A large-scale study of dispersal and survival of young Montagu's Harriers using wingtags

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Conservation status of Montagu's Harriers in Europe
The conservation status of Montagu's Harriers remains uncertain on the scale of whole Europe. According to BirdLife, the population of this species has been growing during the last 10 years, and the species is considered out of danger (safe) (BirdLife International 2004). An intensive analysis per country shows that nevertheless, this status is doubtful. The supposed positive dynamics of the species are for a large part due to uncertain population estimates from European Russia, which certainly hold the largest part of the European population. The difficulty in producing reliables estimates on a large scale has to make us cautious. On a national level, the species is most certainly in decline in France and other European countries. France, Spain and Belarus hold the majority of the European breeding pairs outside Russia (Millon & Bretagnolle 2004). In France, there are 3800-5100 breeding pairs (Thiollay & Bretagnolle 2004). The absence of reliable estimates from the past makes it impossible to prove a negative tendency of population levels, but the shrinking distribution of the species in France compared to earlier publications (Yeatman 1976, Yeatman-Berthelot & Jarry 1994) underlines that one of the most important populations in Europe is in decline since the 1980s. This is also supported by intensive long-term studies in restricted areas (Millon et al. 2004). The absence of peak years of Harriers is observed in e.g. central-western France.

A food availability problem
Montagu's Harrier has moved to agricultural areas while agriculture grew more and more intensive. Monitoring of populations of Common Voles shows that vole peak years do no longer occurr in some areas (data from CEBC-CNRS in Chizé), which could represent a major food availability problem for Montagu's Harriers.

Nest protection
In France, 70% of Montagu's Harriers bred in grain in 2000. The remaining 30% bred in coastal marshes and heaths. The risk of nest destruction in agricultural land varies from year to year and depends on the geographic location (harvesting date, ratio of different grain species which are harvested early or late). In France, the average proportion of nests which need protection is around 30 % (data from Mission FIR-LPO). Furthermore, the lower food availability can contribute to later laying dates and in this respect increase the susceptibility of nests to destruction by harvest.

A unique protection effort by volunteers
Since the beginning of Montagu's Harrier protection in France (A. Perthuis in 1976, D. Béguin in 1977), a national protection network has developped, which has grown to a level never reached anywhere else for the protection of a raptor species. Since 1988, between 600 and 1000 nests are included in conservation programmes.

Conservation efficiency
What are the causes of the decreasing trend of well-studied Montagu's Harrier populations in France? How to optimize conservation efforts in time and space? We need to measure the impact of protection on a national scale to answer these questions.

And for measuring this, we need to understand Montagu's Harrier population dynamics, and identify the reasons for variations in population size, in time and space.

What do we know about Montagu's Harrier population dynamics?

Alain Leroux has taken the initiative for a wingtagging programme in the coastal marshes near Rochefort, in 1988, in order to estimate survival and site fidelity in the breeding area in the context of drastic habitat change in the wet areas. Based at the CEBC-CNRS in Chizé, this programme has been extended to four other sites, at which standardized monitoring has been conducted for at least 10 years now.

Individual marking of adult Harriers allows us to estimate the local survival, which is around 65-70%. It also allows us to prove that males have a higher affinity with their previous nesting site than females, and females have a noticeable breeding dispersal, especially after failed breeding attempts. Distances of dispersal can be further than 100 km. Furthermore, 500 nestlings have been marked with the same method, only in Rochefort. Juvenile survival was estimated at 30-35 %. One third of the birds has been recovered outside their natal area, which means that probably not all of the dispersed young have been reported.

This information, together with data from ring recoveries, gives us a qualitative idea of juvenile dispersal for this species and makes clear that juveniles have a large dispersing potential (fig. 1).

