



Zenderonderzoek naar het
foerageergedrag en habitat
keuze van de Europese
Nachtzwaluw (*Caprimulgus
europaeus*): de effecten van
landschapsheterogeniteit

08-02-2020, Cornelis Michiel

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Europese Nachtzwaluw

Caprimulgus europaeus

Algemeen:

- Familie: Caprimulgidae
- Nacht actieve vogel
- Bescherming: Bird Directive species (Annex 1)

Veldkarakteristieken:

- Cryptische pluimen
- Man vs vrouw: witte vlekken op de vleugels en staartveren



Ecologie:

Dieet:

- Nachtvinders en kevers

Habitat:

- **Broedgebied (“Breeding”)**: open semi-natuurlijke habitats met verspreide takken en mos
- **Slaaplocatie (“Roosting”)**: Dennenbomen (pine stands)
- **Foerageergebieden (“Foraging”)**: in open gebieden zoals graslanden en heide gebieden
- **Ongeschikt (“Unsuitable”)**: stedelijk gebied, waterlichamen en intensief gebruikte akkerlanden



Foerageertechnieken:

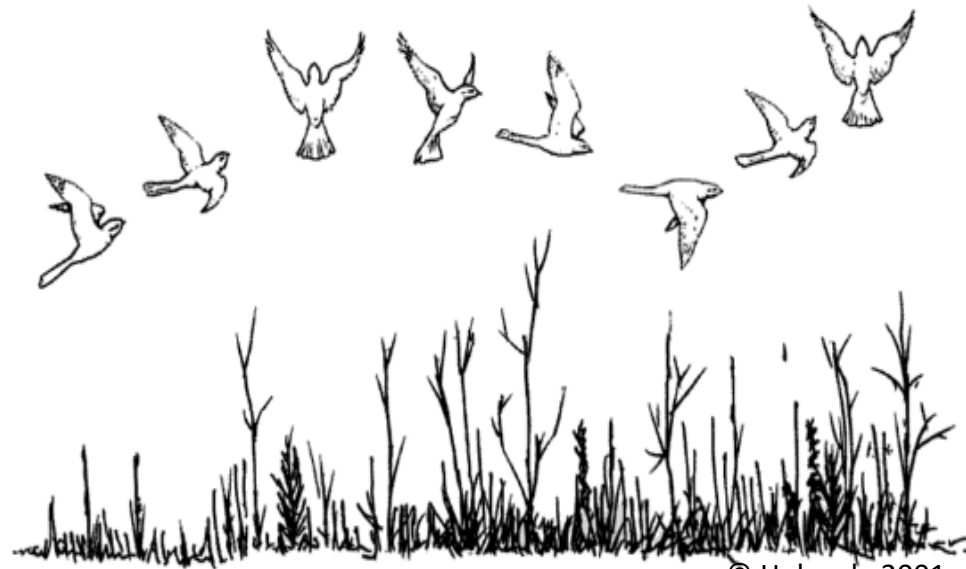
2 technieken: “Sallying” en “Hawking”



© Holyoak, 2001

“Sallying”:

- Passief wachten op een prooi



© Holyoak, 2001

“Hawking”:

- Actief jagen naar prooi

Onderzoeksvragen:

- 1) Hoe ver van de broedlocatie gaan Nachtzwaluwen foerageren?
- 2) Is het habitatgebruik van de Nachtzwaluw random?
- 3) Het studie gebied “Kalmthoutse Heide” vergeleken met andere eerdere studies.



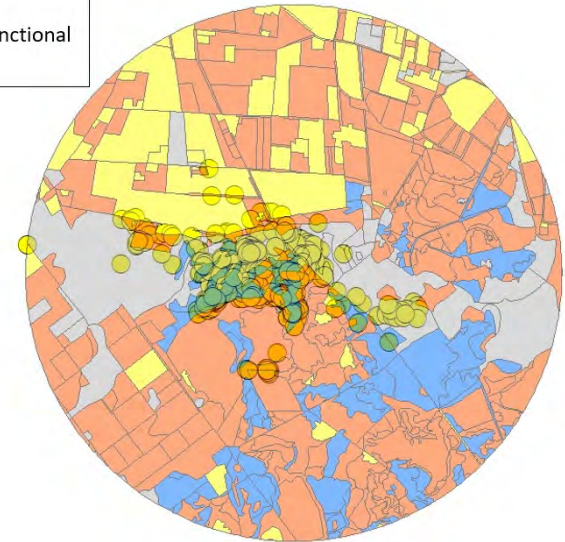
Study areas:

- **Kalmthoutse Heide, Antwerpen:**
 - Natuurpark over de grenzen heen : Grenspark Kalmthoutse Heide (Nederlands en Belgisch gedeelte)
 - Één van de grootste heidegebieden van Vlaanderen
- **Bosland, Limburg:**
 - Gefragmenteerde heidegebieden en naaldboomcomplexen

