



RESEARCH DIRECTIONS AND COLLABORATIVE OPPORTUNITIES USING A NEWLY ESTABLISHED HONEY BEE APIARY IN THE SANTA RITA EXPERIMENTAL RANGE



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Outline

- Summary of what continuous data show us
- Exploring weight and temperature data from our apiaries
- Overwintering experiment at SRER
- Pesticide exposure experiment at SRER



Continuous weight data shows changes in:

- **Forager activity** from changes in the amplitude of the hourly detrended weight;
- **Colony population growth and foraging success** by comparing changes in daily weight variability with changes in running average weight;
- **Swarming** shown as a spike in detrended weight, followed by sharp decrease;
- **Colony decline** from decreases in both average and detrended weights.

References:

- Buchmann S.L., Thoenes S.C. 1990.** The electronic scale honey bee colony as a management and research tool, *Bee Sci.* 1:40–47.
- Hambleton J.I. 1925.** The effect of weather upon the change in weight of a colony of bees during the honey flow, *USDA Dept. Bull. No. 1339.*
- Meikle W.G., Holst N., Mercadier G., Derouané F., James R.R. 2006.** Using balances linked to dataloggers to monitor honeybee colonies, *J. Apic. Res.* 45: 39-41.
- Meikle W.G., Rector B.G., Mercadier G., Holst N. 2008.** Within-day variation in continuous hive weight data as a measure of honey bee colony activity, *Apidologie* 39: 694-707.

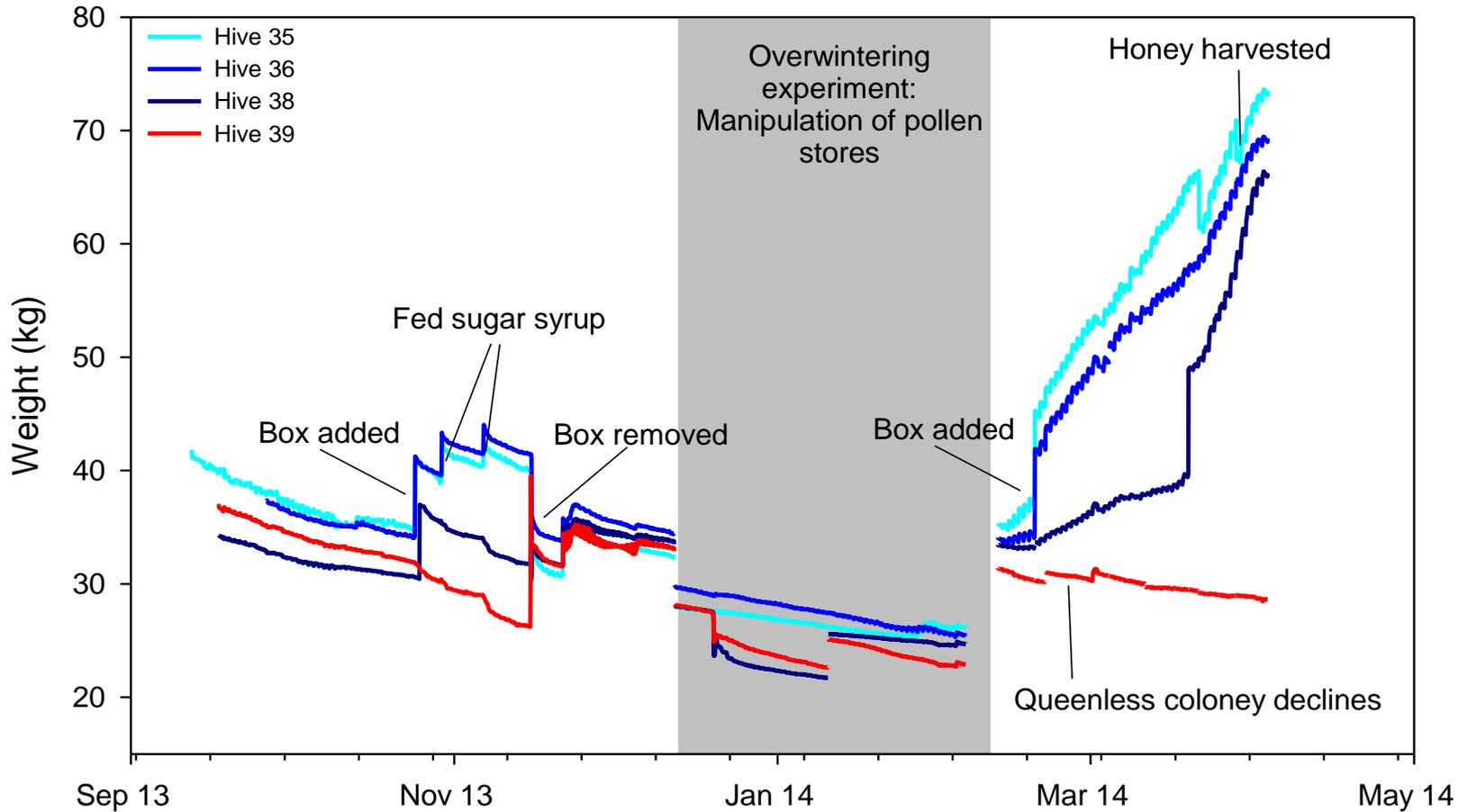
Arizona apiaries:

Carl Hayden Bee Research Center
Tucson, AZ



Santa Rita Experimental Range
near Green Valley, AZ

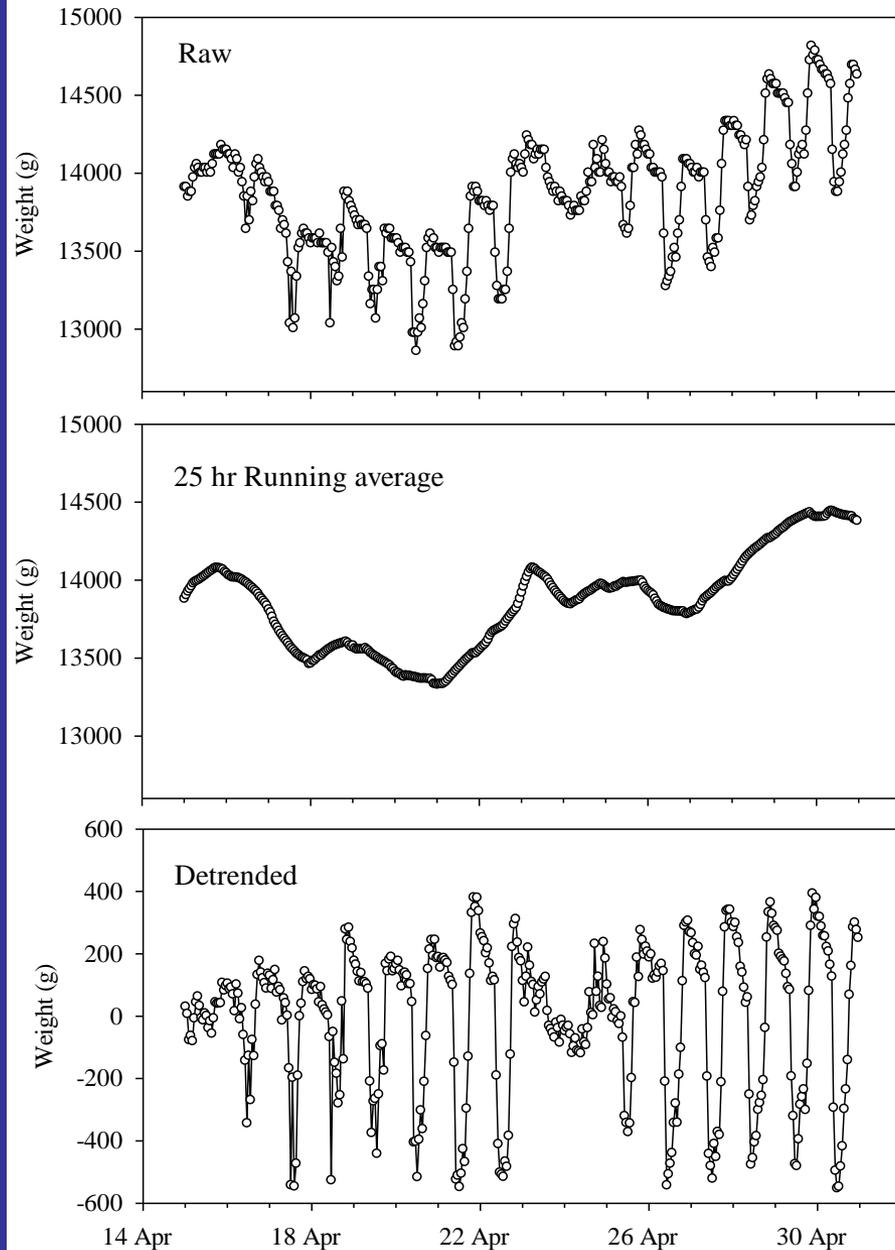
Continuous weight data from hives at SRER



