

Variation in growth site and spore production of wood-inhabiting fungi – implications for dispersal

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Dead Wood Meeting
Lammi Biological Station 2016

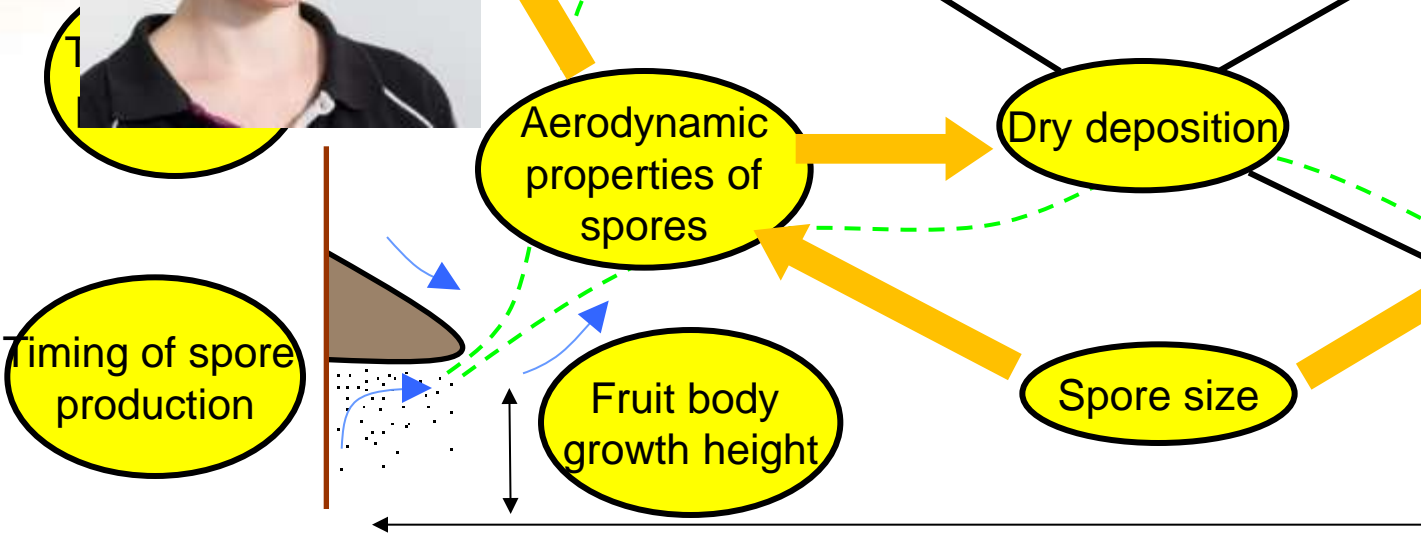


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Fungal dispersal dissected

How dispersal related traits are connected to each other?
Where to get the data?

Join us in Kuusimäki, you'll get your data!
And let's ask some friends to help for the rest



