

STOP COUNTING - IMAGE-BASED MONITORING OF ARCTIC ARTHROPODS

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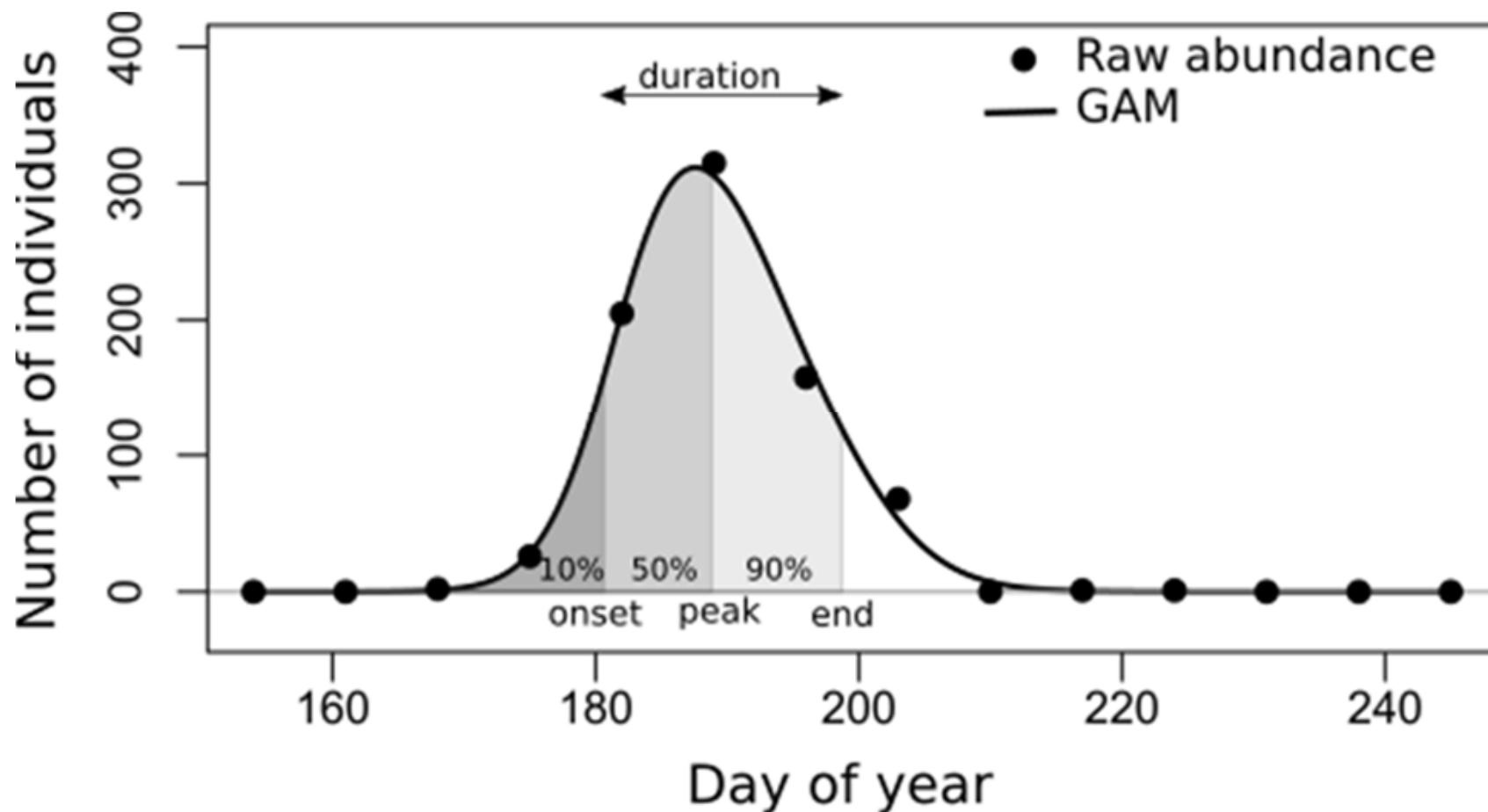
ARCTIC BIODIVERSITY CONGRESS
10. OCTOBER 2018