A 15-day sample of **Raw data**.

The 25-hour running average for the same data sample.

The **detrended data** for that sample, calculated simply by subtracting the running average from the raw data.



Allocating hive weight among bees, brood and food resources

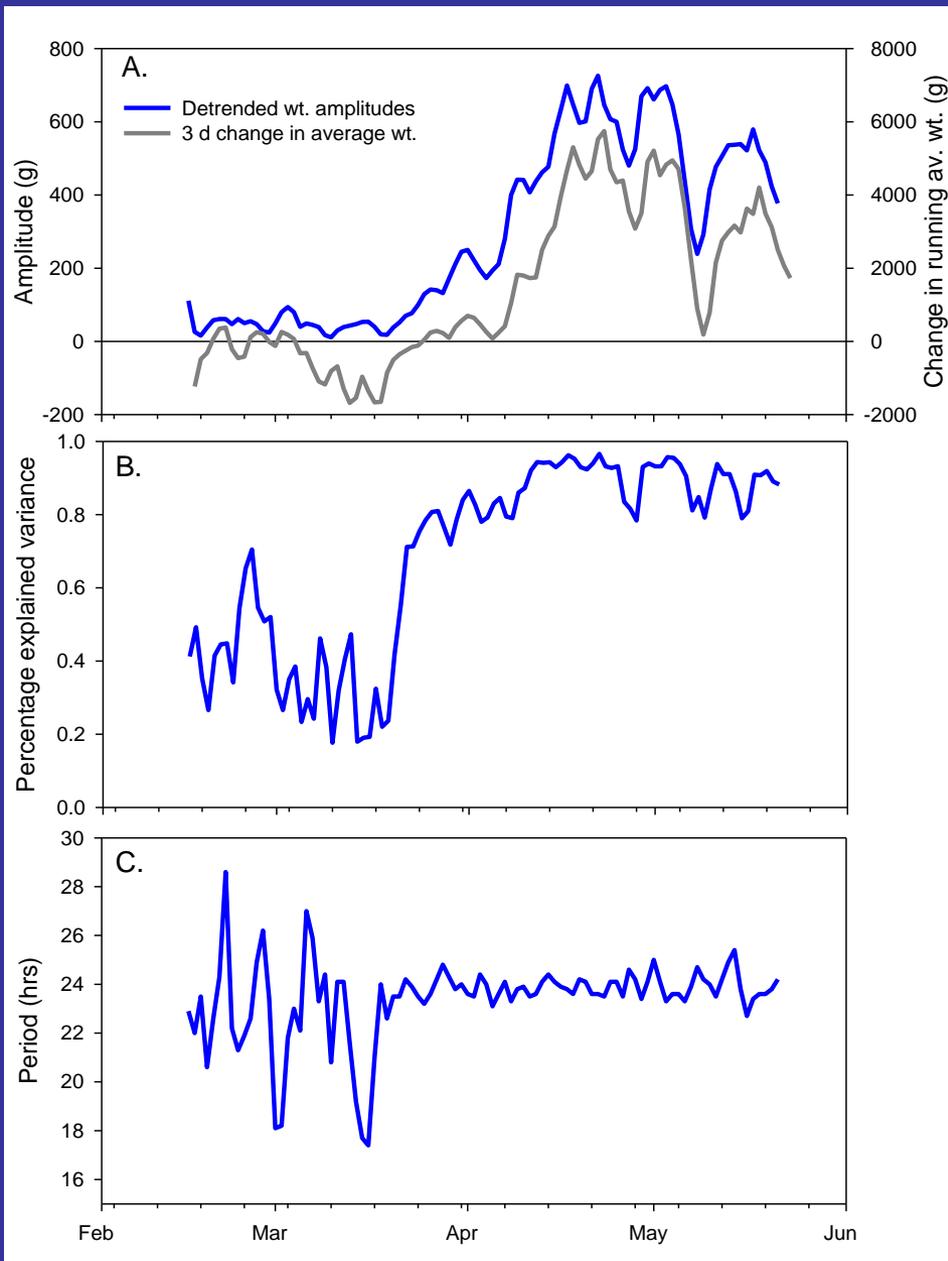
Adult bee mass: weigh the hive and then the parts after shaking them free of bees. Divide by average adult bee weight to get bee population size.

