

SHORT NOTES

Successful reproduction of Hen Harrier *Circus cyaneus* in intensive arable farmland (central-east Belgium)

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KEY WORDS: Agrobiodiversity, Birds Directive, Colonization, Farmland birds, Monitoring, Raptor research, Species protection program

In many European countries the number of Hen Harrier *Circus cyaneus* breeding pairs has declined during the second half of the twentieth century (1, 2, 3). Because of the danger for regional extinction, the European Union (EU) protected the species under the Birds Directive in 1979 and set up the Natura 2000 conservation program (4).

The total European breeding population has been estimated at 32,000-59,000 pairs (2). In France, which is Western Europe's stronghold for the species with 7,800-11,200 pairs, the species seems on the rise with many breeding pairs shifting from natural to more cultivated areas during the past decades (5, 6). As for The Netherlands, recently a few pairs started to breed in Groningen's farmland, probably facilitated by the presence of fauna strips (STICHTING WERKGROEP GRAUWE KIEKENDIEF, unpublished data). In Belgium, Hen Harrier was and still is a very rare breeding bird. Most known breeding occurrences of the last 40 years were located in natural habitats (open areas, such as bogs and fens) in the southern part of the country (Wallonia) (3, 7). From 2002 onwards, breeding attempts have taken place each year in Wallonia,

some of them in agricultural land, with three confirmed and two probable breeding pairs in 2011 (Vincent Leirens, unpublished data). In Flanders (northern Belgium), the species has not bred for the last 40 years (8, 9). Only in the last decade has suspected breeding of Hen Harrier in Flanders reoccurred.

In this contribution we document the first breeding occurrences of Hen Harrier in a previously unoccupied agricultural region in central-east Belgium (Outgaarden, N 50°46' E 04°55'). By following breeding efforts for six consecutive years (2006-2011), we tried to get insights into the ecological requirements of the species in this intensive arable farmland. Information on the breeding and foraging habitat was gathered, allowing optimization of conservation measures for better protection of the species, hopefully resulting in further colonization of the region.

Information on the number of males and females, the number and location of nests, and the number of fledged young was collected by a team of two to five volunteer ornithologists in each study year. Breeding places were located on an orthophoto in a GIS environment, and complemented with information on yearly agricultural crops for each parcel and other present land use (forest, urban & infrastructure) (AGENTSCHAP VOOR LANDBOUW EN VISSERIJ, unpublished data; DIRECTION GÉNÉRALE DE L'AGRICULTURE, DES RESSOURCES NATURELLES

TABLE 1

Summarizing table presenting, for each survey year, the number of involved Hen Harrier.

| Year | Females | Nests | | Fledged young |
|-------|---------|--------|------------|---------------|
| | | Failed | Successful | |
| 2006 | 1 | 0 | 1 | 1 |
| 2007 | 1 | 0 | 1 | 3 |
| 2008 | 2 | 2 | 1 | 2 |
| 2009 | 2 | 2 | 0 | 0 |
| 2010 | 1 | 0 | 1 | 5 |
| 2011 | 1 or 2 | 1 or 2 | 0 | 0 |
| Total | 8 or 9 | 5 or 6 | 4 | 11 |

ET DE L'ENVIRONNEMENT, unpublished data). For each nest of every year, circles with a radius of 350 m (the area around the nest that is normally defended against predators), 2,000 m (suitable foraging habitat close to the nest and where most hunting takes place), and 4,000 m (the general habitat up to where the male occasionally hunts) around the nests were drawn, and the surface area of land uses and crops determined (see also 10, 11). The agricultural data were merged into seven groups, being cereals, corn, permanent and temporary grasslands, potatoes, sugar beets and other crops (mainly consisting of many types of vegetables and fruits).

Over the six-year period, 10 breeding cases were initiated by a yearly average of 1.5 females (Table 1). Four nests were successful and a total of 11 young fledged. In 2006, one young bird fledged, while the next year (2007) three young were raised in a small forest patch of around 9 ha (Fig. 1). In 2008, a breeding case was initiated in the same forest, but failed. A replacement nest was made in a nearby barley field, with two young successfully growing up. In 2009, no nests were successful, while in 2010 five young fledged from a nest located in an adjacent forest patch of around 16 ha. In 2011 no nests were successful, with a so-called 'mourn nest' (quickly constructed and soon abandoned) being built by the male in a nearby meadow. In general, the fledged juveniles left the area during August, in the same period when the first migrant Hen Harriers were seen.

