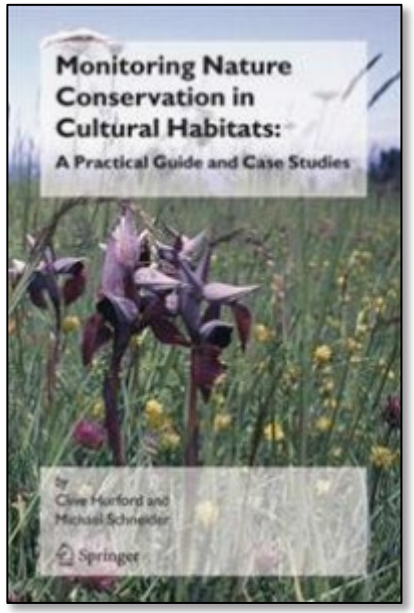
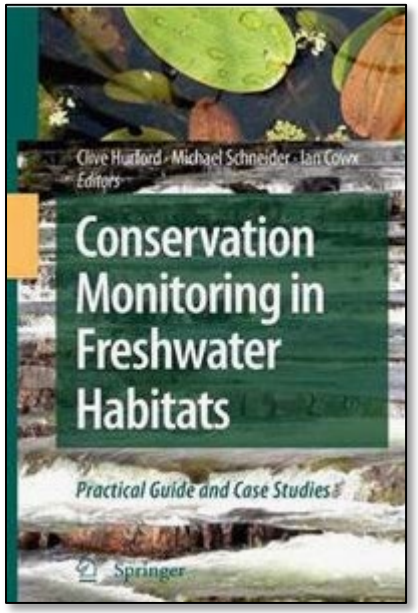
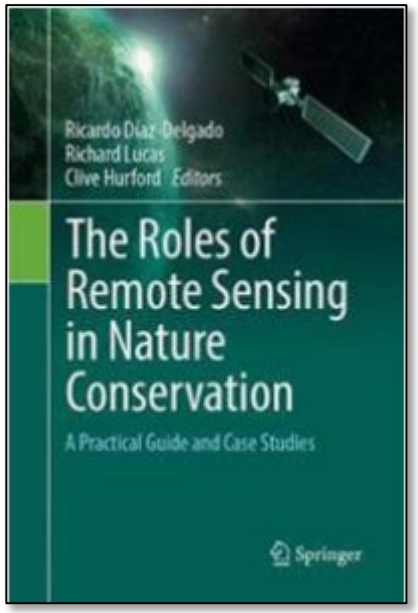
Literature about monitoring large carnivores



2006
Chapter 20 - Brown Bear
Chapter 21 - Wolverine
Chapter 22 – Greater Mouse-eared Bat



2010
Chapter 4 – Freshwater Mammals
Chaper 27 – Ringed Seals



2017
pp. 203-222 – Large Carnivores

2013 (talk)
Terrestrial Natura 2000 monitoring workshop
The Dragon Hotel, Swansea, Wales - 12-14 March 2013

Endeavours in the dark

From remote ideas to remote sensing when monitoring bats in Västerbotten County

Michael Schneider

Eurosites workshop, Umeå, September 2025

Länsstyrelsen
Västerbotten

Starting point in the year 2001

”There are hardly any bats in Västerbotten”

”There is no funding”

”Nobody is interested”

Left alone in the dark … but ”Skam den som ger sig!”

- Compiling the existing information
- Informing colleagues, rising awareness
- Persuading the County Administration to buy the first hand-held detector
- The first active surveys (outside working hours)
- The first plans to establish wind power in Västerbotten
  - Surveys and reports
  - Bats emerge as an important player
- The first passive detector is acquired
- Bats are discussed regularly at the County Administration
- Contact with Finland, starting cooperation on migrating bats
- Interreg-project on coastal lagoons
- Media are getting interested in bats
- Regular compilations of current knowledge
- Regional monitoring is started
- Project on bats and offshore wind farms within Barents
- Research project on migrating bats
- Lots of lectures, workshops and excursions

