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Main migratory direction of Marsh Harrier *Circus aeruginosus*: an analysis of recovery data of specimens ringed in Latvia from 1925 to 2004

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Abstract

This paper describes the main migratory directions of the Latvian Marsh Harrier *Circus aeruginosus* population and provides an overview of recovery data. The study was based on analysis of recovery data of Marsh Harrier that were ringed in Latvia from 1925 to 2004 and subsequently recovered. In total, of the 744 Marsh Harriers that were ringed only 47 (6.30 %) were recovered. The majority of recoveries of Marsh Harrier were due to hunting 46.8 % (n = 22), 25.5 % (n = 12) were found dead and 27.7 % (n = 13) were captured in the area of ringing. Frequency analysis of direction and recovery distribution mapping showed that the Latvian population of Marsh Harrier more frequently had a SSW migration direction, suggesting a Mediterranean passage across Italy.

Key words: Marsh Harrier, migration, recovery, ringing.

Introduction

Diurnal birds of prey *Falconiformes* represent a diverse group of highly mobile, wide-ranging predators, whose populations occur across a broad range of western Palearctic habitats (Cramp, Simmons1980). Each year a number of these birds migrate long distances, in many instances across and among entire continents, en route to their breeding and wintering grounds. Most raptor species are diurnal migrants. Only occasional cases of nocturnal migration of Harrier have been reported (Russel 1991).

The migratory behaviour of birds is controlled by endogenous factors and influenced by various environmental factors. Important exogenous factors are weather and topography (Alerstam 1976). Although raptors often migrate across broad fronts, individuals of many species congregate along established corridors on migration, particularly along specific geographic features including mountain chains, coastal plains, isthmuses, and peninsulas (Bildstein 1998).

The mapping of migration patterns, especially those of long-distance migrants, has long been a major focus of study in the biology of migration. The first ringing in Latvia was made in 1909. Systematic ringing was started in 1925 (Kazubiernis 1989). The first report on the recovery of a Marsh Harrier *Cicer aeruginosus* (hereafter MaH) that was ringed in Latvia came from 1928, when a MaH ringed at Lake Engure was recovered (shot) later in the same year and in the same area. Comparatively little is known about Latvian

population of Harrier migration patterns, routes and destinations. The aim of this study was (i) to describe the main migratory directions of Latvian Marsh Harrier population, and (ii) to provide an overview of recovery data.

Materials and methods

This study was based on ringing data of the Marsh Harrier accumulated in Latvia from 1925 to 2004. Only recovery data were used. Historically, MaH ringing in Latvia has been carried out by two different methods. The first included parent tracing, nest searching and ringing of chicks at a suitable age e.g. a sufficient size of tarsus and toes to keep the ring stable. The second way was linked with predator control programmes in waterfowl breeding areas. This method was applied in the 1960s up to 1998 at Lake Engure. Annually from April to June, about 70 to 80 MaH were captured (Lipsberg 1983; Opermanis et al. 2005). MaH, both full grown and immatures, were trapped on dummy waterfowl nests using a snap-net trap and released in the same area or more than 50 km from the trapping place. Since adult birds trapping were carried out not only in the MaH breeding period, but also during the spring migration, a part of the ringed birds were migrants from northern populations.

The migration map and recovery statistics were produced following Fransson's (2001) described approaches and using ArcView 9 software (ESRI 2004a; ESRI 2004b).

Latitude and longitude co-ordinates of ringing and recovery sites given by the Latvian Ringing Centre were used. The Mercator projection map was used. In this projection, a straight line follows in a constant compass bearing (loxodrome), while the earth's surface is distorted and areas in the North are enlarged compared with areas close to the equator. North, East South and West directions marked as 0°, 90°, 180° and 270° respectively. Four different symbols were used to indicate different stages relating to migration. When translocation co-ordinates were given as start point and co-ordinates of releasing as an end point, these cases were excluded from the ringing-recoveries map and from frequency display. Lines between ringing and accordant recovery places sites were used.

A frequency display based on loxodrome directions for MaH was produced and the median and modal class directions were calculated. When displayed in the figure, directions within five-degree intervals were pooled. To avoid impact of records from postbreeding dispersion and cases when birds from northern populations were ringed, directions more than 270° and less than 90° were not included in calculating the frequency statistic. Recovery data from wintering, spring migration and autumn migration periods were used.

Recovery data for MaH were summarized and included the number ringed, number recovered, proportion recovered and longest travel. The distances of travel were calculated as the shortest distance between the ringing and finding site.