Some results from two studies

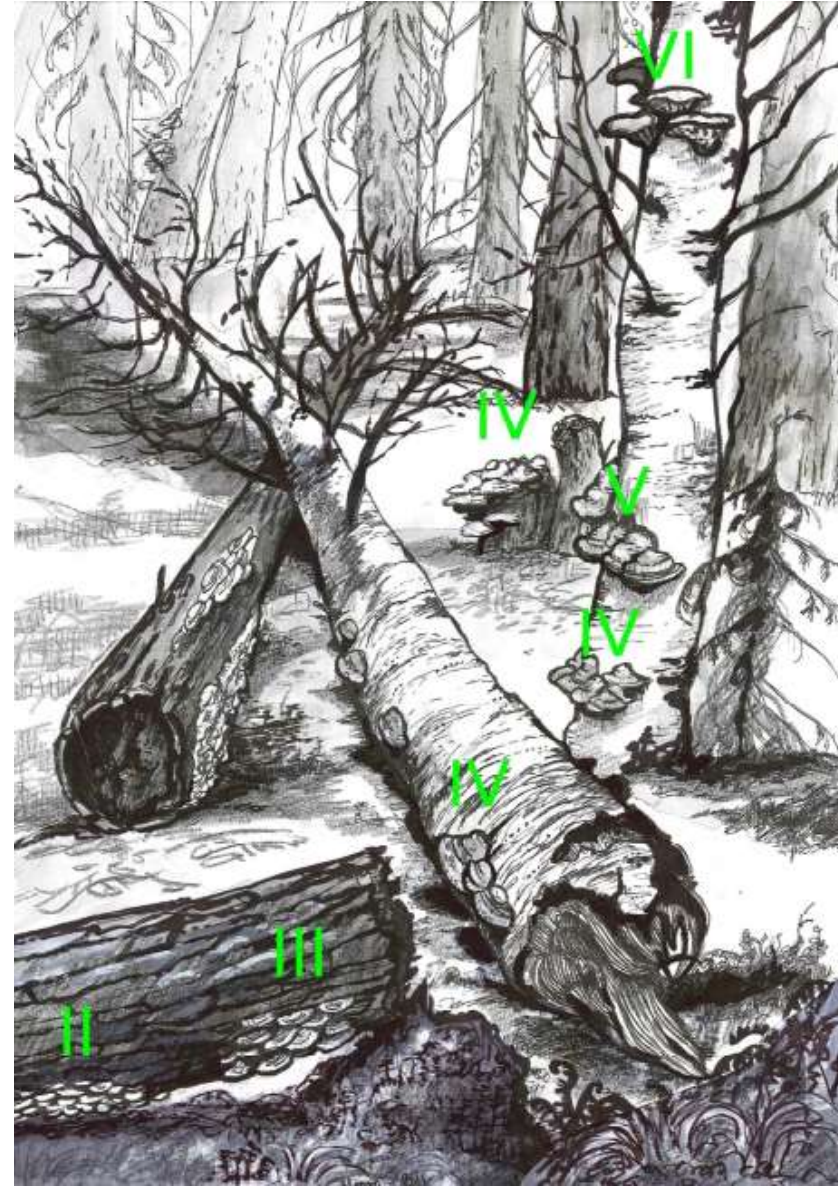
- Veera Norros & Panu Halme 2016:
Growth sites of polypores from quantitative expert evaluation: late-stage decayers and species with small spores grow closer to ground
Manuscript
- Veera Norros, Panu Halme, Anna Norberg & Otso Ovaskainen 2016:
Spore production patterns in wood-inhabiting fungi: relation to species traits and consequences for dispersal
Manuscript

Veera enjoys Kellogg's in USA → I am here



Growth sites of polypores from quantitative expert evaluation

- Finnish polypore experts
 - Where polypores tend to grow?
- 10 replies
 - Altogether 3550 fieldwork days
 - Data on 140 species



Growth sites of polypores from quantitative expert evaluation

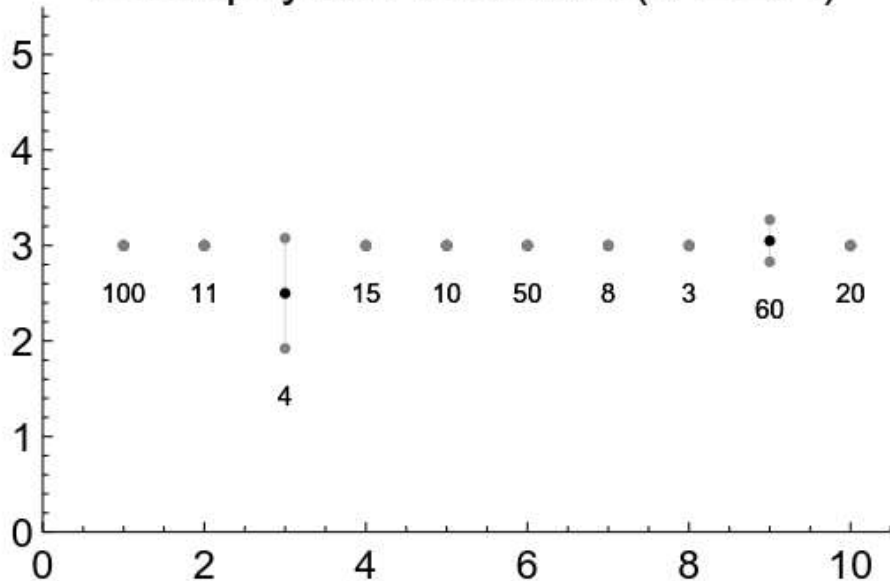
- We studied how expert evaluations on growth sites are related to species traits
 - Spore volume
 - Spore wall thickness
 - From Niemelä 2005
 - Fruit body longevity (annual/perennial)
 - From Halme et al. 2009
 - Commonness in Finland
 - From the data used for last red list
 - Decay stage preference
 - Response to local resource availability
 - Response to connectivity
 - From Nordén et al. 2013