Photo: Morgan Hughes

Länsstyrelsen Västerbotten

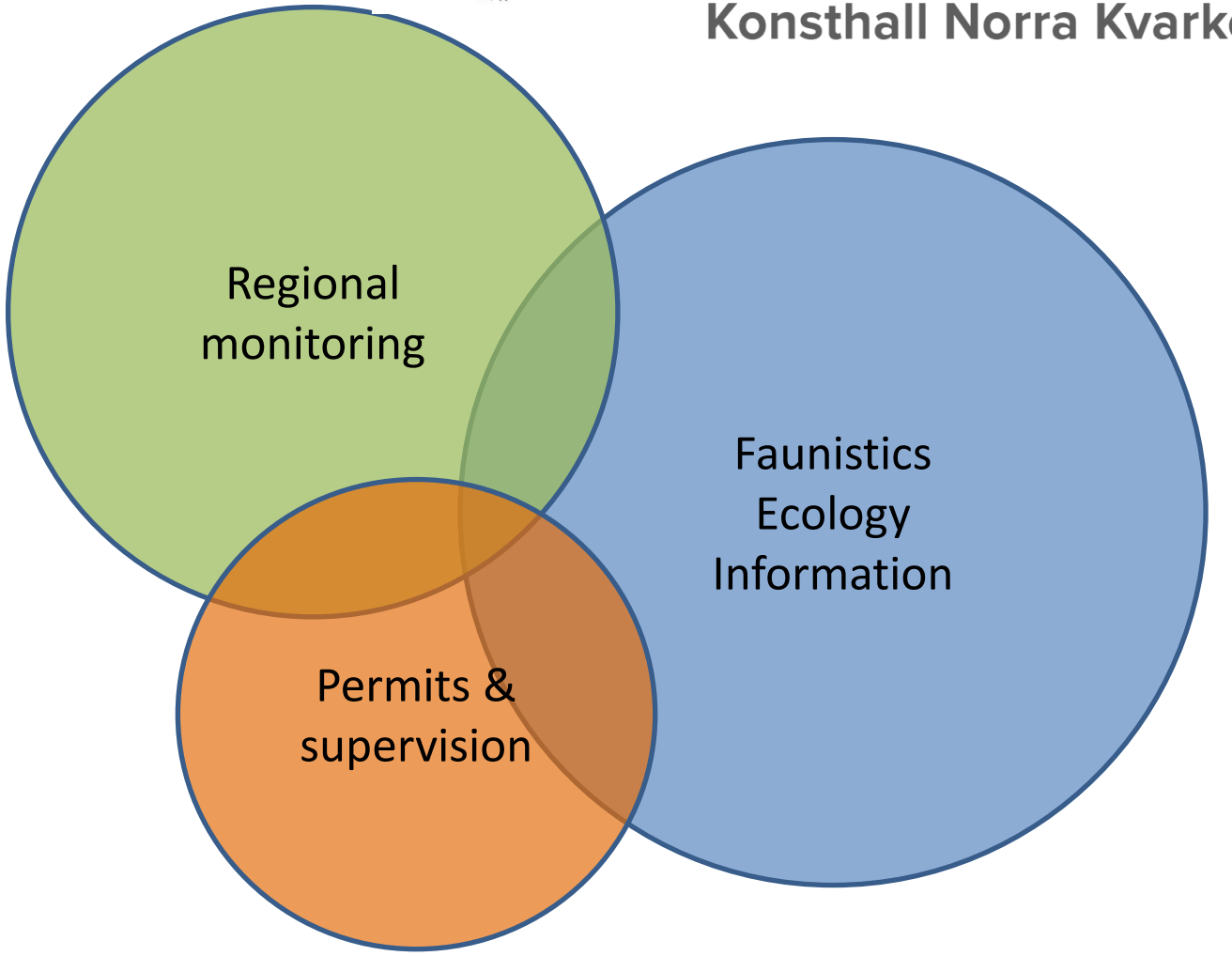
Ostrobothnia Australis 1924–2024 100 år

Lunds universitet

BatLife Sweden

Konsthall Norra Kvarken

Umeå kommun



Länsstyrelsen Norrbotten

Wind power consultants

Länsstyrelsen Västernorrland

SLU

Umeå universitet

Länsstyrelsen i Jönköpings län

Skellefteå kommun

Sjöfartsverket

No. of reported species in Västerbotten

Number of reported species

0
2
4
6
8
10
12

1798
1833
1936
1947
2006
2011
2014
2015
2016
2019
2020

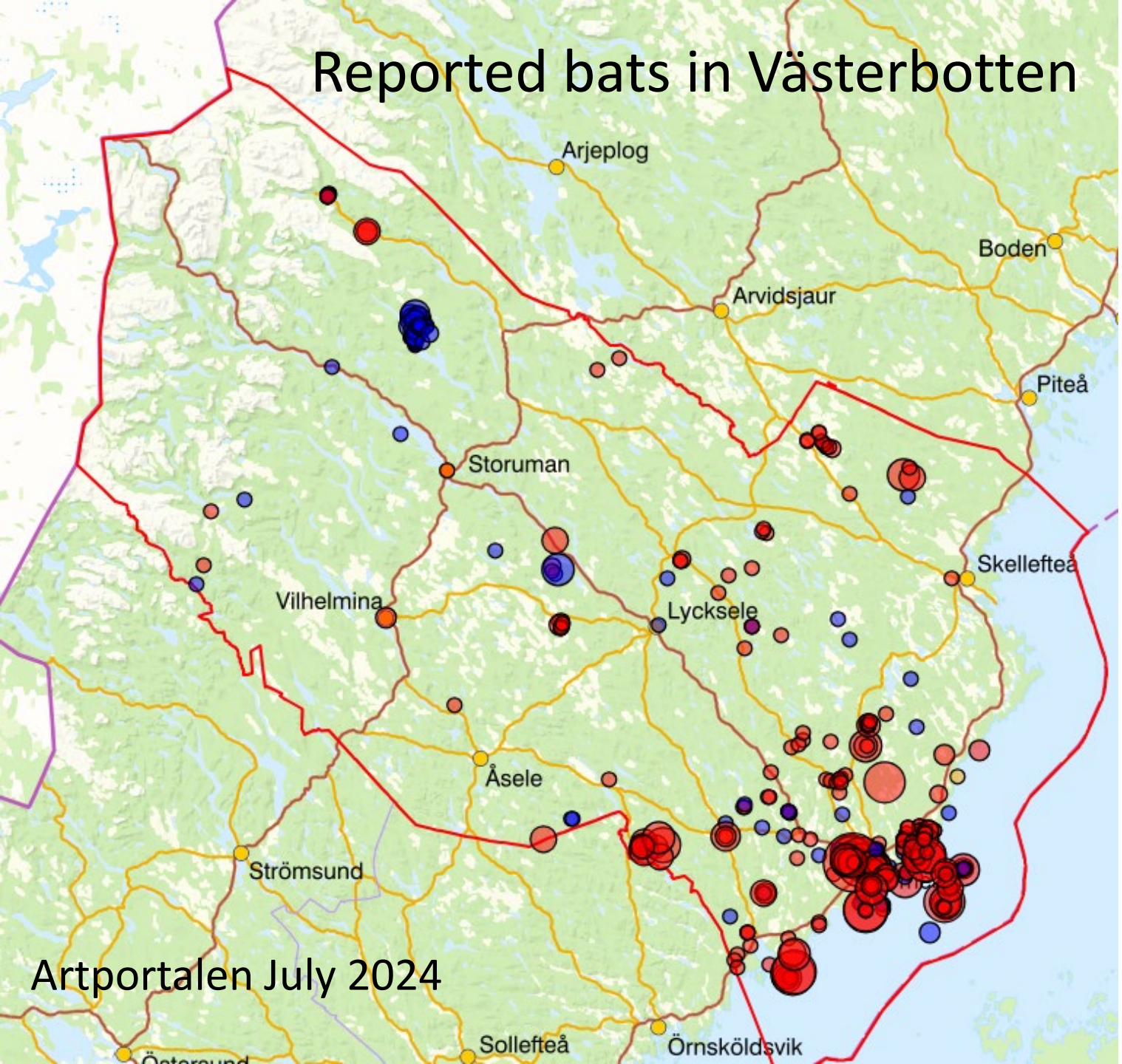
Number of species in Västerbotten

Number of reported species

0
2
4
6
8
10
12

1750
1800
1850
1900
1950
2000
2050

Reported bats in Västerbotten



Artportalen July 2024

Species / group	Reports
Northern bat	109 336
Myotis spec.	15 257
Daubenton's bat	9 042
Whiskered/Brandt's bat	6 668
Parti-coloured bat	4 858
Nathusius' pipistrell	3 572
Noctule	1 094
"Bat"	789
Natterer's bat	54
Nyctaloid	41
Brown long-eared bat	13
Brandt's bat	12
Pond bat	4
Soprano pipistrell	3
Whiskered bat	1
Total	**150 544**

Bat species in Västerbotten's municipalities

Status 2025-09-17

	Norther	Brandt's	Dauben	Natterer	Parti	Nathusi	Soprano	Noctule	Longear	Whisker	Pond	No. species
Sorsele	X	X	X		X	X						5
Storuman	X	X				X						3
Vilhelmina	X											1
Dorotea	X	X	X									3
Malå	X											1
Lycksele	X	X	X			X						4
Åsele	X	X										2
Norsjö	X	X										2
Vindeln	X	X	X			X						4
Vännäs	X	X	X		X	X	X			X		7
Bjurholm	X	X	X									3
Skellefteå	X	X	X		X	X		X				6
Robertsfors	X	X	X	X	X	X		X	X			8
Umeå	X	X	X	X	X	X	X	X	X		X	10
Nordmaling	X	X	X	X	X	X	X	X	X	X	X	11
No. of municipalities	**15**	**13**	**10**	**3**	**6**	**9**	**3**	**4**	**3**	**2**	**2**	

How do we get information about bats in Västerbotten?