THE SPATIAL AND TEMPORAL DOMAINS OF MODERN ECOLOGY

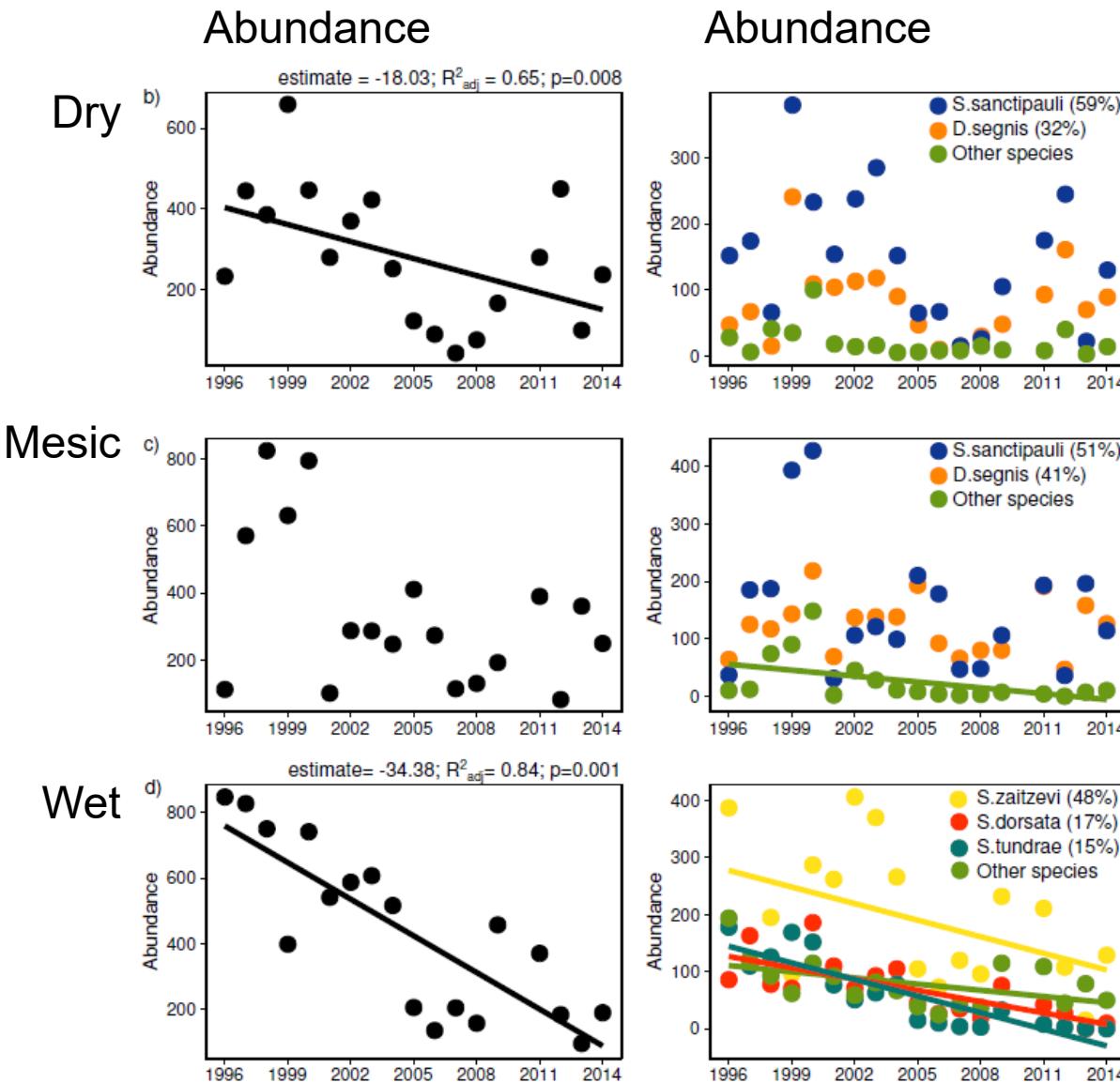
Estes et al. (2018) *Nature Ecology & Evolution*:

- ▶ To understand ecological phenomena, it is necessary to observe their behaviour across multiple spatial and temporal scales
- ▶ We found that observational scales were generally narrow, because *ecologists still primarily use conventional field techniques*
- ▶ We found a large gulf between the scales at which phenomena are actually observed and the scales those observations ostensibly represent

