

The geometry of gametic dispersal in a flying mammal

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Dispersal

- Spatio-temporal variation of environment
- Kinship interactions
 - inbreeding avoidance
 - competition/cooperation
- Costs of dispersal

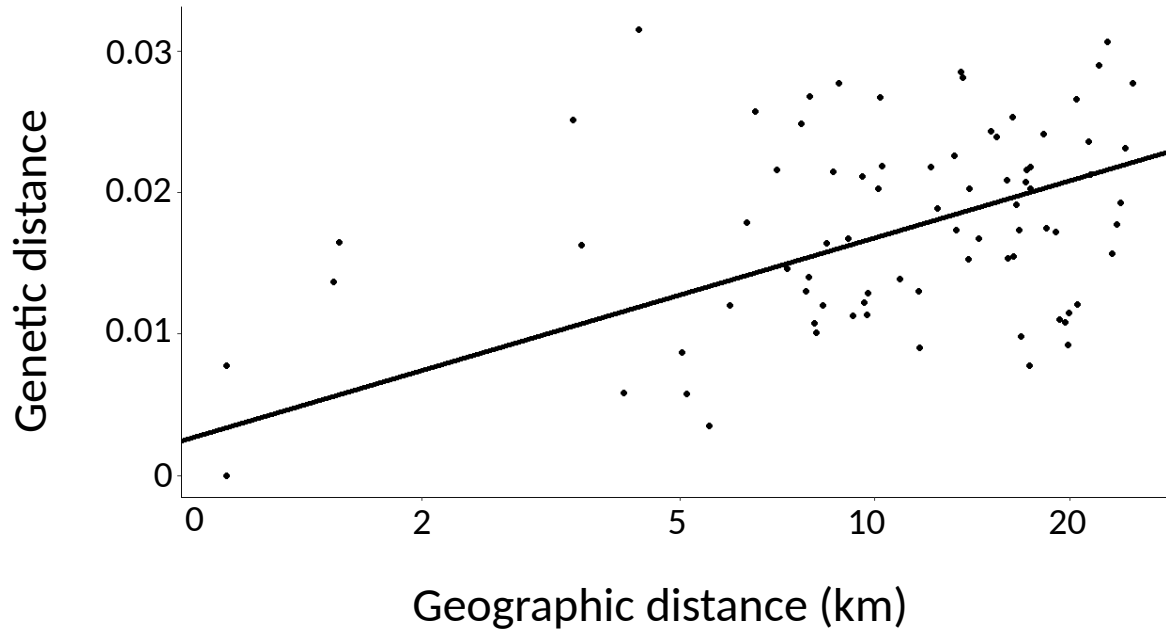
Mammals → female philopatry vs. male dispersal

The lesser horseshoe bat, *Rhinolophus hipposideros*

	Brown long-eared bat (Burland <i>et al.</i> 1999)	Bechstein's bat (Kerth and Petit 2005)	Lesser horseshoe (Jan 2019)
Dispersal	Low	Low	Low
Female philopatry	Strict	Strict	Strict
Reproduction	Swarming	Swarming	?
Isolation by distance	40 km	100 km	20 km



Isolation by distance: limited male dispersal?

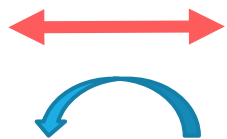


Mantel test : 10,000 iterations, $r = 0.26$, $p = 0.009$

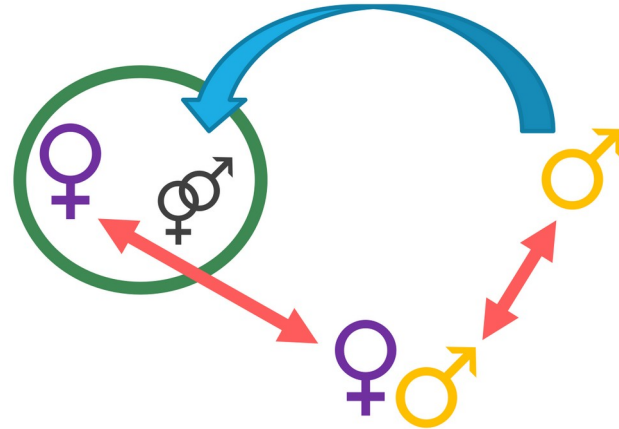
Jan et al. 2019

Mating dispersal

The distance between
father and offspring
are limited?