- On-site surveys
  - ”Active” detectors
  - Hand-held
- Remote sensing
  - ”Passive” detectors
  - Left in the field
  - From 2 nights up to 5.5 months
- Reports from consultants
  - Wind power projects
  - Infrastructure projects
- Reports from the public

Pettersson Autobox D500X

Song Meter Mini Bat 2 Li-Ion

Audiomoth

Batlogger C

Anabat, custom build

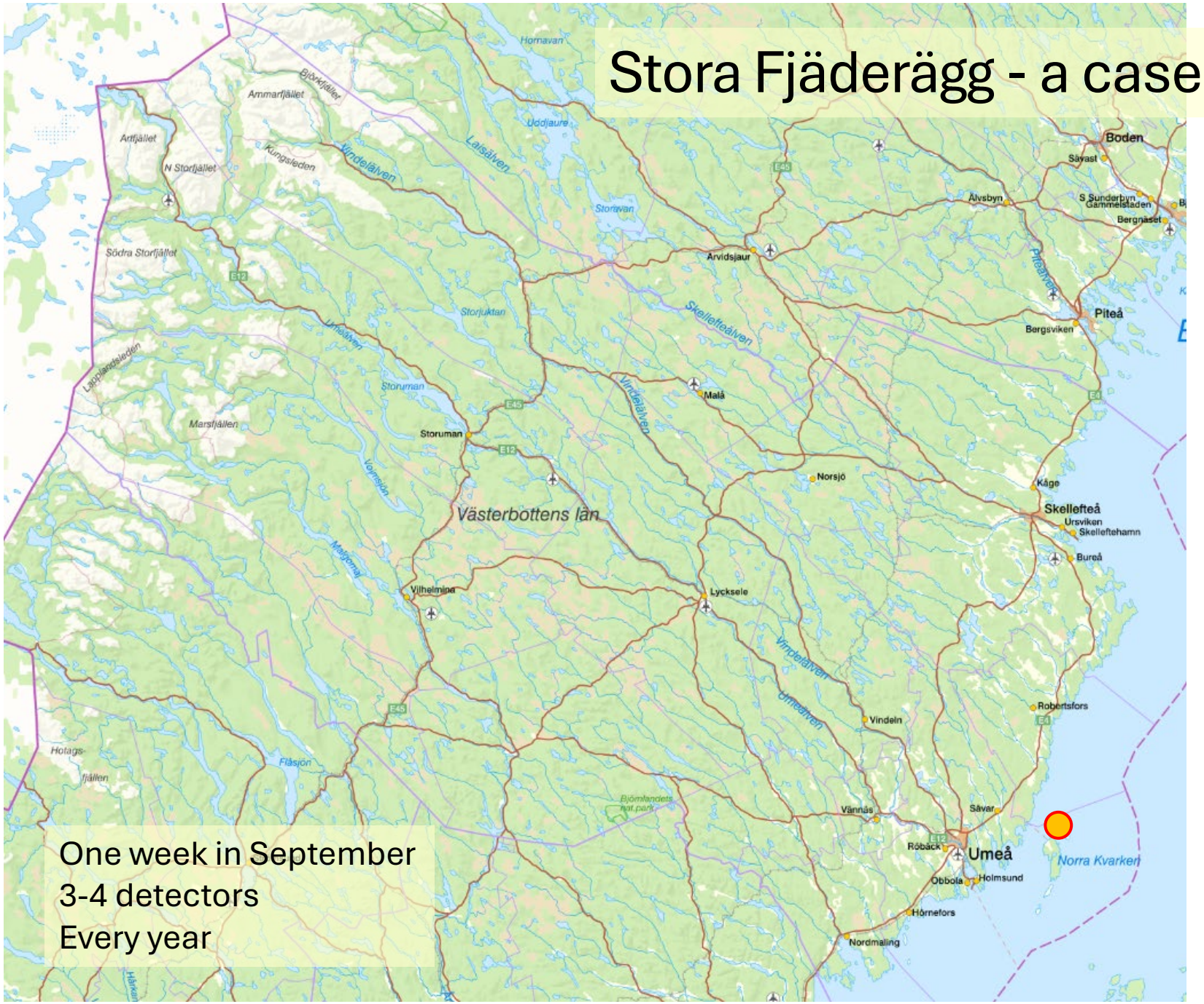
Image: CloudedBats.org / CC-BY

WURB - Wireless Ultrasonic Recorder for Bats

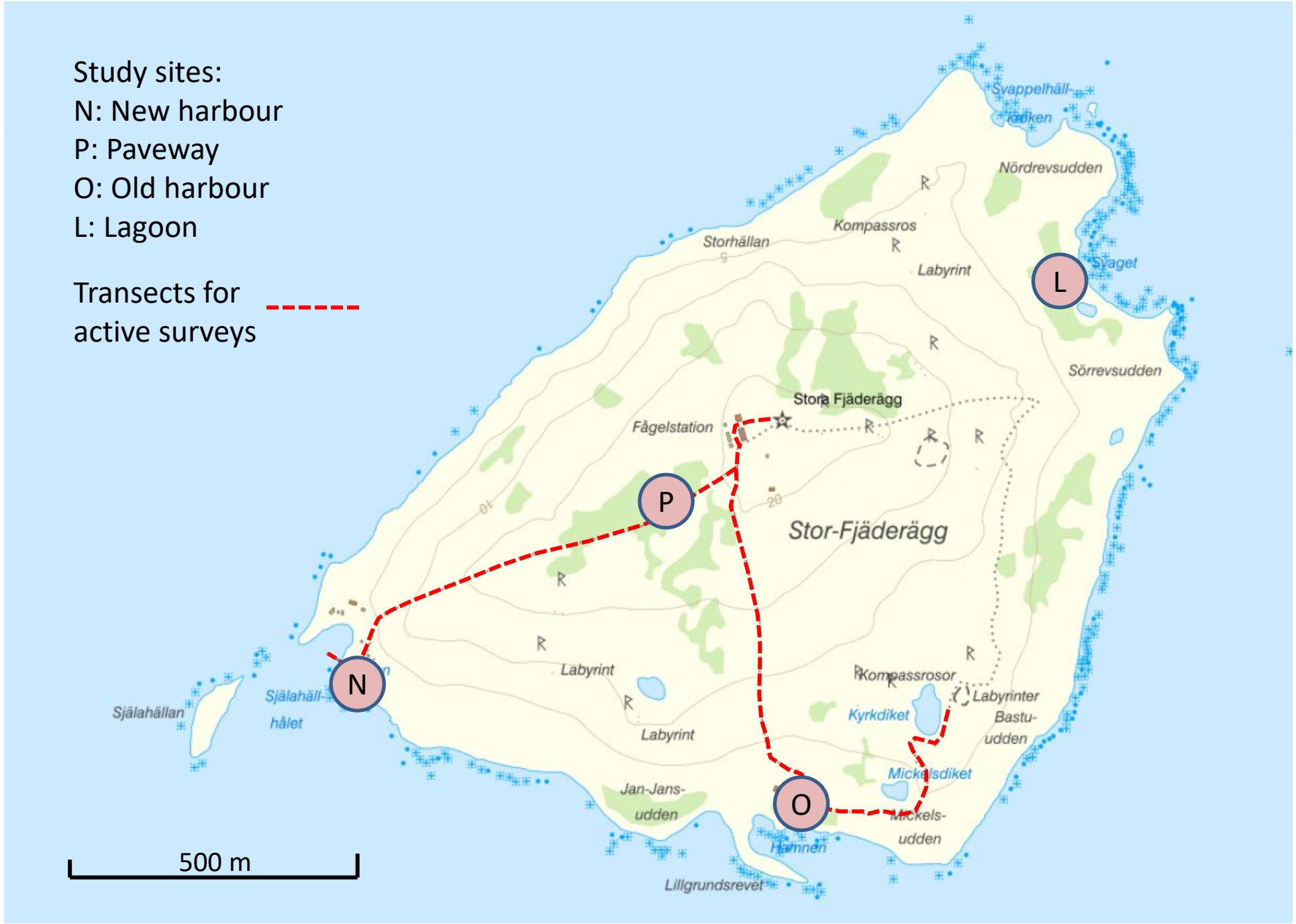
Detector details

Detector	Contact distance	Connection	Remotely accessible information	Price	Webb site
Autobox D500X	None	None	None	Expensive	https://batsound.com/
Song Meter Mini Bat 2 Li-ion	30 m	Bluetooth	Status	Expensive	https://www.wildlifeacoustics.com/
Batlogger C	314 km	SMS	Status	Very expensive	https://www.batlogger.com/
WURB	Unlimited	Internet	Status, recordings	Cheap	https://github.com/cloudedbats/cloudedbats