TEMPORAL RESOLUTION OF OBSERVATIONS MATTERS

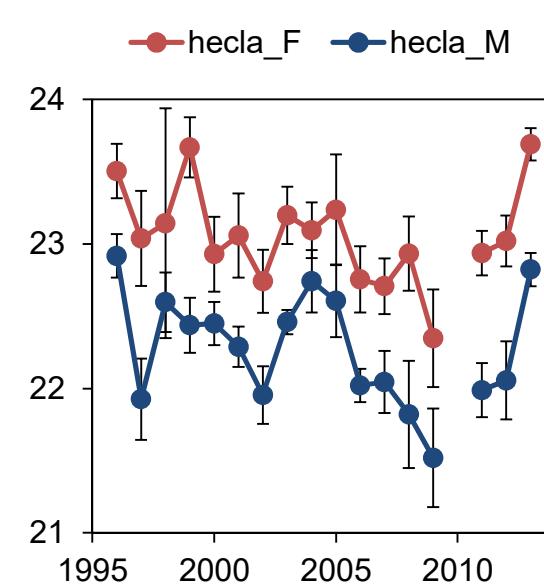
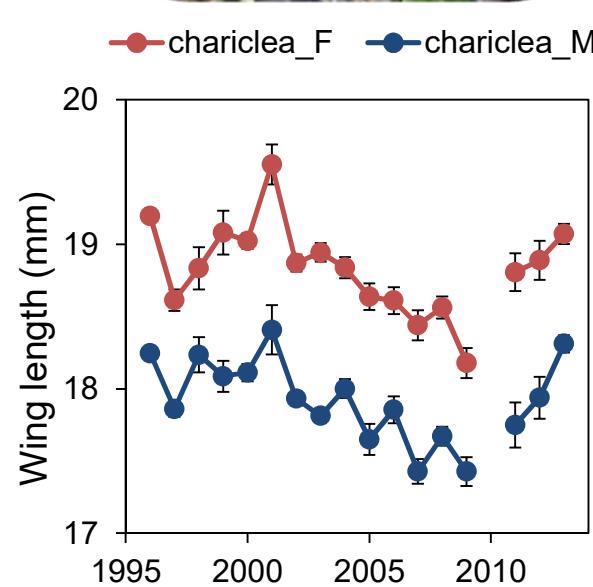


