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# Roosting behaviour of Marsh and Montagu´s Harriers during migration



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## SUMMARY

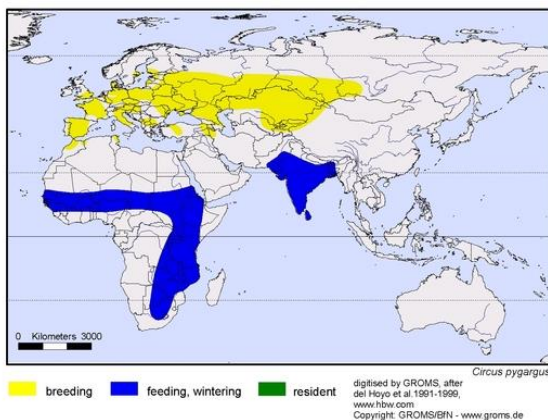
Much of our general knowledge about the ecology of migratory birds is based on visual observations during the breeding and wintering season, when migratory birds are stationary and thus easier to study. That birds can behave very differently during migration is exemplified in this study where we looked at the habitat choice of roosting Marsh and Montagu's Harriers (*Circus aeruginosus* and *C. pygargus*) during migration, using GPS-based tracking devices. Almost twenty-five percent of the night roosts in Europe were in coniferous and broadleaf forest, which was unexpected as Harriers roam very open landscapes during both breeding and wintering, where they breed and roost on the ground. For both Marsh and Montagu's Harriers this phenomenon is found in several years and differ between the autumn and spring migration. Montagu's Harriers tend to rest in trees more often than Marsh Harriers although this phenomenon seems to be influenced by the absence and presence of crops on agricultural fields or other Harriers in the area for both species. Our findings stress the importance of detailed tracking studies in the research of migrating birds and indicate that our knowledge about the general ecology of migrants is still limited. To get a more detailed view of the roosting locations citizen science could be used to get a better overview of the habitat type at different locations through Europe.

## INTRODUCTION

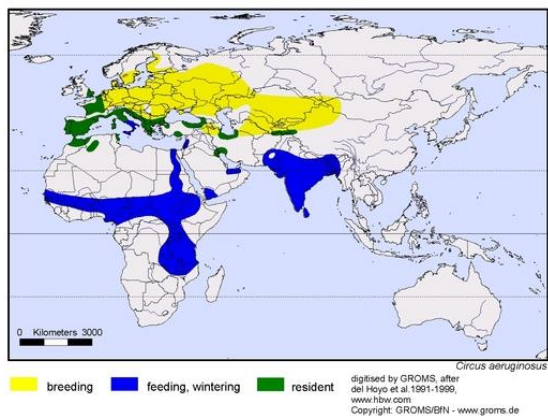
Harriers (*Circus* sp.) are migratory raptors that inhabit open landscapes such as wetlands, grasslands, headlands and agricultural areas. In these open habitats they build their nests on the ground. Also, in winter in Africa Harriers frequent open landscapes, where they roost on the ground, often together with conspecifics. Habitats used by roosting Harriers include reed beds, saltmarshes, grasslands and heathlands in NW Europe, and rice fields and grasslands in Africa. (Clarke 1995, 1996)(Arroyo et al. 2004)

As Harriers are closely associated with open landscapes during both breeding and wintering, it is difficult to conceive that Harriers would use different habitat types during migration. However, some intriguing reports exist about Marsh Harriers roosting in trees in the central Mediterranean region during autumn and spring migration (Sammuto 2005, Panuccio & Agostini 2006). These anecdotal observations prove that Marsh Harriers sometimes roost in forest, but it remains to be established whether this behaviour is an occasional and aberrant phenomenon or an important component of the ecology of migrating Harriers. Harrier

### Montagu's Harrier (*Circus pygargus*)



### Marsh Harrier (*Circus aeruginosus*)





## ROOSTING BEHAVIOUR DURING MIGRATION

Montagu's Harriers were fitted with GPS-loggers (UvA Bird Tracking System, University of Amsterdam, The Netherlands, [www.uva-bits.nl](http://www.uva-bits.nl)) to study behaviour and habitat use during the breeding season to ultimately improve conservation measures for this farmland bird (Schlaich et al. 2017). As the birds carry the loggers year-round, also information during migration and the winter period was collected (Schlaich et al. 2015, 2016). A first inspection of the GPS-data indicated that the Harriers sometimes roosted in trees, and that this occurred throughout Europe. A formal analysis of roosting behaviour was however not possible as too few data were available at that time to infer general patterns.



*Montagu's harrier with a small, hardly visible, GPS-logger. Inserted picture shows placing of the logger.*

Now, a few years later, sufficient data has been collected to study roosting behaviour in the Montagu's Harrier during migration in a more systematic way. In addition, similar tracking data on the Marsh Harrier was collected, allowing for comparisons between these highly related species.

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## RESEARCH QUESTIONS

- How common is roosting in forests for migrating Harriers?

A first step in the analysis of roosting behaviour is to describe how often it occurs. Does it occur all over Europe? Does it occur during autumn as well as spring migration? Answers on these questions can already shed light on the possible causes for roosting in trees instead of on the ground.

- When does it occur (temporal patterns)?

One idea is that Harriers are forced to roost in trees as no habitats are available to roost on the ground, for example because crops have been harvested (in autumn) or crops have not grown yet (in spring). The observations that roosting in trees would become more common throughout autumn (when more crops would be harvested) and less common throughout spring (when crops are growing) would support these ideas.

- Where does it occur (spatial patterns)?

Harriers are social birds that at least in winter roost together. Communal winter roosts could be occupied by hundreds to even thousands of birds. An alternative explanation for roosting in trees during migration is that the birds choose trees when alone but join communal roosts when available. If this is true, we could expect that Harriers roost less often in trees in core breeding areas where it is likely that many other Harriers occur.

- Are there any differences between the two species?

Montagu's and Marsh Harriers both breed and winter in slightly different areas so it is imaginable that they have other habits during migration. Differences in roosting behaviour between species could provide insights in factors explaining roosting in trees.

- Are there differences between females and males?

Male and female Harriers differ in size and in plumage. These are factors that could affect roosting in trees.

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## CITIZEN SCIENCE

A citizen scientist is a volunteer who collects and/or processes data as part of a scientific enquiry. Projects that involve citizen scientists are burgeoning, particularly in ecology and the environmental sciences (Silvertown, 2009)

Citizen science could be used to confirm the different habitats used by the roosting birds. Roosting habitats were identified by inspecting Google Earth satellite images (see below in materials and methods). However, images could be outdated, and the habitat could have changed. To confirm in what habitats the birds have been roosting, ground-truthing is necessary.

The idea of the citizen science project is that non-scientist visit night roost locations to take a standardized set of pictures of the habitat and surroundings. These pictures are subsequently uploaded to a database, where they can be accessed by the researcher for analysis.

Because a Master thesis project of several months is too short to both set up a citizen science project and to analyse and use the data that it could provide, I will only explore the possibilities for a citizen science project. I will develop a possible protocol that could be used by the observers, including a short questionnaire.

## MATERIAL AND METHODS

### DATA COLLECTION

Between 2007 and 2011 a total of twenty-nine Harriers (5 Marsh Harriers, 24 Montagu's Harriers) were caught in The Netherlands: 53.1°N, 7.1°E, Sweden: 56.0°N, 14.0°E or Denmark: 55.2°N, 9.3°E and tracked with 14 g GPS-loggers (UvA Bird Tracking System, University of Amsterdam, The Netherlands, [www.uva-bits.nl](http://www.uva-bits.nl)) or 18 g GPS-based satellite transmitters (Microwave Telemetry, USA, <http://www.microwavetelemetry.com/>) that were programmed to obtain a GPS fix every 5 of 60 minutes (UvA-BITS GPS-loggers) or 1-2 h (GPS-based satellite transmitters).

More details on methods and study population for Marsh Harriers see Strandberg et al. (2009) and Klaassen et al. (2010) and for Montagu's Harriers see Trierweiler (2010), Trierweiler et al. (2007) and Trierweiler & Koks (2009).

