Bats track pests and reduce plant damage in rice fields Iqbal Bhalla

Objective: To identify the temporal drivers of insectivorous bat activity over rice fields, and measure their impact on the rice crop.

Part 1: Exclusion experiment

Methods

- Five pairs of experimental-treatement plots over a rice season in Tezpur, Assam, India.
- Bamboo frames measuring 9m*9m*4m, with nets that were folded up at dawn and unfurled at dusk.

Data:

- Mid season: Degree of **defoliation** and degree of **yellowing** on 30 randomly selected plants per plot (30 * 10 plots).
- End season: **Total yield** of 900 plants, harvested by hand, from each plot.



Results:

- Significant difference in one measure of plant damage between experimental and control plots.
- No significant difference in total yield.

Conclusion:

- Exclusion experiments cannot perfectly insulate the crop against the influences of bats, therefore don't represent a bat-free ecosystem.
- Logistical challenges limit the number of replicants which affects statistical power.

Part 2: Acoustic analysis

Methods

- 48 nights of recording captured 18890 passes at six locations.
- Ambient noise averaged from all six sites was used as a proxy for vocal insect activity.



• Classified into six FM-QCF sonotypes, which called at:

1. 20kHz	2.31kHz	3. 34kHz
4. 38kHz	5. 47kHz	6. 61kHz

• **GLMM**s examined the drivers of bat activity.





What is bat activity driven by?

1. Moonlight (-ve) – S20, S34, S38, S47, S61

- 2. Minimum temperature (+ve) S20, S31, S34, S38, S47, S61
- 3. Minimum temperature squared (-ve) S31
- 4. Insect noise (proxy for insect activity) (+ve) S31, S34, S47
- 5. Interactions of the above: S20, S31, S34, S38, S47



Standardized activity of six sonotypes over a rice season. Six Audiomoth recorders collected this data at six sites adjacent the experimental-treatment plots of the exclusion experiment. Light blue line represents minimum nightly temperature.

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