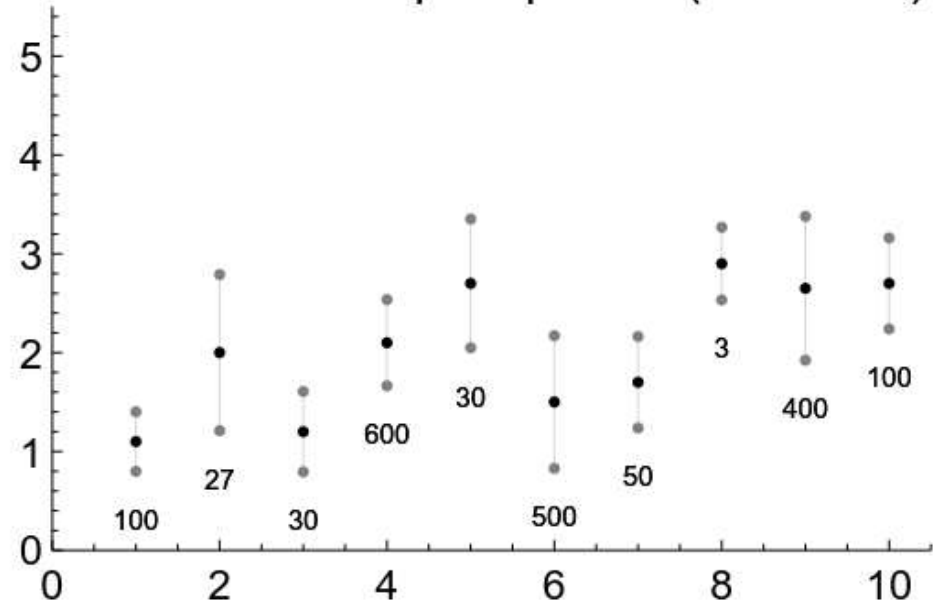
Results

- Experts provided consistent estimates

Gloeophyllum odoratum (N = 281)



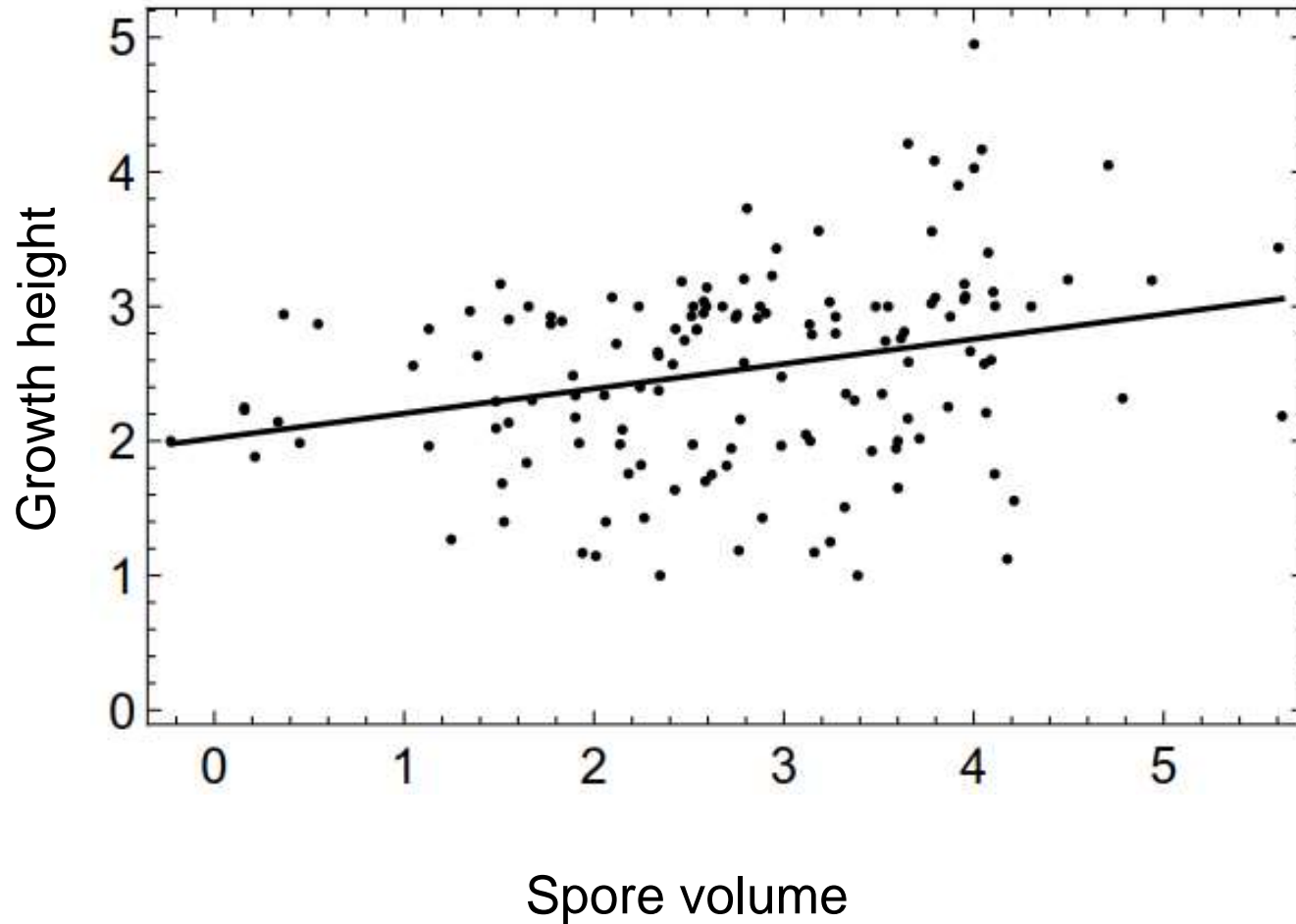
Heterobasidion parviporum (N = 1840)