### IDENTIFYING NIGHTROOST DURING MIGRATORY PERIOD

Alongside every GPS location, the tracking devices recorded the instantaneous speed. This allowed us to distinguish between 'moving' and 'resting' positions, using a threshold of 2 m/s (see Klaassen et al. 2017). When three night-time resting positions were laying within 100 m of each other, the location was considered to be a night roost.

Thus, to identify night roosts we selected:

- GPS points collected during the migratory period at night-time. Night-time was defined as the period the sun was lower than 6.0 degrees below the horizon.
- GPS-locations for the migration period in Europe. This included all locations between the breeding area (latitude 54.6° for birds breeding in DK, 52.6° in NL and 55.6° for S) and the Mediterranean Sea (latitude approx. north of 36°).
- GPS-locations with an instantaneous speed < 2m/s. For every location it was checked whether the bird was moving or not based on the instantaneous speed as recorded by the GPS-logger device.
- During migratory stopovers some individuals roosted at the same locality during subsequent nights, but only the first night roost of a stopover was included in the analysis.

After applying all requirements, a total of 727 different night roosts were identified.



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## SCORING HABITAT TYPES

The habitat at every night roost was identified from satellite and aerial images in Google Earth. We distinguished between the following habitat types: broadleaf forest, coniferous forest, agricultural field/grassland, shrub land (bushes) and natural areas (everything between grasslands and bushes).

As Google Earth images were often not taken at the same time as the GPS-fixes were obtained, we confirmed the habitats of 7 roosting locations in NW Europe (ground truthing) to check that there was no mismatch between habitats scored from Google Earth images and habitats observed in the field.

Several birds were tracked during consecutive years. As individuals never revisited night roosts in subsequent years we included all roost in our analysis. Hence, sample sizes differ between individuals.

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## STATISTICAL TESTS

Roosting in trees was analysed by binomial regression. A linear mixed-effect model (LMM) approach was adopted in which statistical significance was obtained by likelihood ratio tests of the full model including the dependent variable in question against the reduced model excluding the variable, following Zuur et al. (2009). Individual was included as a random effect. All analysis were performed in R (R Core Team), using the 'lme4' package (Bates et al. 2015).

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## CITIZEN SCIENCE

A literature study was conducted to get an overview of the possibilities of citizen science in scientific research and the pros and cons of using it in this study of the migratory behaviour of birds.

## RESULTS

727 different night roosts were identified, 555 for Montagu's Harrier, and 172 for Marsh Harrier (172 roost locations) (figure 1). Roosts were almost evenly distributed between seasons (299 and 256 night roosts for Montagu's Harriers for autumn and spring migration, respectively, and 99 and 73 roosts for Marsh Harrier for autumn and spring migration, respectively).

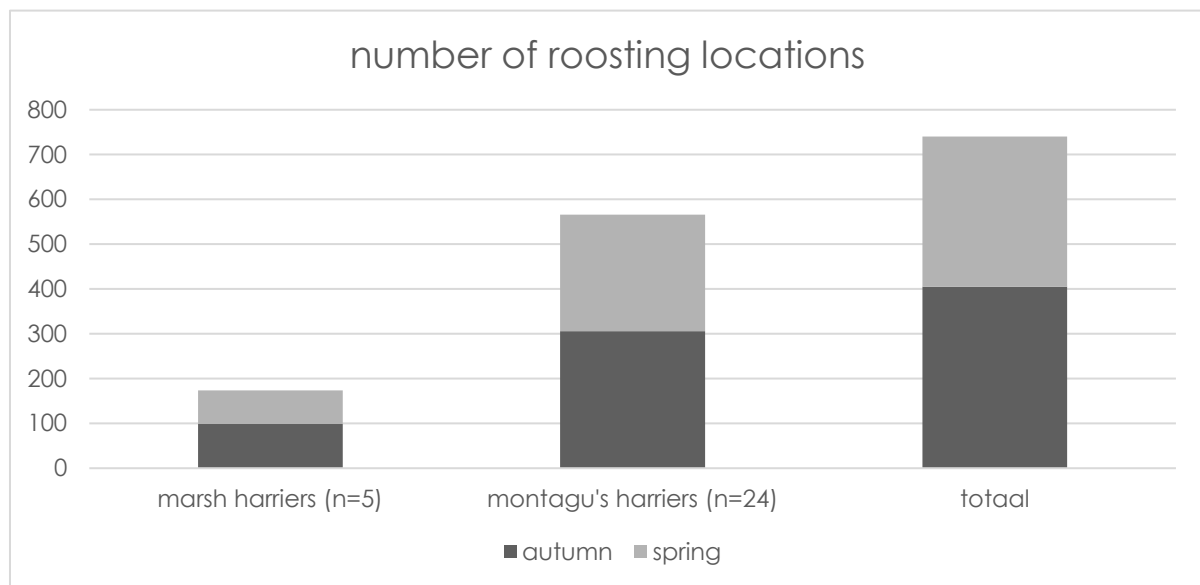


Figure 1: the number of roosting locations for Marsh Harriers and Montagu's Harriers and the total number of roosting locations used in this research. Divided in locations found in autumn migration (dark) and spring migration (light)

## ROOSTING HABITATS

An overview of roosting habitats for Montagu's and Marsh Harrier, for autumn and spring migration, is provided in table 1.

	Montagu's Harrier		Marsh Harrier		Total	Total
	Autumn	Spring	Autumn	Spring	Autumn	Spring
Agricultural field	199	210	8	33	207	243
Broadleaf forest	46	12	18	14	64	26
Coniferous forest	22	21	32	18	54	39
Bushes	18	6	4	3	22	9
Nature	14	7	17	5	31	12
Forest	68	33	50	32	118	65
Other	231	223	29	41	260	264

Table 1: the number of night roost locations in different habitats per species, per season

In figure 2 the night roosts are plotted on maps, separately for the species and seasons. The circular diagram summarizes the frequency in which the different habitats were used for that particular species and season.

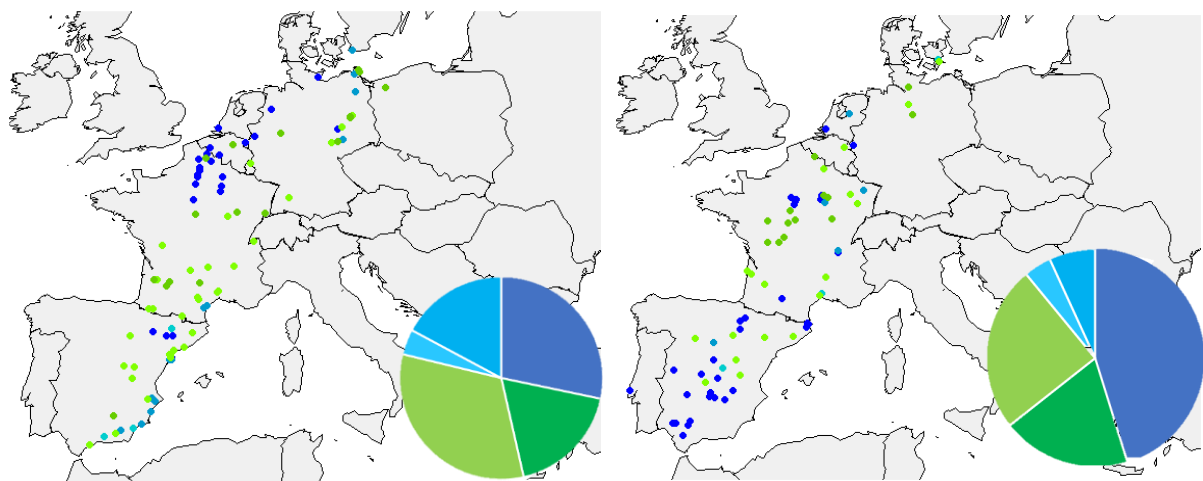
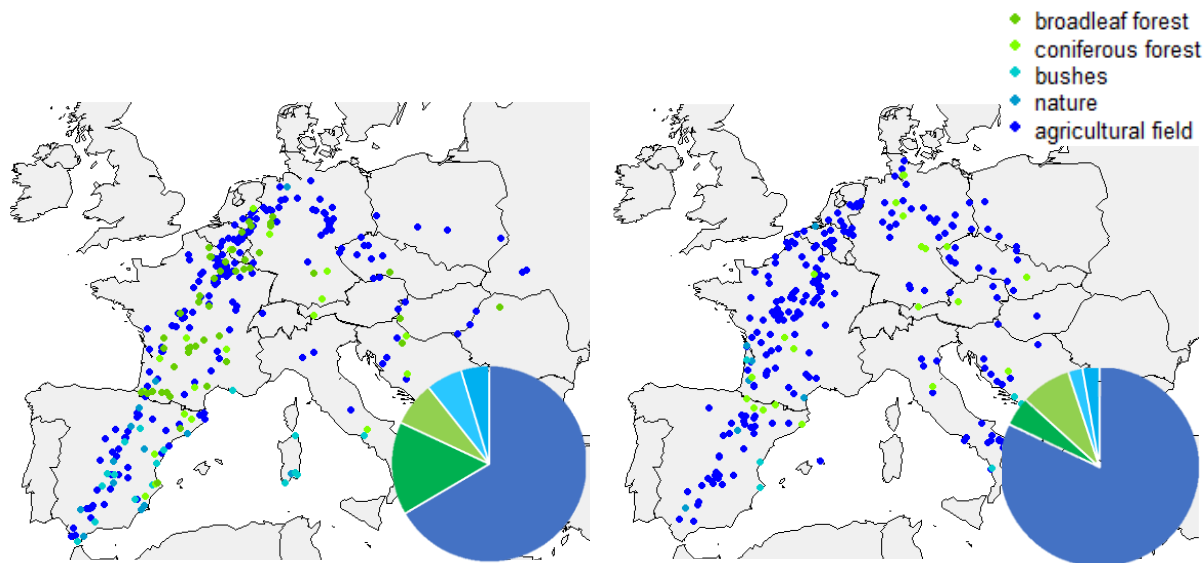


