Bat migration at sea and along the North Sea-coast

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15 March 2018

Photo: René Janssen

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WOZEP
DUTCH GOVERNMENTAL OFFSHORE
WIND ECOLOGICAL PROGRAMME

Contents

- Introduction

- Bat detector research

- Telemetry

- Next steps

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Bat migration over the North Sea

- Bats regularly migrate over sea, as shown by studies with ultrasonic recorders, findings at oil rigs & ships, ringing recoveries and sightings during surveys at sea & coastal bird migration counts

- Risk for barotrauma / collision with offshore wind turbines

- Population effects not excluded for at least Nathusius' pipistrelle, Noctule and Particoloured Bat

- Bats are relevant in (spatial) planning and operating of offshore wind farms

Assessing the overall effect

1 Population size of source populations

2 Which part of these (sub)populations migrate over sea, and which part over land?

3 Are bats migrating over sea attracted to offshore wind farms, and if so, up to what distance and what is their travelling speed?

4 What is the flight behaviour of bats in the vicinity of offshore wind turbines, ie how long do they stay, at which heights and at what distances from the rotor blades?

5 What is the risk of individuals bats to collide with an offshore wind turbine or become victim of barotrauma?

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Mitigation possibilities

- Spatial planning of (offshore) wind farms

- Operation of windfarms
  - Standstill procedures
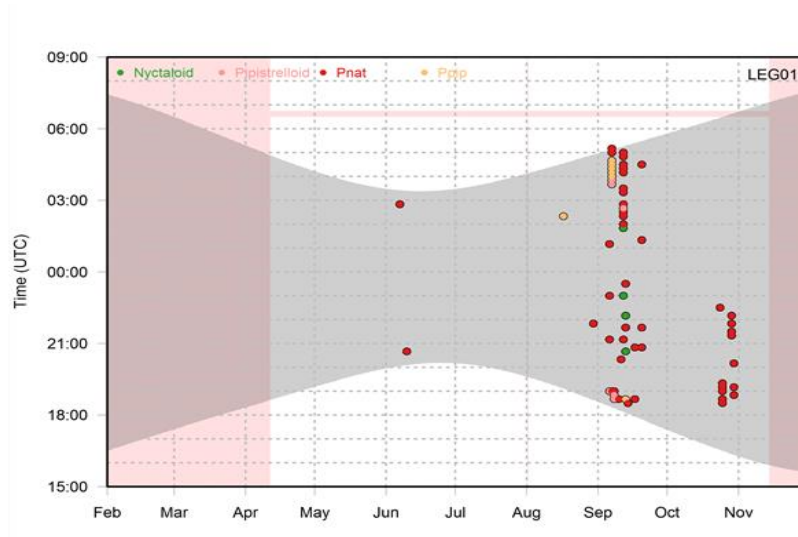 - Deterrents?

Scope of this presentation

- Bat detector research:

    - Species composition

    - Spatial and temporal occurrence

    - Environmental factors

Photo Gerjon Gelling

- Telemetry

    - Motus system
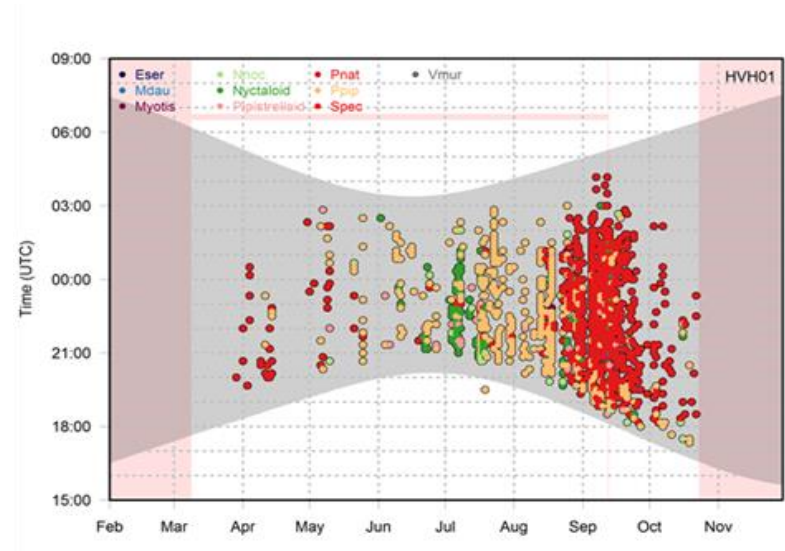
    - Tagging & tracking bats

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Bat detector results (offshore & coastal)



Lichteiland Goeree 2016

Hoek van Holland 2016

- Higher densities at the coast in comparison to sea
- Differences in temporal occurrence and species composition
- Sea: migrants
- Coast: migrants + local populations