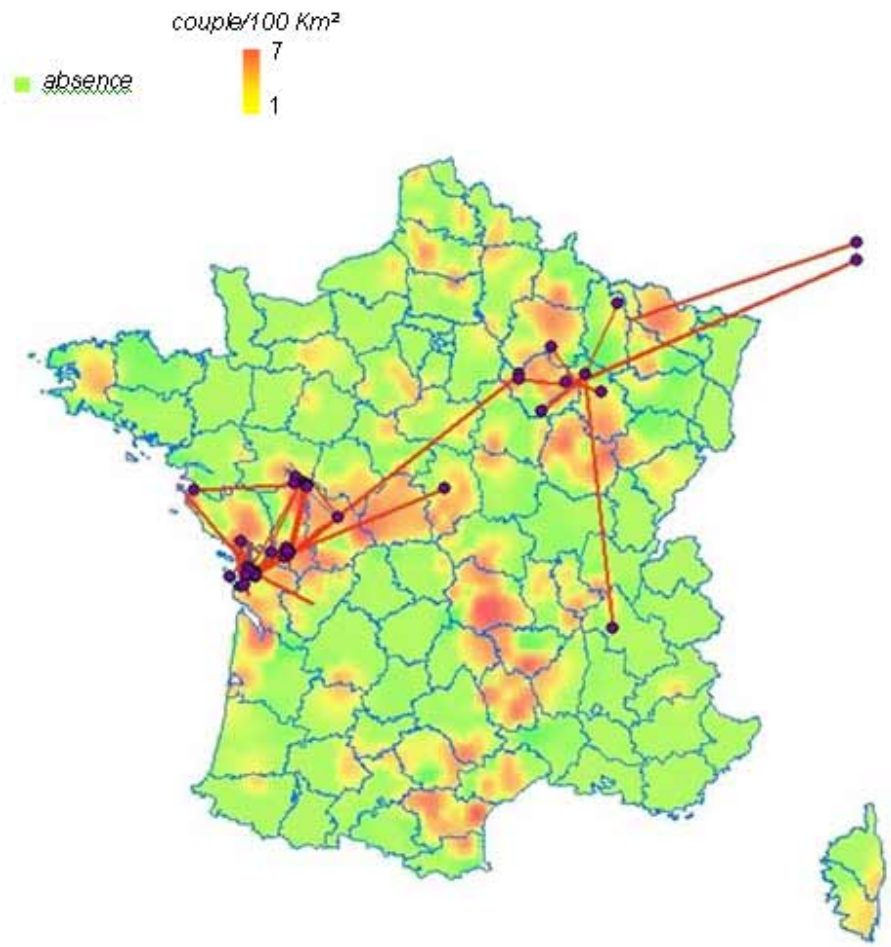

Fig.1: Examples of data on juvenile dispersal of female Montagu's Harriers in France. The blue circle represents the birth place, the red line the movement to the place of first reproduction. The distribution of Montagu's Harriers in France is indicated from yellow (low density) to orange (high density) (changed from Thiollay & Bretagnolle 2004).

It is not surprising that the dispersal potential of Montagu's Harriers is high. It is a long-distance migrating species living in open habitats and dispersal can evolve because of a relatively long lifetime. The high flexibility of the species and individuals is underlined by the fact that the species has changed its main breeding habitat during the 20th century from natural, uncultivated to agricultural, cultivated areas. Recently, the species has colonised geographically isolated regions of suitable habitat, like in Bavaria (R. Krüger, pers. comm.) or in Catalunia (Soutullo et al. 2006).
Data on dispersal and survival can be combined with estimates on laying date, clutch size, number of fledglings, number of young saved from agricultural practices etc. from regions in which the Harrier population is well studied. These data can be used for population dynamics models in order to estimate population trends and test different possibilities of conservation measures against each other. Also, the severeness of different threats can be tested, like harvesting activities, lower food availability or threats in the winter areas.

Exchange rates between populations: the missing link

Each Harrier conservationist has asked himself one day why his nest protection efforts have not resulted in an increase of the local breeding population. Even with a higher protection effort, the population can remain stable or decrease. Where does this heterogeneity come from? Probably because the study area is not large enough to represent a whole breeding population in the biological sense.

In other words, on the spatial scale we work on locally, a lot of the variation we see does not result from demography (i.e. mortaliy and natality), but of immigration and emigration.

An example: in a study site of 34 000 ha of CEBC-CNRS in Chizé, all young have been ringed since 1995. In 2006, only 50 % of the male and 30 % of the female breeding birds were ringed. 95% of the ringed males and 50% of the ringed females were from local origin. It is necessary to understand this large extent of exchange between sub-populations in order to get a picture of Montagu's Harrier population dynamics.

A large-scale project of wingtagging juveniles

The main problem of studies of dispersal is to observe large-scale movements. The existence of a protection network for Harriers in a large part of the species' distribution offers the opportunity to measure dispersal in qualitative, but more important, quantitative terms. The use of individual wingtags assures a high probability of reports because of the good visibility of the tags, also for untrained observers.

That is why we organised an extensive marking programme for juvenile Montagu's Harriers, based on the network of (volunteer) Harrier workers for the time period 2007-2008. The goal of the project is to quantify Montagu's Harrier natal dispersal on national and international scale.