Figure 2c: Marsh Harriers Autumn

Figure 2d: Marsh Harriers Spring

Figure 2: Habitat choose of Montagu's and Marsh Harriers during migration. Green represent resting in trees, blue the other habitat types.

Montagu's Harriers roosted about twice as frequently in trees in autumn compared to spring ( $\chi^2$ : 25.4, df: 4,  $p < 0.001$ ). Marsh Harriers roosted more frequently in trees than Montagu's Harriers (AUT:  $\chi^2$ : 69.1 df: 4,  $p < 0.001$ , SPR:  $\chi^2$ : 41.8, df: 4,  $p < 0.001$ ), but the frequency of roosting in trees was very similar between seasons for this species ( $\chi^2$ : 7.8, df: 4,  $p$ : 0.10).

## DIFFERENCES BETWEEN SEXES

In the Montagu's Harrier, more night roosts were identified for males than for females, for the simple reason that more males were tracked (table 2).

Harrier	male	female
Montagu's AUT	221	78
Montagu's SPR	182	74
Marsh AUT	56	43
Marsh SPR	41	32

Table 2: the number of male and female Harriers per species for the different migratory periods.

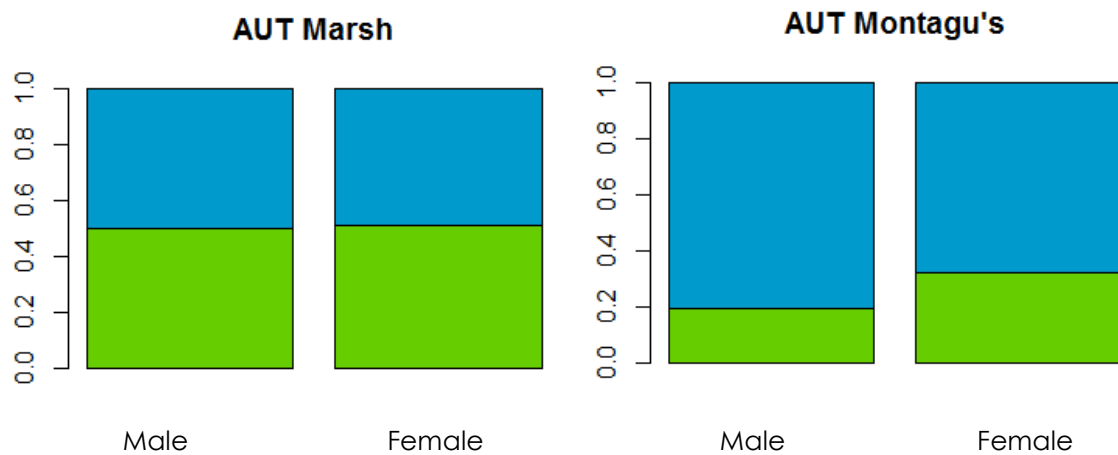


Figure 3: the ratio of autumn roosting locations in trees (green) and other habitat types (blue) shown for males and females.

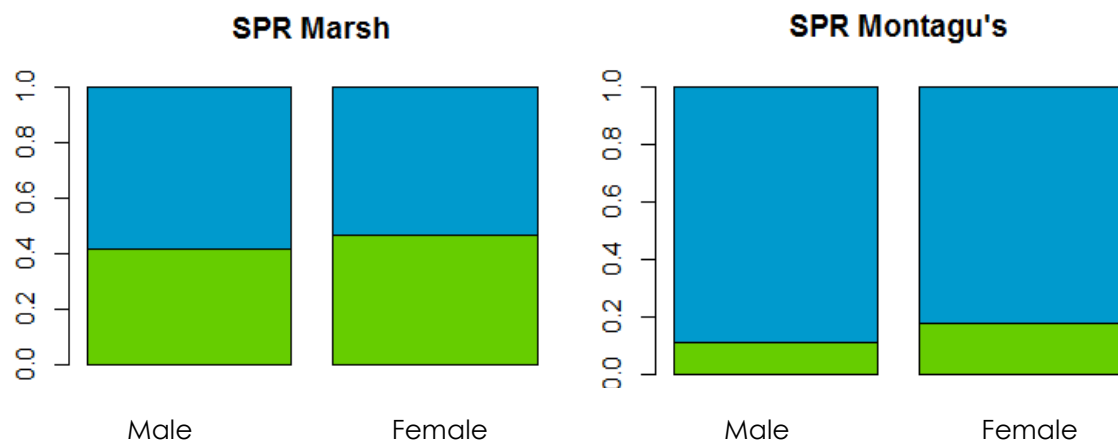


Figure 4: the ratio of spring roosting locations in trees (green) and other habitat types (blue) shown for males and females.

Figure 3 and 4 show the ratio of male and female roosting locations for both species in autumn (figure 3) and spring (figure 4).

In none of the combination of seasons and species, the tendency to roost in trees differed between the sexes (in all cases,  $p > 0.05$ ).

## DIFFERENCES BETWEEN YEARS

The proportion of roosting in trees in different years is shown in figure 5 & 6. In none of the combination of seasons and species, the tendency to roost in trees differed between the years (in all cases,  $p > 0.05$ ).