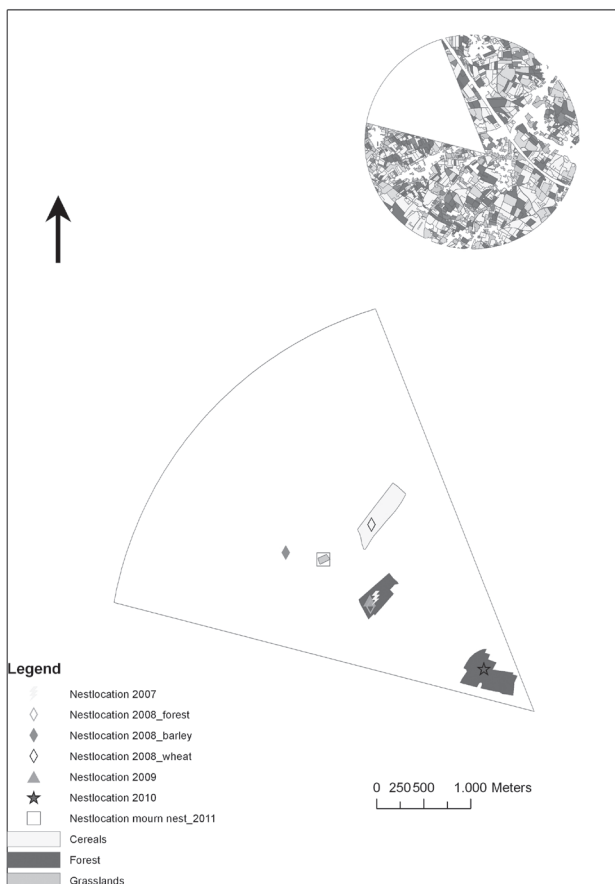


Fig. 1. – Location of all Hen Harrier nests (2006-2011). The map is drawn with a radius of 4,000 m around the 2010 nest. The outset graph depicts the larger setting of the nests (i.e. location of the 2010 nest with a radius of 4,000 m; see Fig. 3 right).

In most of the years breeding took place in isolated deciduous forest patches (Atlantic acidophilous beech forests; habitat type 9120 according to the Habitats Directive). In these forest patches, nests were made in impenetrable and high creeping Bramble thickets *Rubus fruticosus* amidst clearings (Fig. 2). The nests were surrounded by an average of 70 % annual crops in a 4,000 m radius around the nests. In both the 2,000 and 4,000 radiuses, only very small differences were observed over the years for the percentage of occurring land cover classes (cereals: 38 % SE 2, potatoes and sugar beets:



Fig. 2. – Overview picture of the 2010 Hen Harrier nest in a small deciduous forest patch. The nest is located in Bramble thickets amidst a clearing, with in front some hiding chicks.

17 % SE 1, urban: 14 % SE 1, other crops: 12 % SE 1, corn: 8 % SE 1, grasslands: 6 % SE 0, forest: 5 % SE 1; Fig. 3).

The colonization of intensive arable farmland in central-east Belgium by Hen Harrier seems at first sight quite remarkable. Hen Harrier, in Western European countries typically a bird of natural open areas, now cautiously takes a step to adjust and settle in some large-scale agricultural regions. These farmland regions suffered from land use intensification, which generally resulted in a decreased availability of prey (12). To counteract the drop of farmland biodiversity, occasional agrobiodiversity measures have been established throughout Europe, but their effectiveness remains controversial (13, 14). However, for the specific region of Outgaarden there are indications that the former EU agricultural policy of set-aside land, in combination with well-established agrobiodiversity measures, may have resulted locally in an increase of prey and target farmland biodiversity (15). Additionally, individuals from nearby northern France populations seeking new territories (the nearest French breeding populations are located at less than 100 km from Outgaarden) (6), may explain the recent

