

Large-scale long-term passive-acoustic monitoring reveals spatiotemporal activity patterns of boreal bats

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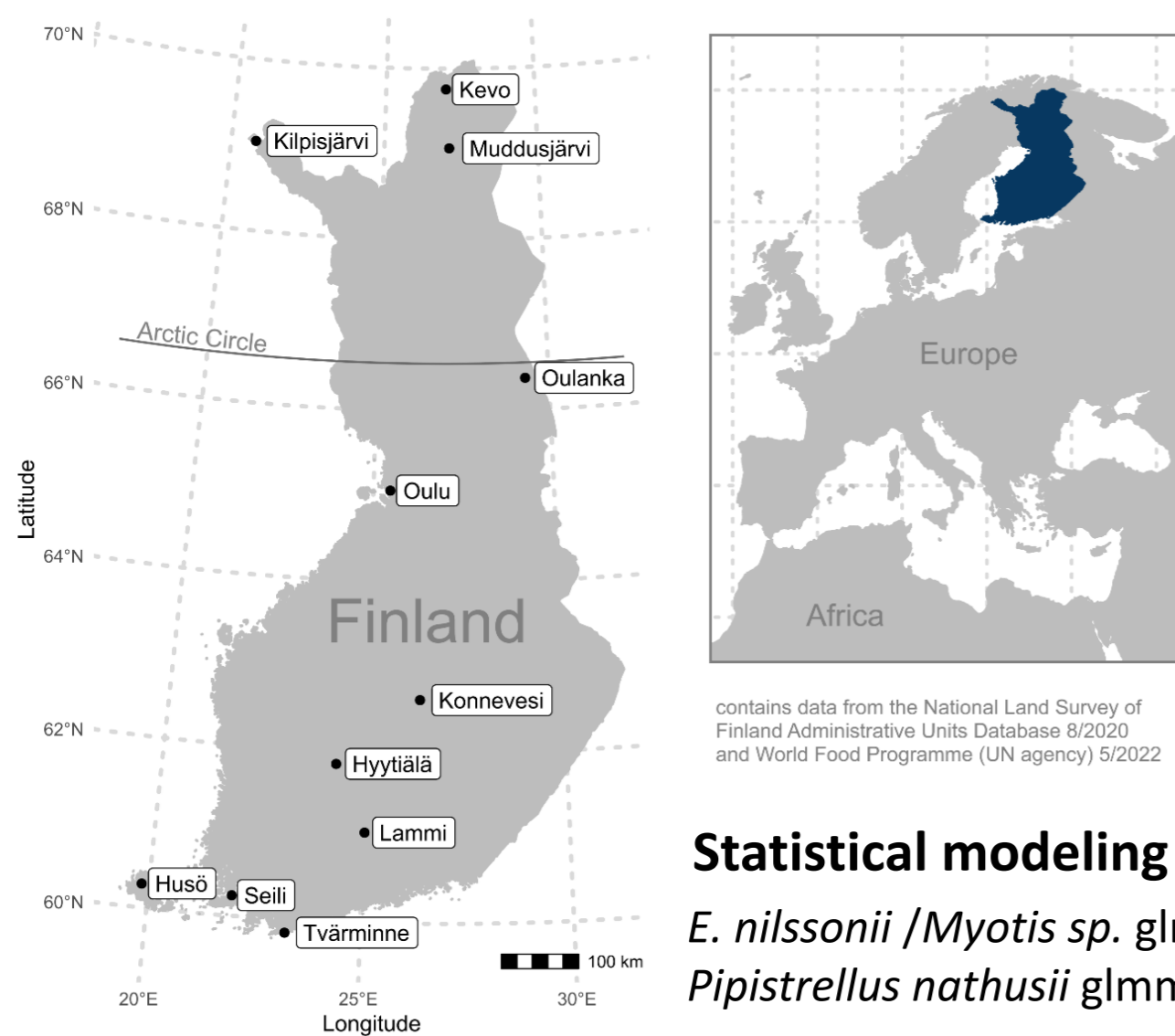


INTRODUCTION

The distribution ranges and spatiotemporal patterns in the activity of boreal bats are yet largely unknown. A lack of knowledge hinders the effective implementation of necessary conservation measures. We approached the issue by establishing **permanent passive-acoustic sampling spanning all of Finland** to gain an **understanding on latitudinal effects on bat species composition and temporal activity patterns** in northern Europe.