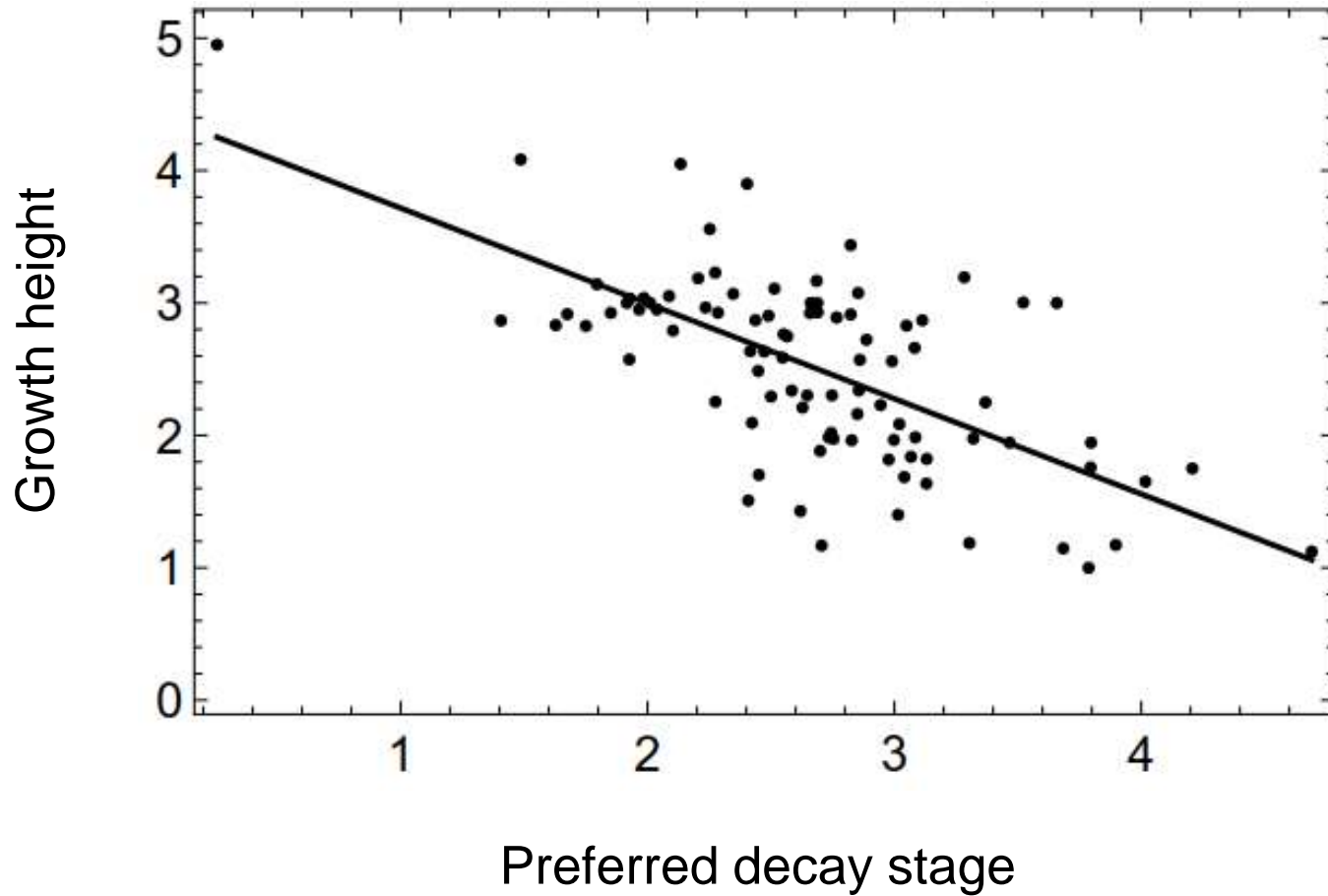
Species explained 67% (or 69%) of the variation
and expert just 26% (or 12%)



Large-spored species grow higher



Late decayers grow lower



Also

- Perennials tend to grow higher
- Common species tend to grow higher

- No connection to spore wall or fragmentation responses!