Source: Lagerveld et al 2017

Nathusius' pipistrelle: main species of interest

- Offshore occurrence in autumn is seasonal and peaked

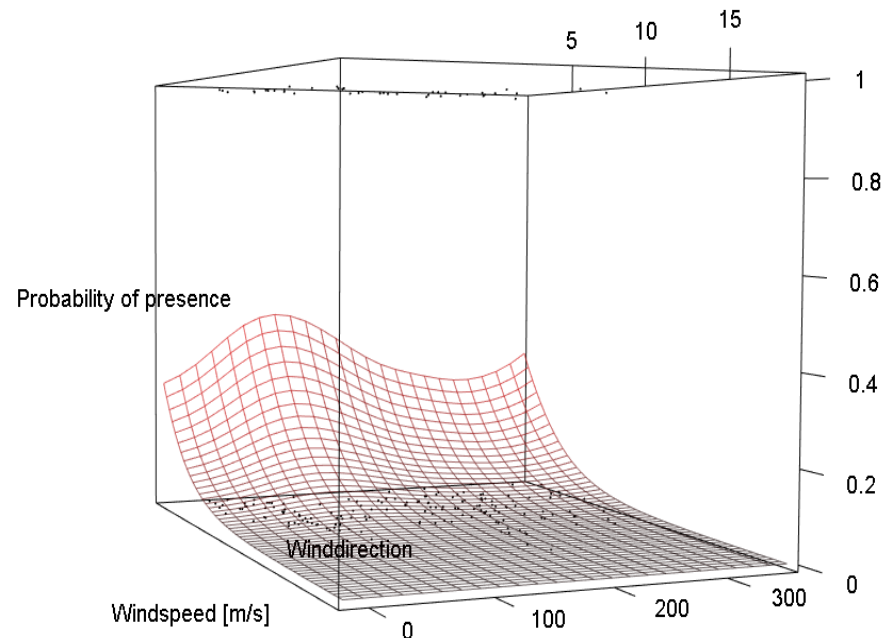- Apparently more regular at Wintershall P6-A platform
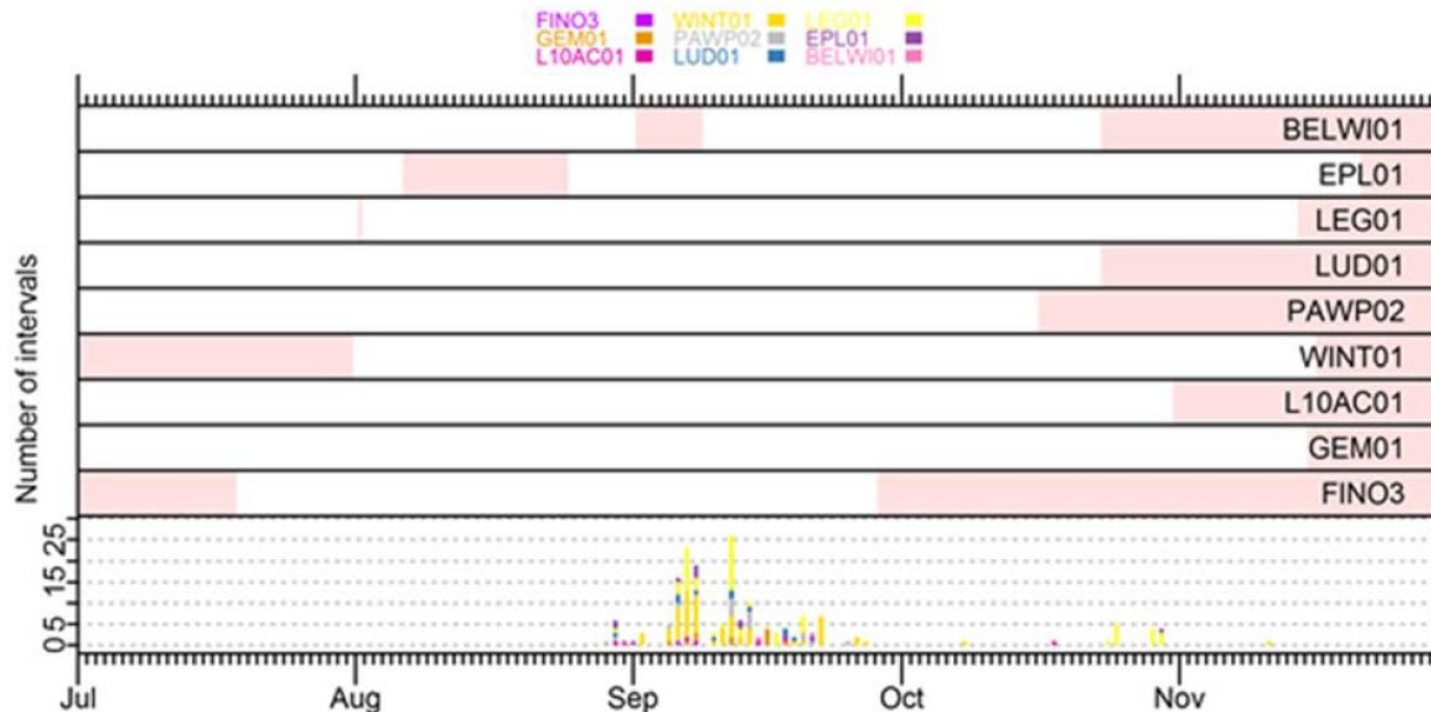
- Offshore occurrence predictable?