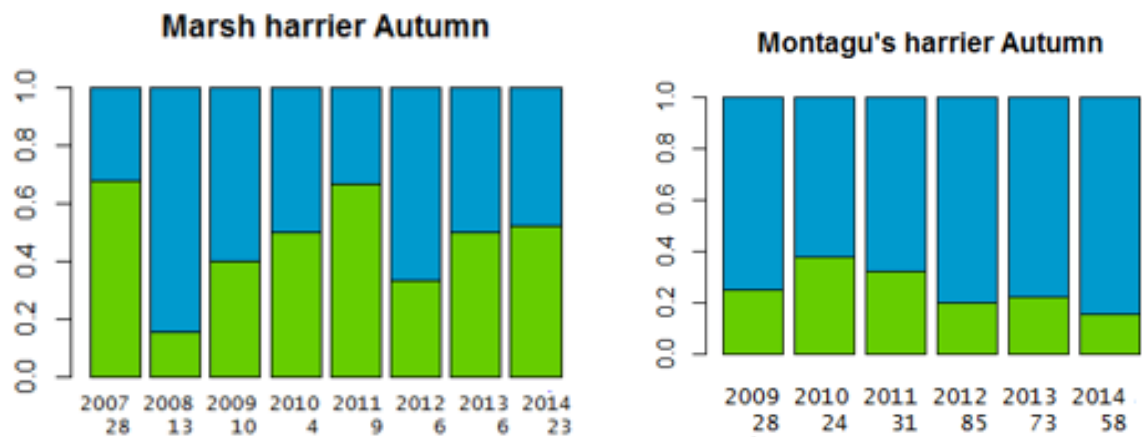


Figure 5: the ratio of autumn roosting locations in trees (green) and other habitat types (blue) shown for different years. On the left shown for Marsh Harriers, on the right for Montagu's Harriers. Number of roosting locations per year are shown underneath the bars.

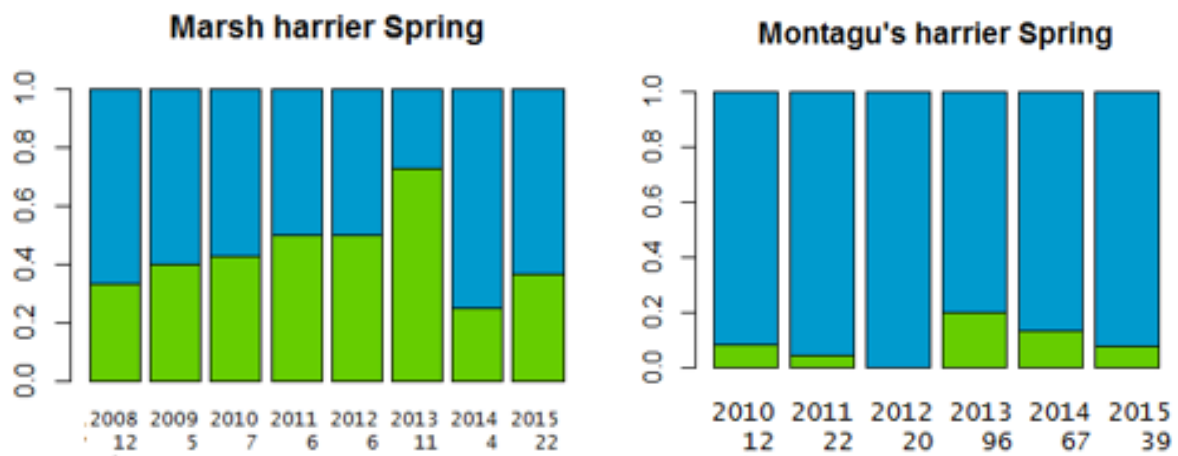


Figure 6: the ratio of spring roosting locations in trees (green) and other habitat types (blue) shown for different years. On the left shown for Marsh Harriers, on the right for Montagu's Harriers. Number of roosting locations per year are shown underneath the bars.



## LATITUDINAL AND DATE DIFFERENCES

In figure 7, the latitudes of the night roosts are plotted against the date, which shows the migratory progress in Marsh and Montagu's Harrier. Clearly, Montagu's Harriers migrate earlier in autumn and later in spring compared to Marsh Harriers.

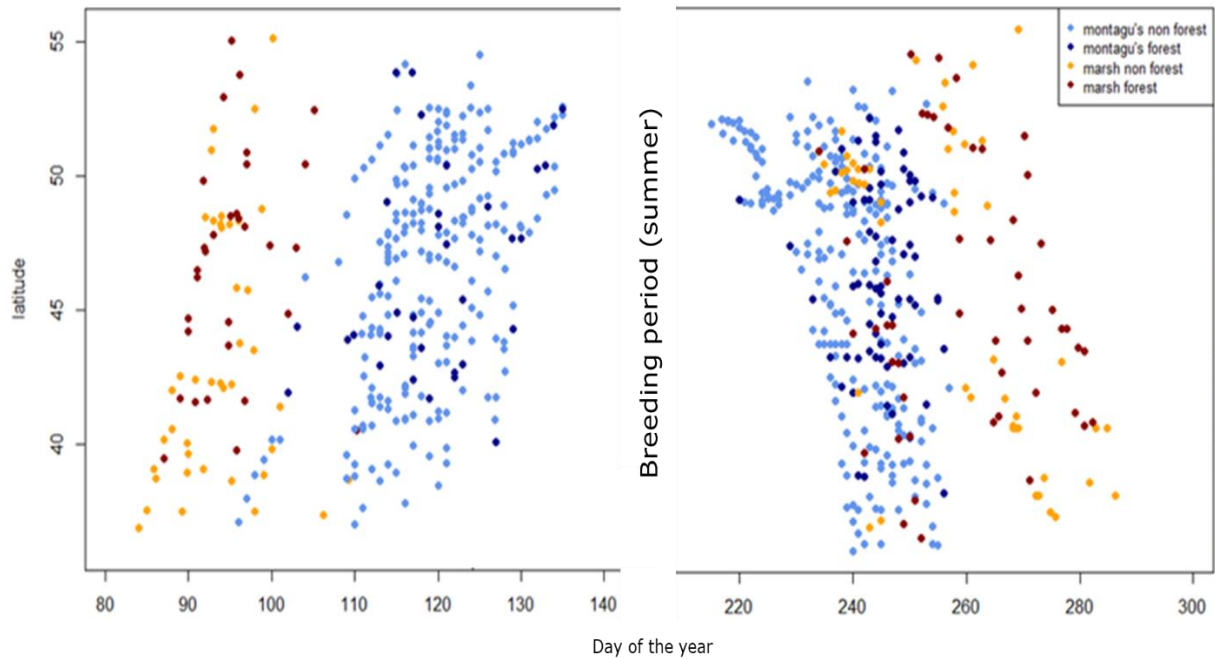


Figure 7: Plot of latitude of the nightroost locations of Montagu's (blue) and Marsh (red/orange) Harriers during spring (left) and autumn (right).

Subsequently, we analysed whether the tendency to roost in trees varied between latitudinal bands (table 3). In autumn, roosting in trees peaked at the latitudinal band of 42.5 – 47 degrees, in both Montagu's and Marsh Harrier. Differences between latitudinal bands were significant in both cases (table 3). In spring, roosting in trees generally increased with latitude, although in Montagu's Harriers roosting in trees was rare in this season. In spring, differences between latitudinal bands were significant for Marsh Harrier only.

	x2	df	P
<b>MoH, AUT</b>	<b>28.0</b>	<b>4</b>	<b>&lt; 0.001</b>
MoH, SPR	6.5	4	0.17
<b>MaH, AUT</b>	<b>17.7</b>	<b>4</b>	<b>0.001</b>
<b>MaH, SPR</b>	<b>11.4</b>	<b>4</b>	<b>0.02</b>

Table 3: Effect of latitude (latitudinal bands).

Finally, we analysed how roosting behaviour varied over time (date). In Montagu's Harriers in autumn, roosting in trees increased over time. In all other combinations of species and seasons no significant effect of time was found (table 4).

	x2	df	P
<b>MoH, AUT</b>	<b>24.3</b>	<b>1</b>	<b>&lt; 0.001</b>
MoH, SPR	0.0	1	0.97
MaH, AUT	0.1	1	0.81
MaH, SPR	0.5	1	0.50

Table 4: Effect of date.

Figure 8 and 9 show the distribution of tree roosts at different latitude groups (figure 8a and 9a) and different dates (figure 8b and 9b) for both Autumn (fig. 8) and Spring (fig. 9). A map is added to show the outlines of the latitudinal bins used.