SPATIAL AND TAXONOMIC RESOLUTION MATTERS



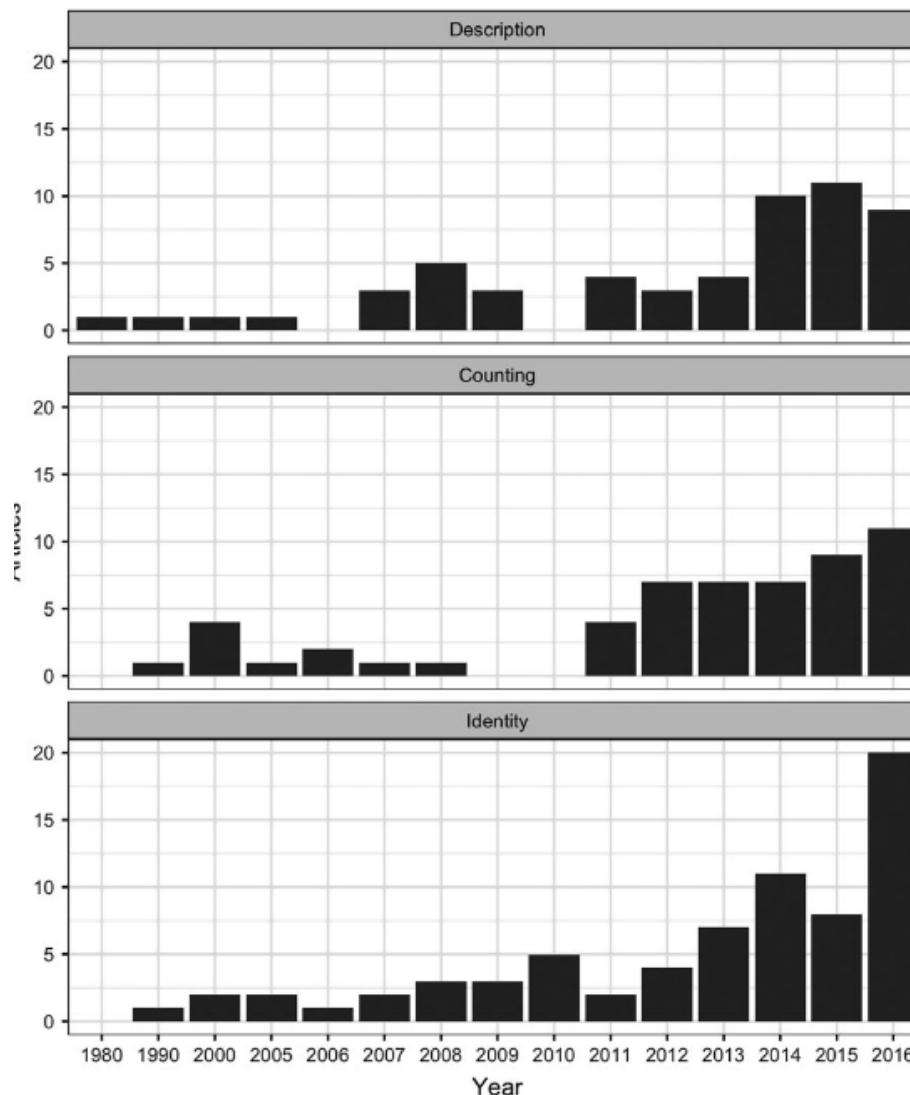
MORPHOLOGICAL VARIATION MATTERS

- ▶ Morphological responses to climate change are rarely studied
- ▶ Body size of butterflies declines with warmer temperatures
- ▶ Whenever we measure interannual variation, we find it

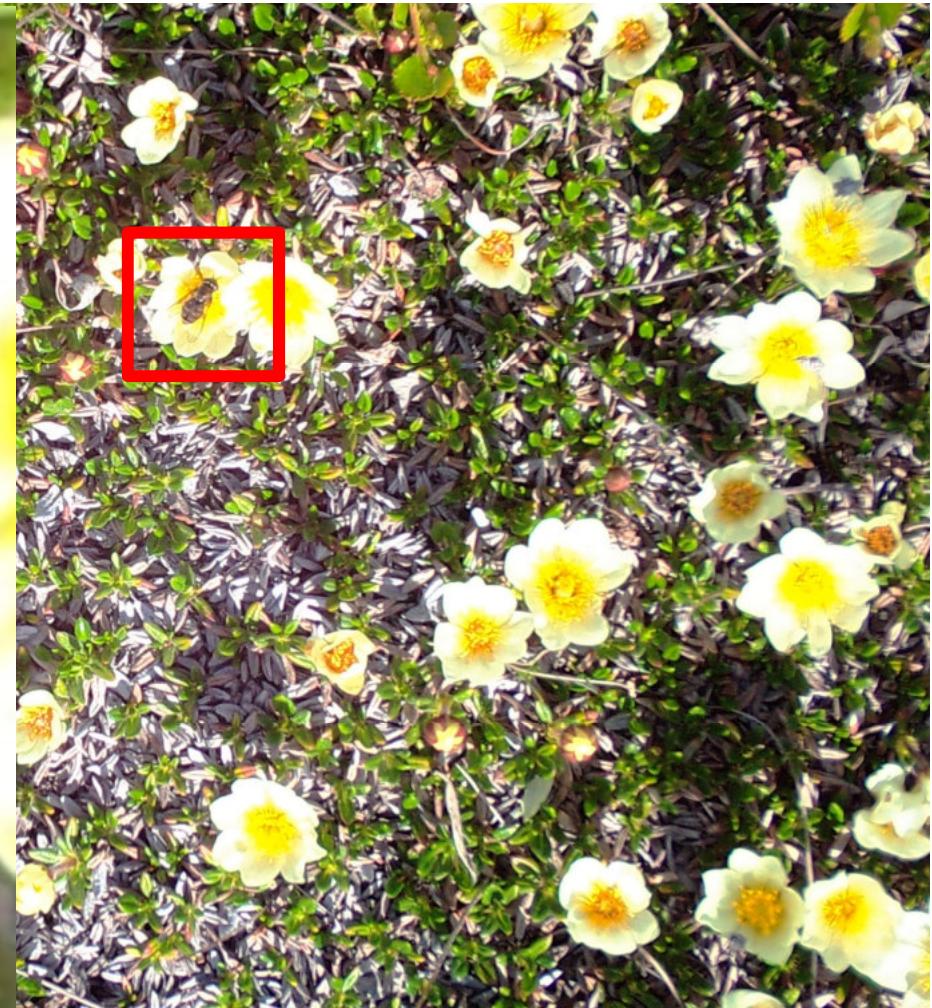
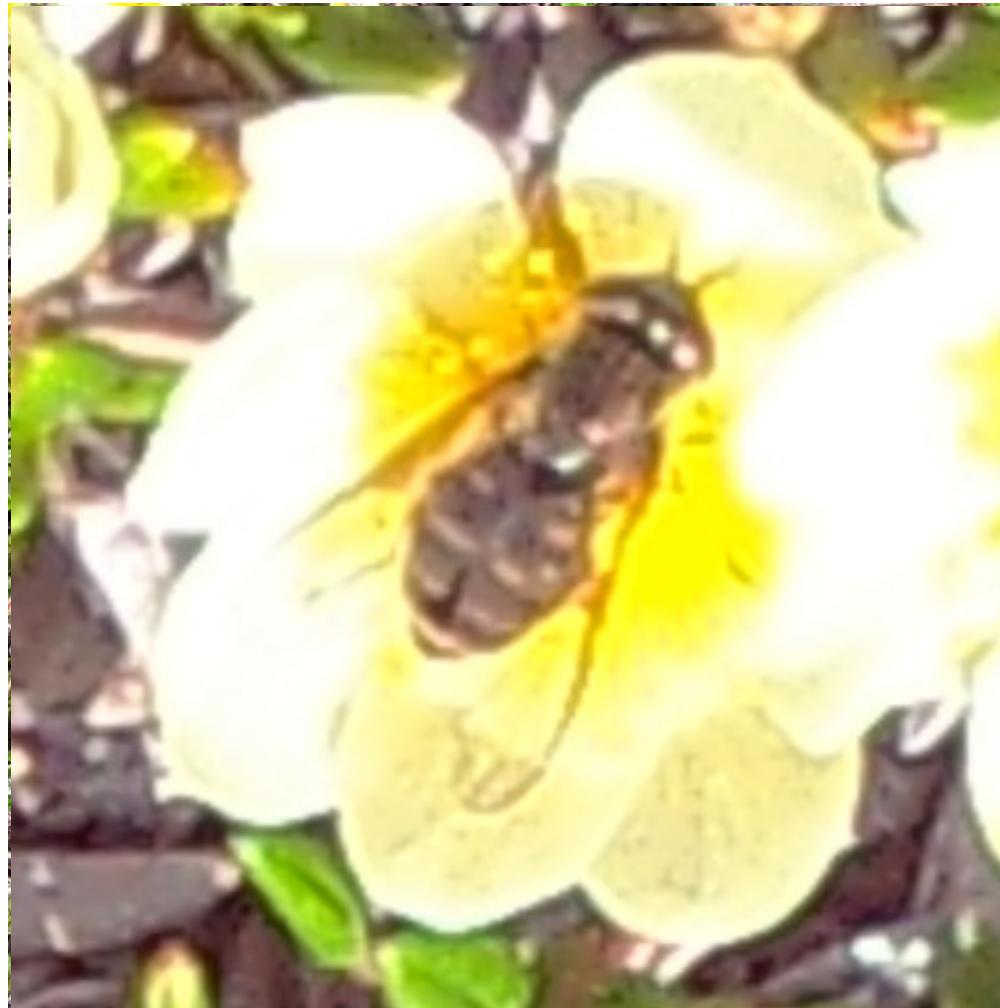