MATERIALS AND METHODS

Sampling sites 2015 - 2021



Audio sampling

FIELD STATIONS



BAT LAB

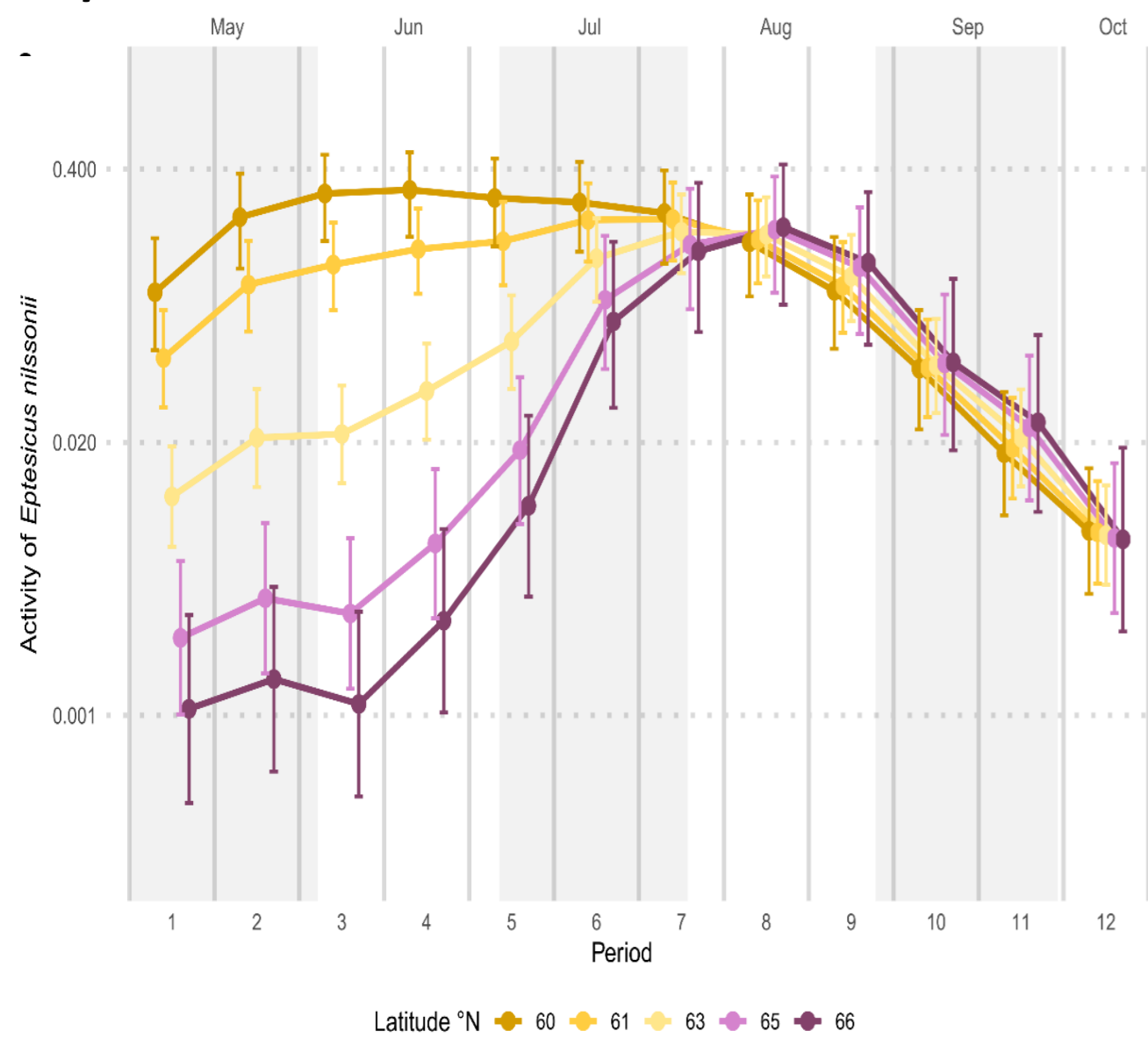


Statistical modeling

E. nilssonii / *Myotis* sp. glmmTMB: Activity = period + year + latitude + latitude*period + (station = random) + (recorder = random), dist = binomial
Pipistrellus nathusii glmmTMB: Activity = period + year + period*year + (station as random) + (recorder as random), dist = binomial