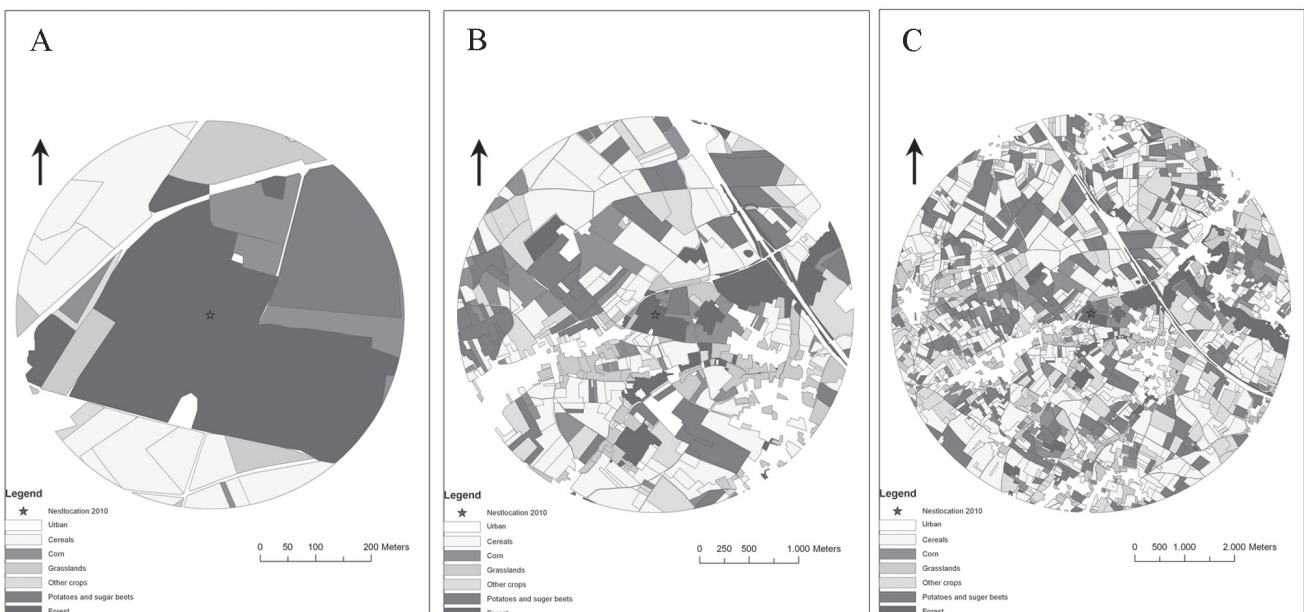


Fig. 3. – Location of the Hen Harrier nest of 2010 with a radius of 350 m around the nest (left), 2,000 m (middle), and 4,000 m (right).

colonization. Nevertheless, individuals in the region may originate from further afield than just adjacent France. For instance, a female ringed as a chick in a salt marsh on a German Wadden Sea Island in 2009, was seen near her successful nest in Wallonia in summer 2011, about 400 km from her birthplace (Vincent Leirens, unpublished data).

Abroad, Hen Harriers present in an intensively cultivated area in the Champagne-Ardenne (France) breed now and then in young woodlands, with the majority using cereal fields (5). On the Dutch Wadden Sea islands, males prefer dune thickets and open dunes for hunting. There, they have a strong preference for non-grazed areas (16). In Groningen (The Netherlands), Hen Harriers recently colonized farmland, where the breeding habitat consists of cereal fields and alfalfa, containing many fauna strips throughout the area (STICHTING WERKGROEP GRAUWE KIEKENDIEF, unpublished data). On the Orkney Islands (UK), most Hen Harriers breed in Heather *Calluna vulgaris* on moorland (17), but males seem to prefer unmanaged rough grass for hunting (18). By contrast, in Ireland, 75 % of the Hen Harrier breeding population chose second rotation plantation forest as nesting habitat (19). These breeding locations contrast considerably with the situation in Outgaarden, as in most years Hen Harriers chose to breed in small forest patches instead of nesting in the abundant cereal fields. This choice is probably due to their early breeding season. During the mating and nesting period (April-early May), the regular (annual) crops (such as winter wheat and barley) provide insufficient cover. In the open forests however, they find the cover they need. Later in the season, when replacement clutches are laid or beta-females start to breed, nests are made in crops that provide enough cover by then.