Results

In total, of the 744 MaH that were ringed only 47 (6.3 %) were recovered. The majority of recoveries of MaH were made by hunting 46.8 % (n = 22), 25.5 % (n = 12) were found dead and 27.7 % (n = 13) were captured in the area of ringing. A distance of 2473 km was the longest from the area of ringing in that a MaH was recovered. The frequency display based

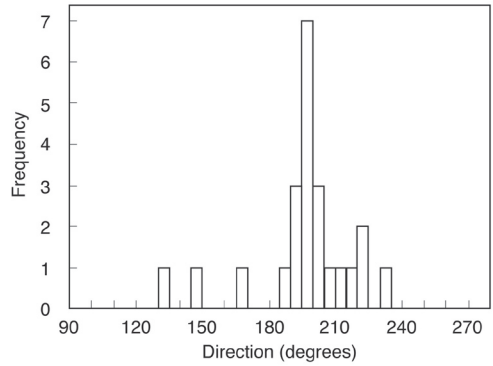

Fig. 1. Frequency distribution of migration direction based on recoveries of Marsh Harrier *Circus aeruginosus* ringed in Latvia 1925 - 2004 (n = 23). Degrees show compass bearing directions between ringing and recovery areas (00 – North, 90° – East, 180° – South and 270° – West, respectively).

on loxodrome directions showed that the central tendency (mode) of migratory direction of MaH was determined as 195° and the median observation of migratory direction of MaH in autumn was 196° (Fig. 1). The migration of MaH was directed SSW, passing through Central Europe and Italy (Fig. 2).

From the 47 recovered MaH, 25 were relocated before releasing. All MaH with subsequent recoveries were ringed from April 29 to July 21, and included adults, immature and juvenile birds. The timescale of recoveries and ringing age of recovered MaH are given in Table 1.

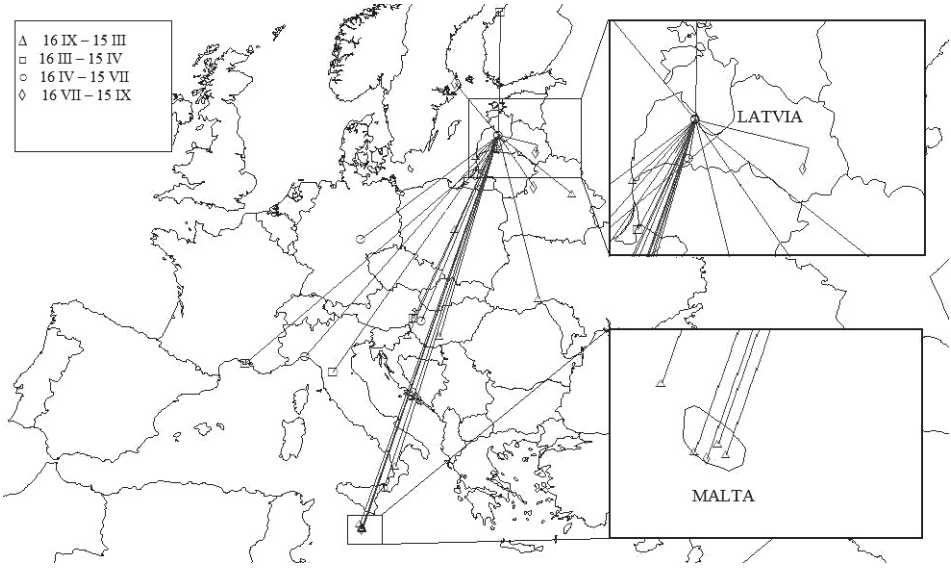

Fig. 2. Recovery of Marsh Harrier *Circus aeruginosus* ringed in Latvia 1925 - 2004 and recovered during 16 July to 15 September (n = 4); 16 September to 15 March (n = 11); 16 March to 15 April (n = 5); 16 April to 15 July (n = 7)..

Table 1. Age of Marsh Harrier *Circus aeruginosus* ringed and recovered in Latvia 1925 - 2004

Age	Recoveries in ringing year (number)	Recoveries in next year (number)	Recoveries after two years and later (number)	Recovered in total (number)
Pull	3	3	5	11
At least 1-year old	4	4	9	17
Second-year birds	1	1	-	2
At least 2-years old	-	1	1	2
Full grown	4	3	8	15

Discussion

Latvian Harrier population can be defined as annual migrants. According to Terrill and Able (1988) this term should be applied to populations (species or geographically defined breeding populations of a species) in which all individuals migrate from their breeding sites on an annual basis. A few MaH individuals occasionally have been found wintering (LOB 1999), particularly in SW Latvia. However, the counted numbers of individuals per year are very few and their area of origin is not clearly known.