Bowden et al. (2015) Biol. Lett.

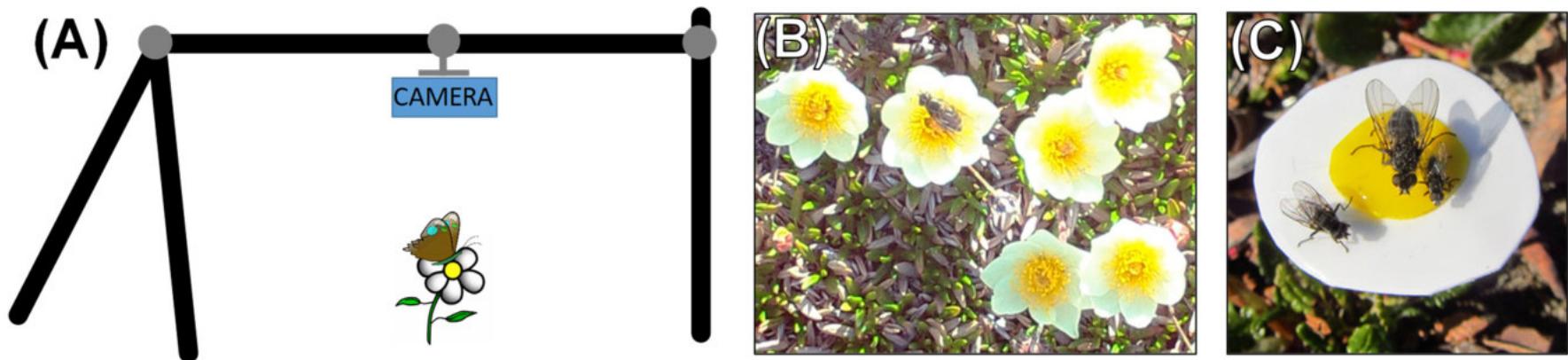
COULD WE LET THE COMPUTER MEASURE, COUNT, AND IDENTIFY?