Figure 8: **Autumn** roosting locations for Montagu's (blue) and Marsh (red) harriers per latitude

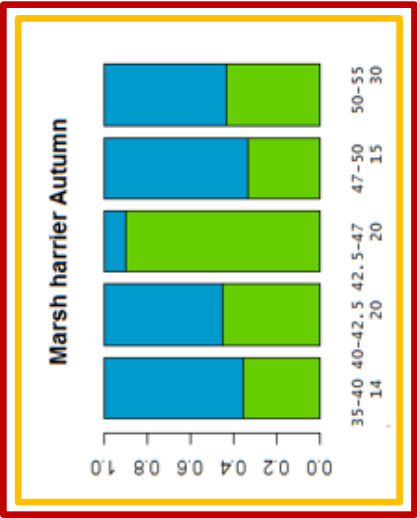
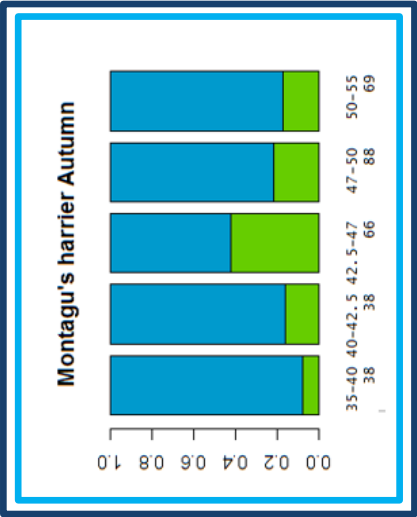
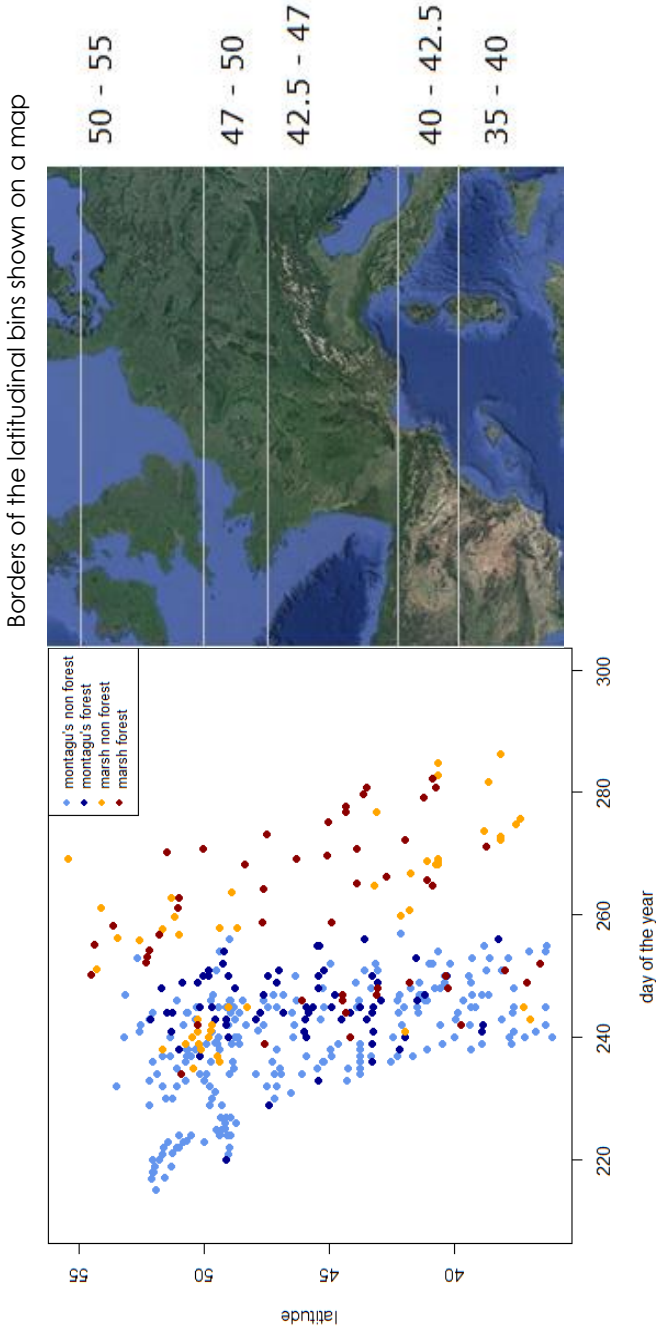


Figure 5b (left): Ratio of Montagu's (blue contour) and Marsh (red contour) harriers roosting in trees (green) or other habitat types (blue) per latitudinal bin. For each bar are the latitudinal group and the number of roosting locations shown underneath the bar, sorted from south (left) to north

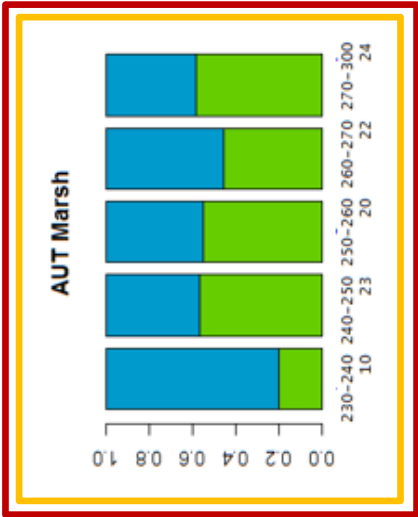
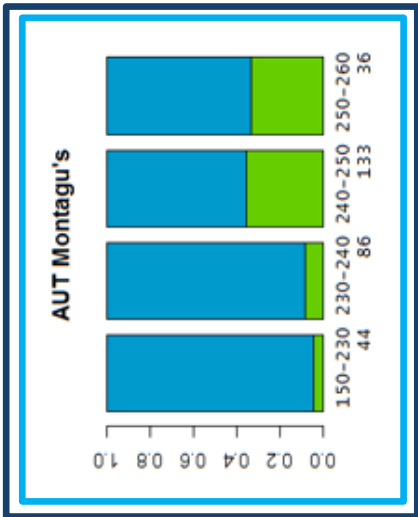


Figure 5b (above): Ratio of Montagu's (blue contour) and Marsh (red contour) harriers roosting in trees (green) or other habitat types (blue) and grouped on day of the year. For each bar are the year of the day groups and the number of roosting locations shown underneath the bar.