Frequency analysis of directions (Fig. 1) and recovery distribution mapping (Fig. 2) showed that the Latvian population of MaH more frequently used a migration direction involving Mediterranean passage across Italy. Since five recoveries came from Malta, it is reasonable to believe that MaH leave Sicily and migrate to Africa across Malta. Wintering in Africa has been documented by Cramp and Simmons (1980) and Fransson and Pettersson (2001). The West European (e.g. British, Netherlands etc. North Sea countries) population has been referred to as migrants across France and Iberia, and the Central/East European population as migrants across central Mediterranean. The easterly breeding populations are described as migrants over land bridges between Europe and Africa at the eastern edge of the Mediterranean Sea (Spaar, Bruderer 1997). In Malta, one female was recovered on 4 March, one male and one female in the second half of September, and one female and one male in the first decade of October, suggesting the Italy was being used in both autumn and spring migrations. However, a possible overwintering in Mediterranean isles is discussed in Misbah (1982). In contrast, Garcia and Arroyo (1998) described that European Montagu's Harrier *C. pygargus* had two main migratory routes across the Mediterranean – the Gibraltar and the Sicily Channel (strait between Sicily and Africa). Their study showed that the passage frequency was higher in the post-breeding than the pre-breeding migration in the Gibraltar Strait, but the opposite occurred in the Sicily Channel. The authors discussed the possibility that Montagu's Harrier have a partially circular migration. In this respect, the recovery of MaH from the Mediterranean coast in South France (Fig. 2) in first decade of April suggests a possible owerwintering in South Europe or using Gibraltar as western land bridge between Europe and Africa.

The number of recoveries used in my analysis was insufficient to identify the correct wintering areas of MaH, and artifacts can disfigure interpretation. As argued by Fransson (2001), even if a few individuals remain in Europe, the chance of receiving a report from these is much higher than from those wintering in Africa. Also, differences in hunting

traditions and hunting legislation between countries in the Harrier flyway might generate differences in recovery probability, e.g. all recoveries from Malta came from shot specimens.

Since 1925 when systematic ringing was started till 1986 in Latvia, 441 MaH were ringed. The recovery rate for MaH from 1961 to 1985 was 7.9 % (Kazubiernis 1989). This high recovery rate was due to waterfowl predator control activities at Lake Engure, where the majority of MaH were ringed. Potentially, this predator control negatively affected the MaH population. However, waterfowl management indirectly provided the highest recovery rates in overall ringed *Falconiformes* species in this period in Latvia (Kazubiernis 1989). From the beginning of the 1990s, when species protection legislation was strengthened, MaH trapping and relocation in the breeding period was terminated. Since that time, the recovery proportion fell to 6.3 %.

Cramp and Simmons (1980) summarized that autumn migration of MaH, started by juveniles moving away from breeding areas, began in early August. Recovery of three specimens that were ringed as nestlings and recovered in the same year within 50 km from the ringing area suggests that fledglings can remain at the natal area till the third decade of August or even mid September. Recoveries in mid January and in the third decade of January in Poland and Belarus, respectively, suggest that the migration period may be spread over a long period or allow owerwintering in areas relatively close to Latvia. Unfortunately, these two birds were ringed there as at least one year old and full grown, and it was not clear whether they came from the Latvian breeding population.

From MaH that were ringed in other countries and recovered in Latvia, 12 were ringed in Finland, four in Sweden and one in Estonia (Latvian Ringing Centre, unpublished data). The majority (excepting one) were ringed as nestlings. Therefore, this indicated that the flyway of these northerly breeding populations pass over Latvia. Overlapping of migrations of Baltic and Finland MaH populations in a route over Hungary has been discussed by Misbah (1982). Two MaH that were ringed in Latvia in the first and third decades of May as at least one-year old and subsequently recovered in Finland and Sweden (Fig. 2.) provide evidence that part of the captured birds represent northern populations. However, Fransson and Pettersson (2001) showed that most of the Swedish MaH population migrated crossing Denmark. A specimen ringed as a nestling in Latvia and recovered in a 194° direction in South Italy indicates the main migratory direction (Fig. 2), suggesting that breeding populations in the Latvian and the nearest Baltic Sea countries (Finnland and Estonia) have the same flyway. Two recoveries in late spring from Italy in the first decade of May were considered to indicate late migration or possible no breeding (Misbah 1982).

As factors affecting the dispersal behaviour of juveniles can differ from those that govern the dispersal behaviour of adults, especially in long-lived species, dispersal of juveniles during their first winter and adults are usually analysed separately (Fransson 2001). Four specimens ringed as nestlings and recovered in the breeding period in the next or later years came from areas less than 50 km distance from the ringing site, and indicating return in the next years to their natal sites. Recovery of four specimens ringed as immature and recovered in the same year and for one specimen that ringed as immature and recovered in the next year were made in Latvia. Three recoveries, to a more westerly directing (232°) in central Germany, a single recovery from Ukraine (167°) and a single recovery from Sweden (317°; Fig. 2), came from specimens that were ringed as immature

in Latvia and recovered in the next year, indicating that wide dispersal is possible.