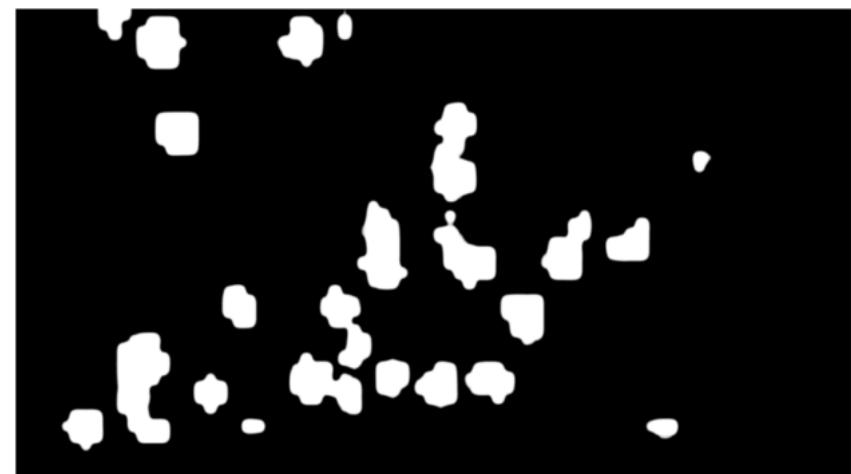
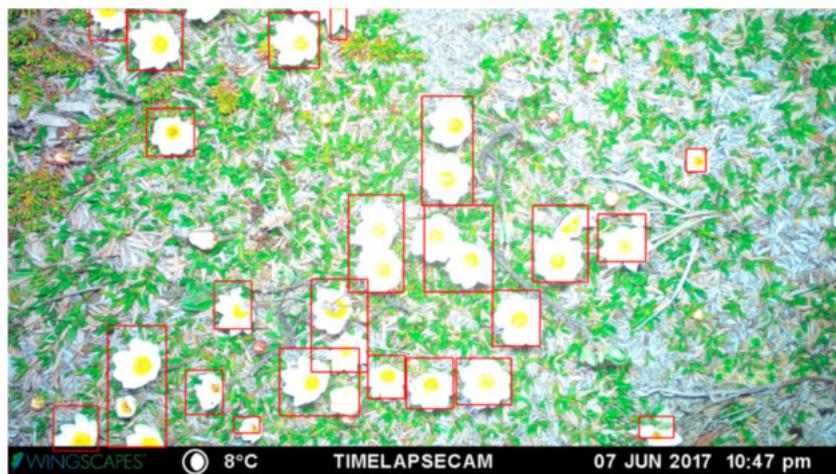
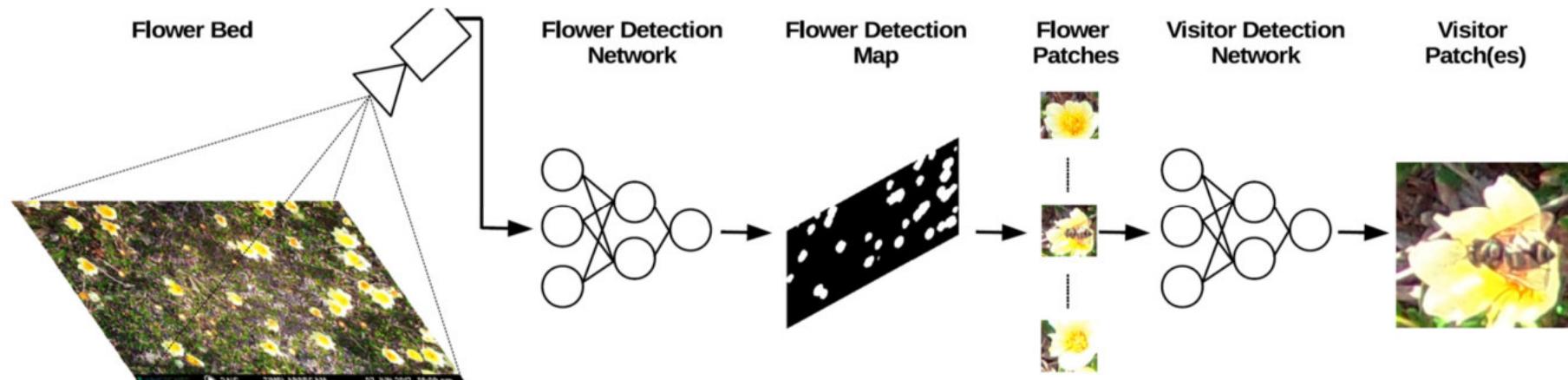
CAN WE DEVELOP NEW IMAGE-BASED MONITORING TOOLS FOR ARTHROPODS