➔ Verschillende landschapscompositie

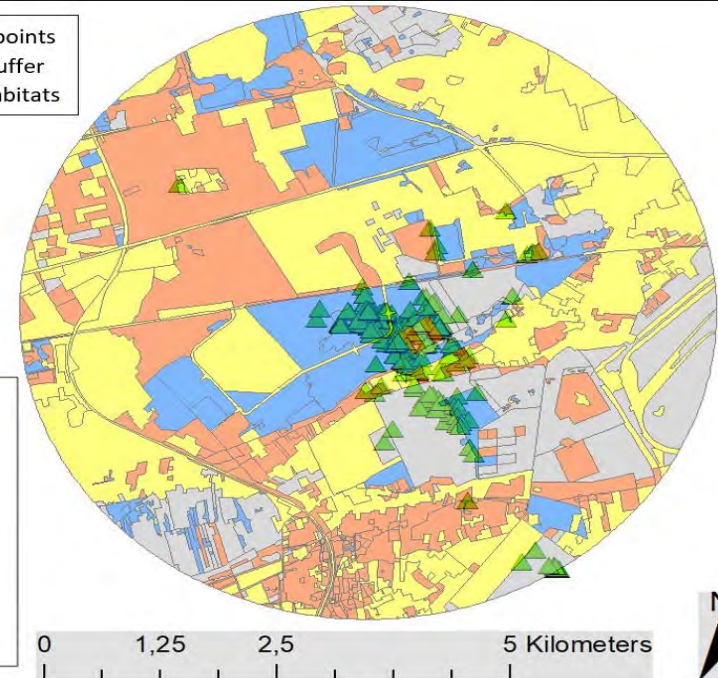
Overview of datapoints I65 (Kalmthout) in buffer with functional habitats

Legend:



Overview of datapoints I57 (Bosland) in buffer with functional habitats

Legend:





Materiaal en methode:

- Mei tot en met augustus 2018
 - Ultra- fijne mistnetten (12m x 3m) en geluid (playback lures)
 - Low- tech drop – off methode beschreven door Evens et al., 2018
- ➔ Combinatie van GPS zender en VHF- tag