RESULTS

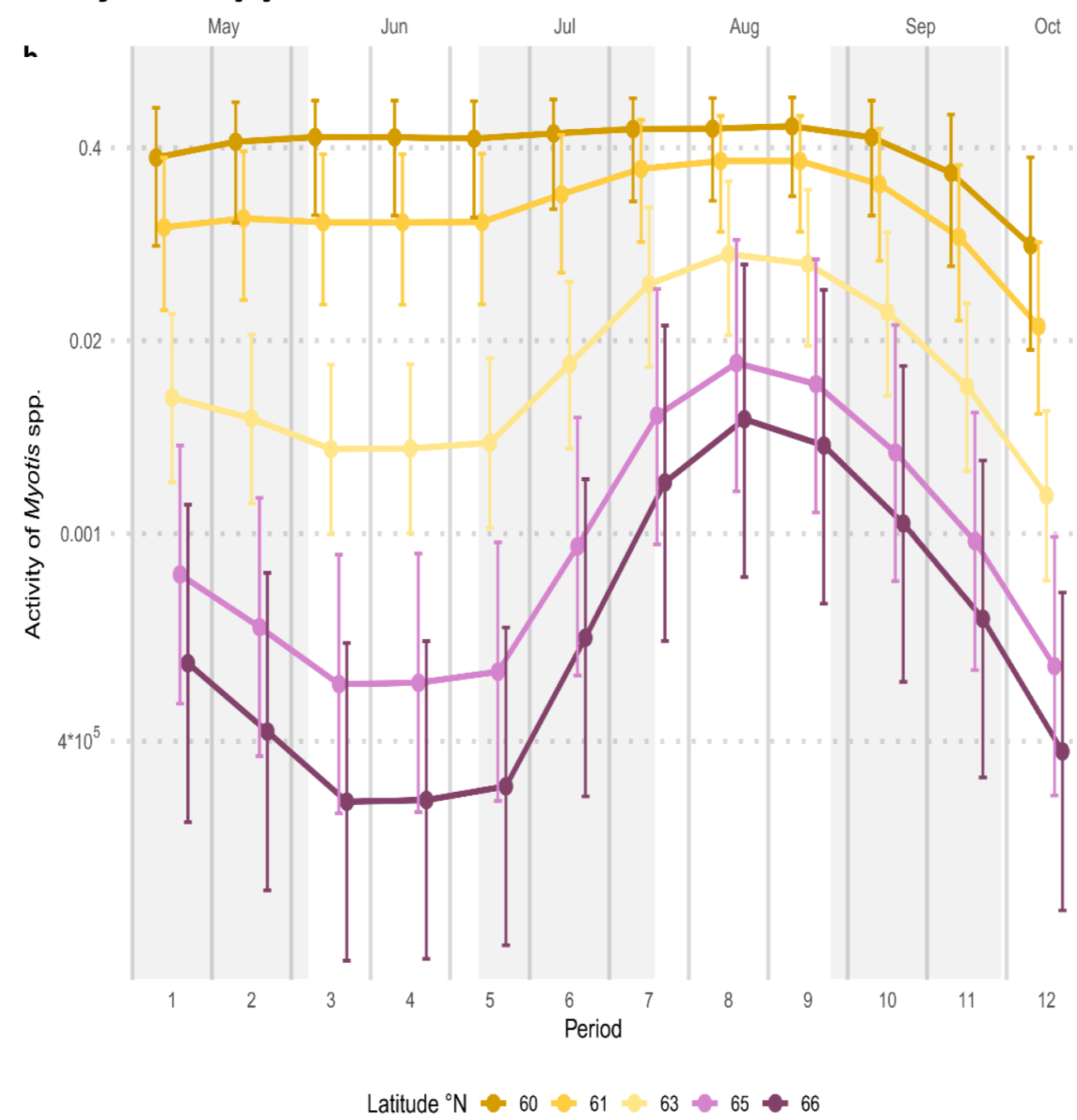
Eptesicus nilssonii



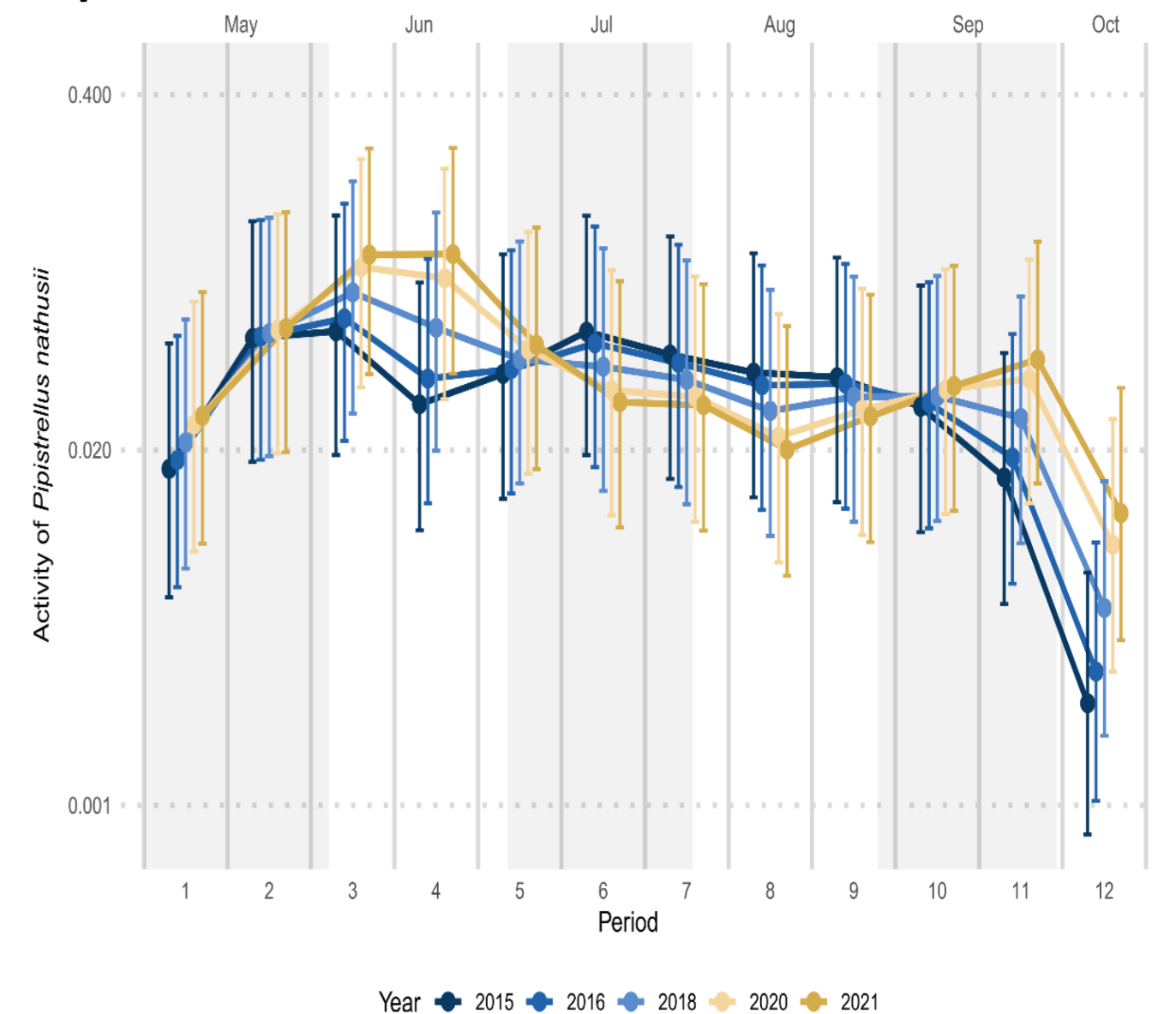
Bonus result!

Overall activity of *E. nilssonii* and *Myotis* sp. have increased across the years from 2015 to 2021.

Myotis spp.



Pipistrellus nathusii



Bonus result #2!

The northernmost stations only had observations of *Vespertilio murinus*, *P. nathusii* and *E. nilssonii*.

CONCLUSIONS

As expected, bat activity decreases with increasing latitude. *E. nilssonii* and *Myotis* spp. show an increasing trend in annual activity. The distinguished activity peak in late summer and autumn for the two species may reflect seasonal dispersal/migration to the north.

P. nathusii, listed as vulnerable (VU) in the Red List of Finnish Species, exemplifies the importance of long-term monitoring. It is increasing activity in the north and delaying autumn migration. Based on the recent observation of hibernation in SW Finland and increase of late activity in our data, local overwintering should be carefully monitored.

A permanent acoustic monitoring network provides feasible tools for conservation planning. As our network continues to operate, the models become more reliable and especially long-term trends become more accurate.