Spore production patterns in wood-inhabiting fungi

- How many spores they produce?
- When this happens?
- Variation between species?

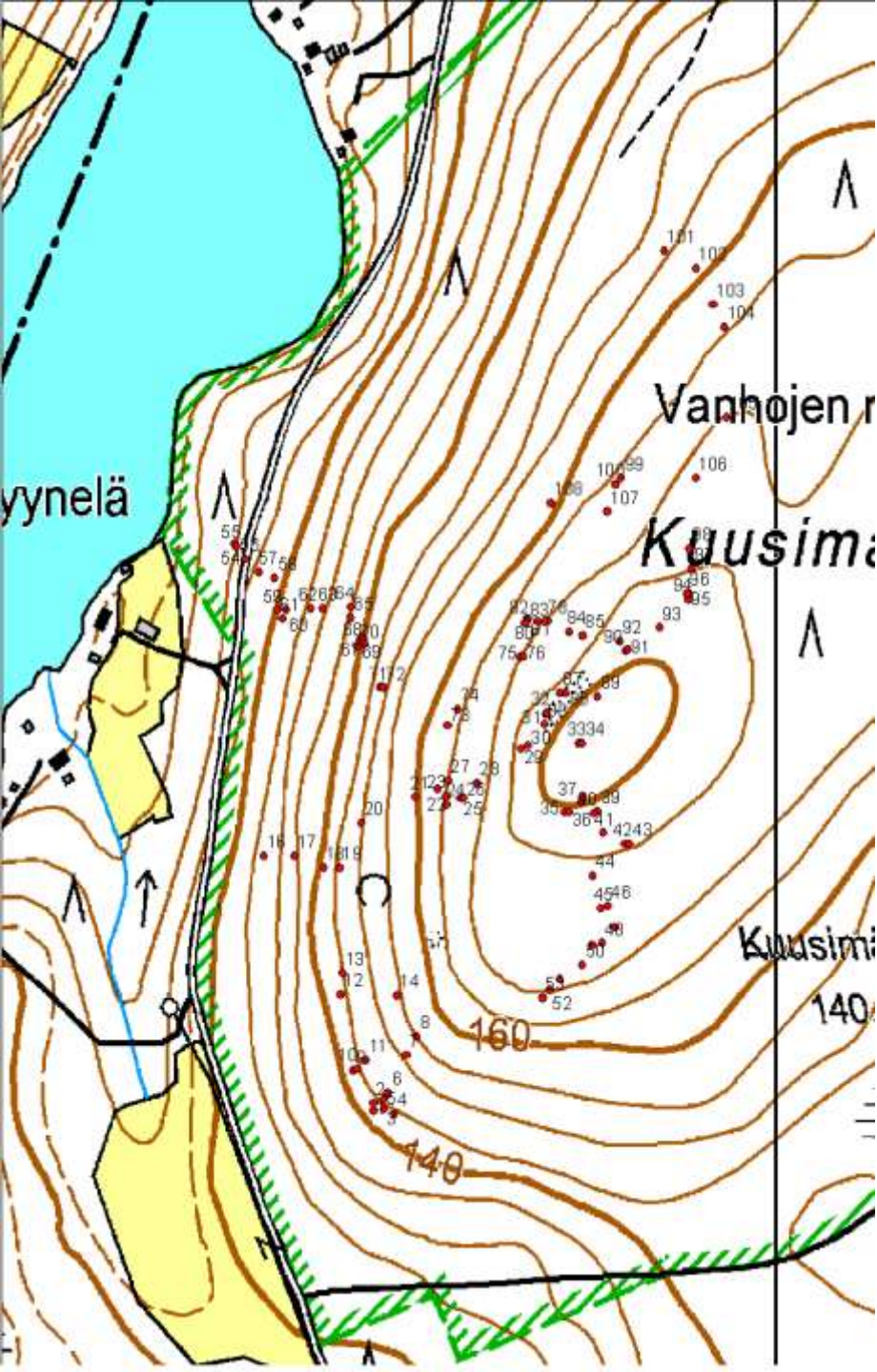
→ Connections to other traits



Kuusimäki data

Monthly (May-October) spore production measurements in 2009-2010

107 logs
97 species (polypores, corticioids, hydroids)