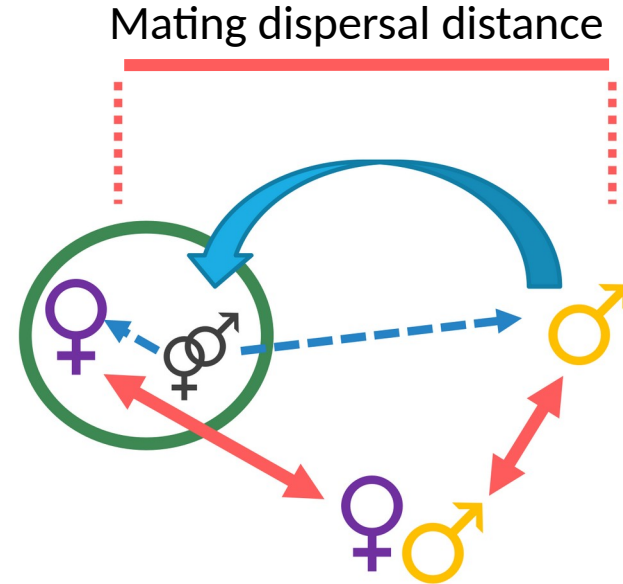
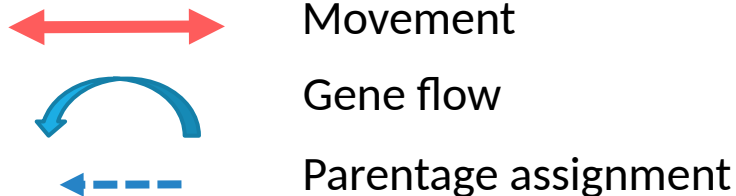
Movement
Gene flow



Mating dispersal

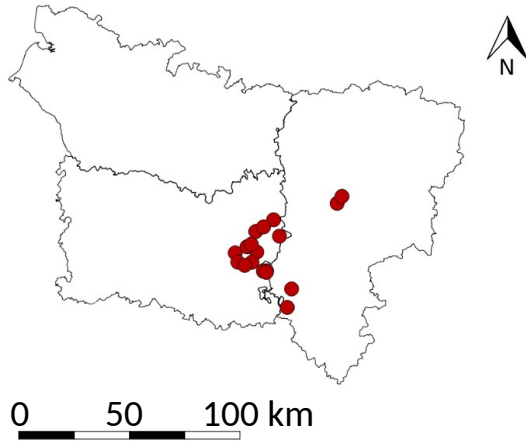
The distance between
father and offspring
are limited?

How to measure it?

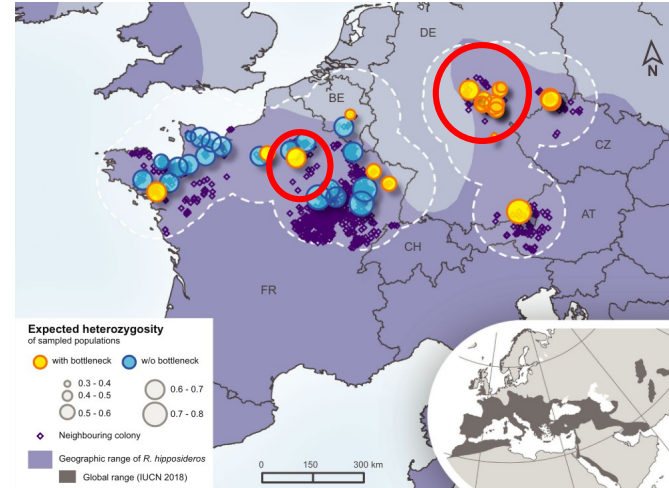


Sampling: 3-4 years in 2 populations

Compiègne forest, Picardie, France



Species distribution



17 maternity roosts in France, 19 in Germany 

3-4 years survey, before/after parturition

Jan *et al.* 2019 ; Lehnert *et al.* 2021

Genetic data

Non-invasive genetics → faeces

Genotypes?