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Occurrence depends on environmental conditions

- Important predictors:

  - Windspeed

  - Wind-direction

  - Temperature

  - Cloud cover

  - Moon illumination

Current offshore bat detector network


Photo: Hans Verdaat

Further steps batdetector monitoring programme

- Increase robustness dataset

- Access spatiotemporal patterns (migration route?)

- Flight heights

Telemetry - aims

- Determine the proportion of bats that follows the coast and the proportion that heads out to sea

- Attraction to wind farms?

- Staging times in offshore wind farms?

- Access environmental conditions when migration occurs

Telemetry – approach/technology
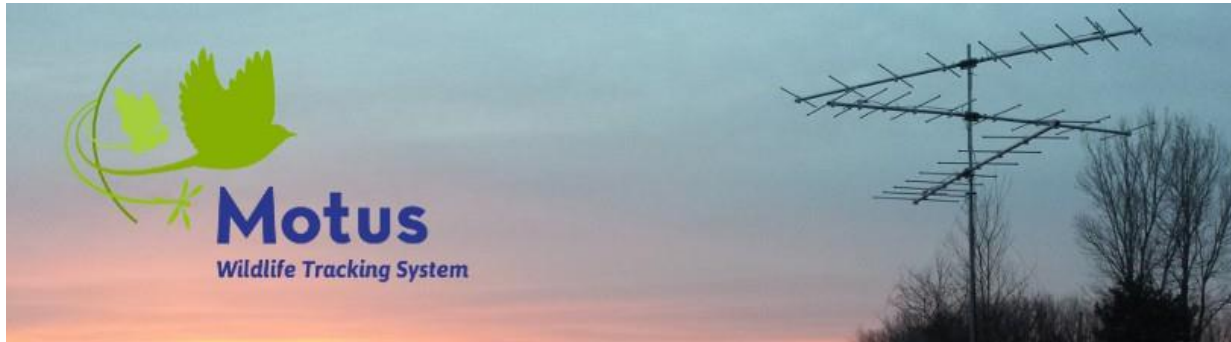
- Coded radio tags

- A stationary network of receivers

- Central data repository to exchange data amongst users

- State/space model to access flight paths more detailed

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http://motus.org

Study setup

- Planned receiver network

- 500 bats (2018 – 2020)

Receivers

Photos Sander Lagerveld

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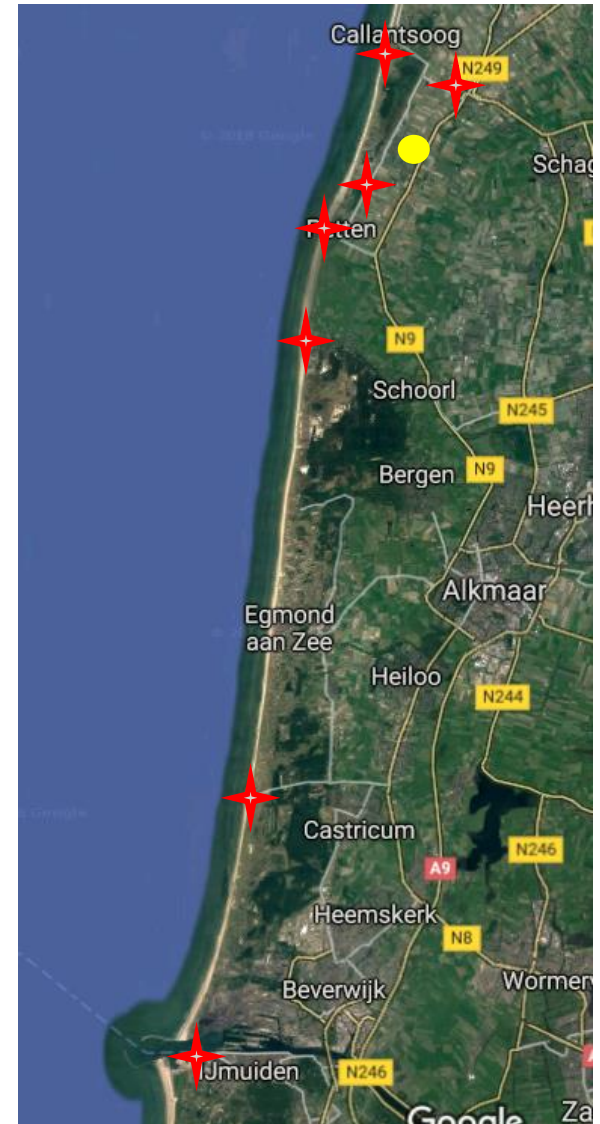# Tagging bats – 5 Oct 2017