CAMERA TRAPS SHOULD BE SIMPLE, STURDY AND ENABLE VALIDATION



BUILDING AN ANALYSIS PIPELINE



Tranh et al. (2018)

FLOWER PHENOLOGY & INSECT VISITATION



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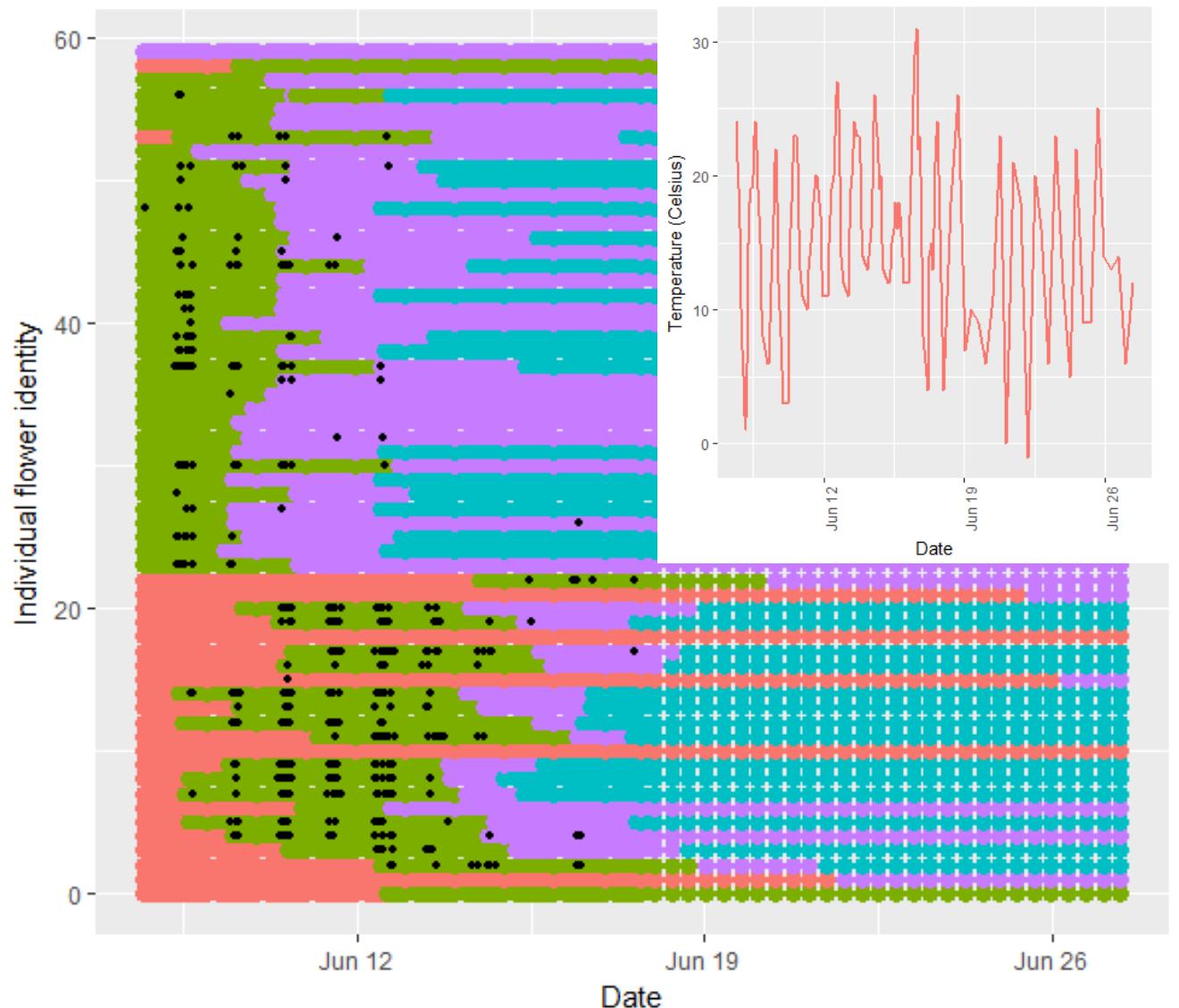