Unique genotype = 1 individual

3,706 ind.   3,913 ind. 

8 microsatellite markers

Age?

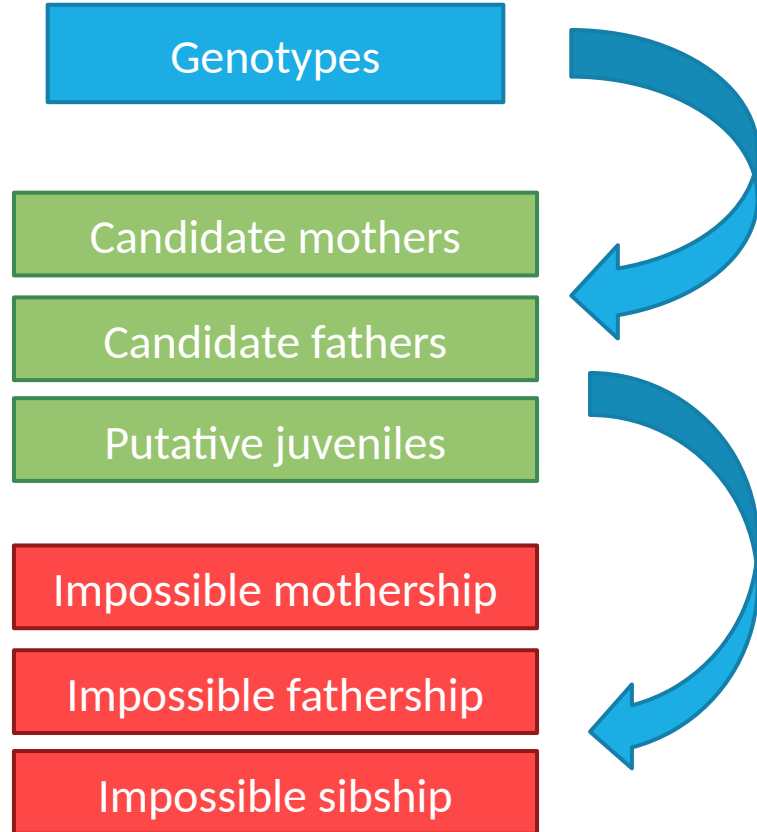
BEFORE parturition = Adult (57-54 %)

AFTER parturition = Juvénile (43-67 %)

Sex?

