.

The Hungarian - related recoveries of the Brambling and Siskin, which are the most irruptive species, connect these birds to those wintering in W Europe, but the other species use different, more eastern wintering areas. While those spend the winter in western parts of the Mediterranean area, particularly on the Iberian peninsula, the Hungarian related Chaffinch, Linnet and Hawfinch populations spend the winter on the Apennine peninsula, while the Greenfinch and Goldfinch on the Balkan peninsula.

The three large Mediterranean peninsulas served as refuges for the finch populations in the glacial period. According to the observable pattern today, the role of the peninsulas were not significantly different, as finches use all three areas for wintering. The differences are on a population level, which possibly means that the populations survived on the different peninsulas, and when expanded to north occupied different breeding areas in Europe.

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Összefoglalás

A pintyfélék (Fringillidae) vonulása és telelése a Kárpát-medencében a külföldi visszafogások alapján

Vizsgálatainkat a Magyar Madártani és Természetvédelmi Egyesület Gyűrűző és Vonuláskutató Szakosztály Adatbankjának külföldi vonatkozású, 100 km-nél hosszabb távú visszafogásai alapján végeztük. Az 1997 végéig összegyűlt összesen 603 visszafogási adatot térképen ábrázolva elemeztük. A vizsgált 8 gyakori faj (erdei pinty - *Fringilla coelebs*, fenyőpinty - *F. montifringilla*, zöldike - *Carduelis chloris*, tengelic - *C. carduelis*, csíz - *C. spinus*, kenderike - *Acanthis cannabina*, süvöltő - *Pyrrhula pyrrhula*, meggyvágó - *Coccothraustes coccothraustes*) parciális vonuló, különböző mértékű inváziós hajlammal. Vonulásukat erősen befolyásolja az időjárás és a táplálék elérhetőség évenkénti változékonysága. A parciálisan vonuló fajokra általában nem jellemző a vonulási út és telelőterület hűség, ezért a megkerülések nagy egyedi és évenkénti változatosságot mutatnak. A nyolc faj átvonuló egyedei különböző helyről származnak, és telelő területük is különböző. A Kárpát-medencének megfelelő szélességen nagyrészt magas hegyek terülnek el, ezért az észak felől a Mediterráneum felé tartó magevő madaraknak fontos átvonulási területe. Innen fajokként különböző irányba, az Appenin- vagy a Balkán-félsziget felé haladnak tovább, míg az inváziós fajok Európa nagy területén szétszóródnak. A leginváziósabb hajlamú fenyőpinty és csíz hazai vonatkozású visszafogásai a Ny-Európában telelőkhöz kapcsolják az itt átvonulókat is, de a többi faj eltérő, keletebbi telelő területeket használ. Míg azok általában az Ibériai félszigeten vagy legalábbis a Mediterráneum nyugati medencéjében telelnek, a magyar vonatkozású madarak közül az erdei pinty, a süvöltő, a kenderike és a meggyvágó az Appenin félszigeten, a zöldike és a tengelic a Balkán félszigeten telel. A jégkorszakban a három nagy mediterrán félsziget az északról délre szoruló pintyfélék refugiumaként is szolgálhatott. A mai kép szerint szerepük a vizsgált fajok esetében nem különbözhetett lényegesen, mivel ma mindhárom terület telelőhelyként szolgál. A különbségek populációs szintűek, ami azt jelenti, hogy a felmelegedéssel észak felé terjedő fajok a félszigetéről kiindulva Európa különböző területeit foglalták el.

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Appendix continued.

	Haw finch						Chaffinch						Brambling						Bullfinch					
	I.			II.			I.			II.			I.			II.			I.			II.		
	A1	A2	B	A1	A2	B	A1	A2	B	A1	A2	B	A1	A2	B	A1	A2	B	A1	A2	B	A1	A2	B
Austria			1																					
Switzerland																								
Germany						1								1			2							
Belgium																								
Holland																								
France		3	1						1					2		1								
Spain														1										
Portugal																								
Algeria									1					1	8		3							
Italy		27	63			5		34	46												1			
Malta																								
Slovene																								
Croatia		1	6						3					2		1				2				
Bosnia		2																						
Yugoslavia				1																				
Albania																								
Greece																								
Turkey			1																					
Cyprus																								
Bulgaria																								
Romania																								
Czech Rep.																	1						1	2
Slovakia	1		1		1	1																		
Ukraine			1						1													1		
Georgia														1										
Russia														1								3	1	
Belarus									1															
Estonia			2																			1		
Lithuania																								
Latvia																								
Poland	1		1																		1			1
Finland																							1	2
Sweden						1																		2
Norway													1								1			