Brood mass: weigh frames and then analyze photos to determine brood density and proportion of frames covered by brood.

Food mass: same as for brood mass



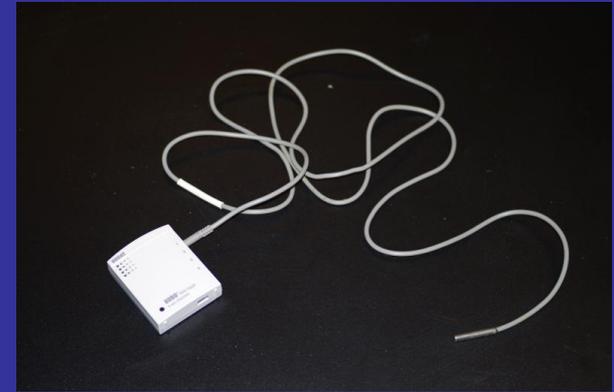




Monitoring temperature & humidity:

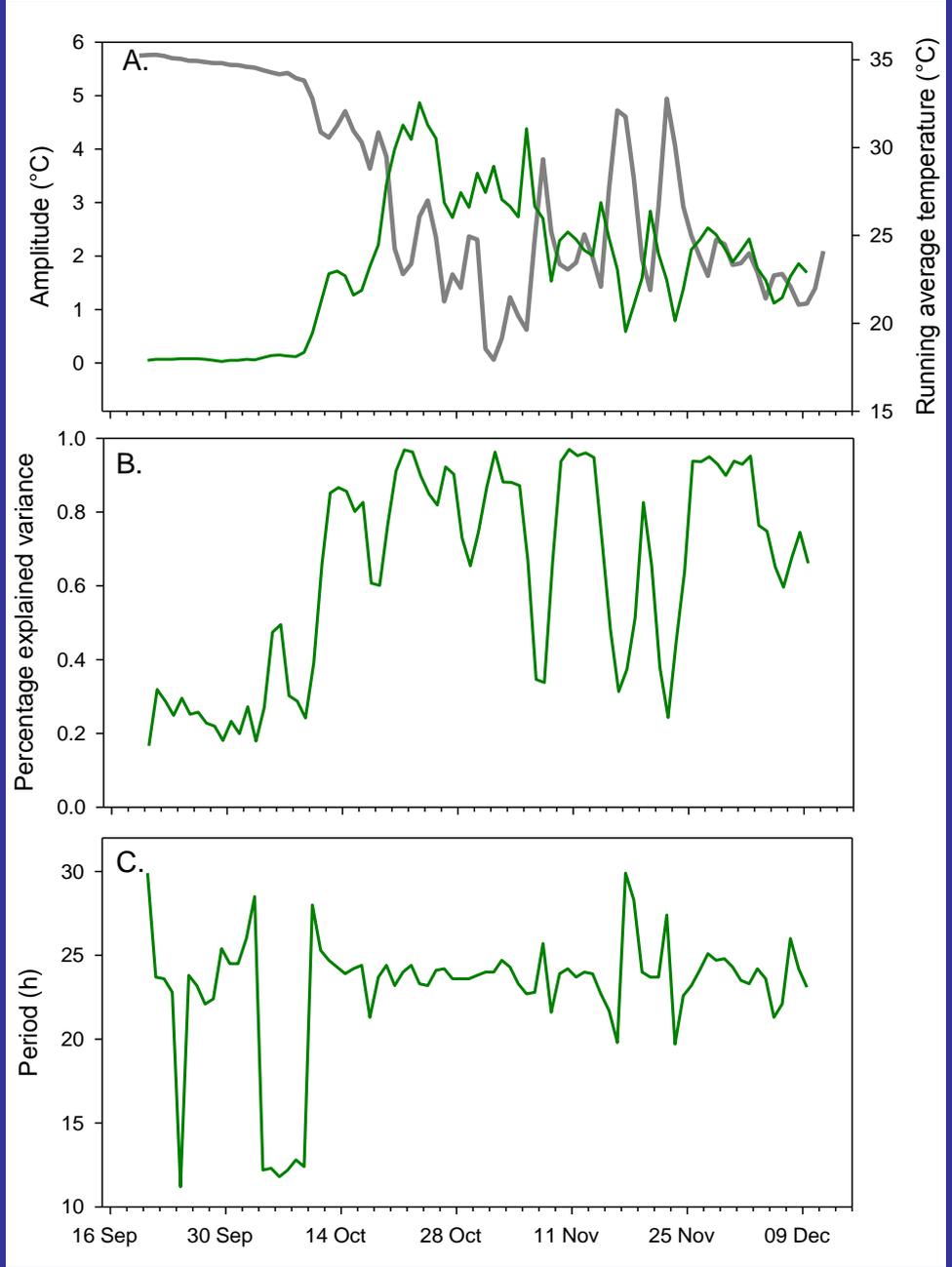


Temperature and humidity sensor with integrated data logger



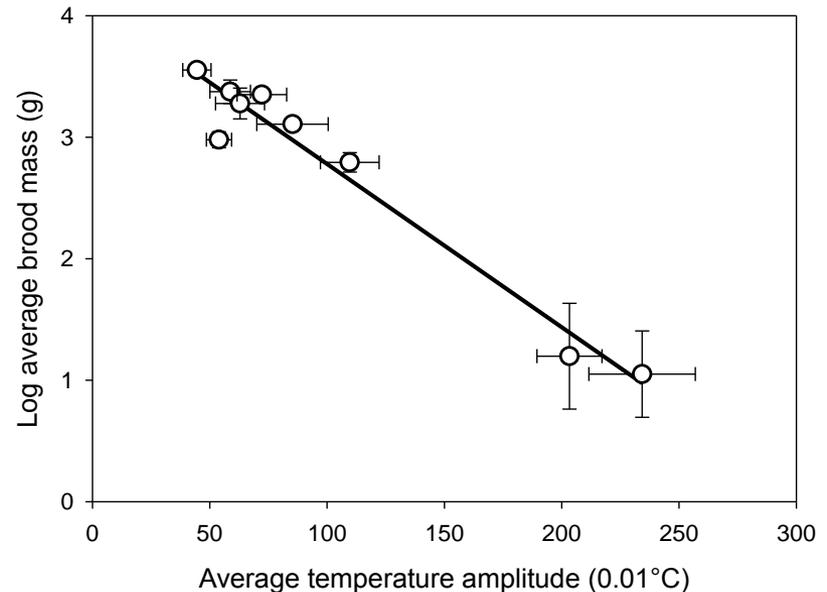
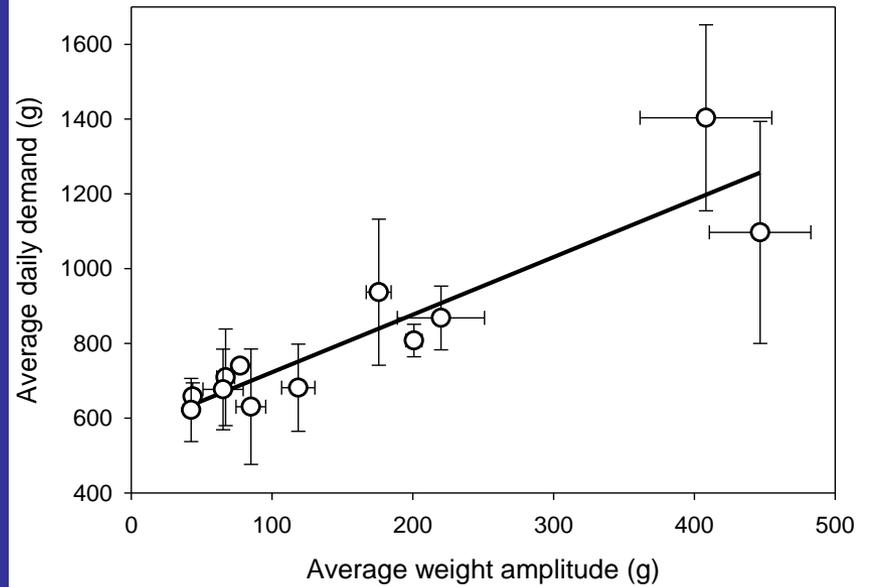
Data logger with attached temperature sensor cable