Sexual marker (Zarzoso-Lacoste *et al.* 2018)  72-62 %

Parentage assignment with COLONY



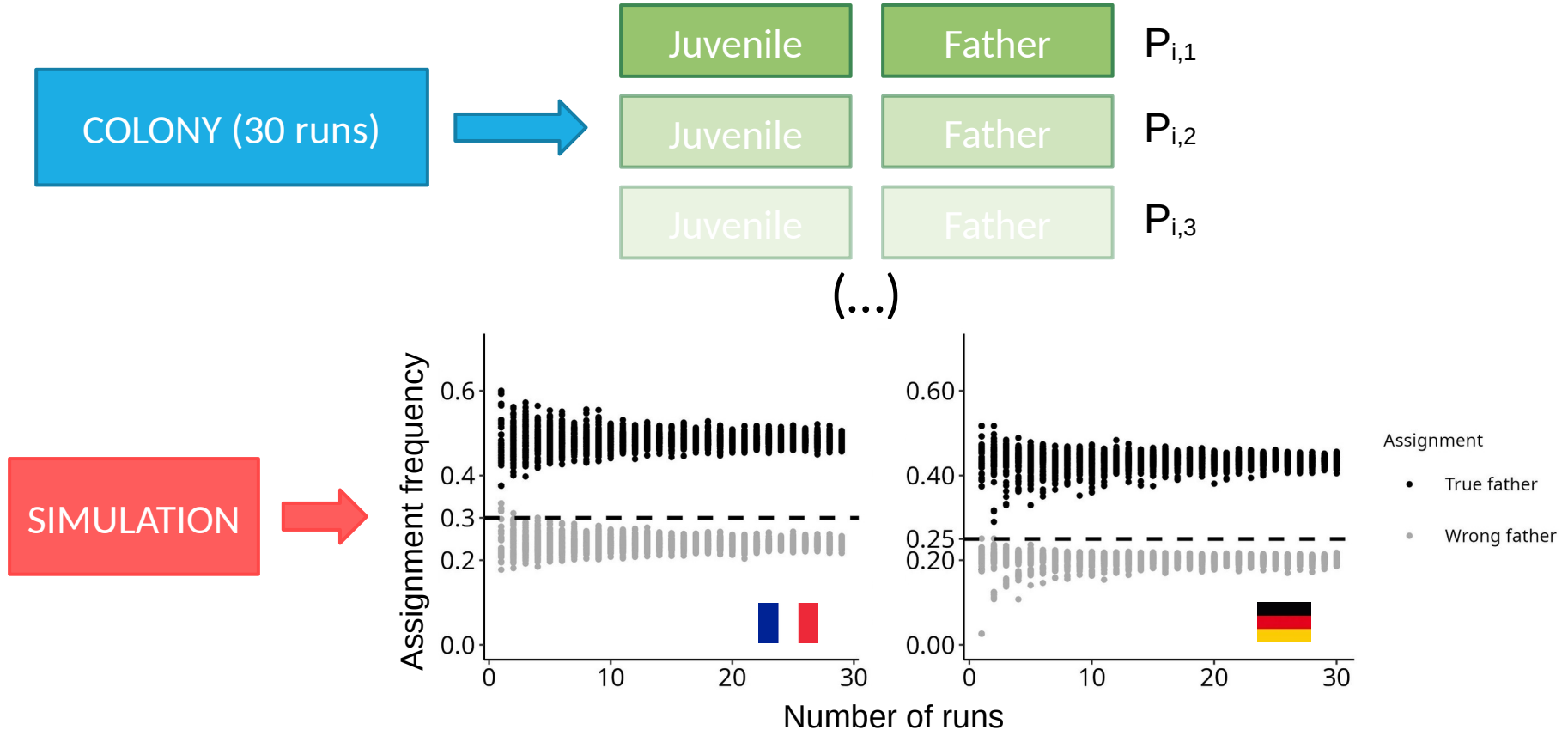
4 years (2013-2016)

Candidates parents:

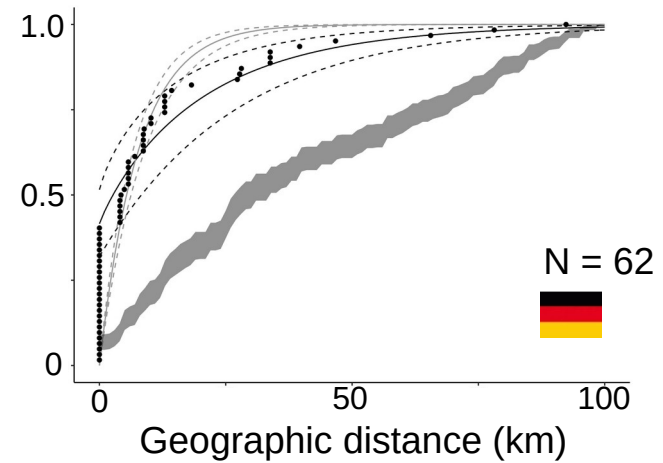
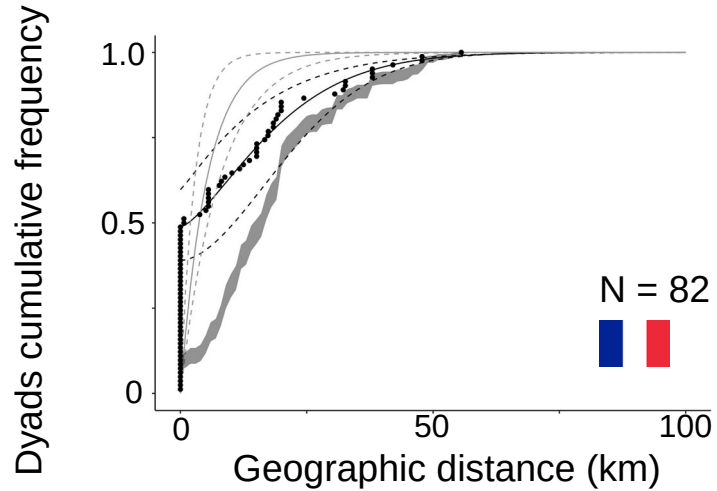
- Adults + juveniles born before 2016
- Parents are born before juveniles
- Juvenile and mother in the same colony
- Max. 1 juvenile/mother/year