Recovery of full grown specimen in the breeding season indicates breeding philopatry in both sexes. One male that was ringed in the Lake Engure as more than two-years old subsequently was recovered in the same area after more than seven years and one female ringed as full grown was recovered after 447 days at a 21 km distance from the ringing area.

In subsequent breeding seasons, four birds from both sexes and ringed at different ages (at least one year old and full grown) were recovered near the capturing area. One female that was trapped in the second decade of May in the Lake Engure was repeatedly captured in the same area after 30 days. Founding areas of recoveries during migration of relocated MaH were not outside of the main direction tendencies. Thus, capture and relocation showed no impact on migration and dispersal.

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References

Alerstam T. 1976. *Bird Migration in Relation to Wind and Topography.* PhD thesis, University of Lund, Sweden.

Bildstein K.L. 1998. Long-term counts of migrating raptors: a role for volunteers in wildlife research. *J. Wildlife Manage.* 62: 435–445.

Cramp S., Simmons K.E.L. (eds.) 1980. *Handbook of the Birds of Europe, the Middle East, and North Africa: the Birds of the Western Palaearctic.* Vol. 2. Oxford University Press, Oxford.

ESRI 2004a. *ArcView 9.* ESRI, California.

ESRI 2004b. *ESRI Data & Maps CD 1.* ESRI, California.

Fransson T. 2001. To analyse ringing recoveries in a national atlas – examples from the Swedish project. *Ardea* 89: 21–30.

Fransson T., Pettersson J. 2001. *Swedish Bird Ringing Atlas.* Vol. 1, Divers - Raptors. Ljungföretagen Tryckeri AB, Stockholm. 189 p. (in Swedish)

Garcia J.T., Arroyo B.E. 1998. Migratory movements of western European Montagu's Harrier Circus pygargus: a review. *Bird Study* 45: 188–194.

Kazubiernis J. 1989. Bird ringing in the Latvian SSR (1925 - 1986). *Putni dabā* 2: 135–165. (in Latvian)

Lipsberg J. 1983. Marsh Harrier. In: Vīksne J. (ed), *Birds of Latvia. Territorial Distribution and Number.* Zinātne, Rīga, p. 63. (in Russian)

LOB 1999. *Latvian Birds of Inland Wetlands.* Riga, 208 p. (in Latvian)

Misbah D. 1982. Marsh Harrier – *Circus aeruginosus* (L.). In: Iljicev V.D. (ed.), *Migrations of Birds of Eastern Europe and Northern Asia. Falconiformes – Gruiformes.* Nauka, Moscow, pp. 115–131. (in Russian)

Opermanis O. Mednis A. Bauga I. 2005. Assessment of compensatory predation and re-colonisation using long-term duck nest predator removal data. *Acta Univ. Latv.* 691: 17–29.

Russel R.W. 1991. Nocturnal flight by migrant "diurnal" raptors. *J. Field Ornithol.* 62: 505–508.

Spaar R., Bruderer B. 1997. Migration by flapping or soaring: flight strategies of Marsh, Montagu's and Pallid harriers in southern Israel. *Condor* 99: 458–469.

Terrill S.B., Able K.P. 1988. Bird migration terminology. *Auk* 105: 205–206.

Latvijā ligzdojošo niedru liju *Circus aeruginosus* galvenie migrācijas virzieni: laikā no 1925. gada līdz 2004. gadam Latvijā gredzenoto īpatņu gredzenošanas atradumu analīze

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Kopsavilkums

Šajā darbā aprakstīti Latvijā ligzdojošo niedru liju *Circus aeruginosus* galvenie migrācijas virzieni un sniegts pārskats par gredzenu atradumiem. Veiktais pētījums balstīts uz laikā no 1925. līdz 2004. gadam Latvijā gredzenoto niedru liju gredzenošanas datiem. No kopējā šajā laikā apgredzenotā liju skaita (n = 744) saņemti tikai 47 (6,3 %) ziņojumi par gredzenu atrašanu. Atrašanas apstākļu analīze parādīja, ka vairumā gadījumu gredzenotās niedru lijas bija cilvēku nomedītas (46,8 %; n = 22); atrastas beigtas (25,5 %; n = 12) vai gredzenu dati nolasīti, tās atkārtoti kontrolējot ligzdošanas vietās (27,7 %; n = 13). Migrācijas virzienu frekvenču analīze un gredzenošanas atradumu attēlojums kartē parādīja, ka Latvijā ligzdojošā niedru liju populācija galvenokārt migrē dienvidu-dienvidrietumu virzienā un šķērso Vidusjūru, pārlidojot Itāliju.