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TIMELAPSECAM

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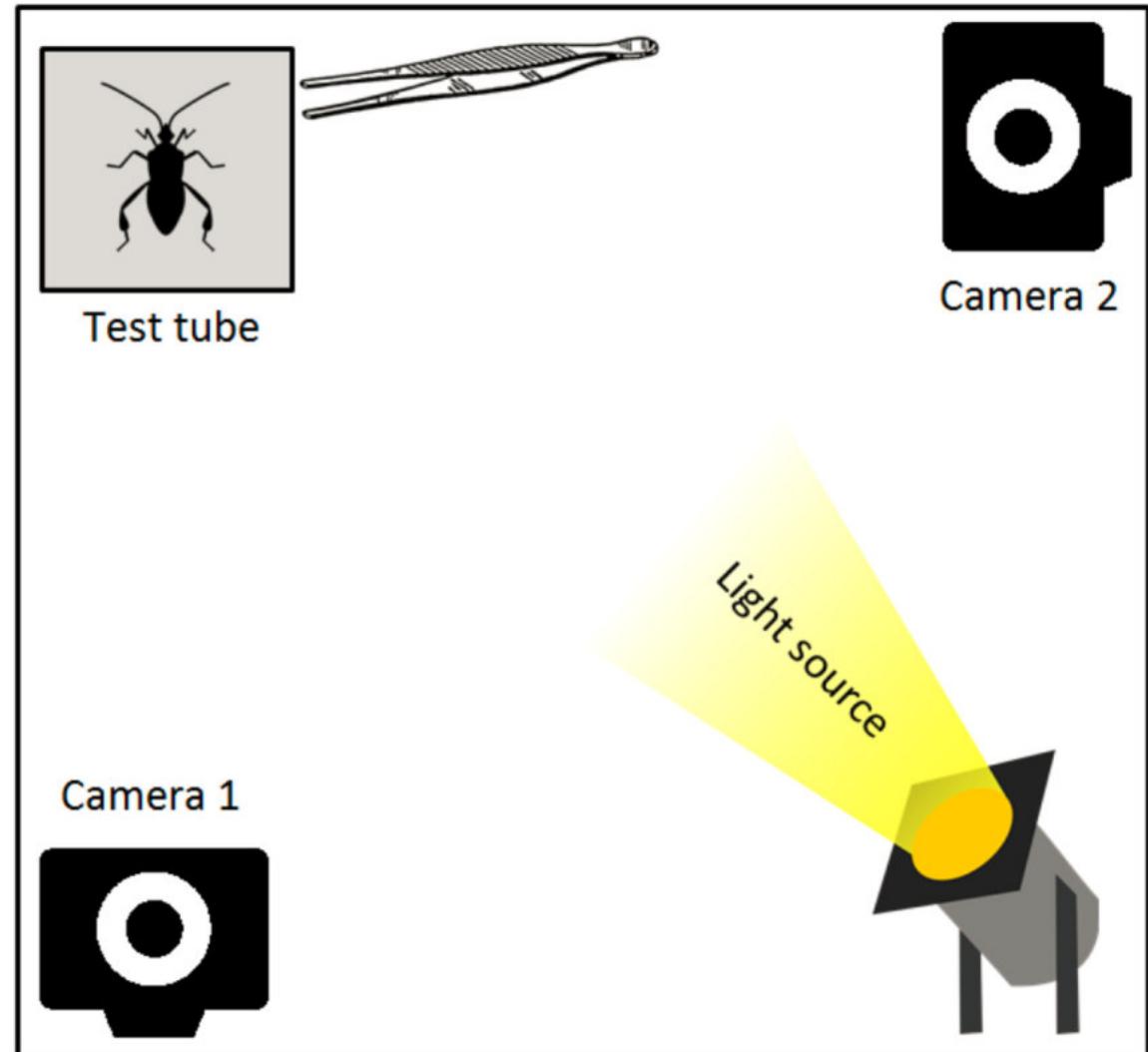
QUANTIFYING FLOWER PHENOLOGY INSECT VISITS ONE FLOWER AT A TIME



Høye et al. (unpublished results)

SPECIES IDENTIFICATION IN THE LAB - ON PAR WITH HUMAN EXPERTS

- ▶ Convolutional neural networks provide the highest accuracy (93.4%).
- ▶ Ten taxonomic experts scored an average (92.7%)



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THANKS FOR YOUR ATTENTION