Jones & Wang 2010

A simulation approach to understand COLONY

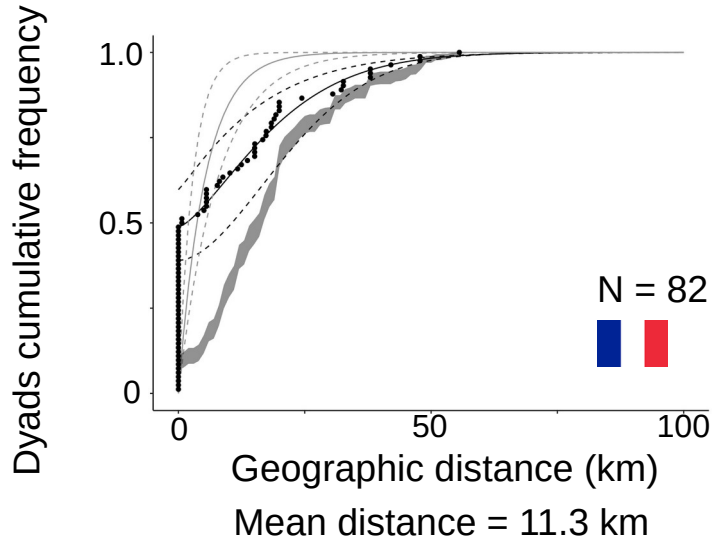


Mating dispersal distances

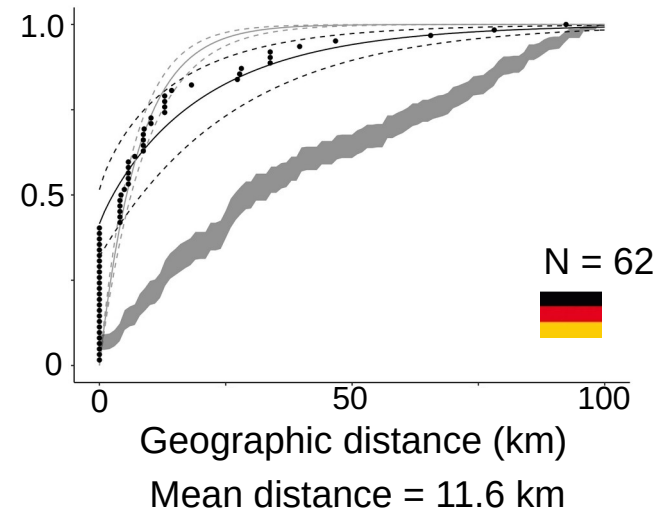


Mating dispersal distances

Sperm goes further than individuals