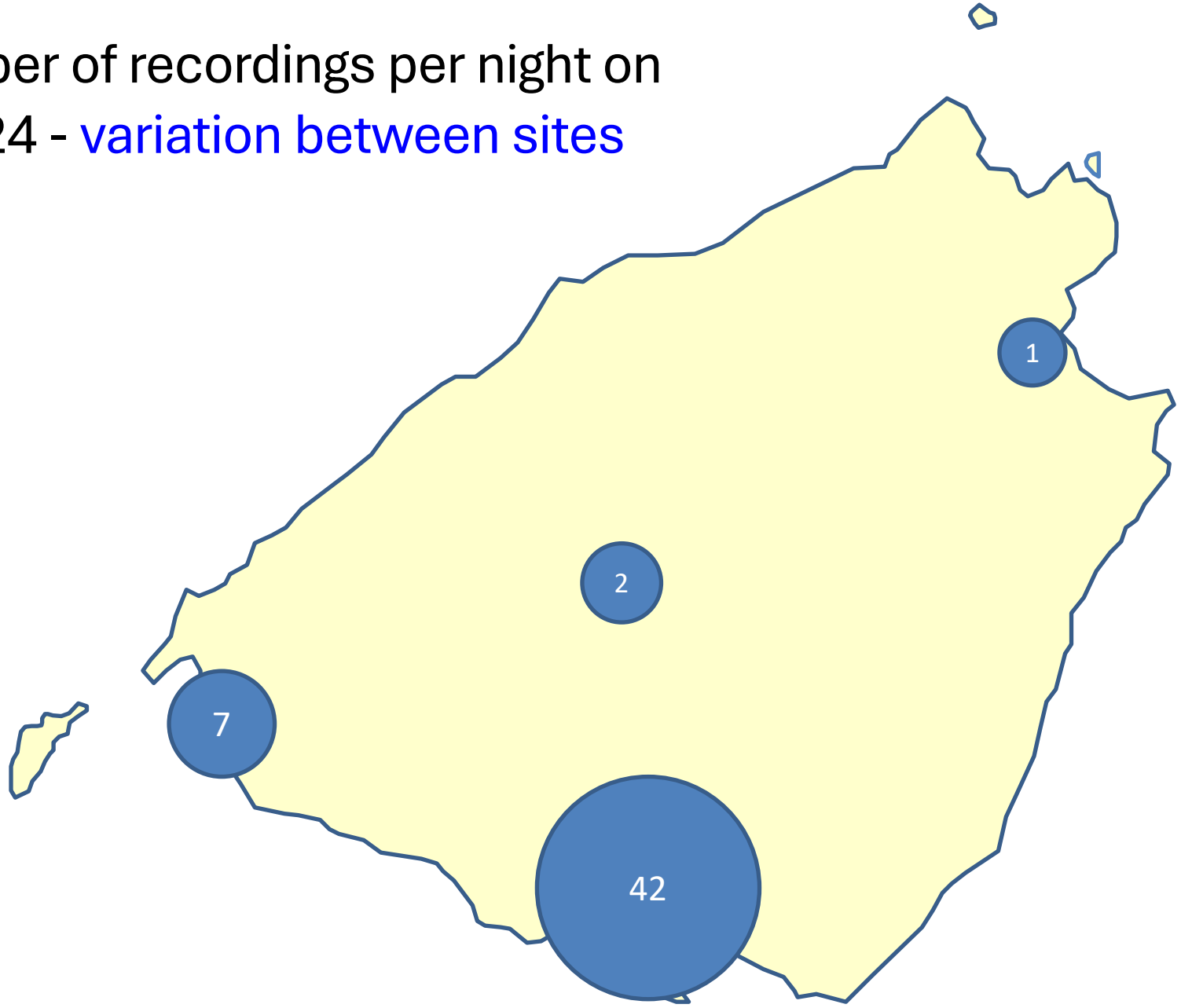
Stora Fjäderägg - a case study



One week in September
3-4 detectors
Every year


Study sites:
N: New harbour
P: Paveway
O: Old harbour
L: Lagoon
Transects for active surveys
N
P
O
L
Svappelhäll-
Nördrevsudden
Kompassros
Storhällan
Labyrint
Svaget
Sörrevsudden
Stora Fjäderägg
Fågelstation
Stor-Fjäderägg
Labyrint
Kompassrosor
Labyrinter
Kyrkdiket
Bastu-
udden
Själahällan
Själahäll-
hålet
Labyrint
Jan-Jans-
udden
Mickels-
udden
Hamnen
Lillgrundsrevet
500 m

Average number of recordings per night on Fjäderägg 2024 - variation between sites