- 5 Nathusius' pipistrelles

- 8 Noctules

Photo: Sander Lagerveld

Tagging bats

Receiver at work

My machine ID is 5016BBBK23B1.
I'm running the Tue, 03 Oct 2017 12:34:21 GMT software release.
I have restarted 9 times since the last software update.
I have been running for 1 days, 5 hours, and 15 minutes since the last restart.

I am located at ... ... Update GPS fix

My clock says it is 2017-10-26 20:19:14.119 UTC accurate to 0.000001 seconds PPS present

Live Pulses

```
05:23:50.101 p4 @150.101 MHz -64.37 / -79.36 dB
05:23:50.101 p4 @150.099 MHz -54.2 / -76.21 dB
05:23:50.101 p2 @150.099 MHz -70.96 / -79.14 dB
05:23:50.101 p6 @150.1 MHz -70.89 / -80.02 dB
05:23:50.160 p6 @150.1 MHz -75.36 / -84.11 dB
05:23:50.160 p6 @150.1 MHz -71.7 / -79.57 dB
05:23:50.159 p3 @150.101 MHz -68.24 / -81.42 dB
05:23:50.160 p3 @150.099 MHz -58.75 / -77.88 dB
05:23:50.160 p4 @150.099 MHz -54.21 / 76.47 dB
```

Clear Window ☑ Scroll to latest pulses

Live Known Tags

```
05:23:37.960 ant 3 WLR#361@150.1:4 + 4.861 kHz -61.2 / -79.3 dB
05:23:37.960 ant 4 WLR#361@150.1:4 + 3.757 kHz -55.4 / -76.7 dB
05:23:41.961 ant 6 WLR#361@150.1:4 + 3.835 kHz -71.6 / -80.3 dB
05:23:41.961 ant 3 WLR#361@150.1:4 + 4.862 kHz -61.1 / -79.2 dB
05:23:41.961 ant 4 WLR#361@150.1:4 + 4.85 kHz 56.0 / 77.4 dB
05:23:44.253 ant 2 WLR#384@150.1:7 + 3.714 kHz -68.4 / -79.2 dB
05:23:45.961 ant 6 WLR#361@150.1:4 + 3.843 kHz -70.3 / -80 dB
05:23:45.961 ant 3 WLR#361@150.1:4 + 3.773 kHz 59.8 / -78.7 dB
05:23:45.961 ant 4 WLR#361@150.1:4 + 3.76 kHz -55.7 / -76.6 dB
```