Data details

- Monitoring data
 - 107 trunks (29 spruce, 30 pine, 30 birch, 18 aspen)
 - Data collected separately from four segments on each log
 - Trunk variables: length, diameter, height from ground, decay class, epiphyte cover
 - Fruit bodies in each month: number of alive & dead (pileate) / proportion of length covered, live area (%) (resupinate)
- Spore data
 - One 24 hour print per segment per (live) species each month, placed at a maximally viable part of fruit body
 - Counted with counting chamber (2009) / Coulter Counter + counting chamber (2010)
- Weather data



Analysis

- Hierarchical community model
 - Species level: how do environmental variables affect spore production?
 - Community level: how do species traits affect the env. responses?
- Two separate response variables
 - Live abundance (# (pil); length (res))
 - Hymenial spore prod rate (spores/cm²/h)
 - Spore production (spores/h) per trunk (/segment) = live area (estimated from live abundance) * hymenial spore prod rate

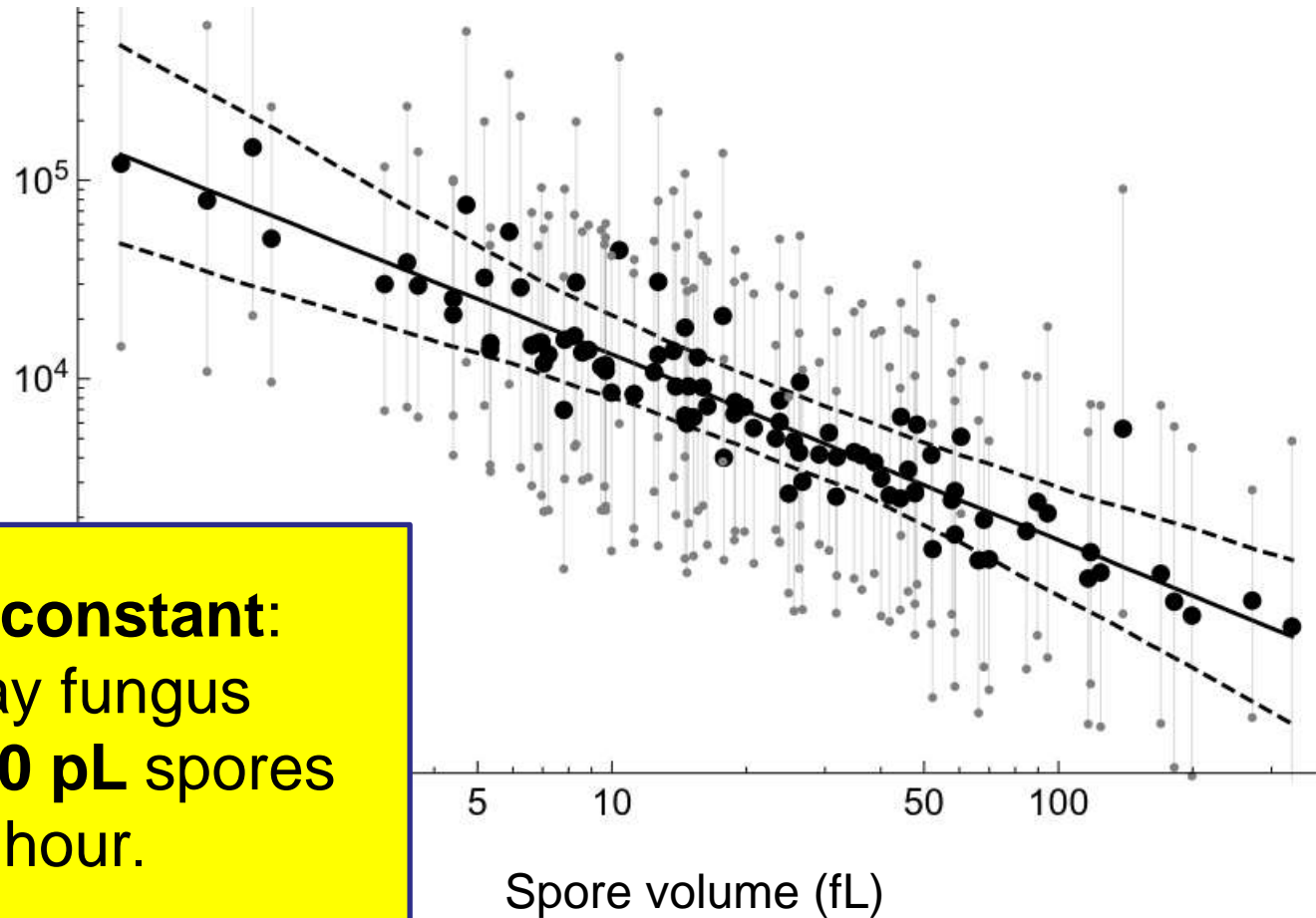


- For each species: additive effects of the log and the measuring day
 - Log-specific covariates: tree species, diameter, decay stage
 - Log-specific random effects (samples within a log not independent)
 - Day-specific covariates: calendar day (x , x^2), RH, rain
 - Day-specific random effects (samples within a day not independent)
 - Additionally: proportion of night-time in the measuring period of each sample
- Community level: species' level of spore production and the environmental responses can depend on traits
 - Spore volume, growth form (pileate/resupinate)



Results: volume-number relationship

Predicted level of
spore production
under average
conditions
(spores/cm²/h)



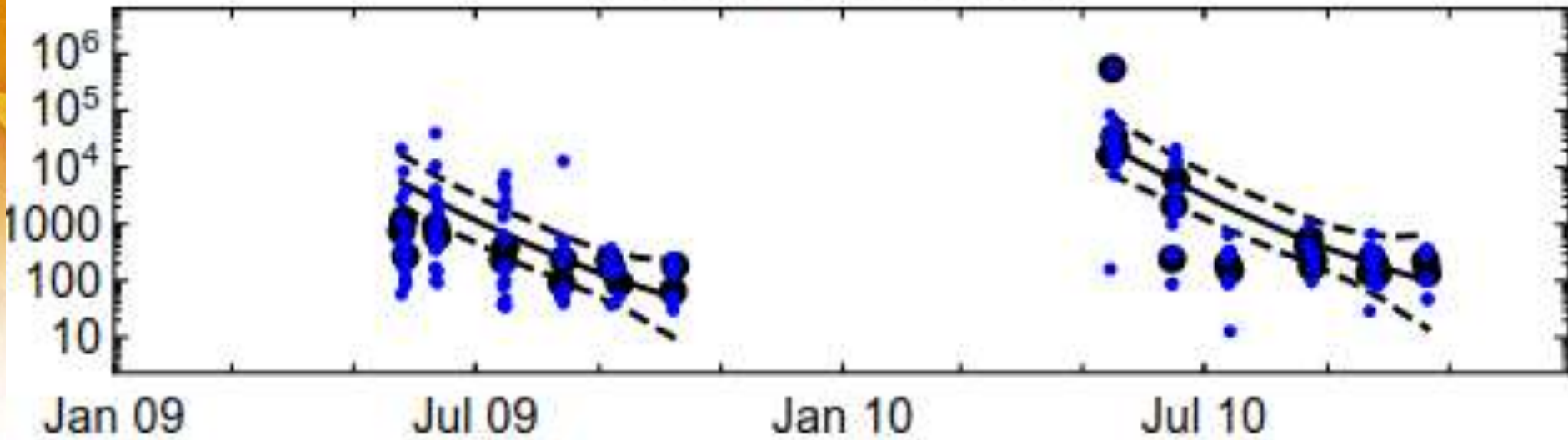
The **Norros constant**:
A wood decay fungus
produces **100 pL** spores
per cm² per hour.

Amazingly strong relationship!