In France, the Harriers encounter contrasting ecological conditions. The impact of nest losses due to harvest and the diet (proportion of voles in the diet) differt greatly between areas. These differences between areas can lead to marked differences in population dynamics, creating zones of more and less productive breeders, and potentially defining "source" and "sink" populations. These dynamics can influence dispersal behaviour and result in asymmetric dispersal. This is what we would like to identify and quantify in the framework of this programme. For example, it is especially important to know whether the populations that reproduce in natural vegetation export breeders for the grain-breeding populations.

A large geographical cover: key to success

The success of this project depends on the large geographical cover of different ecological situations within the breeding range of Montagu's Harrier. This means a large effort to tag birds in areas that have not been studied before, especially in natural breeding habitats.

Time period and effort of the wingtag programme

The year 2007 was a trial year, where lots of people have been instructed on how to wingtag young Montagu's Harriers. The French system works with local co-ordinators who personally instruct taggers, and new taggers are registered with their personal data and a picture. The goal was to mark 500-1000 young. Eventually, more than 1600 have been tagged in 2007 (France: 1524, Germany: 64, Netherlands: 40). In 2008, the goal is to mark 2000-3000 young, covering areas where the impact of harvesting losses is strong, intermediate and absent, the diet is based on voles, voles and birds, birds etc.

We have chosen to restrict this programme in time to make sure that the benefits of a success will compensate all the extra work needed, which cannot be done on the long term. We have chosen to concentrate our efforts in only two years (2007-2008) instead of maintaining the same effort over a longer period of time. In the years after the end of the tagging, it will still be necessary to invest extra time to read the tags in a wider geographical area. The experience from marking at the Rochefort site have shown that 90 % of the resightings happened within four years after marking the young.

Which conservation implications does this programme have?

The number one goal of this programme is to collect data in order to be able to design large scale conservation measures. These conservation measures will depend for a large part on a co-operation of volunteers and the agricultural world, and does not profit from the regular nature protection efforts, as agricultural fields are not usually considered to contribute much to biodiversity. We want to find out how to optimize our protection efforts in time and space. We could for example choose to concentrate our conservation efforts on the populations that are the most productive ("sources") and extend our efforts in Harrier peak years. Bird conservation needs a good understanding of large scale species ecology.

Additional information

By C. Trierweiler

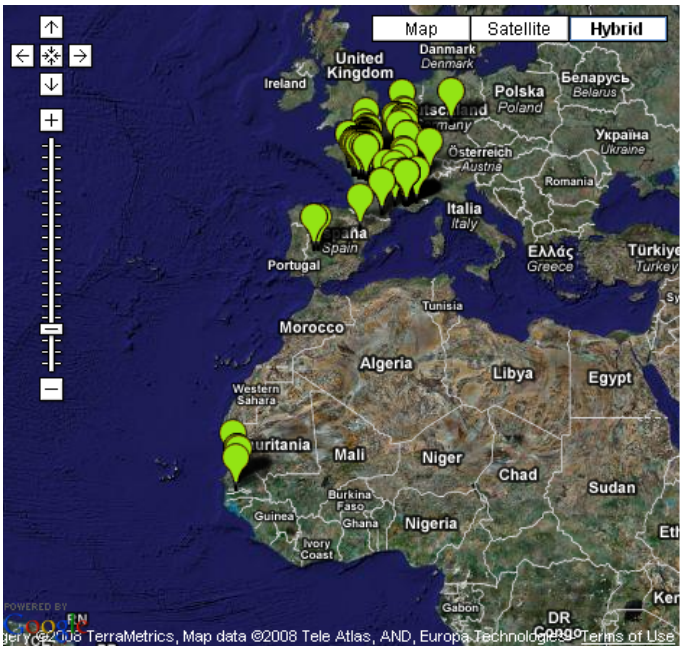

Fig. 2: Wingtag readings from www.busards.com.
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What were the results of the first year?

Already within the first year, a lot of wingtag readings were made (fig. 2). There were even several readings from Africa. Compared to ring readings, the wingtags have delivered already now a much better efficiency of recovery/reading. The chance that wingtags are read is at least twice as high as for colour rings.

For the Dutch population holds that the wingtags of several young have been read during their pre-migration, and one Dutch female young has been read on her migration through France. A Dutch team travelling in W-Africa on a Harrier mission could read several wingtags, one of which a young male from France (fig. 3).

Fig. 3: A young male Montagu's Harrier whose wingtags were read in Senegal.