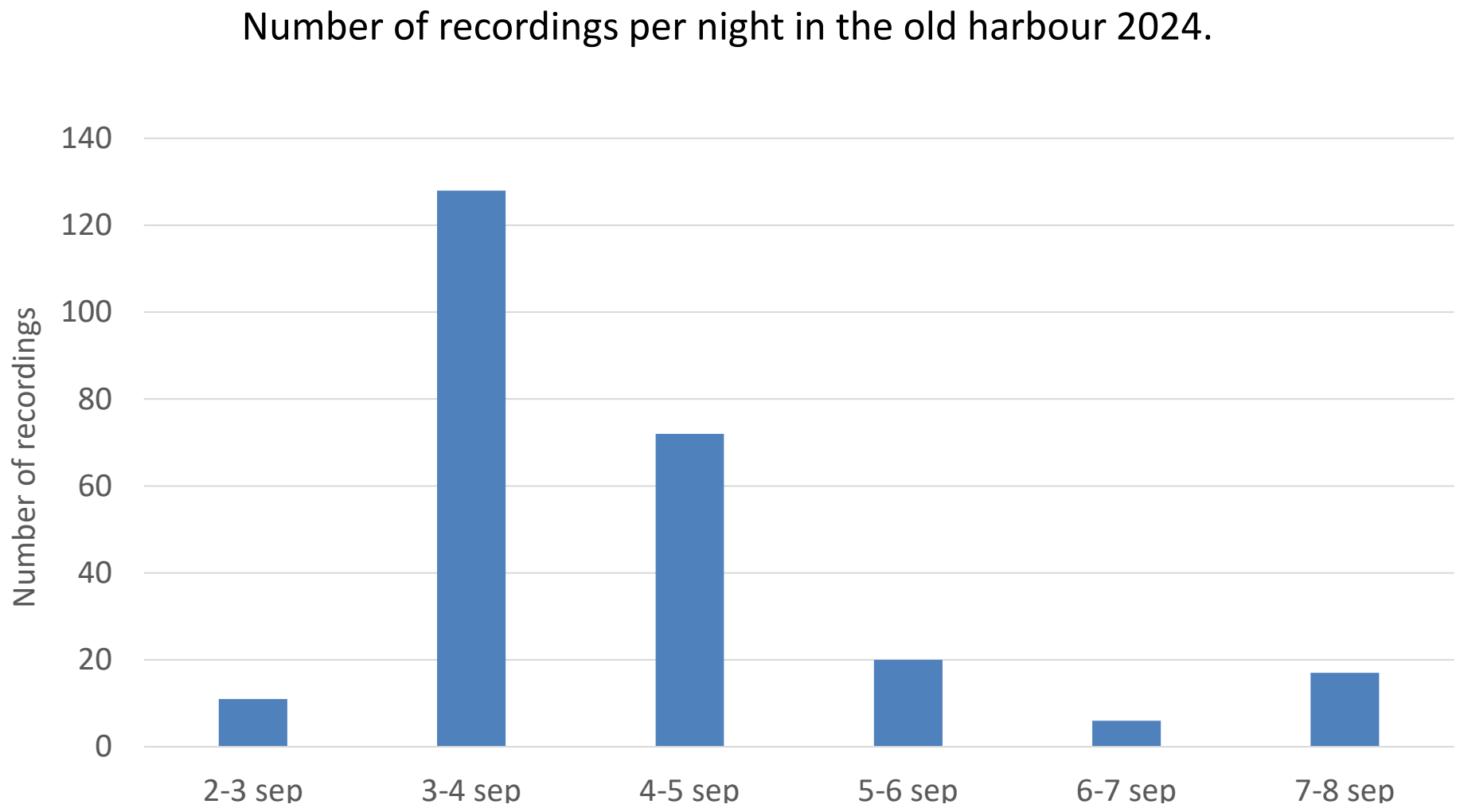


Recordings of bats on Fjäderägg – variaton between sites and years

Comparison between the old and the new harbour.
Average number of recordings per night.

	Old harbour	New harbour
2016	4	1083.5
2020	46.3	10.5
2021	61	146.3
2022	19.9	33.3
2023	10.9	1.1
2024	42.3	7.2

Recordings of bats on Fjäderägg – variation between nights

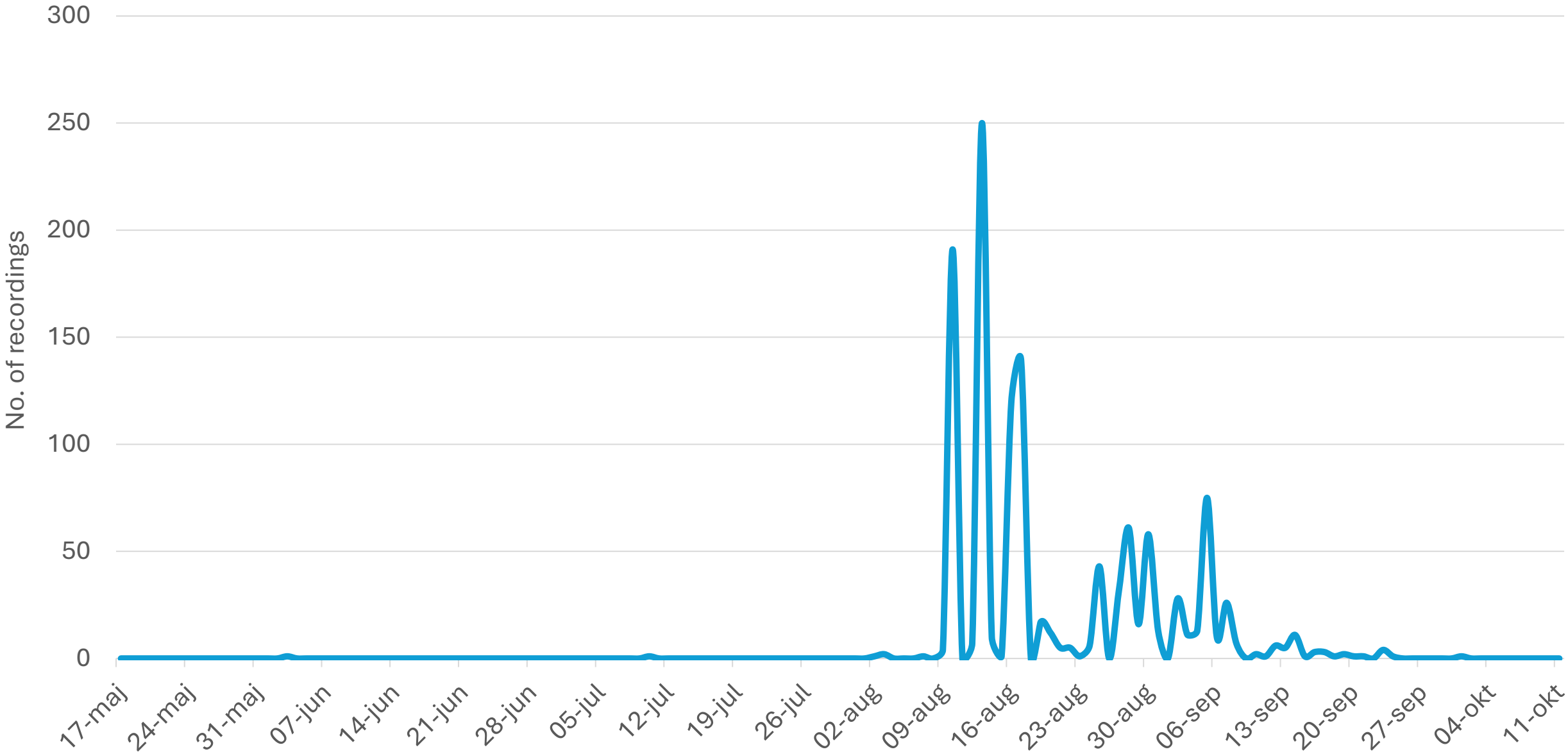


Recordings of bats on Fjäderägg – annual variation

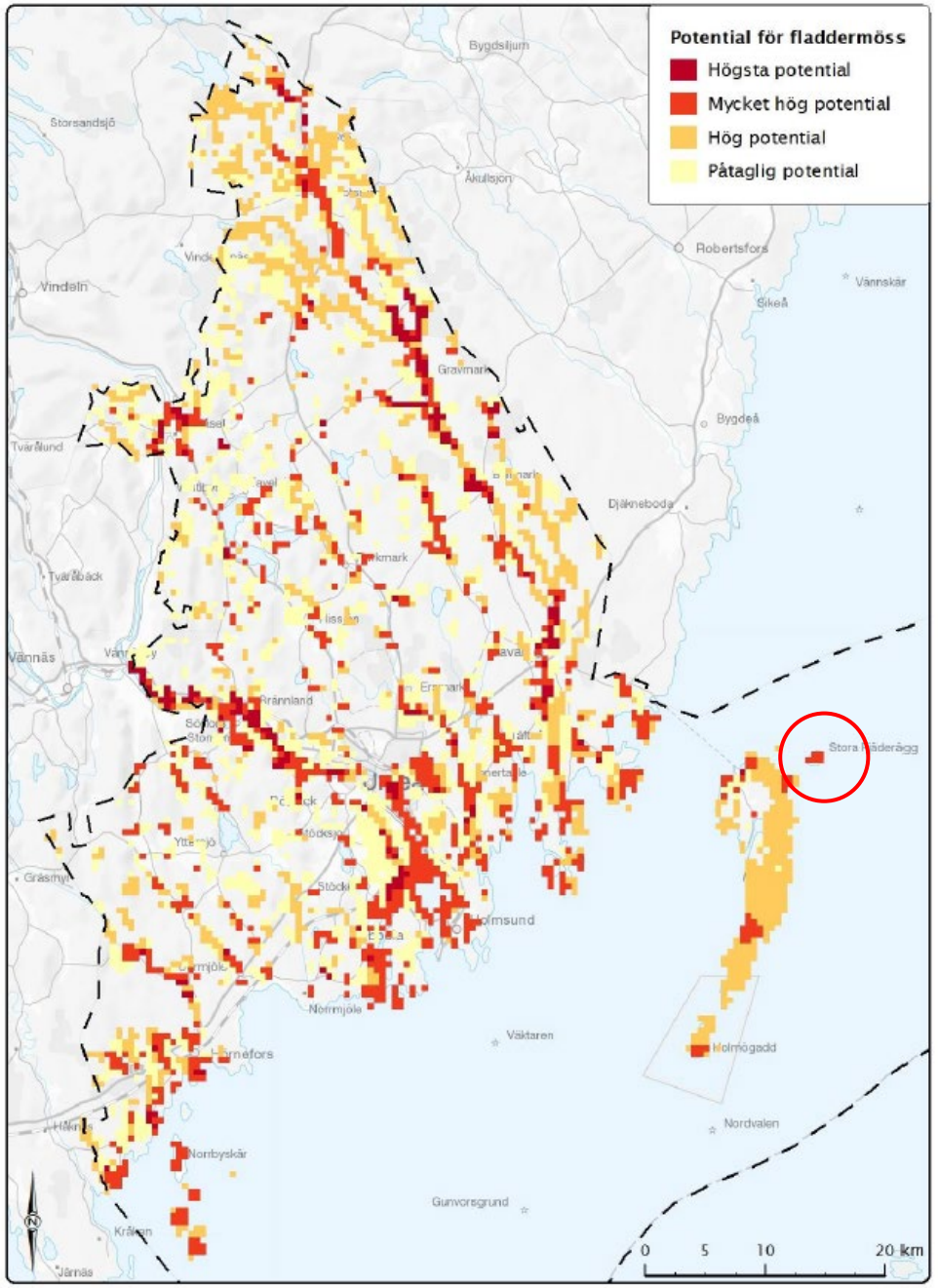
	All species	Nathusius' pipistrell	Prop. Nat. Pip. (%)	Week in September
2014	18	12	67	First
2015	84	0	0	First
2016	2176	0	0	Second
2017	No detectors			
2018	No detectors			
2019	43	7	16	First
2020	329	242	74	Second
2021	1525	38	3	Second
2022	414	4	1	Second
2023	208	82	39	Second
2024	313	23	7	First