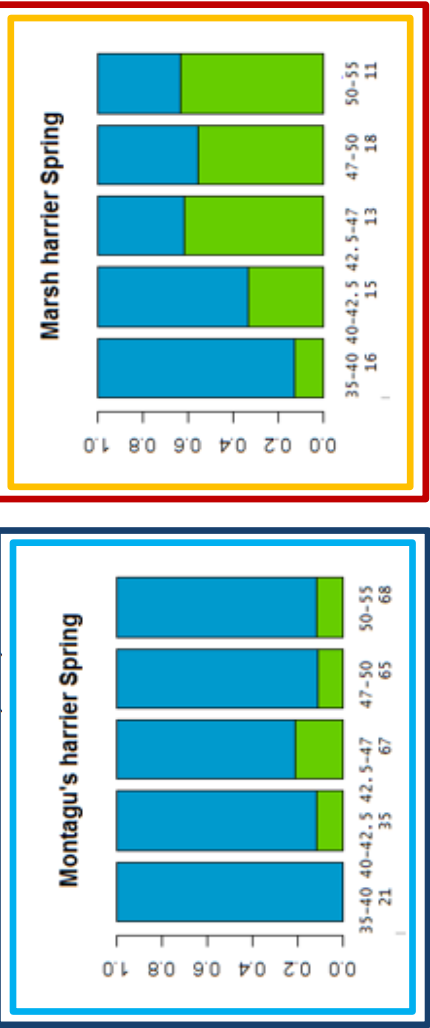
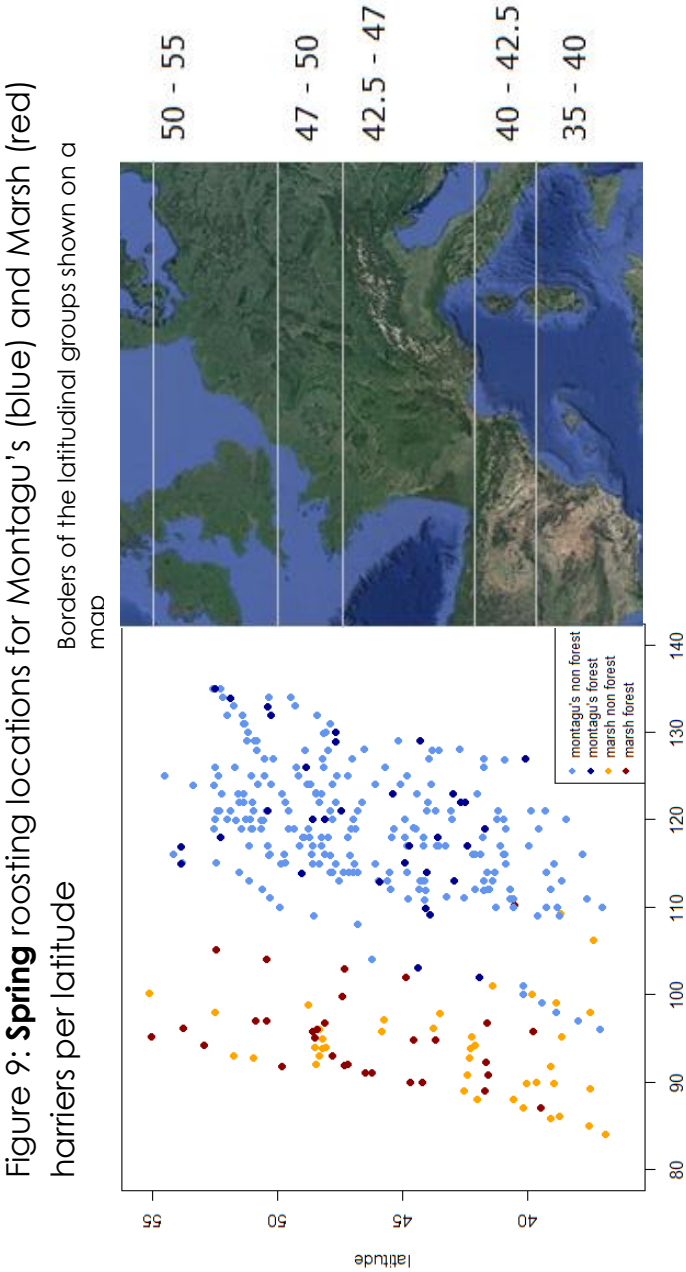


Figure 11a (left): Ratio of Montagu's (blue contour) and Marsh (red contour) harriers roosting in trees (green) or other habitat types (blue) and grouped on latitudinal differences. For each bar are the latitudinal group and the number of roosting locations shown underneath the bar, sorted from south (left) to north (right)

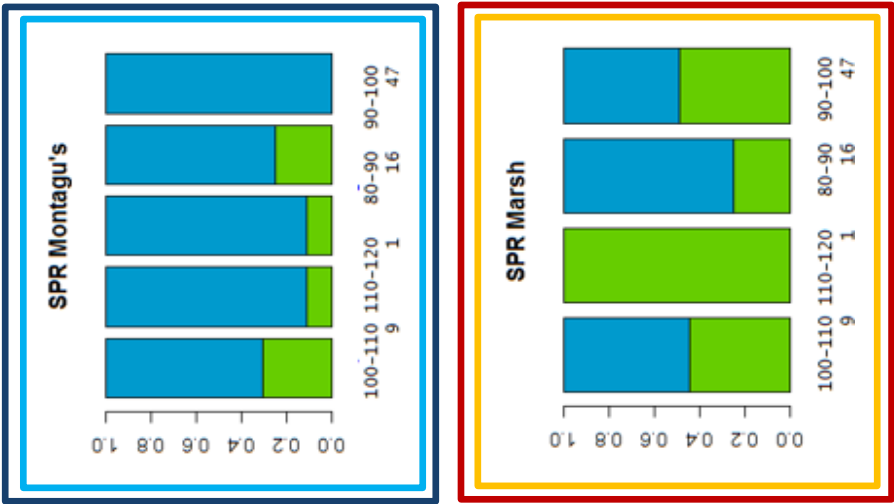


Figure 11b (above): Ratio of Montagu's (blue contour) and Marsh (red contour) harriers roosting in trees (green) or other habitat types (blue) and grouped on day of the year. For each bar are the year of the day groups and the number of roosting locations shown underneath the bar.

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## CITIZEN SCIENCE PROJECT

A citizen science project could be very valuable for the study of night roost habitats of Harriers, if it could help to verify the habitats as identified from Google Earth images. For many roosting locations, we are confident about the habitat at the night roost as pictures where of a high resolution and habitat structures (trees, fields) could readily be identified. However, the identification of habitats in southern Europe turned out to be challenging, especially bushy and natural habitats.

I identified several communities that could be involved in a citizen science project. One of them are the so called 'geocachers', people that like to hide small boxes for each other and go looking for them by GPS coordinates. This group of people is used to work with a GPS in the field, and thus the probability that they will reach the exact roosting location is therefore very high, which would result in reliable habitat ground truthing.

Another community that is of interest for such citizens science project are the people registering their bird, insect and plant observations on websites like waarneming.nl (Dutch) and observation.org (international). Sites offer the possibility to upload pictures, thus the basic framework for a citizens science project of people uploading pictures from Harrier roost sites is already in place. A possible interface was developed (appendix 2).

Both communities were contacted, and they were in principle interested to support the citizens science project. Internet provides unique opportunities to both get in touch with potential observers and to collect the data. There already are different research groups that use citizens for their data collection, for example amateur birdwatchers registering colour ringed birds. An important aspect is providing feedback to the observer, to ensure future commitment to citizens science projects.



## CONCLUSION AND DISCUSSION

GPS-tracking revealed that during migration, roosting in trees was a rather common behaviour in the two Harrier species. Thus, previous observations by Sammut (2005) were not exceptions. This result was unexpected as 785 night roosts during the breeding period in the Netherlands were all located in (agricultural) fields. During migration, tree roosts were located in both broadleaf and coniferous forest. Roosting in trees occurred in almost all individuals (all individual Marsh Harriers, 22 out of 24 Montagu's Harriers), in males and in females, and thus seems an important aspect of the behaviour of migrating Harriers. It is interesting to realize that this common behaviour of Harriers has virtually remained unnoticed in Northern and Central Europe even though Harriers arrive at sunset at their roost location and leave only after sunrise.

Roosting in trees was more common in Marsh Harriers than in Montagu's Harriers, and slightly more common during autumn compared to spring migration. In autumn, the Harriers seem to roost more often in trees at a certain latitudinal band (42.5 – 47 degrees), whereas in spring the tendency to roost in trees increased with latitude. These results provide insights in the possible factors promoting roosting in trees.

The difference in the extent of roosting in trees between the species might be explained by a difference in timing of their migrations. Ground roosts of Harriers are typically situated in 20 to 80 cm high vegetation which provides cover for the roosting birds (Clarke 1996, Cramp & Simmons 1994). Montagu's Harriers migrate earlier in autumn, and later in spring, i.e. when less crops have been harvested (autumn) or crops have developed more (spring), suggesting that the availability of standing crops might influence tree roosting. However, within species, only for Montagu's Harriers in autumn an effect of date on tree roosting was found. Instead, in almost all cases (except Montagu's Harriers in spring – when tree roosting was less common anyway) an effect of latitude was found, suggesting that other factors than timing affect tree roosting. The result that tree roosting occurred less at specific latitudes suggests that other factors are also involved.

Safety is an important aspect for all migrants (Alerstam & Lindstrom 1990). By roosting on the ground, an individual exposes itself to predation by mammals like for example the Red Fox (*Vulpes vulpes*). This could suggest that Harriers choose to rest in trees when the local predation risk by mammals is too high.

This may be explained by the fact that individuals often travel through unknown areas during migration and do not know the local circumstances (Vardanis et al. 2011). Although in trees there is a possible increase of the predation risk by avian predators such as the Goshawk (*Accipiter gentilis*). So, the possible safety a tree provides cannot be the only reason for a Harrier to rest in trees instead of on the ground.