Why did the Dutch participate in this programme?
In earlier years, wingtag programmes that have been proposed suffered from unclear goals and poor organisation. In that case, we stuck to our own colour ring programme in the Netherlands. That programme started in 1998 and since then, all our young and a sample of adults have been provided with colour rings. After 10 years, the rate at which we see colour-ringed birds increases fast. We have read around 40 colour rings in total, many of which were read several times (e.g. site-faithful breeding birds in different years). The programme has since then expanded to Lower Saxony and Hellwegbörde in Germany, to Denmark, Poland, Slovak Republic and Belarus. Why do we participate in a two-year wingtag programme when we have a well-functioning colour-ring programme?



Colour-ringed (left) and wingtagged (right) Montagu's Harrier in the Netherlands. Fotos: Hans Hut.

We think that nature protection goes hand in hand with proper data collection. We were convinced for the use of wingtags by the high proportion of readings of wingtags, which is not only caused by the good visibility of the tags, but also by the extra effort of observers in Europe and Africa to read as many tags as possible, from now on and at least for the next four years. After the project period, we will use colour-rings again. Next to the high reading rate of wingtags, the excellent organisation, clear scientific question and conservation relevance of the French project has convinced us. Besides that, the material (tags) provided is of good quality.

Are there risks to the use of wingtags? We have talked to a scientist and a raptor specialist in our own country and both thought that the use of the tags would not negatively influence the well-being of the birds. The fact that wingtags have been used in Germany and France for decades convinced us that the use on birds may not be esthetic, but useful and not harmful.


Photograph: Hans Hut

Two of our group members were instructed by Jean-Luc Bourrioux in France to apply wingtags. He showed us how the metal clips which hold the tag in place are pierced through the thin skin in front of the elbow joint. That part of the skin is so thin that it shines through. There is no blood spilt during piercing a small hole, as this skin hardly contains any

blood vessels. Contamination is prevented as each bird is pierced with its own clip which remains in the wing. Most of the young do not react at all to the piercing. When applied correctly, the tags do not flap during flight and lie on the wing. The position of the tag on the wing is chosed in order to prevent any aero-dynamical problems.

Photograph: Hans Hut.

The position of the Danish Montagu's Harrier population in Europe

The Harrier population in Denmark is probably the northernmost part of the NW-European Montagu's Harrier population, which stretches from Denmark through Schleswig-Holstein and Lower Saxony in Germany and Groningen and Flevoland in the Netherlands. Ring recoveries and readings in the Netherlands regularly include breeding birds from Lower Saxony, e.g. the Emsland and the Diepholzer Moorniederung areas. Dutch birds have been shown to breed in Lower Saxony and Schleswig-Holstein, e.g. in the Bremerhaven-Cuxhaven area, the Meldorfer Bucht and further north. Lower Saxony seems also to be in contact with more southern German breeding populations like the Hellwegbörde and Bavaria-populations, as well as the eastern population in Brandenburg. The Flevoland - Groningen - Lower Saxony - Schleswig-Holstein and Denmark populations are located in geographically more or less adjacent areas of suitable habitat and are probably not separated either ecologically or genetically.

The French wingtag programme has in 2007 been imported to the Netherlands and will in 2008 be extended to areas in Lower Saxony (possibly the east Frisian Rheiderland, Emsland and the Bremerhaven-Cuxhaven area). Tagging in Schleswig-Holstein is also a possibility (no reaction from the local co-ordinators yet). If Denmark at the northern end of the NW-European population would participate in the programme as well, birds would be tagged in all parts of the population, which would add to the completeness and value of the programme.

The tagged birds from the NW-European sub-populations are most likely to disperse within the meta-population. Outside the NW-European meta-population, there are large areas of unsuitable habitat. Dispersal within the NW-European range has the advantage that wingtag readings are likely to be made, as the population is monitored in many

areas. The wingtags replace colour rings only during one year (2008). They can function for the local Danish observers just as well (or easier) as colour rings, but the chance of readings outside the own area will increase for the wingtags, because they are more easily discovered and read by other professional or hobby ornithologists. As the wingtag approach is most likely to be successful when applied on a large scale, the participation of Denmark would add a valuable extension to the already tagged areas in the Netherlands and northern Germany.

Technical part

Application of tags
In case Denmark would like to participate in the programme, the Dutch Montagu's Harrier Foundation would send a registerd tagger (instructed by the French). The French have even offered to send a tagger themselves (if necessary due to time constraints). As only large chicks can be tagged, not all nests can be tagged at the same time. We could make a second visit or instruct the Danish fieldworkers to tag themselves, and leave tags and tools behind.