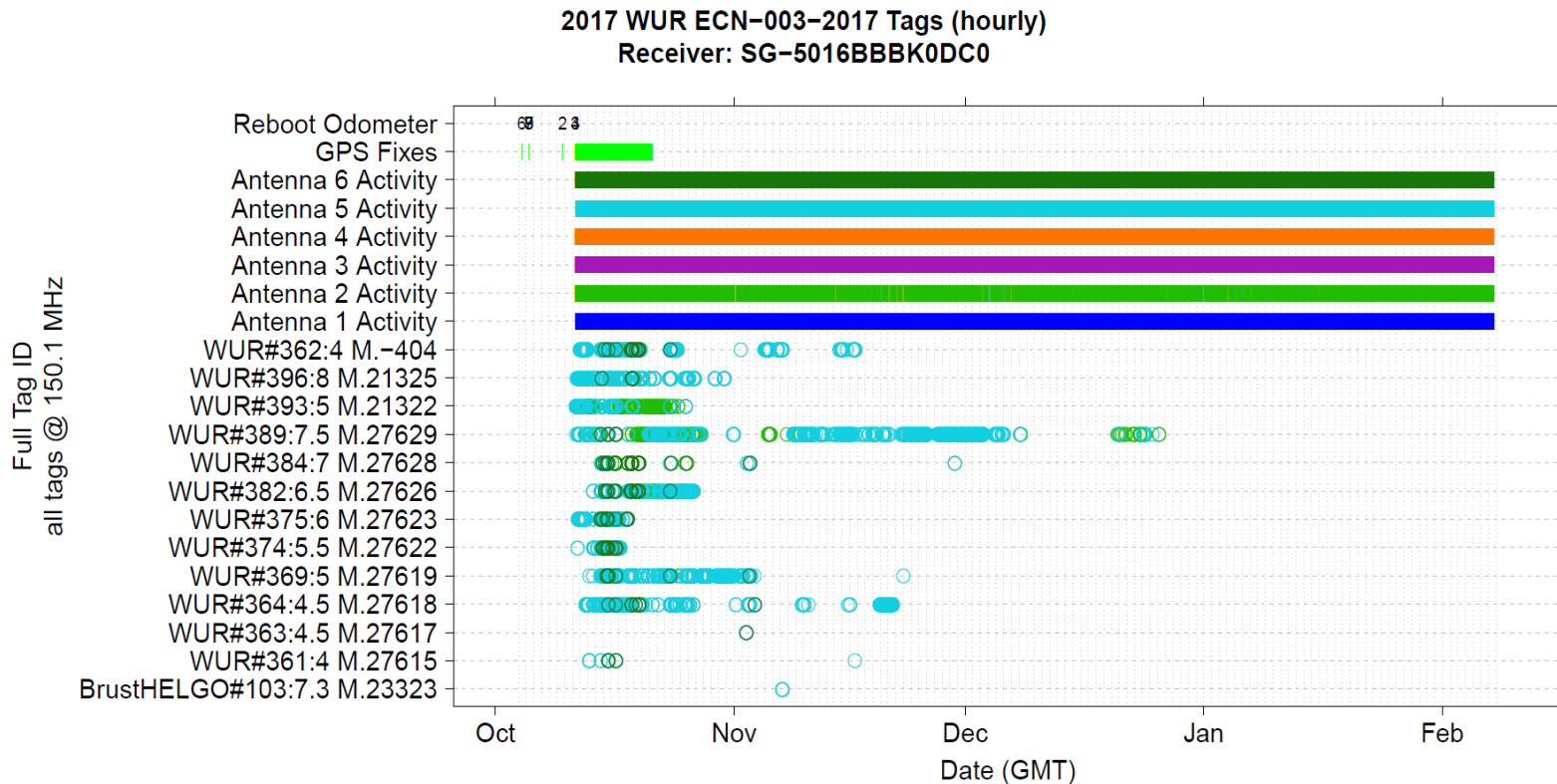Clear Window ☑ Scroll to latest tags

Note: only shows tags known to this SensorGnome - see Tag Database below.

What I'm doing now: Copy

USB Port #	Hardware Frame Rate kHz	Channels	Plugin	Current Feature Detection Rate pulses per minute	Long term Feature Detection Rate pulses per minute	Current Frame Processing Rate kHz
1	48.0	2	findpulsefdbatch	0.0000	0.00681392	47.8
2	48.0	2	findpulsefdbatch	0.0000	73.3054	47.8
3	48.0	2	findpulsefdbatch	0.0000	118.343	47.8
4	48.0	2	findpulsefdbatch	0.0000	115.571	47.8

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Preliminary results

- 3 million detections !
- All Noctules and 3 (out of 5) Nathusius' pipistrelles

2017 WUR ECN–003–2017 Tags (hourly)
Receiver: SG–5016BBBK0DC0

- Song Thrush from Germany!

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Song thrush – BrustHELGO#103:7:3 M.23323