Another important factor might be that Harriers are social birds, especially in winter when communal roosts can be very large (Clarke 1996, Clarke et al. 1998, Trierweiler & Koks 2009). The presence of a communal roost might promote roosting on the ground (and vice versa, the absence of a communal roost might promote roosting in trees). The latitudinal bands where Harriers tended to roost less often in trees are indeed known to be breeding areas of Harriers, and it is likely that communal roosts are present in these areas during migration periods, although a formal analysis is complex due to the general lack of data on Harrier roosts.

So, besides vegetation, the presence of other Harriers might influence the choice to a roost in a tree or on the ground. Because it is much easier to study the bird's behaviour during stationary periods (breeding and wintering) there is still a lot to learn about Harrier behaviour during migration. Much fieldwork is needed to draw more firm conclusions on the ideas on factors shaping roosting in trees in Harriers during migration periods. A citizen science approach might be required to be able to conduct such study over such extended spatial scale.

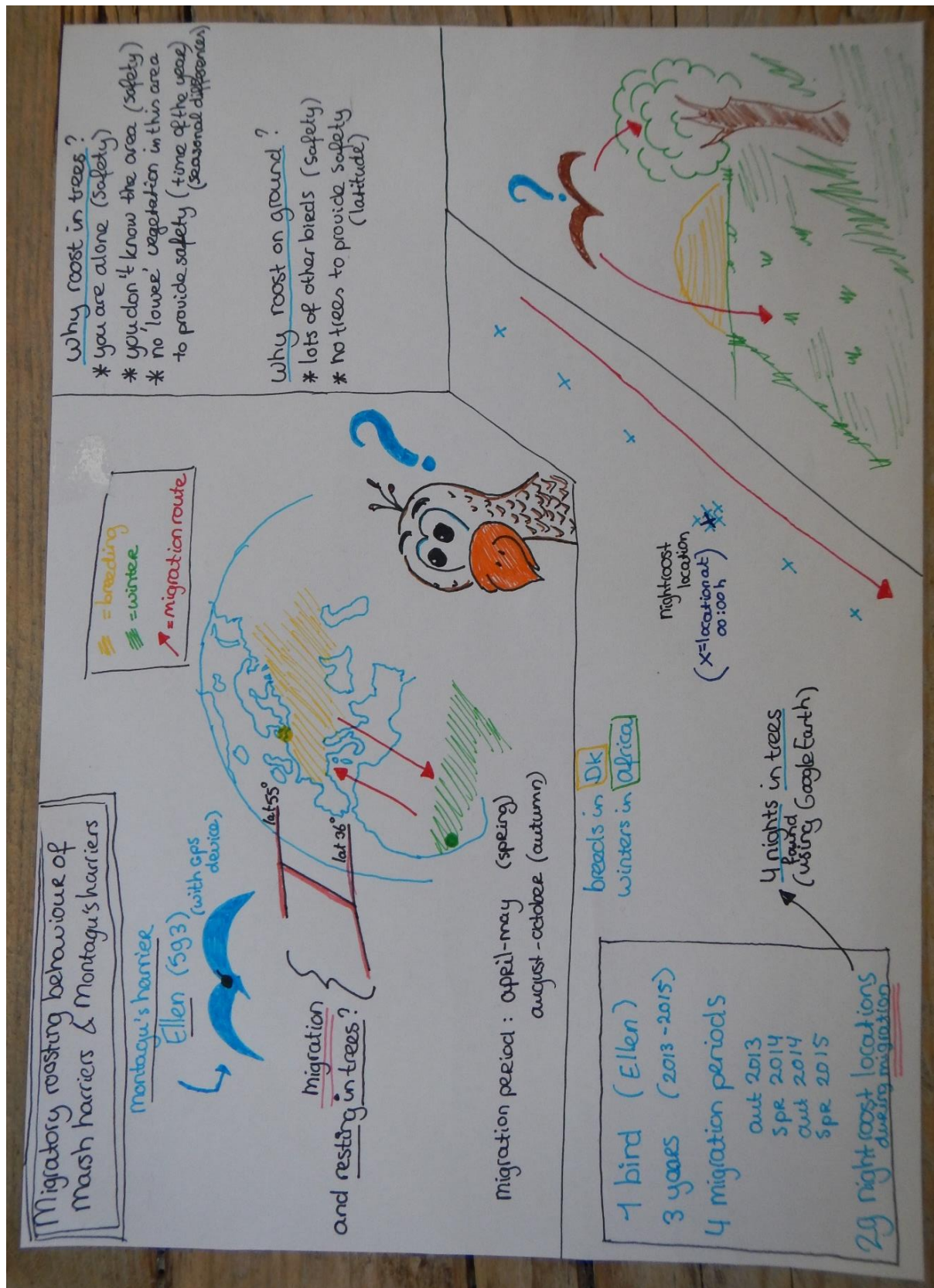
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## APPENDICES

## 1) A SMALL POSTER WITH THE AIM OF THIS STUDY





## 2) TEMPLATE OF THE USE OF A CITIZEN SCIENCE PROJECT

### WAARNEMING.NL:



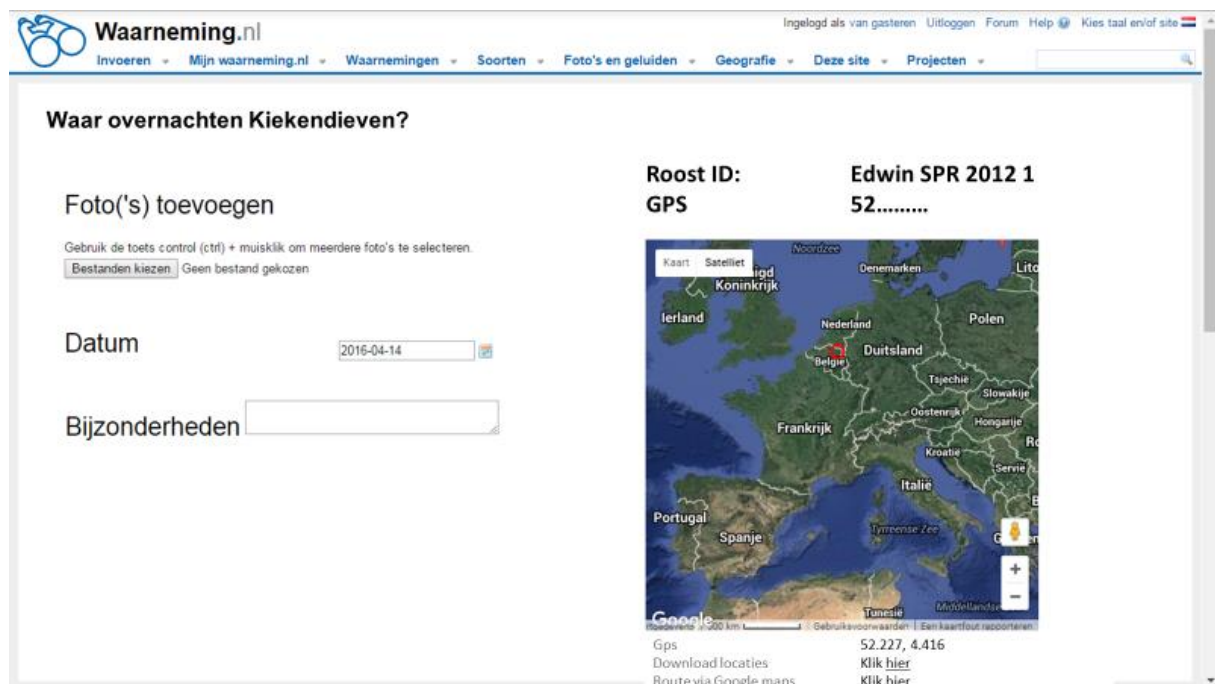
**Waar overnachten Kiekendieven?**

Kiekedieven staan in Nederland bekend als vogels van het open landschap en broeden op de grond. Recent onderzoek laat zien dat ze tijdens de trek van en naar het broedgebied ook veel in bomen rusten. In de kaart hiernaast zijn overnachtingslocaties aangegeven van verschillende bruine en grauwe kiekendieven die gevonden zijn door kiekedieven uit te rusten met GPS zenders.