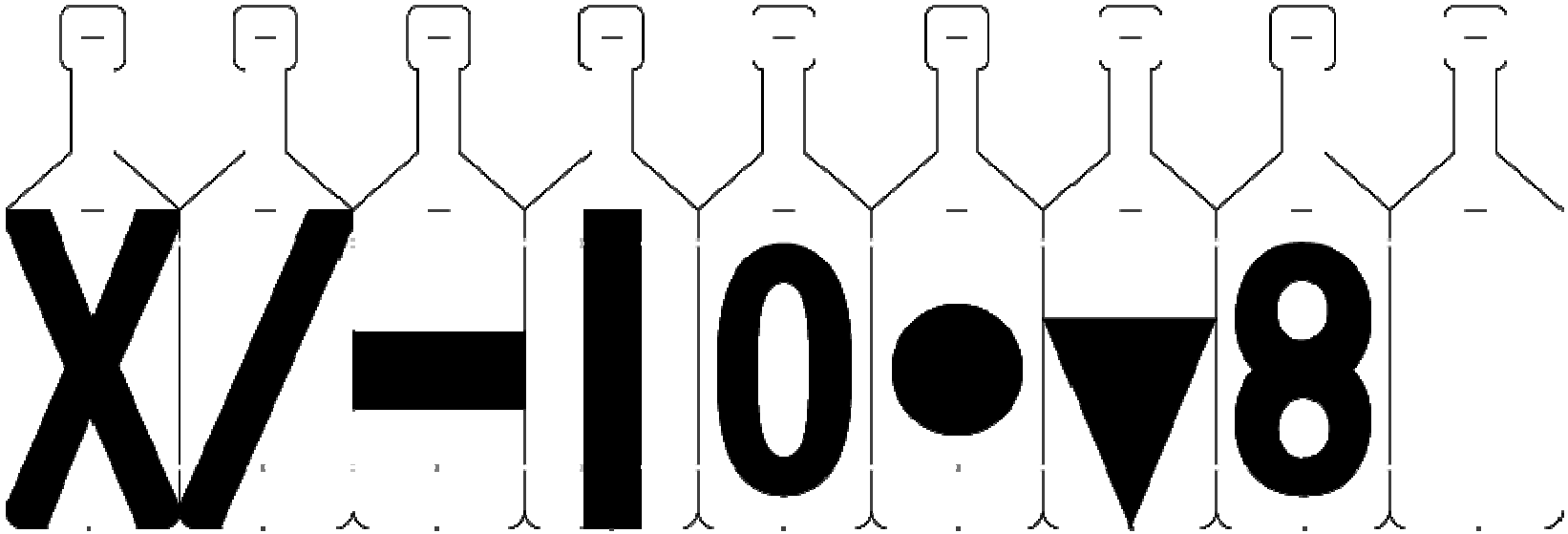
Codes
Codes are unique for each individual and consist of a combination of colours and symbols. The tags on each wing are not the same. The codes are not country-specific but randomly distributed over the whole area where the project is carried out. This should encourage readers to read complete and not only partial codes. It should also prevent subjective interpretation of the codes by the observer.

The colours are the following: blue, pink, yellow, orange, green, red and white. The codes for these colours are based on the French/English colour names: B (bleu), F (fuchsia), J (jaune), O (orange), P (pistache), R (rouge) and W (white).

The symbols are the following: X (cross), / (slash), H (horizontal line), V (vertical line), 0 (zero), P (point), T (triangle), 8 (eight), A (absent = no symbol).

The symbols on the blue and orange background are printed in black (code n [noir]) or white (code w [white]). On the other background colours, the symbols are only printed in either one or the other colour. The code n is also used as the colour code when the symbol is absent (A).

The code is read from starting at the left wing and continuing at the right wing. For an overview of all codes see next page.



X	/	H	V	0	P	T	8	A
Croix	Barre oblique	Barre horizontale	Barre verticale	Zéro	Point	Triangle	Huit	Inscription absente

nB	wB	nF	nJ	nO	wO	nP	wR	nW
inscription noire sur fond bleu	inscription blanche sur fond bleu	inscription noire sur fond fuschia	inscription noire sur fond jaune	inscription noire sur fond orange	inscription blanche sur fond orange	inscription noire sur fond vert	inscription blanche sur fond rouge	inscription noire sur fond blanc

Examples:

These tags correspond to the code XnO - /wB

These tags correspond to the code 8nJ - AnF