Source: Birdmove project
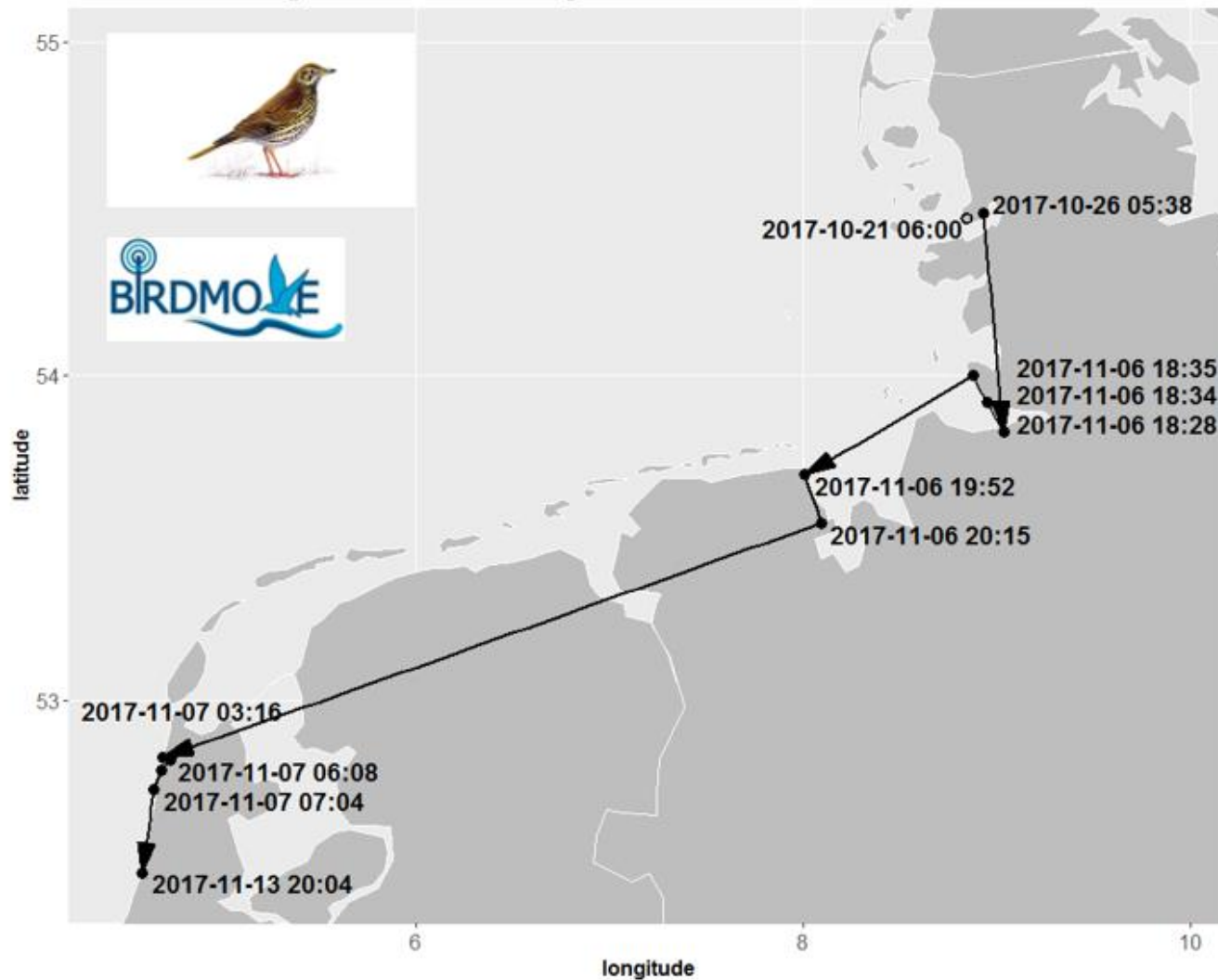
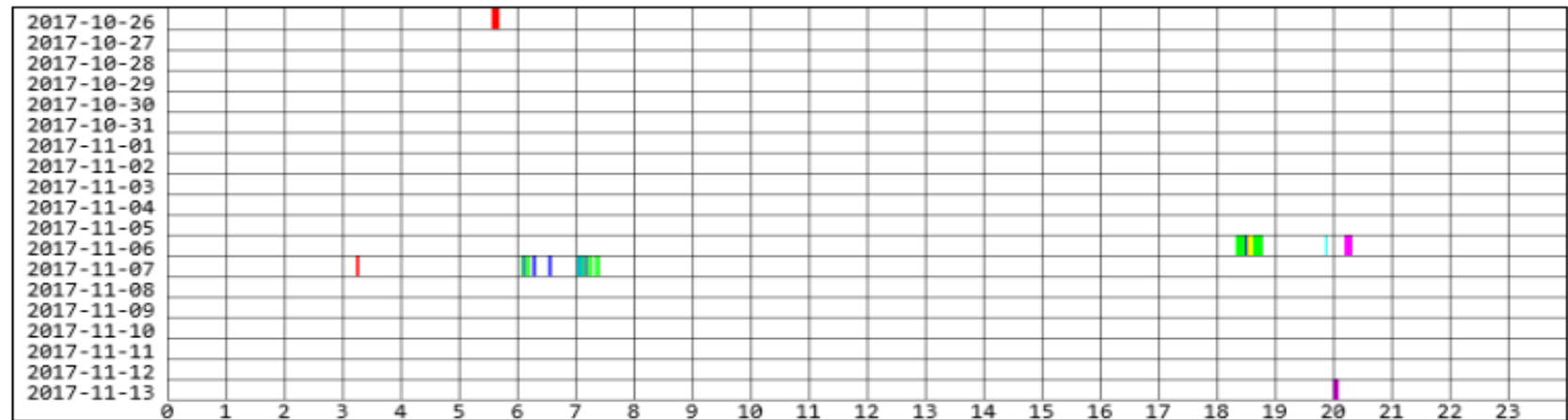# Song thrush – tagged 21 Oct 2017

Tag deployment: ID# 12320

Show detections in: a table | a timeline | a map

Chart uses UTC time on the X-axis, starting at midnight UTC on the left.