Om in kaart te brengen in wat voor type habitat de vogels overnachten hebben we duidelijke foto's nodig van het habitat waar ze overnacht hebben. Dit kan een inzicht geven in waarom kiekendieven tijdens de trek een andere rustlocatie kiezen dan tijdens de winter en broedperiode.

**Doe mee en maak foto's!**  
Klik hiernaast op de kaart op een weergegeven locatie voor meer informatie of om de gemaakte foto's te uploaden.

Voor meer uitgebreide informatie klik [hier](#)



**Waar overnachten Kiekendieven?**

**Foto(s) toevoegen**


Gebruik de toets control (ctrl) + muisklik om meerdere foto's te selecteren.  
Bestanden kiezen: Geen bestand gekozen

**Datum** 2016-04-14

**Bijzonderheden**

**Roost ID: GPS** Edwin SPR 2012 1 52.....

Gps 52.227, 4.416  
Download locaties [Klik hier](#)  
Route via Google maps [Klik hier](#)


**Waarneming.nl**

[Invoeren](#)
[Mijn waarneming.nl](#)
[Waarnemingen](#)
[Soorten](#)
[Foto's en geluiden](#)
[Geografie](#)
[Deze site](#)
[Projecten](#)

[Inloggen](#)
[als van gasten](#)
[Uitloggen](#)
[Forum](#)
[Help](#)
[Kies taal en/of site](#)

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## Waar overnachten Kiekendieven?

Ga je naar een gebied met veel rustlocaties en wil je van meerdere locaties foto's maken, download dan de GPS coördinaten van alle rustlocaties in de buurt.


Zoom in op de kaart door middel van de + rechts onder in beeld. Klik op het gebied waar je de GPS coördinaten van rustlocaties van wilt downloaden of voer hieronder de locatie in.


Waar

Vul hier het adres van de locatie in en druk op zoek.  
Bijvoorbeeld Utrecht, Vredenburg 10

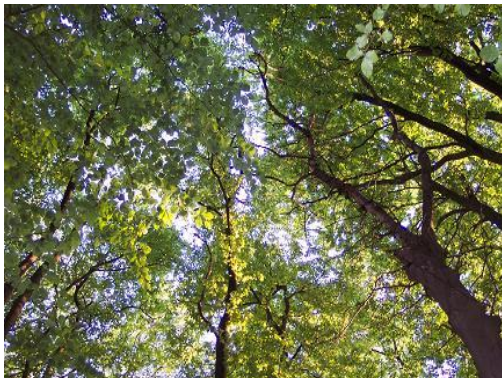
### GPS coördinaten rond dit punt

52.227, 4.416  
52.235, 4.478  
.....  
Totaal: 45 coördinaten





## EXAMPLES OF PICTURES



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### 3) LIST OF INDIVIDUAL BIRDS (YEAR OF PLACING GPS LOGGER)

**Grauwe Kiek NL (Montagu's Harriers):**

2009	187 Willem	
2009	191 Edwin	x
2009	188 Alida	
2009	190 Rita	
2010	187 Willem	(terug 1 <sup>ste</sup> keer)
2010	190 Rita	(terug 1 <sup>ste</sup> keer)
2010	191 Edwin	(terug 1 <sup>ste</sup> keer)
2010	426 Gert	
2010	427 Rik	
2010	428 Elzo	
2010	429 Jan	(geen data)
2011	190 Rita	(terug 2 <sup>de</sup> keer)
2011	191/582 Edwin	(terug 2 <sup>de</sup> keer, nieuwe logger)
2011	427 Rik	(terug 1 <sup>ste</sup> keer, onvolledige track)
2011	428 Elzo	(terug 1 <sup>ste</sup> keer)
2011	505 Pieter	
2011	507 Harold	
2011	508 Paul	
2011	510 Hiltje	
2011	515 Yde	
2011	587 Martijn	

2012	428 Elzo ( <i>terug 2<sup>de</sup> keer</i> )	x
	314 Corry	
2012	505 Pieter ( <i>terug 1<sup>ste</sup> keer</i> )	x
	308 Floortje	
2012	515 Yde ( <i>terug 1<sup>ste</sup> keer</i> )	x
	293 Paulien	
2012	582 Edwin ( <i>terug 3<sup>de</sup> keer</i> )	
2012	669 Marc	x
	310 Ellen	
2012	686 JanGerard	x
	685 Jannie	
2012	704 Morri	x
	312 Marycha	
2012	677 Gijs	
2012	679 Ronny (geen data)	
2012	684 Alje	
2012	745 Boelo	
2013	582 Edwin ( <i>terug 4<sup>de</sup> keer</i> )	x
	832 Nadine	
2013	505 Pieter ( <i>terug 2<sup>de</sup> keer</i> )	
2013	669 Marc ( <i>terug 1<sup>ste</sup> keer</i> )	
2013	686 JanGerard ( <i>terug 1<sup>ste</sup> keer</i> )	x
	685 Jannie ( <i>terug 1<sup>ste</sup> keer</i> )	
2013	704 Morri ( <i>terug 1<sup>ste</sup> keer</i> )	
2013	314 Corry ( <i>terug 1<sup>ste</sup> keer</i> )	
2013	819 Joey	
	308 Floortje ( <i>terug 1<sup>ste</sup> keer</i> )	
2013	696 Laurens	

2014 582 Edwin (terug 5<sup>de</sup> keer)  
2014 819 Joey (terug 1<sup>ste</sup> keer)  
2014 696 Laurens (terug 1<sup>ste</sup> keer)  
2014 308 Floortje (terug 2<sup>de</sup> keer)  
2014 5119 Dirk x  
685 Jannie (terug 2<sup>de</sup> keer)  
2014 5120 Tim  
2014 5130 Cornelis  
2014 5131 Hinrich  
2014 5132 Fritz

2015 5130 Cornelis (terug 1<sup>ste</sup> keer)  
2015 582 Edwin (terug 5<sup>de</sup> keer)

**Grauwe Kiek DK (Montagu's Harrier):**

2011 583 Jeppe  
2011 585 Bo  
  
2012 589 Flemming x  
590 Inga  
  
2013 583 Jeppe (terug 1<sup>de</sup> keer na 2 jaar)  
2013 589/815 Flemming (terug 1<sup>ste</sup> keer) x  
590 Inga (terug 1<sup>ste</sup> keer)  
2013 593 Ellen  
2013 594 Vibeke  
2013 749 Peder



2014 815 Flemming (*terug 2<sup>de</sup> keer*)  
2014 749 Peder (*terug 1<sup>ste</sup> keer*)  
2014 593 Ellen (*terug 1<sup>ste</sup> keer*)  
2014 5121 Asbjoern  
2014 5123 Bjarke

2015 5121 Asbjoern (*terug 1<sup>ste</sup> keer*)  
2015 593 Ellen (*terug 2<sup>de</sup> keer*)

**Bruine Kiek NL (Marsh Harrier):**

2012 291 William  
  
2013 291 William (*terug 1<sup>ste</sup> keer*)  
  
2014 291 William (*terug 2<sup>de</sup> keer*)  
2014 634 Kjell  
2014 6064 Roelof  
  
2015 6064 Roelof (*terug 1<sup>e</sup> keer*)  
2015 291 William (*terug 3<sup>e</sup> keer*)

**Bruine kiek Sweden (Marsh Harrier):**

2007 Fe71  
2007 Ma72  
  
2008 Fe71 (*terug 1<sup>e</sup> keer*)  
2008 Ma72 (*terug 1<sup>e</sup> keer*)  
2008 Ma74

2009 Fe65

2009 Fe71 (terug 2<sup>de</sup> keer)

2009 Fe72

2010 Fe65 (terug 1<sup>e</sup> keer)

2010 Fe71 (terug 3<sup>e</sup> keer)

2011 Fe71 (terug 4<sup>e</sup> keer)

2012 Fe71 (terug 5<sup>e</sup> keer)