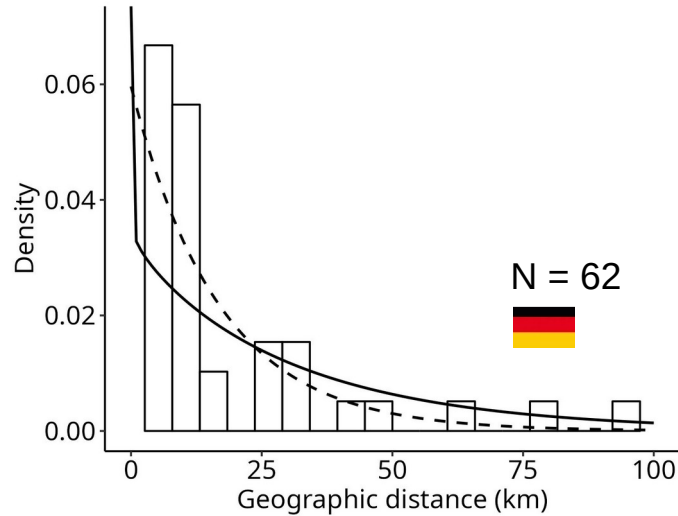
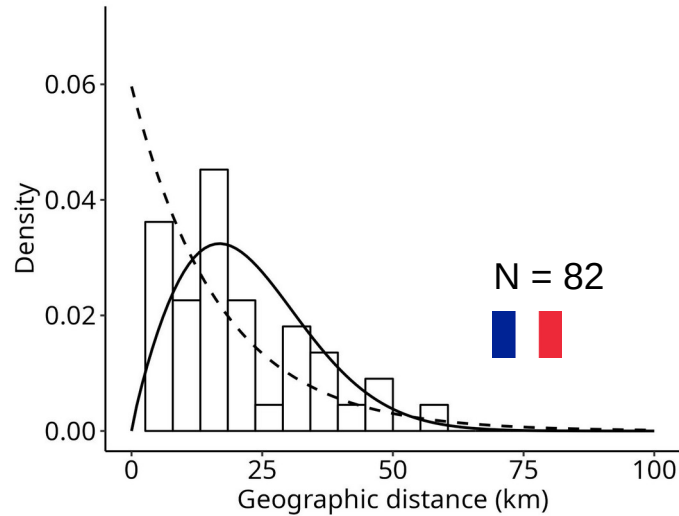
~50 % Intra-colonial mating



Long distance mating dispersal

The complete gametic dispersal

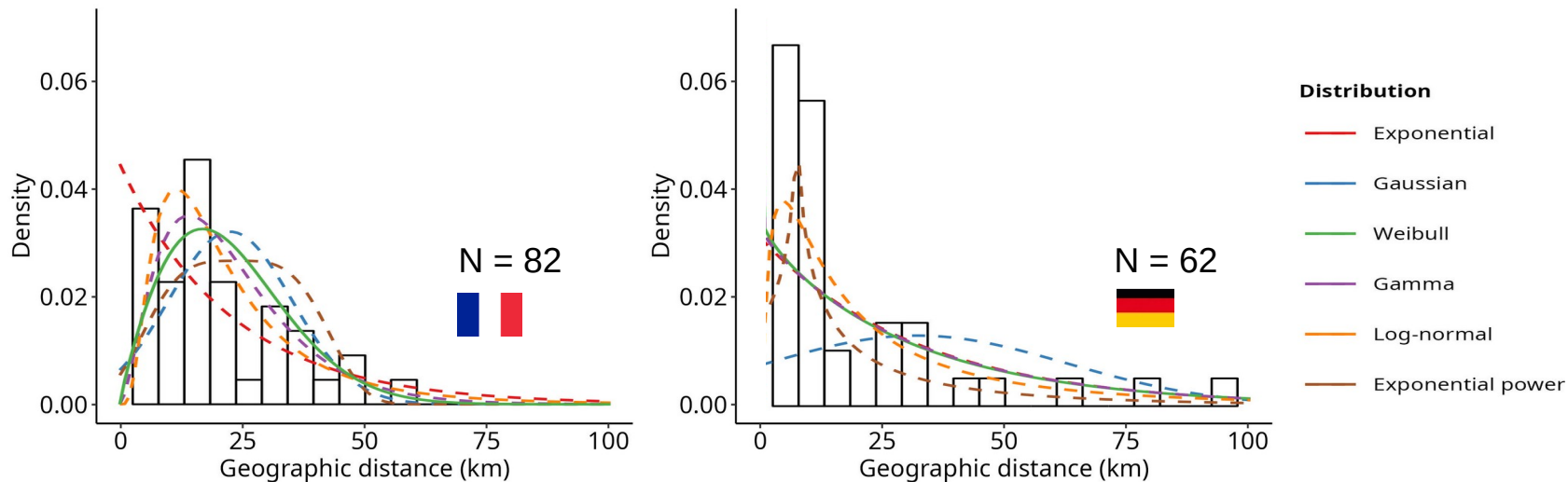
Gametic = natal + dispersal
~20-30 % Intra-colonial mating