To counteract the negative tendency in farmland bird abundances, policymakers initiated agrobiodiversity measures in the wider area of Hesbaye (20). Agro-environment schemes started six years ago, with the first measures taken in 2007, and now reaching a few hundred

ha in the wider region. These agrobiodiversity measures may additionally have facilitated the breeding of Hen Harrier, after the agricultural set-aside land policy ceased a few years ago. Agrobiodiversity measures consist of broad strips, where a favourable mixture of grasses (leading to improved structure and food supply) is sown, and that are managed through a phased extensive mowing regime. Another important factor in the reproductive success of Hen Harriers may be the presence of farmland nature reserves. In these reserves, untreated spring wheat is sown, which is not mown or sprayed for a year. This may stimulate a high density of rodents (mainly voles), and makes these reserves an ideal hunting area for harriers throughout the year. More specifically, optimal food conditions in the pre-lay period (April) may be crucial for successful nesting. During this period, the male is bound to find enough food so that the female can be piloted in good breeding condition, and clutch formation is strongly influenced by the abundance of food during this period (18). By adjusting the mowing time of grasslands next to extensive management of arable fields, prey may be concentrated on accessible locations when the need for food is at its peak. Whether breeding is successful, however, depends on more, often non-controllable factors, such as age and previous breeding experience of the birds, weather, disturbance, predation, and persecution (21, 22, 23). Analysis of the ecological requirements of the species, although based on a single, but profound survey near Outgaarden, suggests that many regions in Belgium could support breeding Hen Harriers. Detecting the most promising areas in Belgium, and installing suitable agro-environment schemes would probably improve the chances on colonization and conservation of the species on a regional scale.

ACKNOWLEDGEMENTS

The authors acknowledge all the volunteers of Natuurpunt Velpe-Mene, Werkgroep Grauwe Gors, and Groupe d'Etude et de Protection des Busards for the countless hours they spent in

observing Hen Harriers. We are grateful to the Vlaamse Landmaatschappij, Agentschap voor Landbouw en Visserij, and Direction Générale de l'Agriculture, des Ressources Naturelles et de l'Environnement for supplying agricultural data. We thank Anny Anselin, Olaf Klaassen, Rob Bijlsma and two anonymous reviewers for commenting on this article.

