

# Migrating birds and the effect of an onshore wind farm

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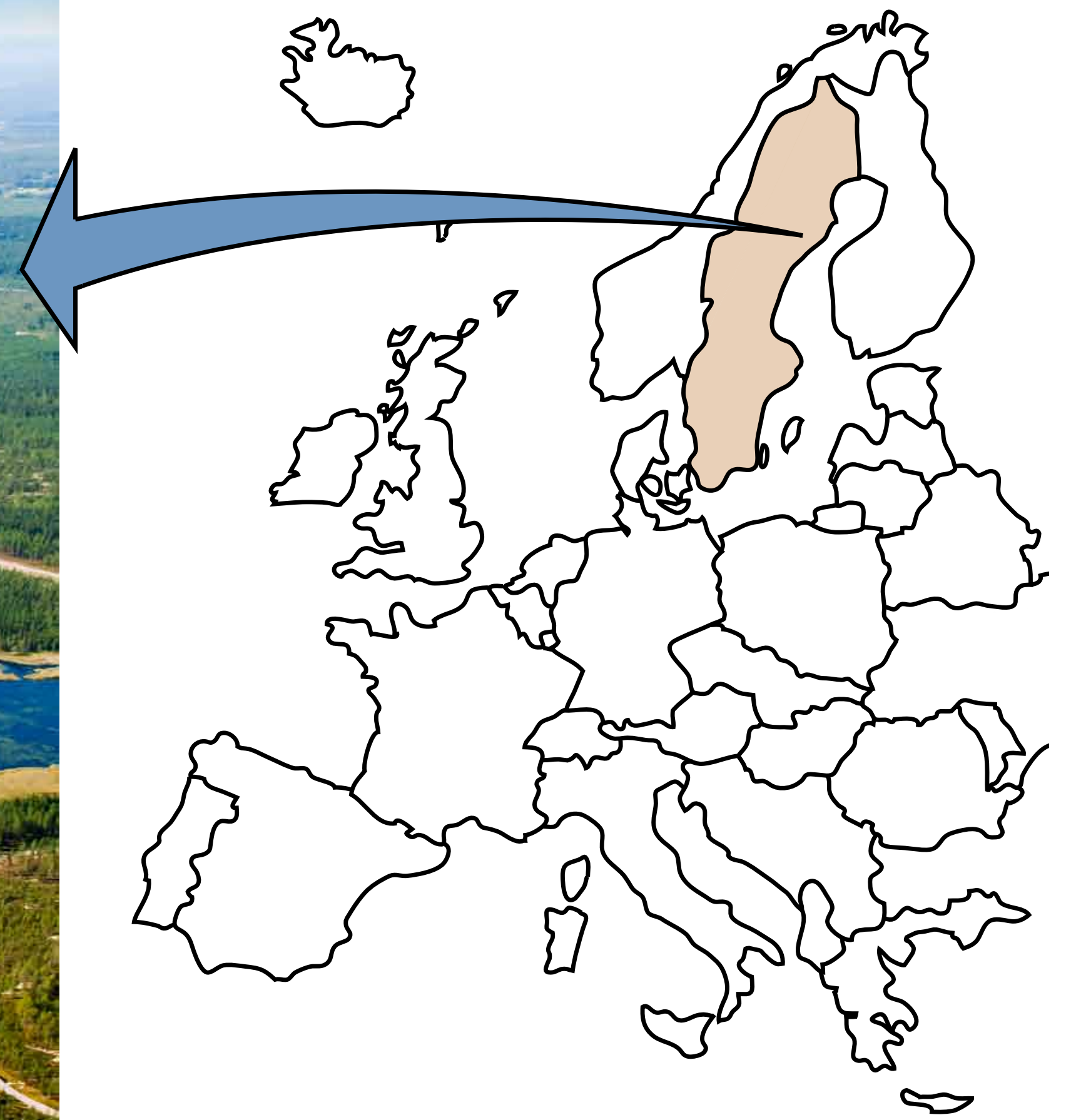


Figure 1. Aerial photo of the Hörnefors onshore wind farm during construction in 2009. Five of the wind turbines have been added to the original photo since they were not built when the photo was taken. Original photo above Lars Lindh, photo cranes Jörgen Wiklund.

## Introduction

Although a few studies have focused on the behaviour of migrating birds close to offshore wind farms, the effect of large-scale onshore wind farms on the behaviour of migrating birds is little known. The Hörnefors onshore wind farm, south of Umeå in northern Sweden, consists of 11 large wind power turbines (2 MW) and is located within a heavily trafficked south-north bird migratory route along the Swedish east coast. To investigate the behaviour of migrating birds near the wind farm, counts of migrating birds have been conducted before and after the establishment of the wind farm. The monitoring program was an requirement from the County Administrative Board when giving permission to establish the wind farm.