© Ruben Evens

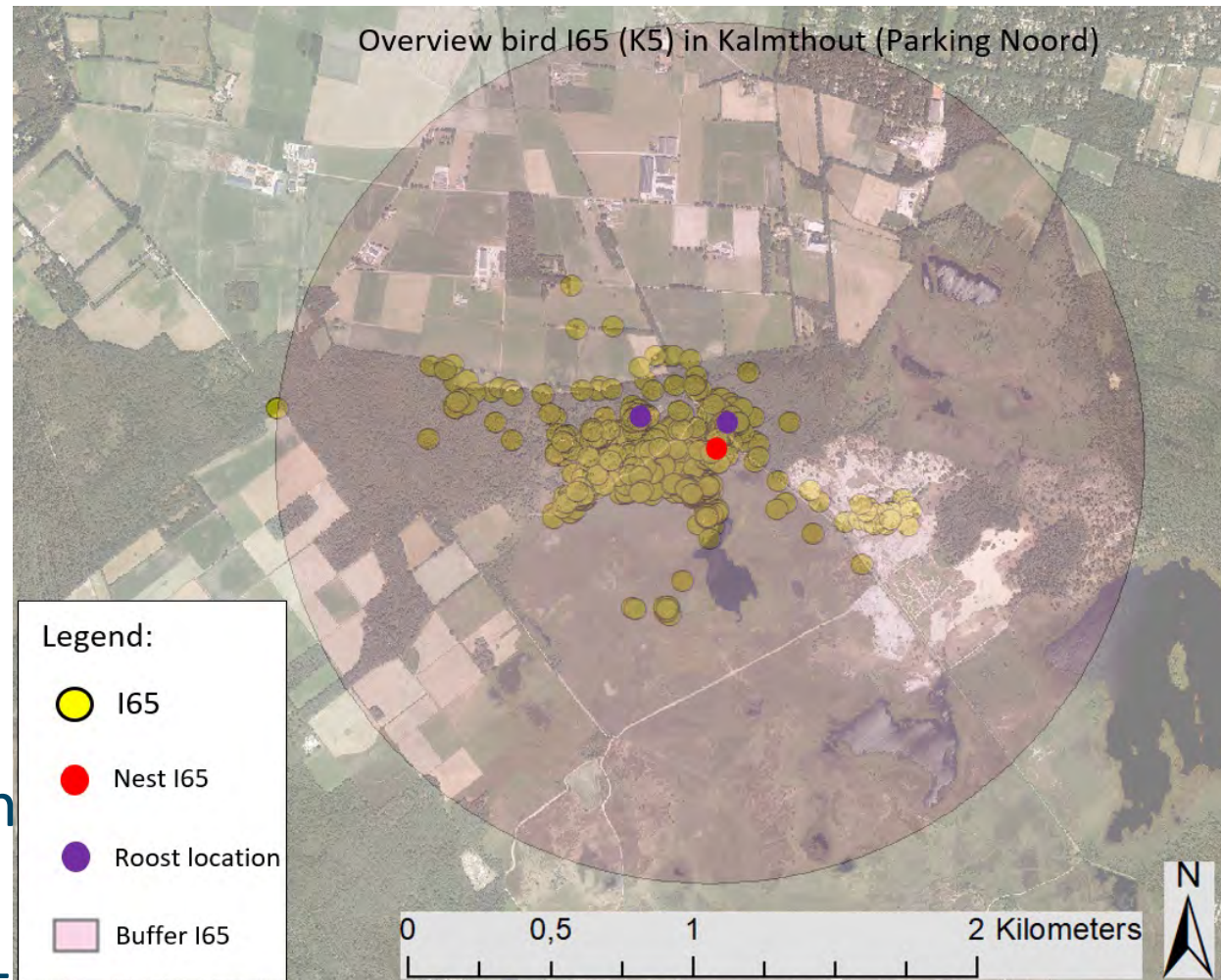
VHF/GPS logger

- Geplaatst dichtbij het gravitatie centrum van de vogel (op de schaften van de achterste staartveren)
- Eco Ballon Ribbon → in contact met water = oplossen binnen de 2 min.
- “Radiotracking”: Hand – held three – element Yagi directional antenna + Sika radio- tracking ontvanger



GPS data:

- Determinatie van de gedragingen
- Veldobservaties en interpretaties van de GPS data
- Nest locaties en slaaplocaties
- Territorium grootte
- Foerageerafstanden
- Buffer = beschikbaar habitat



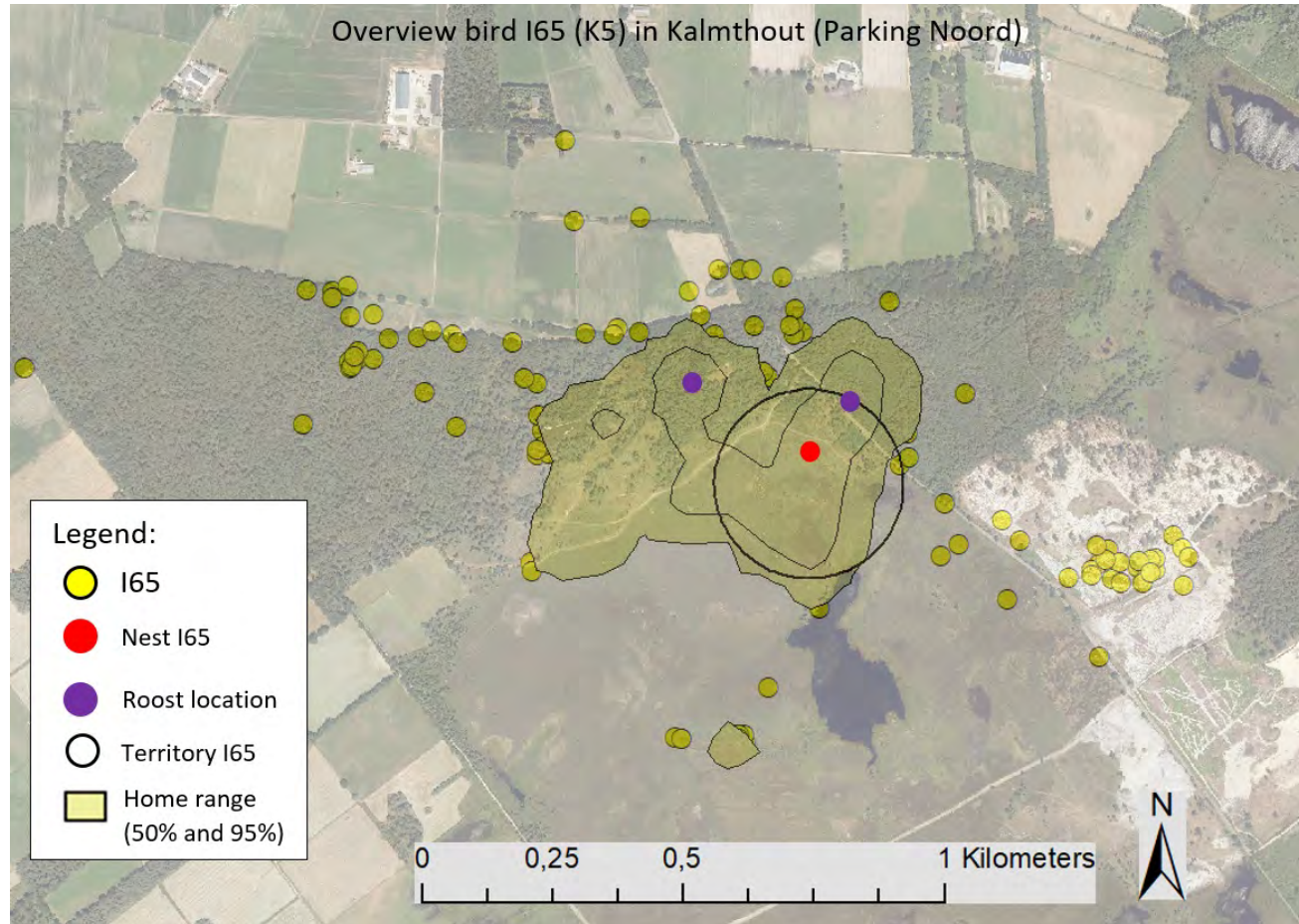
Habitatgebruik:

50% kernels:

- Kern gebied

95% kernels:

- Gebruikte gebied



Habitat reclassificatie, functionele habitats en habitat selectie:

- Herclassificatie van de BWK (± 750 habitat types) naar 20 relevante habitat types.
- Determinatie van functionele habitats (Evens et al., 2017 and Evens et al., 2018)
- Habitat selectie en habitat gebruik

Number	Category	Functional Habitat	Habitat selection	
1	Dry heathland	Breeding	Breeding	
2	Dunes with heather			
3	Clearcuts with broom			
4	Clearcuts with willow			
5	Clearcuts			
6	Riverine forest	Foraging	Wet heathlands and Swamps	
7	Wet heathlands			
8	Swamp			
9	Grasslands		Grasslands and recreation	
10	Agricultural land			
11	Recreational areas			
12	Wide tracks			
13	Small remaining landscape elements			
14	Deciduous forest			Deciduous forest
15	Oak stands			
16	Pine forest, high undergrowth	Roosting	Roosting	
17	Pine forest, low undergrowth			
18	Urbanisation	Unsuitable	Unsuitable	
19	Farmland			
20	Natural water			

Habitatgebruik I65:

Habitat use of bird I65 in Kalmthout

Legend:

- agricultural land
- clearcut
- clearcuts with willow
- deciduous
- dry heathland
- dunes
- farmland
- grassland
- natural water
- oak stand
- pine forest high
- pine forest low
- recreational area
- riverine forest
- small remaining landscape element
- swamp
- urbanisation
- wet heathland



Resultaten en discussie:

Tracking data:

16 plaatsingen



13 werden teruggevonden

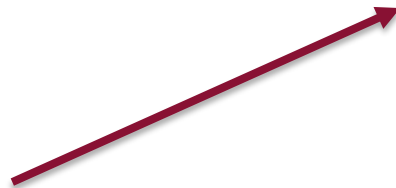


10 representatieve data



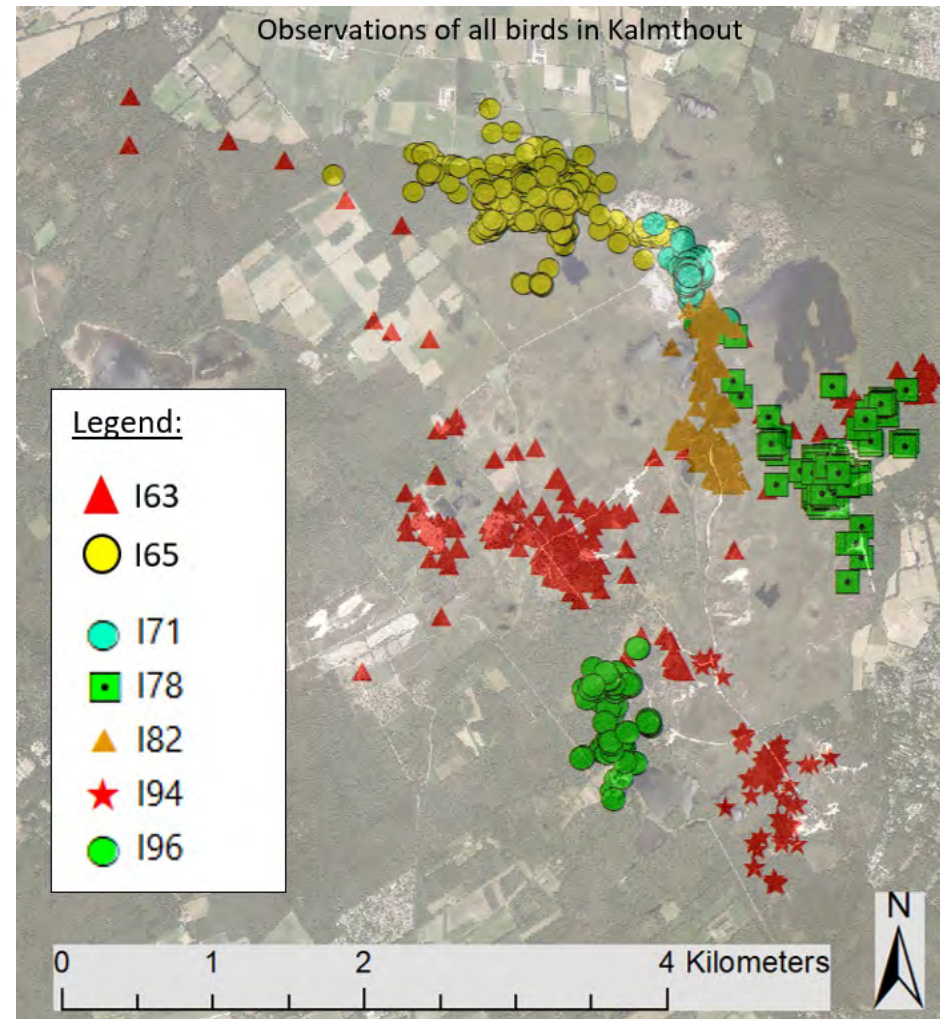
3 Bosland

7 Kalmthout



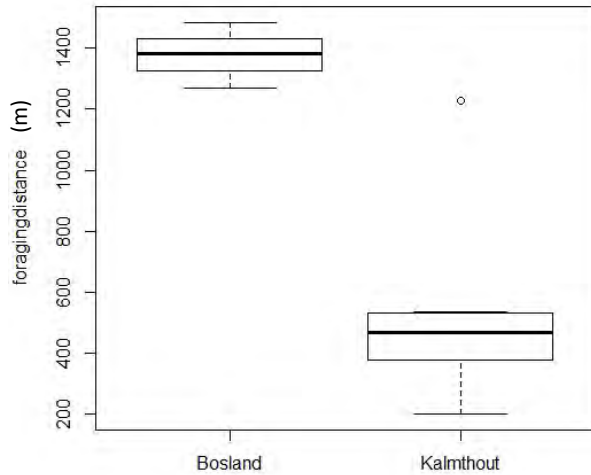
➔ Gemiddeld # GPS observaties per ID = 898