Detrended weight amplitude is related to the adult bee population and
Detrended weight amplitude is related to brood mass

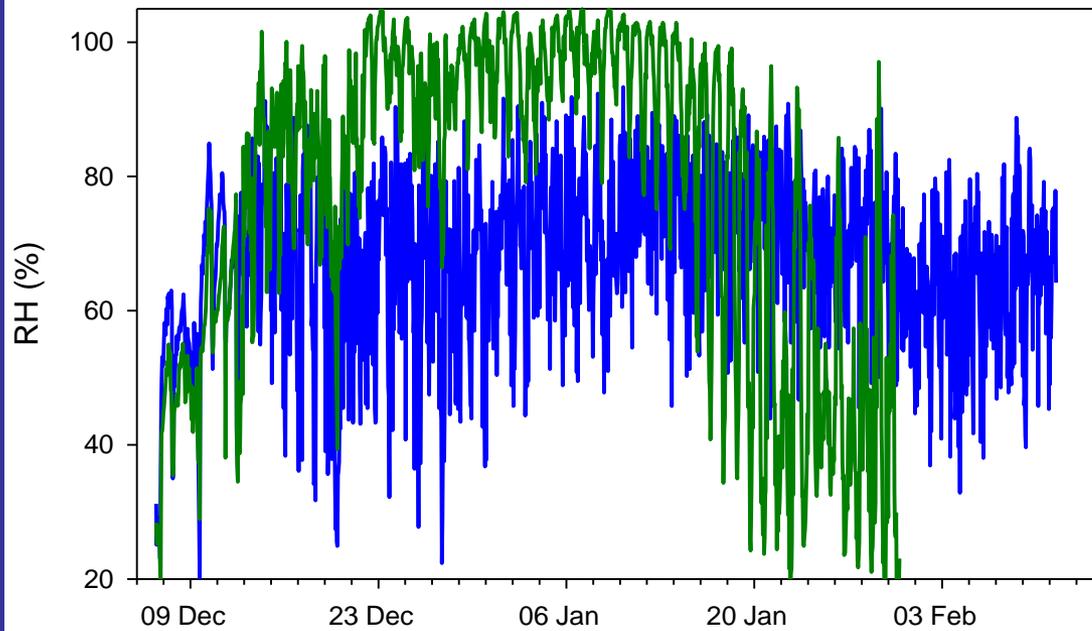
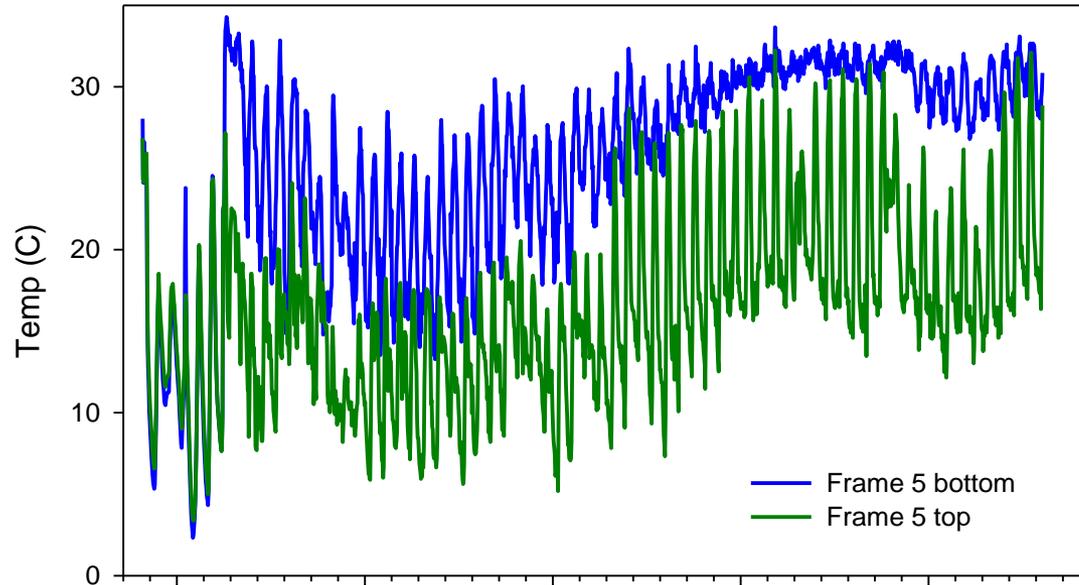
Each point is the average of 3-4 hives at a given sampling occasion at one of 2 locations.
Adjusted $r^2=0.81$ for weight and 0.95 for temperature