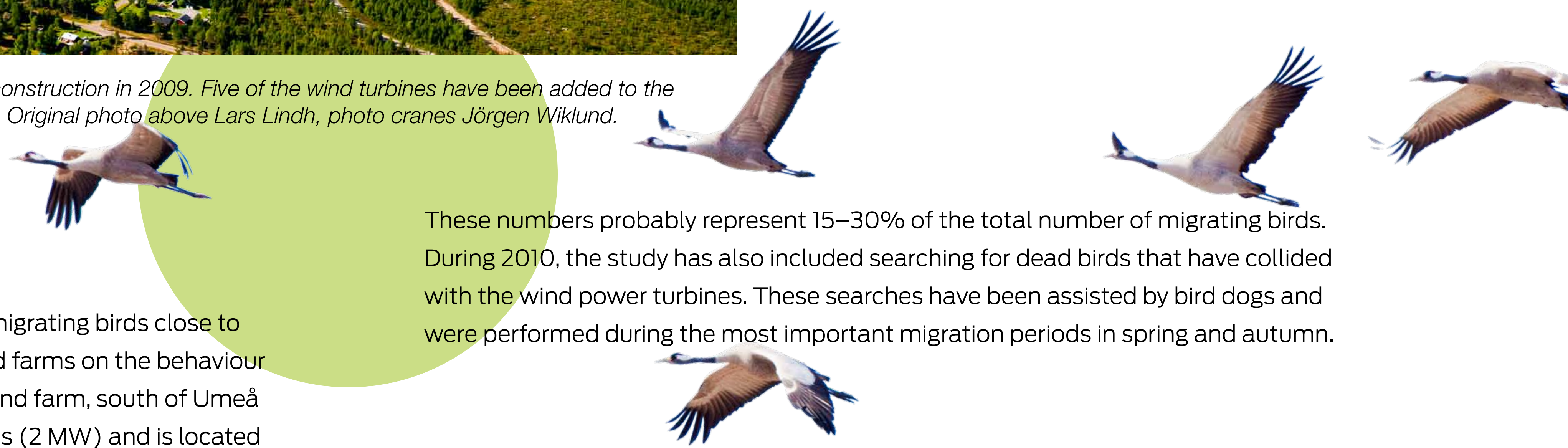
## Methods

Counts of migrating birds have been conducted during spring (April–May) and autumn (August–October) for two years before establishment of the turbines (2003 and 2008), during establishment (2009) and for one year after establishment (2010). The study will continue for at least one more year. Observations were done from a nearby water tower located 2 km from the nearest wind turbine (Fig. 2). The migrating route was divided into 3 different sectors (A-C), where B represents the wind power area. To illustrate the avoidance of the turbines within sector B, this sector was in 2009–2010 divided into two smaller sectors; sector Bv, (north of the turbines) and sector Bt (over and through the turbines) (Fig. 2).

Most of the counts have been performed during days with large numbers of migrating birds. Between 20,000 and 46,000 migrating birds have been counted yearly.



Figure 2. Map over the Hörnefors onshore windfarm showing the location of the wind turbines and the different sectors used when monitoring bird migration routes. Blue arrow shows a common avoidance route for birds flying in sector B.



These numbers probably represent 15–30% of the total number of migrating birds. During 2010, the study has also included searching for dead birds that have collided with the wind power turbines. These searches have been assisted by bird dogs and were performed during the most important migration periods in spring and autumn.

## Results and conclusion

The results clearly indicate avoidance of the wind power farm by migrating birds. Before establishment (2003, 2008), around 50% of the counted birds flew within sector B, and during and after establishment (2009 and 2010), only 7,2% and 11,0%, respectively, flew within sector B (Fig. 3). Bird groups that frequently flew through sector B were doves and pigeons, buzzards, crows, gulls and waders (Table 1 - red marking). However, a majority (70,6% in 2010) of the birds flying within sector B avoided the wind power area by flying north of the turbines, in sector Bv (Fig. 2-3). This was especially evident for doves and pigeons, crows, cranes and waders (Table 1 - green marking). Thus, in 2009 and 2010, only 3,0% and 3,2% of the registered birds, respectively, passed the wind turbine sector (sector Bt) (Fig. 2-3). Among the birds seen flying very close to the turbines were rough-legged buzzard (*Buteo lagopus*) and gulls (Table 1 - yellow marking). During autumn, very few birds were observed within the wind power area (sector B); only 0,5% of the total number of registered birds. A large number of these were raptors. The number of birds that collide with the wind turbines seem to be very low. During the organized search in 2010, no dead birds were found.

Although avoidance of the wind power farm has decreased slightly from 2009 to 2010, it is still evident that the vast majority of the migrating birds avoid the Hörnefors onshore wind farm.