- Drop-off: 8 – 53 dagen (n=13, gemiddelde = 23 ± 14 days)



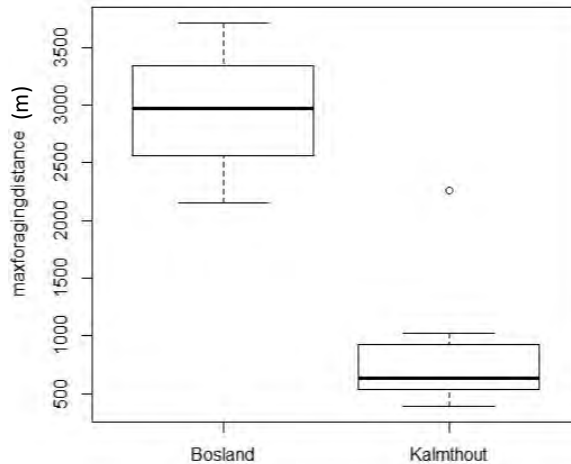
Foerageerafstanden:

Gemiddelde foerageerafstand:



Test: LM
(ANOVA)
P- value:
0.003

Maximale foerageerafstand:

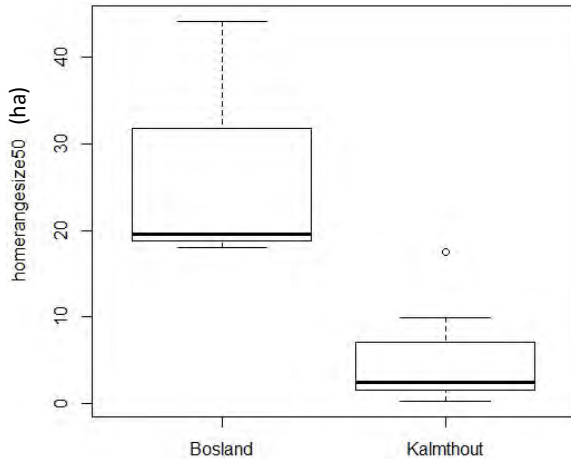


Test: LM
(ANOVA)
P- value:
0.002

	Bosland	Kalmthout	All birds
N	3	7	10
Total # GPS observations	4056	4926	8982
Average # GPS observations per ID	1352 ± 209	704 ± 405	898 ± 466
Mean foraging distance (m)	1379 ± 1179	532 ± 303	786 ± 566
Maximal foraging distance (m)	2946 ± 779	888 ± 643	1505 ± 1183

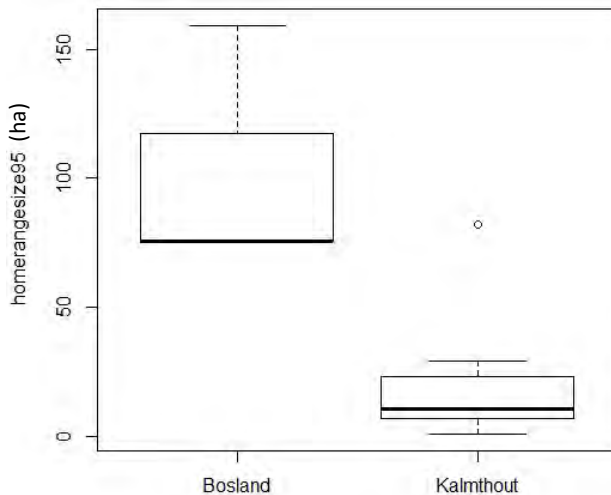
Home range grootte:

50% kernels:



Test: LM
(ANOVA)
P- value:
0.008

95% kernels:



Test: LM
(ANOVA)
P- value:
0.009

	Bosland	Kalmthout	All birds
N	3	7	10
Total # GPS observations	4056	4926	8982
Average # GPS observations per ID	1352 ± 209	704 ± 405	898 ± 466
Mean foraging distance (m)	1379 ± 1179	532 ± 303	786 ± 566
Maximal foraging distance (m)	2946 ± 779	888 ± 643	1505 ± 1183
Home range size 50% kernel (ha)	27 ± 15	5 ± 6	12 ± 14
Home range size 95% kernel (ha)	103 ± 48	22 ± 28	46 ± 51

Habitat selectie (Kalmthout):

→ COMPOSITIONAL ANALYSIS in Rstudio

50% kernels: NIET RANDOM (p-value: 0.015)