Overwintering: Manipulating the locations of pollen stores in collaboration with the Kirk Anderson lab

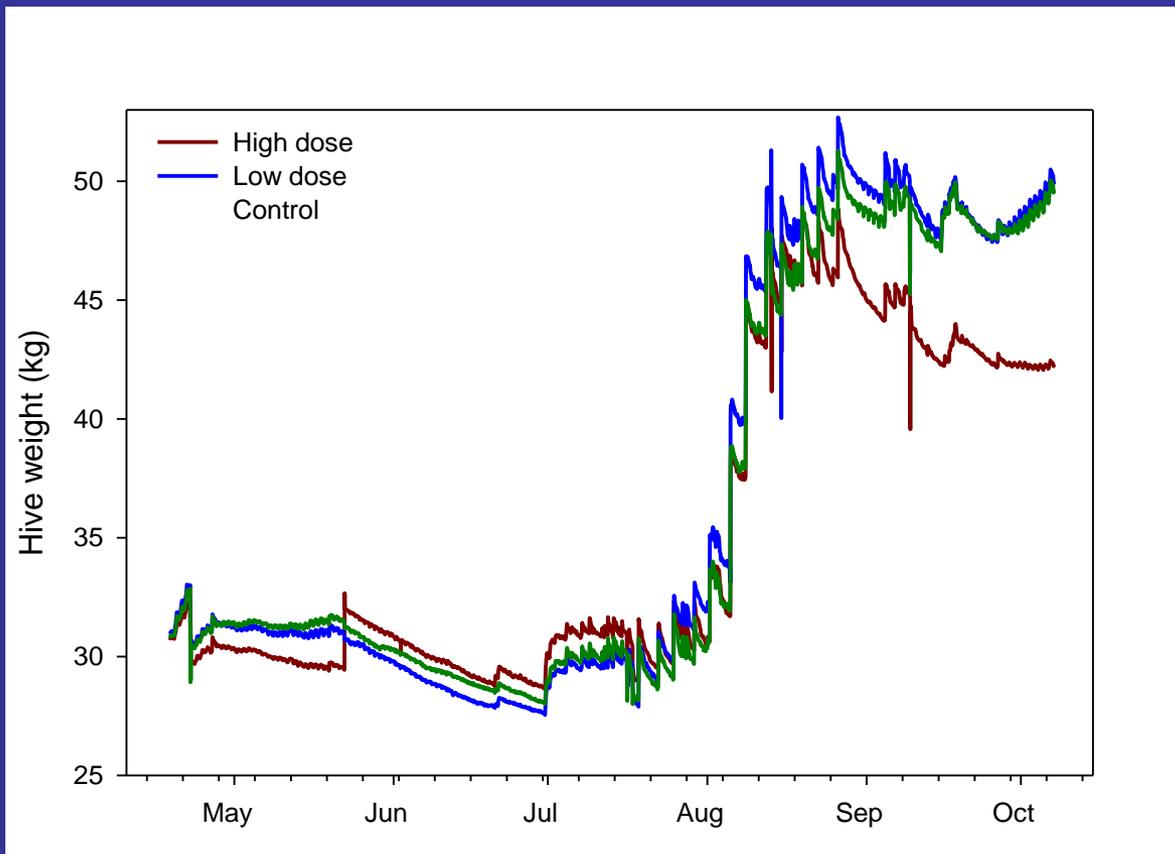


Hive 36 SRER



Pesticide effects on the colony growth and activity in collaboration with the Mark Carroll lab





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