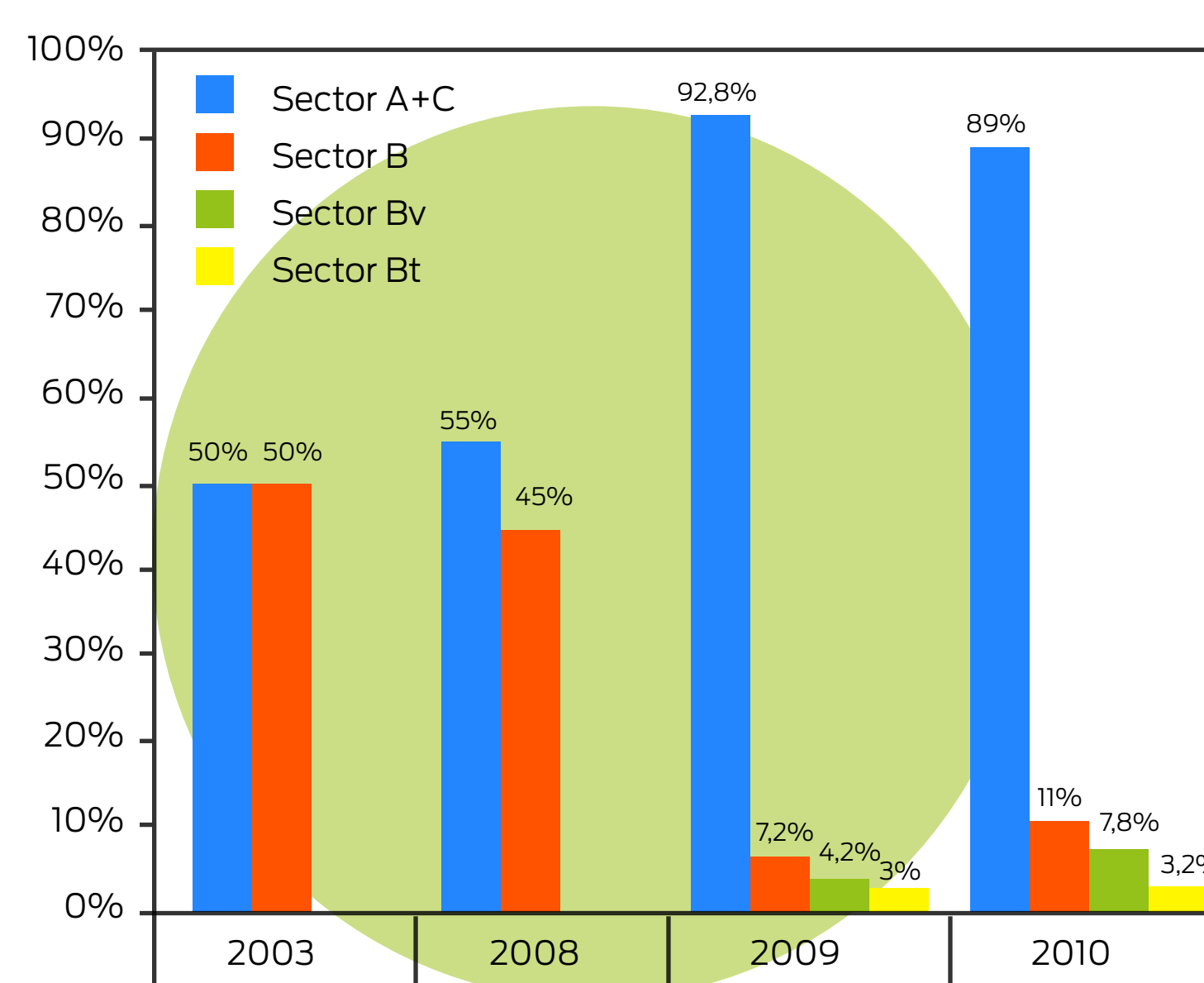


Figure 3. Percentages of registered birds in different migrating sectors before, (2003, 2008), during (2009) and after (2010) establishment of the Hörnefors wind farm. Sector B represents the wind power area and is divided into two smaller sectors (see Fig. 2).

Species group	Sector A or C	Sector B total	Share of sector B in Bv	Share of sector B in Bt
Doves and pigeons	64,6	35,4	95,2	4,8
Rough-legged buzzard	63,3	36,7	13,8	86,2
Geese	96,6	3,4	34,4	65,6
Crows	73,0	27,0	88,8	11,2
Gulls	74,5	25,5	15,7	84,3
Cormorant	100,0	0,0	0,0	0,0
Whooper swan	94,2	5,8	62,4	37,6
Crane	91,3	8,7	100,0	0,0
Waders	64,8	35,2	88,3	11,7
Ducks	100,0	0,0	0,0	0,0
Other raptors	89,5	10,5	53,6	46,4
Other passerines	97,2	2,8	63,4	36,6
<b>Total</b>	<b>89,0</b>	<b>11,0</b>	<b>70,6</b>	<b>29,4</b>

Table 1. Percentages of registered birds in different migrating sectors in 2010. Red, green and yellow markings show results of special interest.