Breeding habitats (5) > wet heathlands (4) > pine stands (3) > deciduous forests (2) > unsuitable habitats(1) > grasslands (0)

	Breeding	Grassland	Wet heathland	Unsuitable	Pine stand	Deciduous forest	Ranking:
Breeding	0	+++	+++	+++	+	+	5
Grassland	---	0	---	-	-	-	0
Wet heathland	---	+++	0	+	+	+	4
Unsuitable	---	+	-	0	-	-	1
Pine stand	-	+	-	+	0	+	3
Deciduous forest	-	+	-	+	-	0	2

95% kernels: NIET RANDOM (p-value: 0.029)

Breeding habitats (5) > wet heathlands (4) > pine stands (3) > deciduous forests (2) > unsuitable habitats(1) > grasslands (0)

	Breeding	Grassland	Wet heathland	Unsuitable	Pine stand	Deciduous forest	Ranking:
Breeding	0	+++	+	+++	+	+	5
Grassland	---	0	---	-	---	-	0
Wet heathland	-	+++	0	+	+	+	4
Unsuitable	---	+	-	0	-	-	1
Pine stand	-	+++	-	+	0	+	3
Deciduous forest	-	+	-	+	-	0	2



Discussie overzicht:

1) Foerageerafstand (gemiddeld en maximaal):

In Bosland = verder foerageren

2) Home ranges (beide kernels):

In Bosland = groter

3) Habitat gebruik en selectie:

- Niet random voor beide kernels
- Sommige habitats meer gebruikt dan andere, ten opzichte van wat er beschikbaar is



Landschapsheterogeniteit

Conclusie:

- 1) Habitatgebruik is verschillend tussen de locaties en niet random, ten opzichte van de habitat compositie
- 2) Habitatselectie is gebaseerd op de eenvoudigheid van het bereiken van de foerageerlocaties (vlakbij nestlocatie)
- 3) Volledige analyse van de regionale habitat context is noodzakelijk voor het opstellen van beheer- en beschermingsplannen.



Voorstel voor
bescherming =
broedlocaties in de
buurt van
foerageerlocaties

Vragen?



EXTRA SLIDES



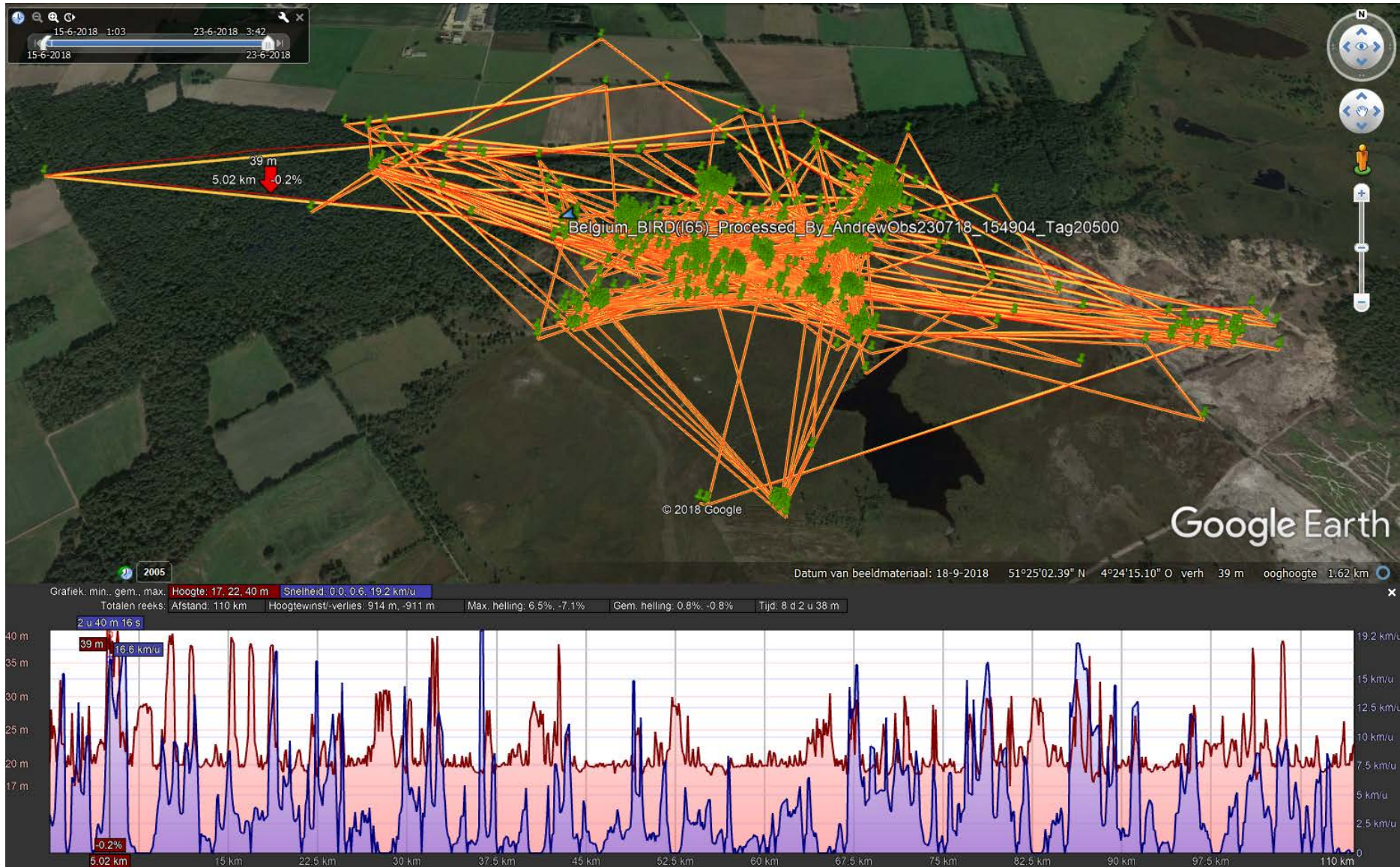
Distribution in Flanders:



Source INBO, 2008

- 500 – 550 pairs present
- Mainly in Limburg
- In Kalmthout : 63 territoria in Flanders, 79 in the Netherlands
- In Bosland, Limburg: 200 – 300 breeding pairs

Flight altitude + speed of bird I65:

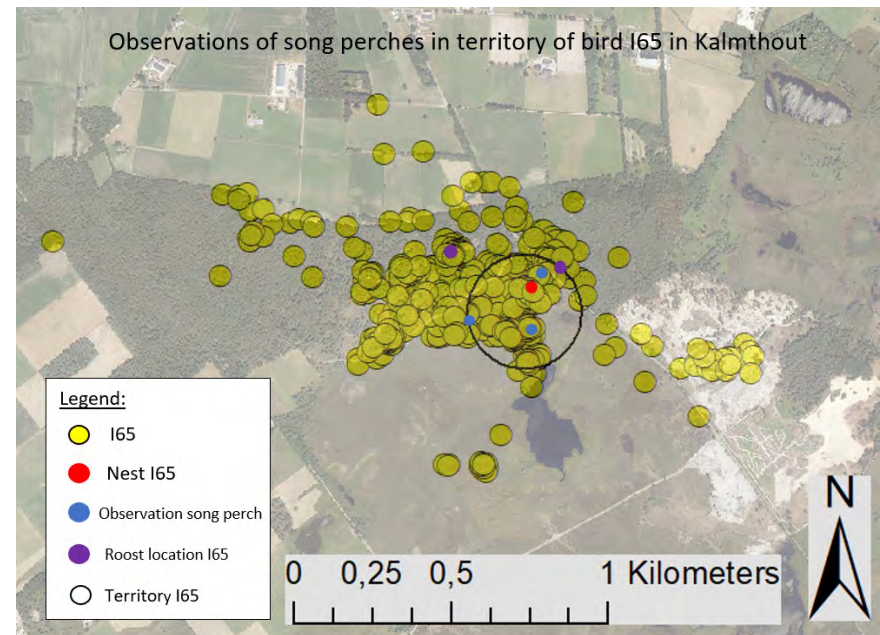


Territorial behaviours (I65):

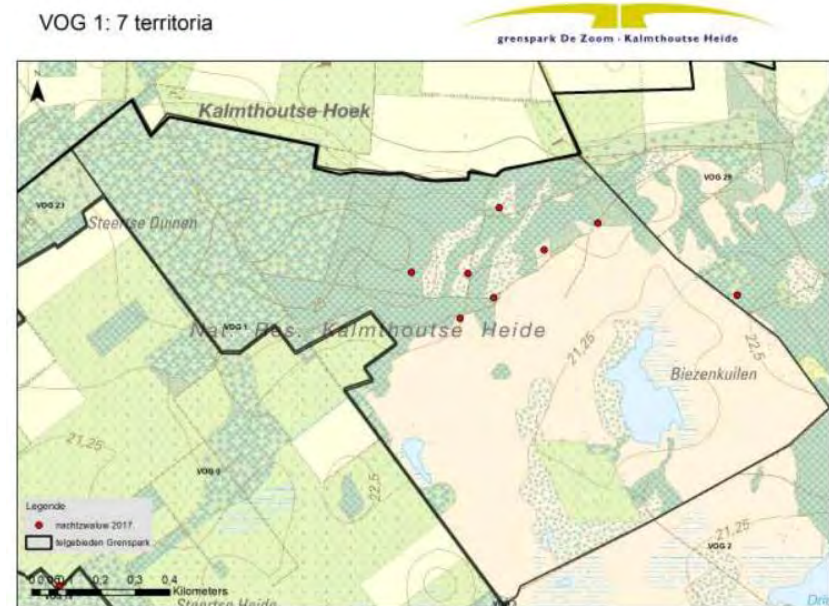
- Field observations + interpretations from the data

→ Field observations:

- Min. 5 min per location
- In line with earlier results from Kalmthout (2017 monitoring)



VOG 1: 7 territoria



Habitat use I65:

Functional habitats:

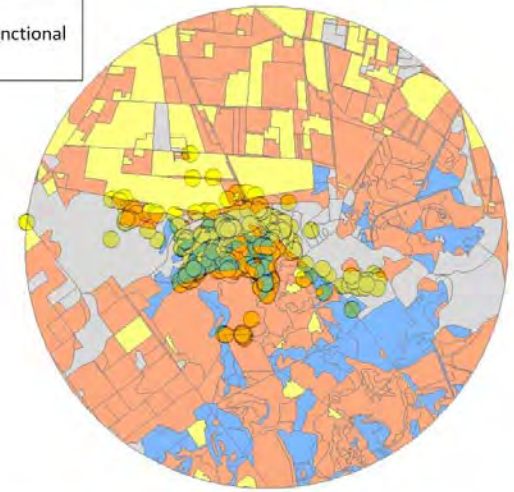
	50% kernels (%)	95% kernels (%)	Available (%)
breeding	28.93	13.63	13.41
foraging	23.38	44.65	52.50
roosting	47.69	20.84	12.88
unsuitable	0.00	20.88	21.21

Habitat use:

Habitat	50% kernels (%)	95% kernels (%)	Available (%)
Wet heathland	21.68	33.82	18.13
Dunes	28.93	13.63	6.64
Pine forest , high undergrowth	31.42	14.38	12.07
Pine forest, low undergrowth	16.27	6.46	0.81
deciduous forest	1.70	0.93	0.23
Grassland	0.00	4.86	3.69
Oak stands	0.00	0.92	2.61
Swamp	0.00	4.12	7.75
Farmland	0.00	20.88	17.19
Dry heathland	0.00	0.00	4.89
Riverine valley	0.00	0.00	0.26
Clearcuts with willow	0.00	0.00	0.15
Agricultural land	0.00	0.00	18.08
Small remaining landscape elements	0.00	0.00	1.63
Clearcuts	0.00	0.00	1.74
Recreational area	0.00	0.00	0.11
Urbanisation	0.00	0.00	3.41
Natural water	0.00	0.00	0.62

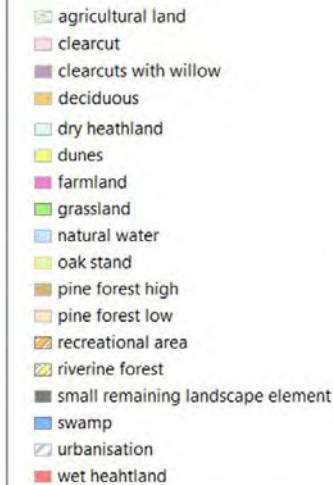
Overview of datapoints I65 (Kalmthout) in buffer with functional habitats

Legend:



Habitat use of bird I65 in Kalmthout

Legend:



Comparison between studies:

	Bosland	Kalmthout	All birds	Evens et al., 2018		Evens et al., 2017 (Bosland)	Sharps et al., 2015	Alexander and Cresswell, 1990	Berry, 1979
Mean foraging distance (m)	1379 ± 1179	532 ± 303	786 ± 566	Bosland:1201 ± 1058	M-G: 593 ± 270	NA	NA	NA	NA
Maximal foraging distance (m)	2946 ± 779	888 ± 643	1505 ± 1183	NA	NA	2603 ± 1094	747 ± 513	3000 ± 1000	NA
Home range size 50% kernel (ha)	27 ± 15	5 ± 6	12 ± 14	NA	NA	44 ± 31	10	NA	NA
Home range size 95% kernel (ha)	103 ± 48	22 ± 28	46 ± 51	NA	NA	190 ± 125	50	NA	NA
Territory size (ha)	19 ± 9	8 ± 8	11 ± 10	NA	NA	3.1 - 6.7 ha (Holyoak, 2001)			5.3 - 19.6

References:

- Alexander, I. and Cresswell, B. (1990). Foraging by nightjars *Caprimulgus europaeus* away from their nesting areas. – *Ibis* 132: 568–574.
- Berry, R. (1979). Nightjar habitats and breeding in East Anglia. *Brit. Birds* 72: 207- 218.
- Delvaux, R. (2017). Broedvogelinventarisatie: Nachtzwaluw 2017. Grenspark De Zoom-Kalmthoutse Heide. 49p.
- Evens, R., Beenaerts, N., Witters, N. & Artois, T. (2017a). Study on the foraging behaviour of the European Nightjar *Caprimulgus europaeus* reveals the need for a change in conservation strategy in Belgium. *Journal of Avian Biology* 48, 1238 – 1245.
- Evens, R., Beenaerts, N., Neyens, T., Witters, N., Smeets, K., & Artois, T. (2018a): Proximity of breeding and foraging areas affects foraging effort of a crepuscular, insectivorous bird., *Nature* 8:3008. 1-11.
- Evens, R., Beenaerts, N., Ulenaers, E., Witters, N., & Artois, T. (2018b): An effective, low-tech dropoff solution to facilitate the retrieval of data loggers in animal tracking studies, *Ringing & Migration*, 1- 10.
- Holyoak, D.T., (2001). Nightjars and Their Allies: The Caprimulgiformes. Volume 7 of *Bird Families of the World*. OUP Oxford. 773p.
- Sharps, K., Henderson, I. A. N., Conway, G., Armour-chelu, N. and Dolman, P. M. (2015). Home-range size and habitat use of European nightjars *Caprimulgus europaeus* nesting in a complex plantation forest landscape. – *Ibis* 157: 260–272.