Receiver deployments

- 04_Nordstrand (ID# 3861) (show only this receiver deployment)
- 11_Natureum_Niederelbe (ID# 3802) (show only this receiver deployment)
- 10_KWK (ID# 4366) (show only this receiver deployment)
- 09_Friedrichskoog (ID# 4365) (show only this receiver deployment)
- 22_Schillig (ID# 3807) (show only this receiver deployment)
- 20_Wilhelmshaven (ID# 4057) (show only this receiver deployment)
- Zwan-001.2017 (ID# 4309) (show only this receiver deployment)
- Schagerbrug - 004-2017 (ID# 4455) (show only this receiver deployment)
- ECN-003-2017 (ID# 4310) (show only this receiver deployment)
- Cam-008-2017 (ID# 4316) (show only this receiver deployment)
- Camp-009-2017 (ID# 4317) (show only this receiver deployment)
- IJmuiden - WURSG011 (ID# 4454) (show only this receiver deployment)

Nathusius' pipistrelle

- 391: ad female: no detections

- 484: ad female: no detections

- 486: ad female: departed 6 Oct: Petten > Camperduin

- 396: juv female: departed 30 Oct: ECN > Petten > Camperduin

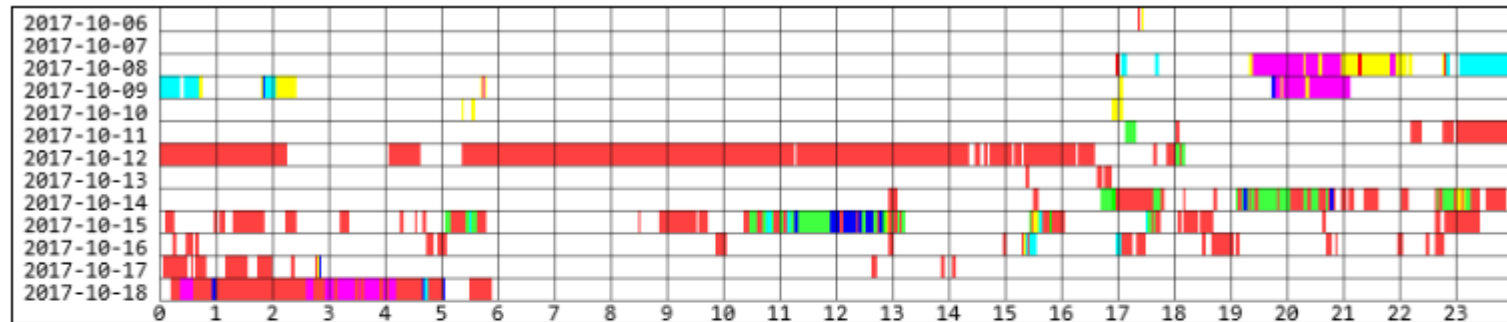- 393: juv male – departed 25 Oct: Schagerbrug > ECN > IJmuiden
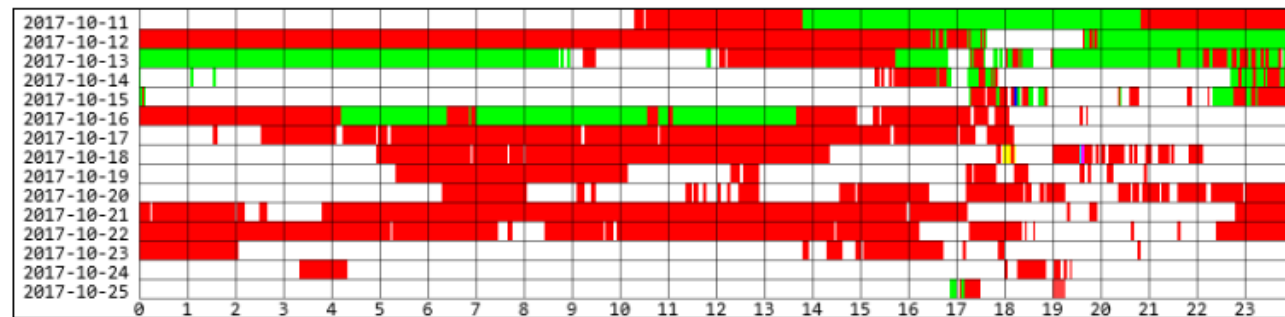
Receiver deployments