Antalet inspelningar är inte direkt jämförbart mellan åren, eftersom detektorerna var ute olika länge och på delvis olika platser vid de olika tillfällena.

Bat activity on Stora Fjäderägg – seasonal variation



Analysis of bat habitats at the landscape scale

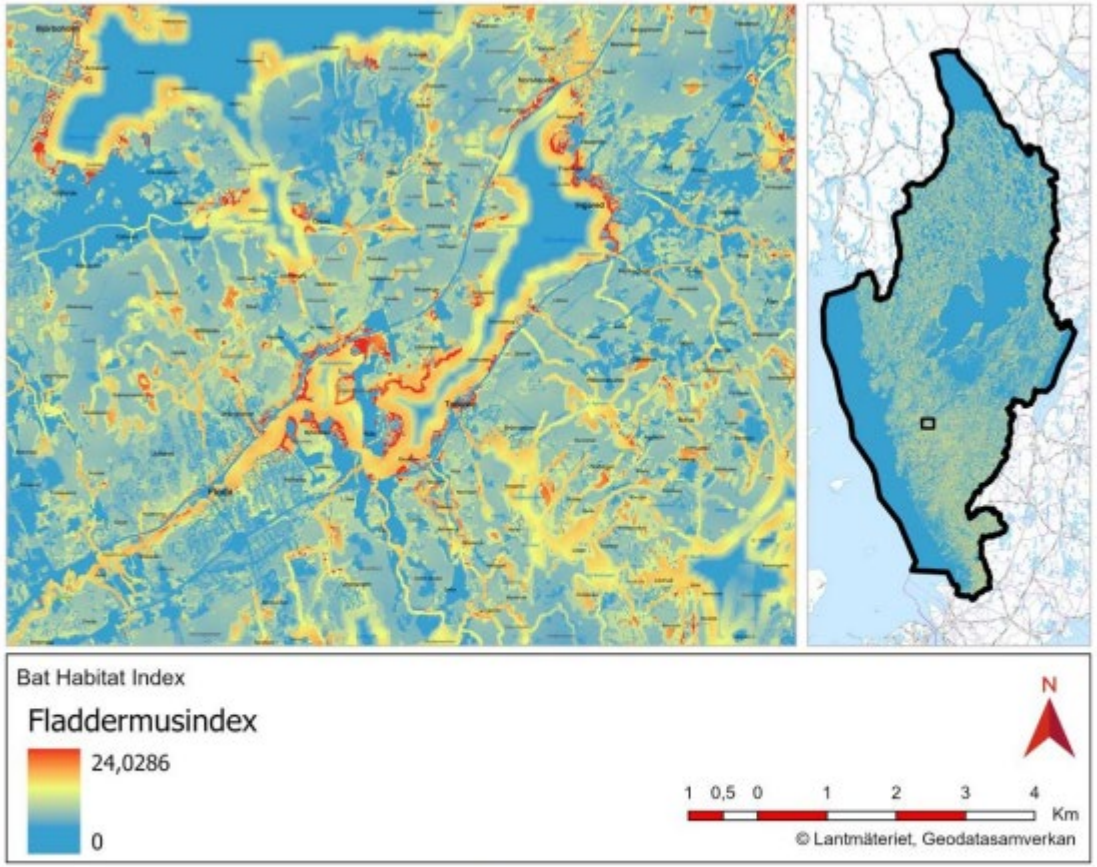


The Swedish Transport Administration

GIS-tool PREBAT

A connectivity-based habitat suitability model

Modelling the effects of infrastructure on bats and their habitats



Figur 9. Exempel på en karta som visar fladdermusindexet. Indexet ökar både i relation till ökad biotopkvalitet med avseende på förväntad födotillgång och nåbarhet för fladdermushonor under den period då de föder upp sina ungar.