REFERENCES

1. AMAR A & REDPATH S (2002). Determining the cause of the Hen Harrier decline on the Orkney Islands: an experimental test of two hypotheses. *Animal Conservation*, 5: 21-28.
2. BIRDLIFE INTERNATIONAL (2004). Birds in Europe: population estimates, trends and conservation status. Birdlife International, Cambridge.
3. JACOB J-P (2010). Busard Saint-Martin, *Circus cyaneus*. In: JACOB J-P, DEHEM C, BURNEL A, DAMBIERMONT J-L, FASOL M, KINET T, VAN DER ELST D & PAQUET J-Y, Atlas des oiseaux nicheurs de Wallonie 2001-2007. Aves et Région wallonne, Gembloux: 180-181.
4. LOUETTE G, ADRIAENS D, ADRIAENS P, ANSELIN A, DEVOS K, SANNEN K, VAN LANDUYT W, PAELINCKX D & HOFFMANN M (2011). Bridging the gap between the Natura 2000 regional conservation status and local conservation objectives. *Journal for Nature Conservation*, 19: 224-235.
5. MILLON A, BOURRIOUX J-L, RIOLS C & BRETAGNOLLE V (2002). Comparative breeding biology of Hen Harrier and Montagu's Harrier: an 8-year study in north-eastern France. *Ibis*, 144: 94-105.
6. MILLON A & BRETAGNOLLE V (2004). Busard Saint-Martin, *Circus cyaneus*. In: THIOLLAY J-M & BRETAGNOLLE V, Rapaces nicheurs de France. Distribution, effectifs et conservation. Delachaux et Niestlé, Paris: 66-69.
7. HANUS B & DEWOLF P (1997). Chronique d'une nidification réussie de Busard Saint-Martin (*Circus cyaneus*) en Wallonie. *Aves*, 34: 39-45.
8. VLAVICO 1989. Vogels in Vlaanderen: voorkomen en verspreiding. VLAVICO, Bornem: 121-122.
9. VERMEERSCH G, ANSELIN A, DEVOS K, HERREMANS M, STEVENS J, GABRIËLS J & VAN DER KRIEKEN B (2004). Atlas van de Vlaamse broedvogels: 2000-2002. Mededeling van het Instituut voor Natuurbehoud 23, Brussel.
10. CRAMP S (1980). Handbook of the birds of Europe, the middle east, and north Africa: the birds of the Western Palearctic. Vol. 2: Hawks-Bustards. Oxford University, Oxford.
11. ARROYO B, LECKIE F & REDPATH S (2006). Habitat use and range management on priority areas for Hen Harriers: report to Scottish Natural Heritage. CEH, Banchory.
12. BUTET A, MICHEL N, RANTIER Y, COMOR V, HUBERT-MOY L, NABUCET J & DELETTRE Y (2010). Responses of Common Buzzard (*Buteo buteo*) and Eurasian Kestrel (*Falco tinnunculus*) to land use changes in agricultural landscapes of Western France. *Agriculture, Ecosystems and Environment*, 138: 152-159.
13. KLEIJN D & SUTHERLAND WJ (2003). How effective are European agri-environment schemes in conserving and promoting biodiversity? *Journal of Applied Ecology*, 40: 947-969.
14. KLEIJN D, RUNDLÖF M, SCHEPER J, SMITH HG & TSCHARNTKE T (2011). Does conservation on farmland contribute to halting the biodiversity decline? *Trends in Ecology and Evolution*, 26: 474-481.
15. GUELINCKX R et al. (2012). Graan voor gorzen in Natuurpunt Velpe-Mene – Akkerreservaten (Internet address: <http://www.velpe-mene.be/nbakkerreservaten.htm>).
16. KLAASSEN O, DIJKSEN L, DE BOER P, WILLEMS F, FOPPEN R & OOSTERBEEK K (2006). Broedsucces, voedselécologie en dispersie van de Blauwe Kiekendief op de Waddeneilanden in 2004-2006. SOVON-onderzoeksrapport 2006/15, SOVON Vogelonderzoek Nederland, Beek-Ubbergen.
17. REDPATH S, MADDERS M, DONNELLY E, ANDERSON B, THIRGOOD S, MARTIN A & MCLEOD D (1998). Nest site selection by Hen Harriers in Scotland. *Bird Study*, 45: 51-61.
18. AMAR A & REDPATH S (2005). Habitat use by Hen Harriers *Circus cyaneus* on Orkney: implications of land use change for this declining population. *Ibis*, 147: 37-47.
19. WILSON MW, IRWIN S, NORRIS DW, NEWTON SF, COLLINS K, KELLY TC & O'HALLORAN J (2009). The importance of pre-thicket conifer plantations for nesting Hen Harriers *Circus cyaneus* in Ireland. *Ibis*, 151: 332-343.

20. STRUBBE D, VERSCHELDE P, HENS M, WILS C, BAUWENS D, DERMOUT M & DE BRUYN L (2010). Impact van PDPO II maatregelen op de biodiversiteit. Instituut voor Natuur- en Bosonderzoek, Brussel.
21. GREEN RE & ETHERIDGE B (1999). Breeding success of the Hen Harrier *Circus cyaneus* in relation to the distribution of grouse moors and the Red Fox *Vulpes vulpes*. *Journal of Applied Ecology*, 36: 472-483.
22. PARISH DMB, THOMPSON PS & COULSON JC (2001). Effects of age, cohort and individual on breeding performance in the Lapwing *Vanellus vanellus*. *Ibis*, 143: 288-295.
23. AMAR A, DAVIES J, MEEK E, WILLIAMS J, KNIGHT A & REDPATH S (2011). Long-term impact of changes in sheep *Ovis aries* densities on the breeding output of the Hen Harrier *Circus cyaneus*. *Journal of Applied Ecology*, 48: 220-227.

Received: May 15th, 2013

Accepted: September 16th, 2013

Branch editor: Eens Marcel