Natal dispersal → population assignment of fathers (STRUCTURE)

The complete gametic dispersal

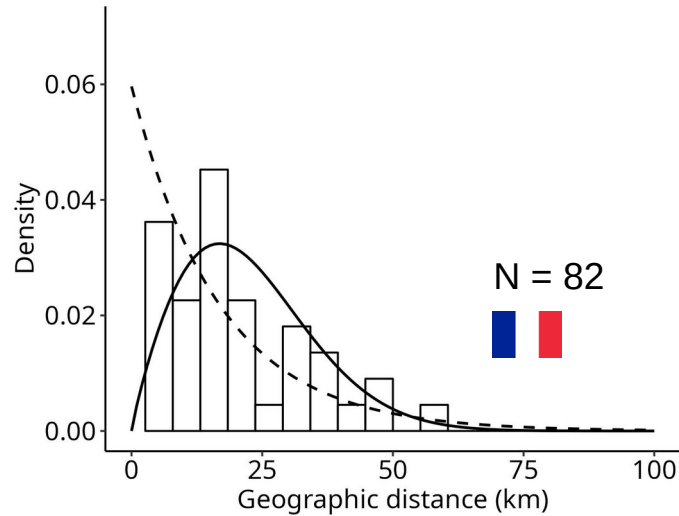
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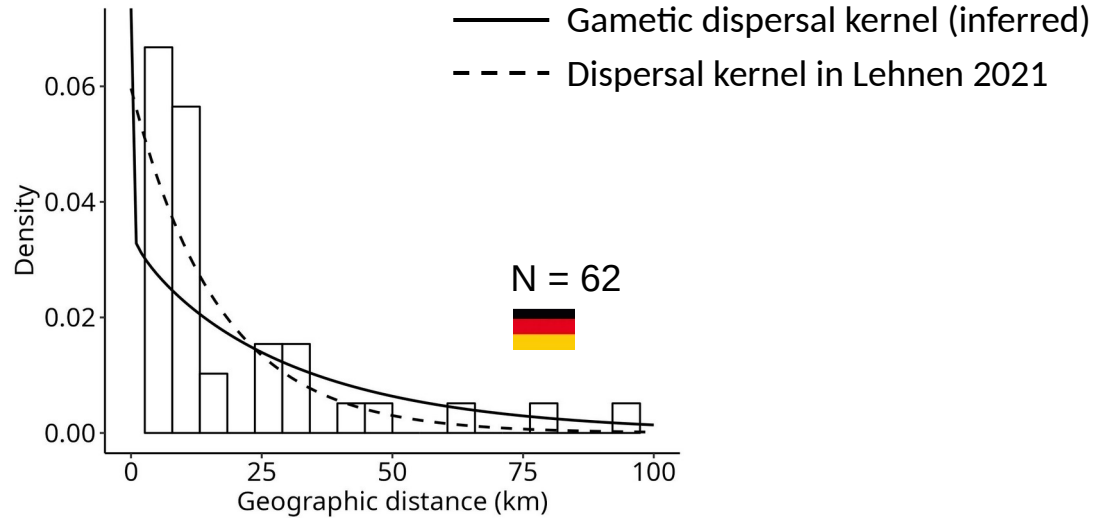
Best AICc/BIC → **Weibull**

The complete gametic dispersal

Gametic = natal + dispersal



Mean distance = 17.6 km



Mean distance = 22.2 km

Short distance dispersal

Mating & gametic dispersal distances shorter than in similar species
Rare long distance events

Intra-colonial mating (male philopatry)
A rare pattern in bats



Parentage assignment is powerful to study dispersal

Detect transient/cryptic movements

Decouple gene flow and individuals movement

Separate natal and mating dispersal



Also applied to *Myotis myotis*
Foley *et al.* 2020, Mol. Ecol.

Thank you

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Sebastien Puechmaille, Lisa Lehnén
Gerald Kerth,...

Colleagues at ECOBIO lab

You (for listening and questions)



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New Results

The geometry of gametic dispersal in a flying mammal, *Rhinolophus hipposideros*

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