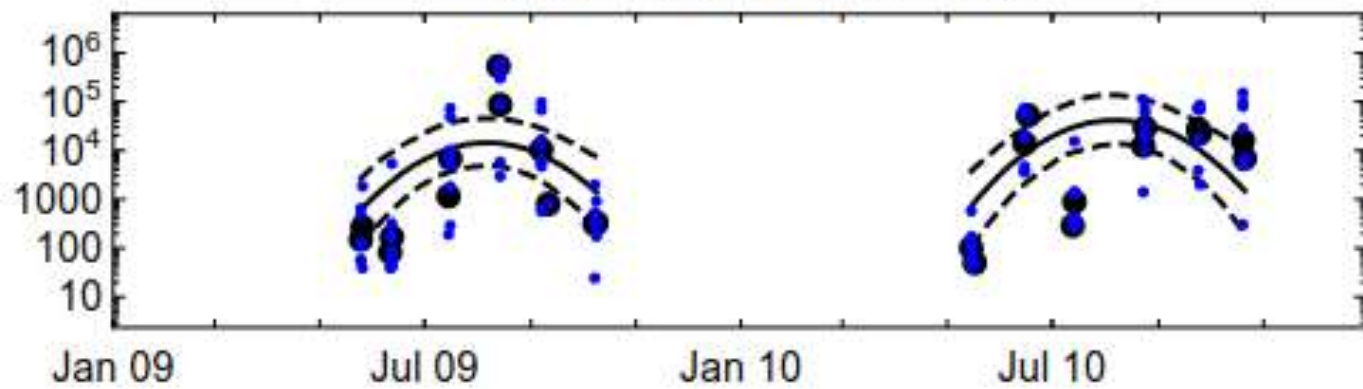


Results

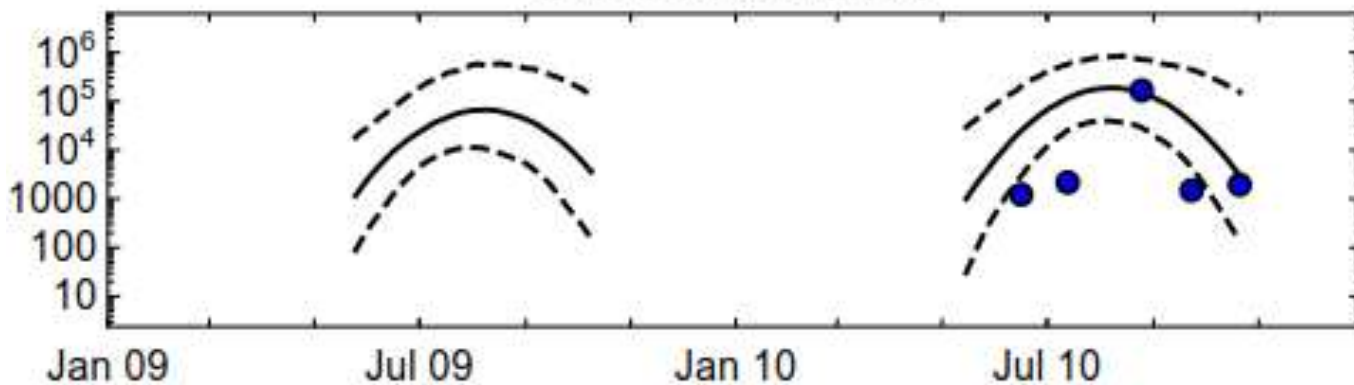
Fomes fomentarius



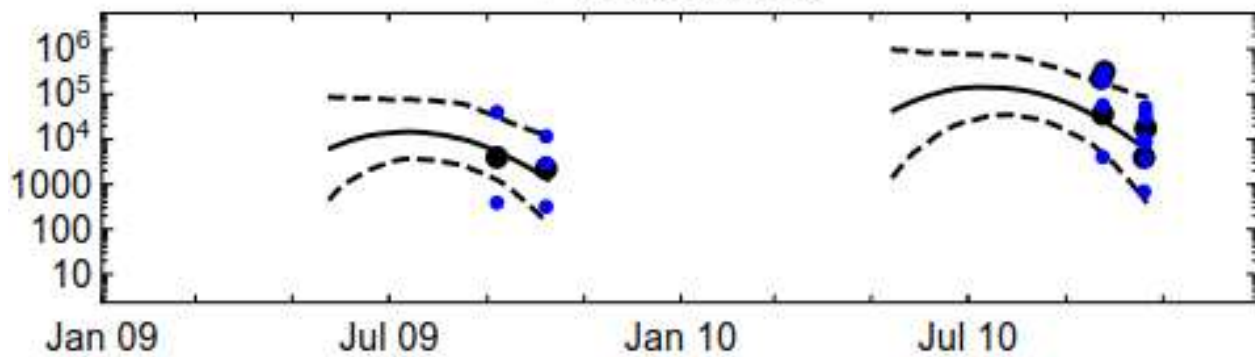
Phellinus ferrugineofuscus



Skeletocutis nivea



Postia caesia



Results

- Interpretation: posterior probability that an effect (e.g. the corresponding parameter) is positive or negative
- Community level results:
 - Year (+)
 - Day nbr 2 (-) → unimodal seasonal pattern
 - Rain (-)
 - RH (+)
 - Night (+)
 - Spore size (-)
- Species level:
 - Generally no opposite effects to the community level effects
 - Some individual species with a decreasing seasonal pattern (“spring species”)
 - Generally no effect of log (neither covariates nor random effects)



Summary

- Consistent between-species variation in growth site
 - Spore size
- Consistent between-species variation in number of released spores
 - Spore size
- We should analyse the spore production measures against some environmental responses
- You can measure these things in many ways!



Acknowledgements

- Veera Norros
- Anna Norberg and Otso Ovaskainen
- The experts in growth site study
- Field assistants in spore production study

