Movers and Shakers: Modelling foraging distributions of agri-rural & urban Honey bees.

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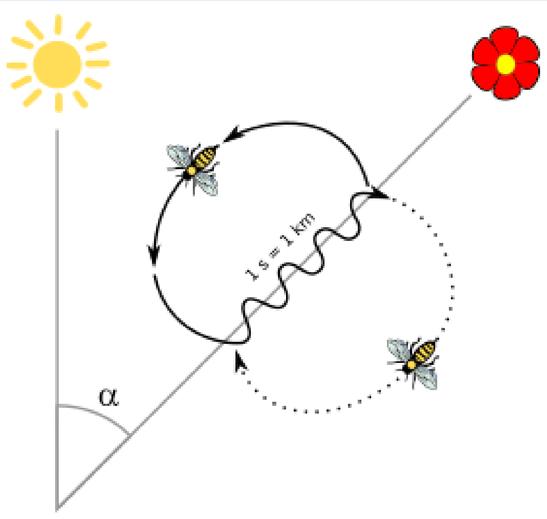
Rational: Global land use change is highly detrimental to pollinators; Understanding foraging behaviour in these altered environments is a key question.

Previous research found **differences in foraging distance** between **agri-rural and urban areas**, but we still don't know the **structure** of these differences.

Honey bees provide an ideal study system. We can **evesdrop** on the **waggle dance**, which they use to **communicate resource locations,** to build distributions of where the hive as a whole is foraging in different environments.



Methods: Foraging distances were decoded from **414 waggle dance observations** from **urban** and **agri-rural hives**.

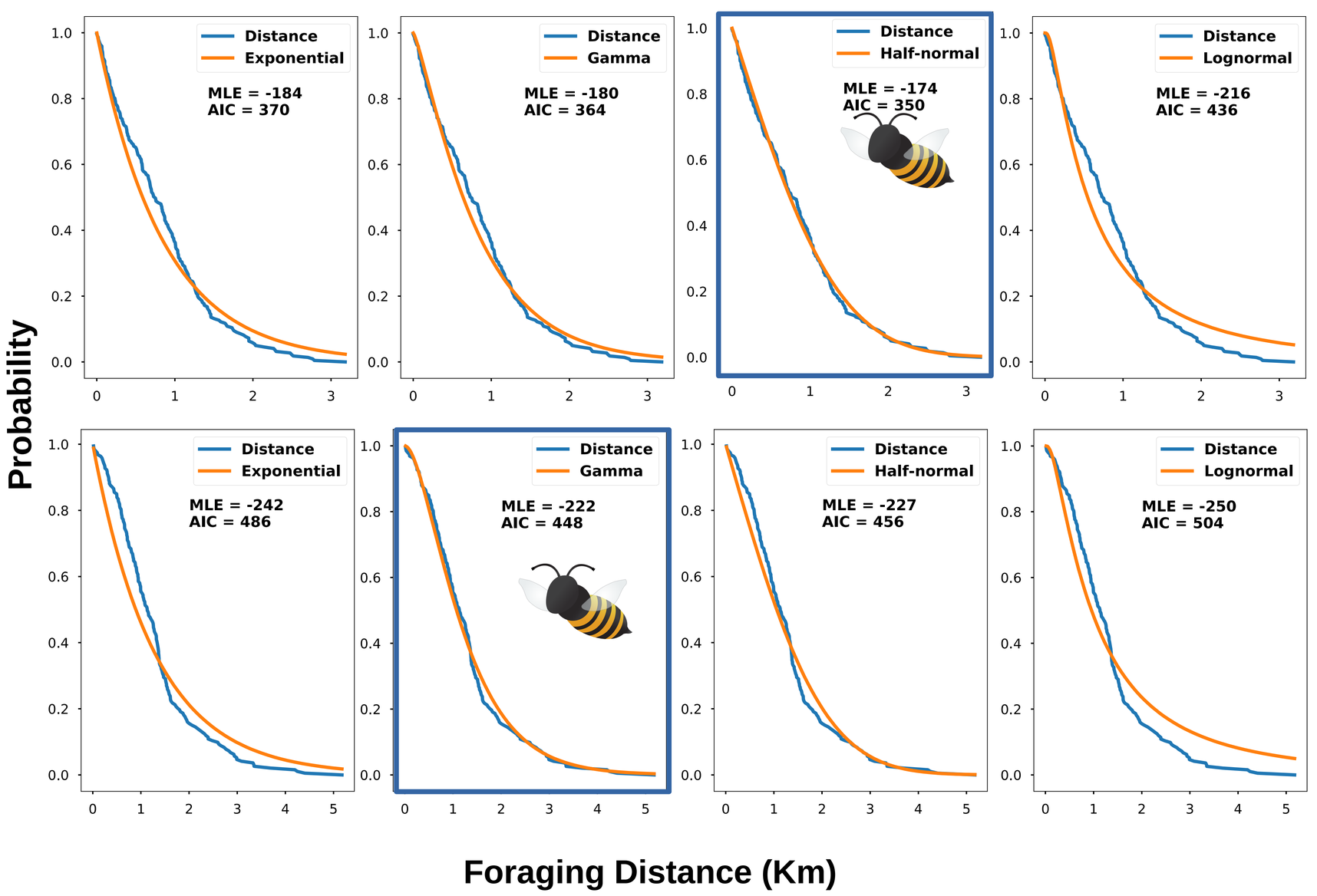
Using **Maximum Likelihood** we fit 4 **distributions** to the foraging data and compared each fit using **AIC**:

Exponential, Gamma, Half-Normal, Log-Normal

These distributions were chosen for their contrasting **properties**, capturing **normal** and **power law like** movement distributions.

Results: Urban & Agri-rural Honey bees show different foraging distributions

= Best fitting model



Discussion: Honey bees forage along a gamma distribution in agri-rural and a half-normal distribution in urban environments.

This suggests the type of environment has the capacity to influence the scales at which honey bees forage.

There are multiple different **mechanisms** which could influence this behaviour [1] such as:

Difference in resource patches, 3D landscape structures, Increased travel costs [2].

By developing methods to identify the **relative contributions of movements at different scales** we aim to better quantify honey bee foraging patterns in **different environments** in order to build more effective **mechanistic** models.

References

[1] Olsson, O., Brown, J. S., & Helf, K. L. (2008). A guide to central place effects in foraging. Theoretical Population Biology, 74(1), 22-33. doi:10.1016/j.tpb.2008.04.005

[2] Olsson, O., Bolin, A., Smith, H. G., & Lonsdorf, E. V. (2015). Modeling pollinating bee visitation rates in heterogeneous landscapes from foraging theory. Ecological Modelling, 316, 133-143. doi:10.1016/ j.ecolmodel.2015.08.009

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