- ECN-003-2017 (ID# 4310) (show only this receiver deployment)
- Schagerbrug - 004-2017 (ID# 4455) (show only this receiver deployment)
- Pett-007-2017 (ID# 4313) (show only this receiver deployment)
- Camp-009-2017 (ID# 4317) (show only this receiver deployment)
- Zwan-001.2017 (ID# 4309) (show only this receiver deployment)
- Pett-006-2017 (ID# 4312) (show only this receiver deployment)
- IJmuiden - WURSG011 (ID# 4454) (show only this receiver deployment)

Noctule

- 375 ad male

Receiver deployments

■ Cam-008-2017 (ID# 4316) (show only this receiver deployment)
■ Zwan.002-2017 (ID# 4307) (show only this receiver deployment)
■ Pett-006-2017 (ID# 4312) (show only this receiver deployment)
□ Pett-007-2017 (ID# 4313) (show only this receiver deployment)
□ Zwan-001.2017 (ID# 4309) (show only this receiver deployment)
■ Camp-009-2017 (ID# 4317) (show only this receiver deployment)
■ ECN-003-2017 (ID# 4310) (show only this receiver deployment)
□ Schagerbrug - 004-2017 (ID# 4455) (show only this receiver deployment)

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Further steps telemetry (2018)

- Finalize monitoring network

- Develop state/space model

- Tag 150 bats

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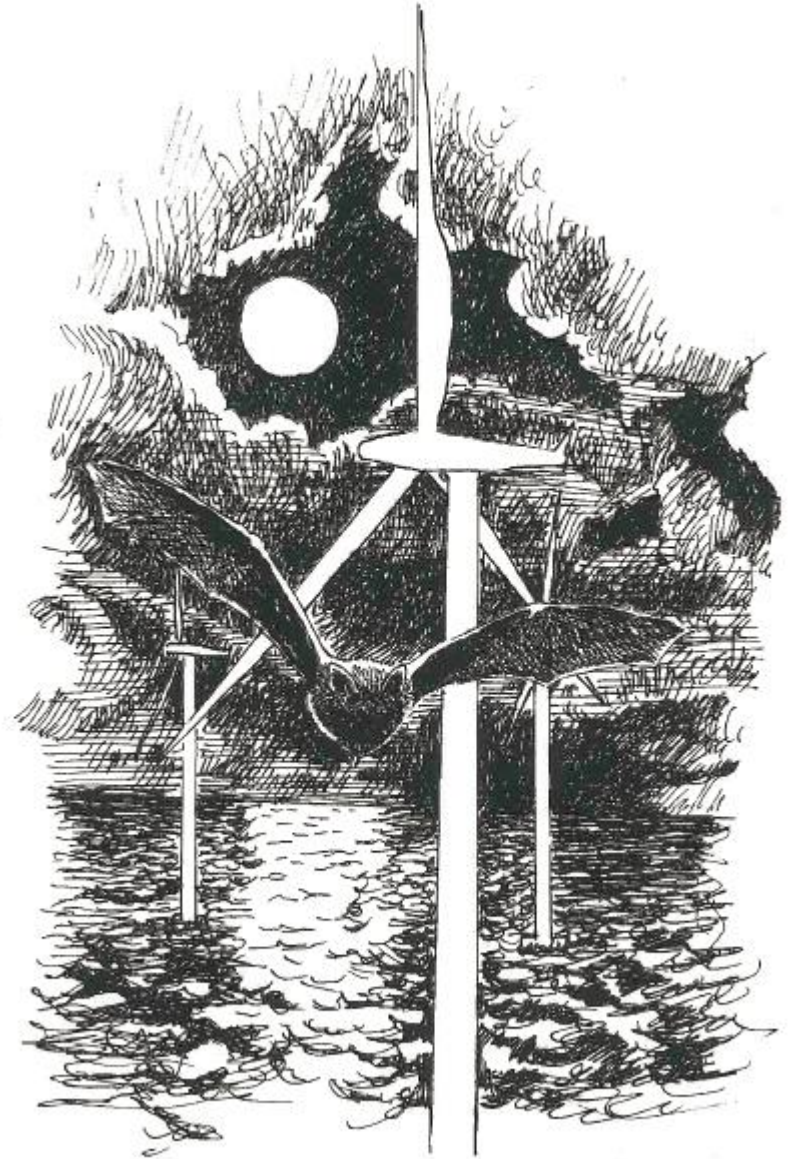*For quality of life*

In cooperation with:

Jan Boshamer

Thanks for your attention!

Any questions?

Drawing: Ed Hazebroek

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