GIS-tool PREBAT

Scientific evaluation

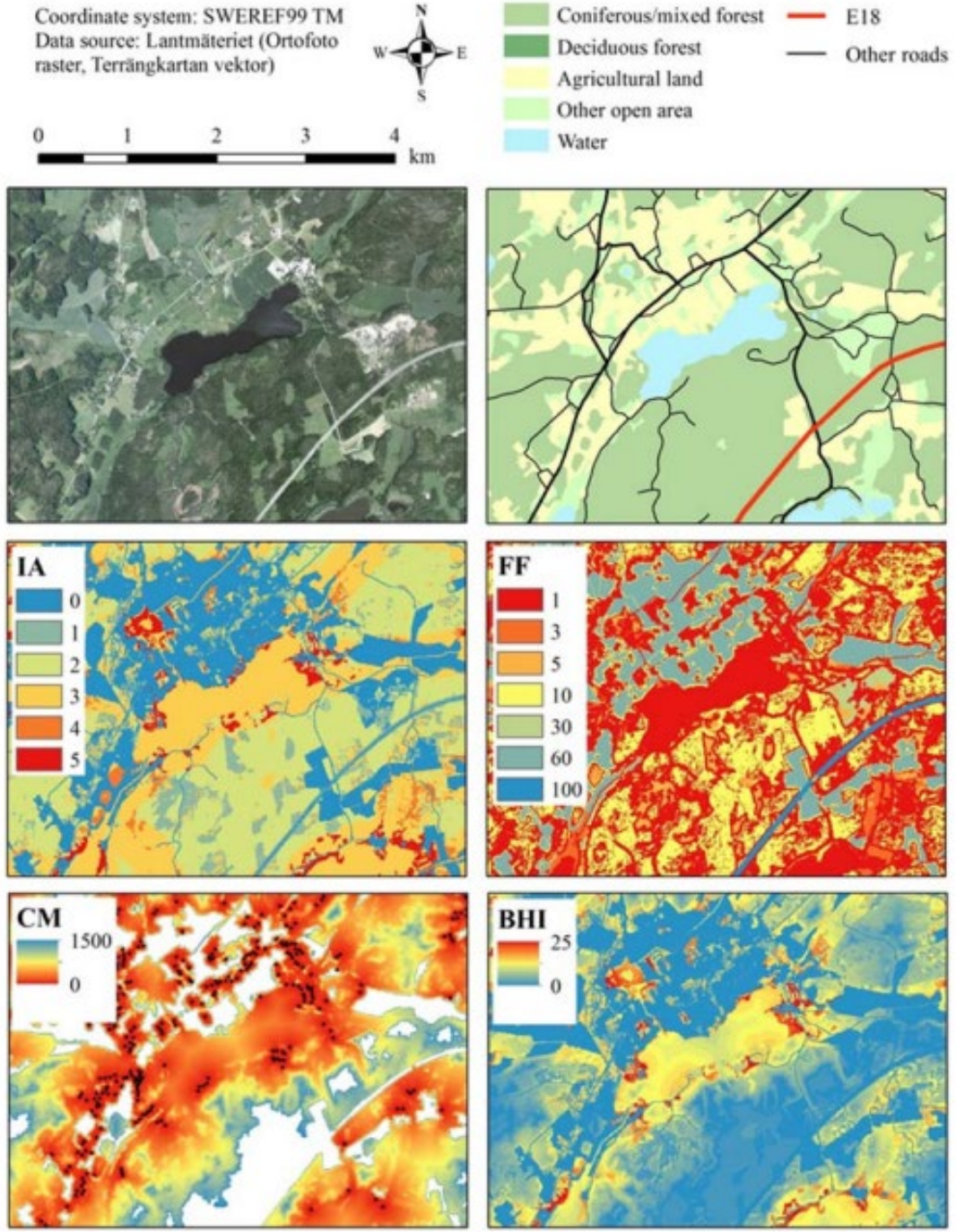


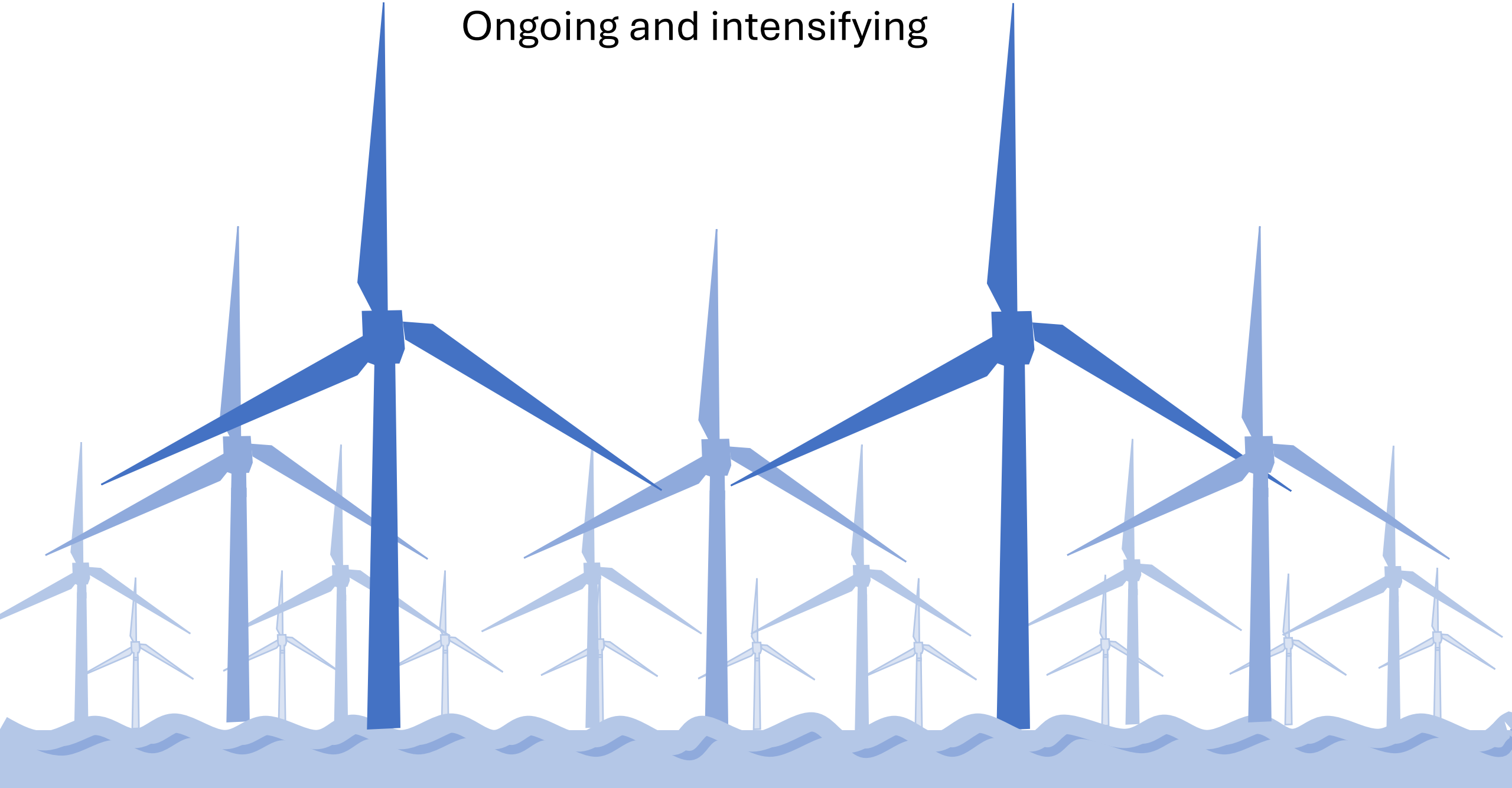
Fig. 2 Illustration of different stages of the PREBAT modelling. The maps display different variables from the same location. The first row shows an orthophoto (left) and a simplified terrain map (right), followed by the primary maps for insect abundance (IA) and flight friction (FF) in the middle row. Colony movement (CM) on the bottom left represents the penultimate stage in the construction of the BHI; the black dots in this map indicate potential colony sites. The final bat habitat index (BHI) is shown on the bottom right. In all maps, the red colour represents favourable conditions for bats, whereas the blue colour represents unfavourable conditions

Research article | 2020 | Peer reviewed | Open access

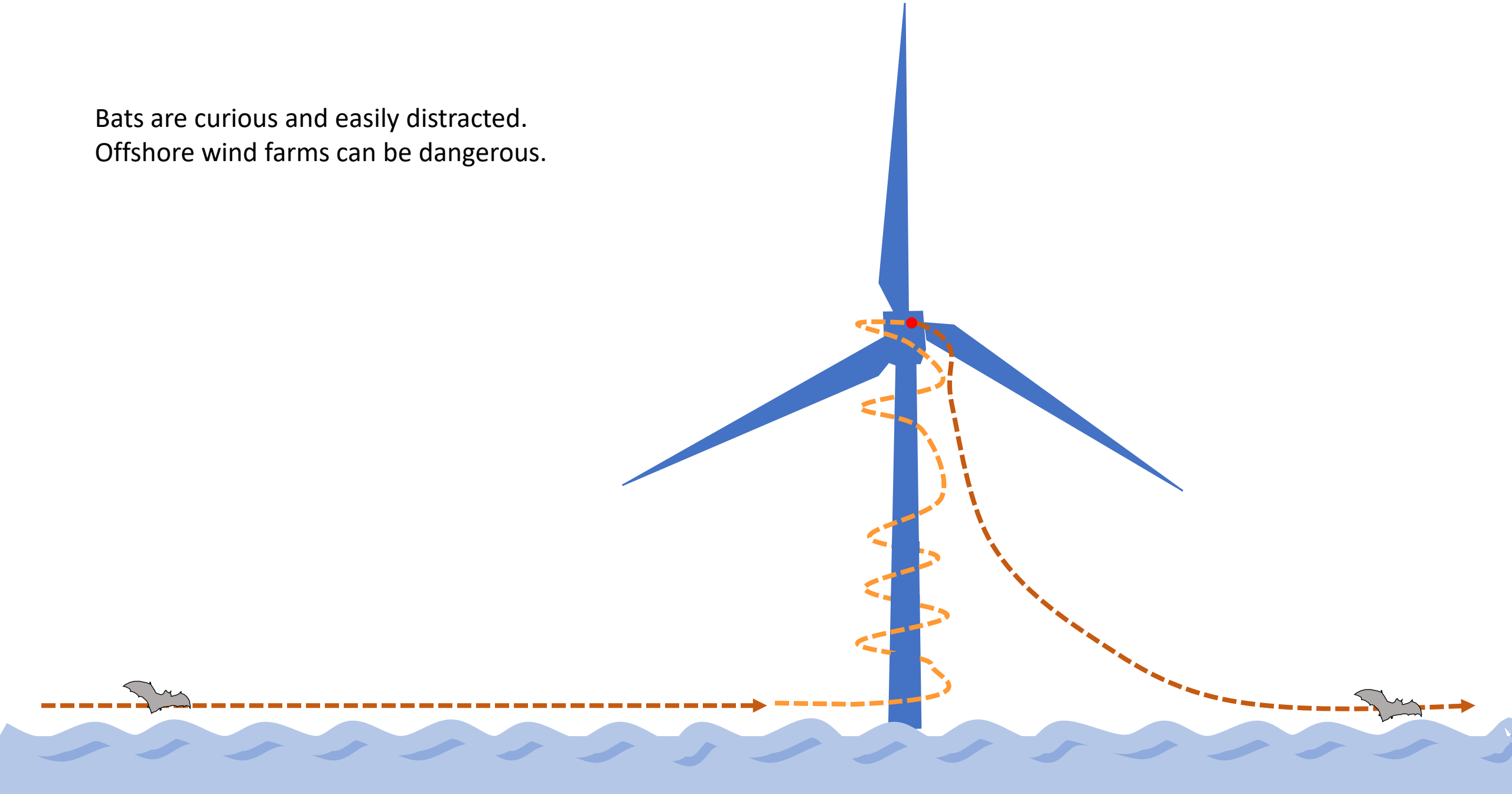
Testing bat abundance and diversity predictions by PREBAT, a connectivity-based habitat suitability model for insectivorous bats

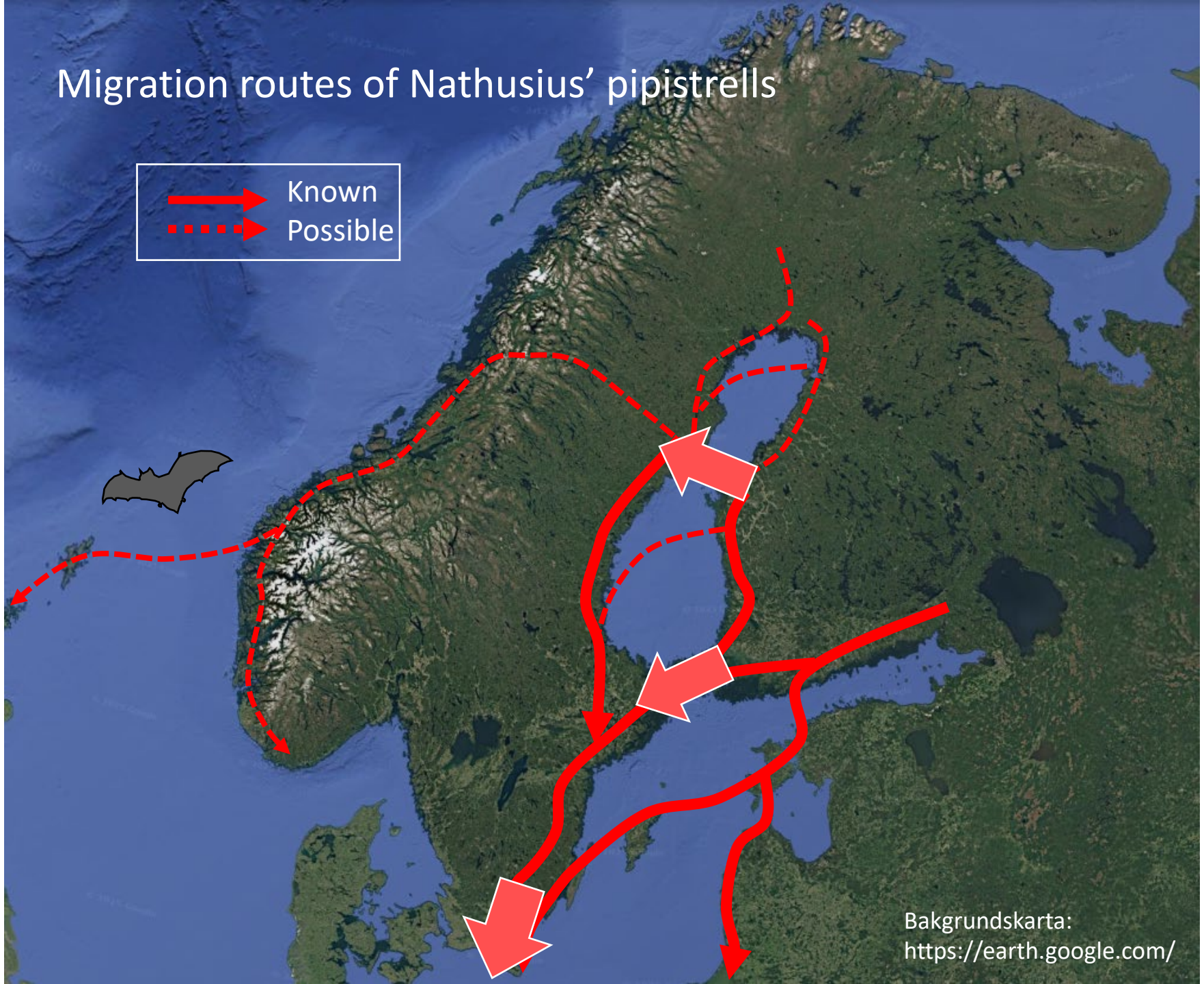
von Hirschheydt, Gesa; Kindvall, Oskar; de Jong, Johnny

Ongoing and intensifying



Bats are curious and easily distracted.
Offshore wind farms can be dangerous.




Migration routes of Nathusius’ pipistrells
Known
Possible
Bakgrundskarta:
https://earth.google.com/

Conclusions

- Bats live and behave differently in northern Sweden
- Temperature is important, but Northern bats seem adapted
- Climate change alters the distribution of bat species
- Light is an important factor
- Light could determine the northern limit of bat occurrence
- The green transition can affect bat populations negatively (large scale wind power establishment)
- Monitoring programs are important
- Monitoring methods must fit conditions in the north