

# Monitoring bumble bee populations in a changing world

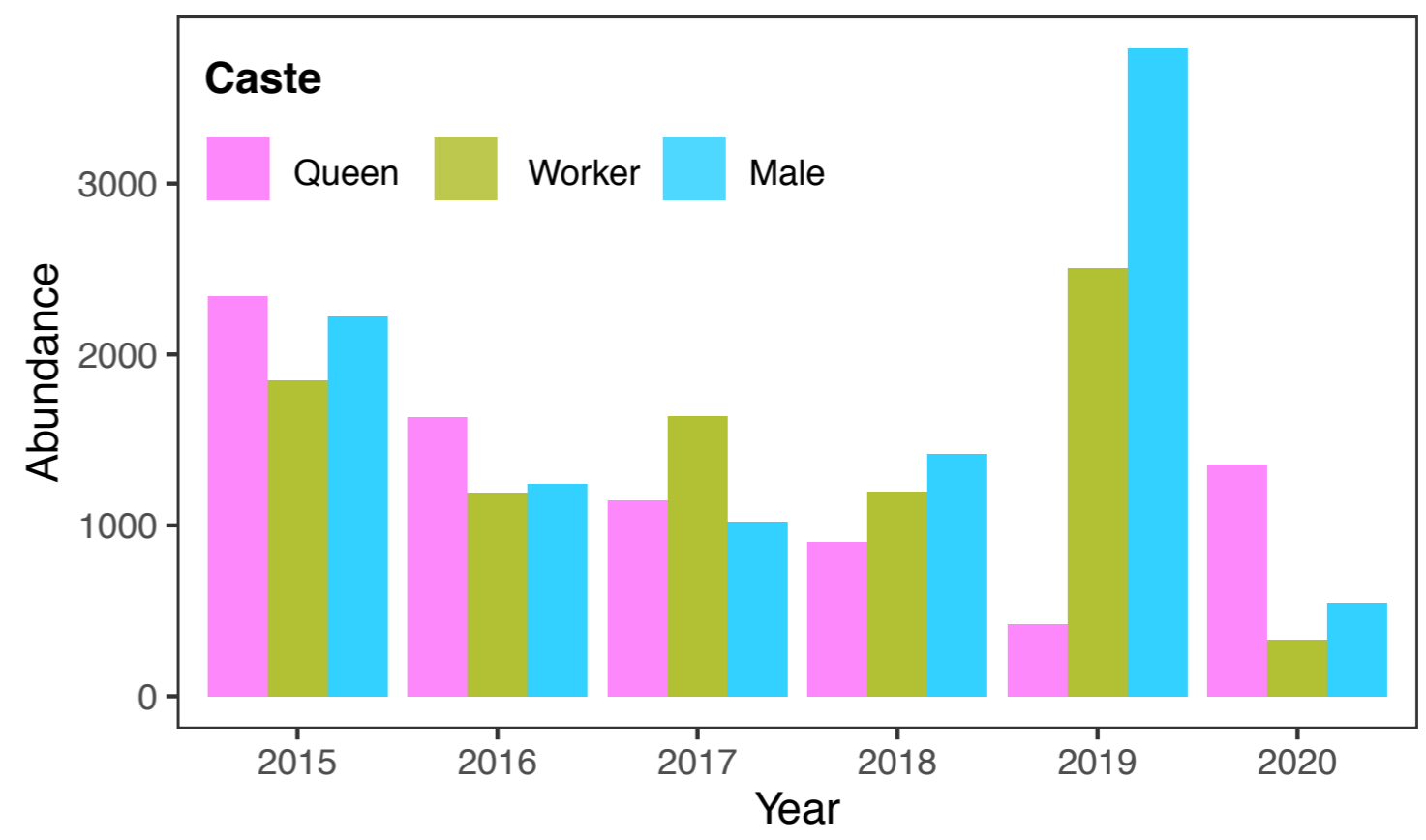
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Bumble bees are ecologically and economically important pollinators<sup>1</sup>, but have experienced rapid declines in recent decades<sup>2,3</sup>. In the Colorado Rocky Mountains, we have been monitoring bumble bees to better understand the drivers of population changes.

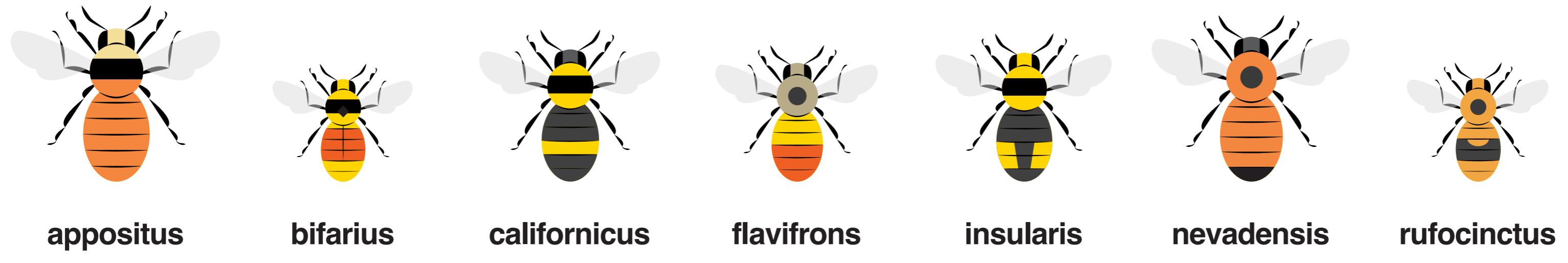
At the Rocky Mountain Biological Laboratory in Gothic, CO, we have been monitoring bumble bees since 2015. Bumble bees are social and distinct castes: queens, workers, and males. Each caste is unique. Queens are reproductive females, and workers are sterile females. Males immediately leave the colony and look for queens to mate.

Bumble bee abundance varies by year and caste



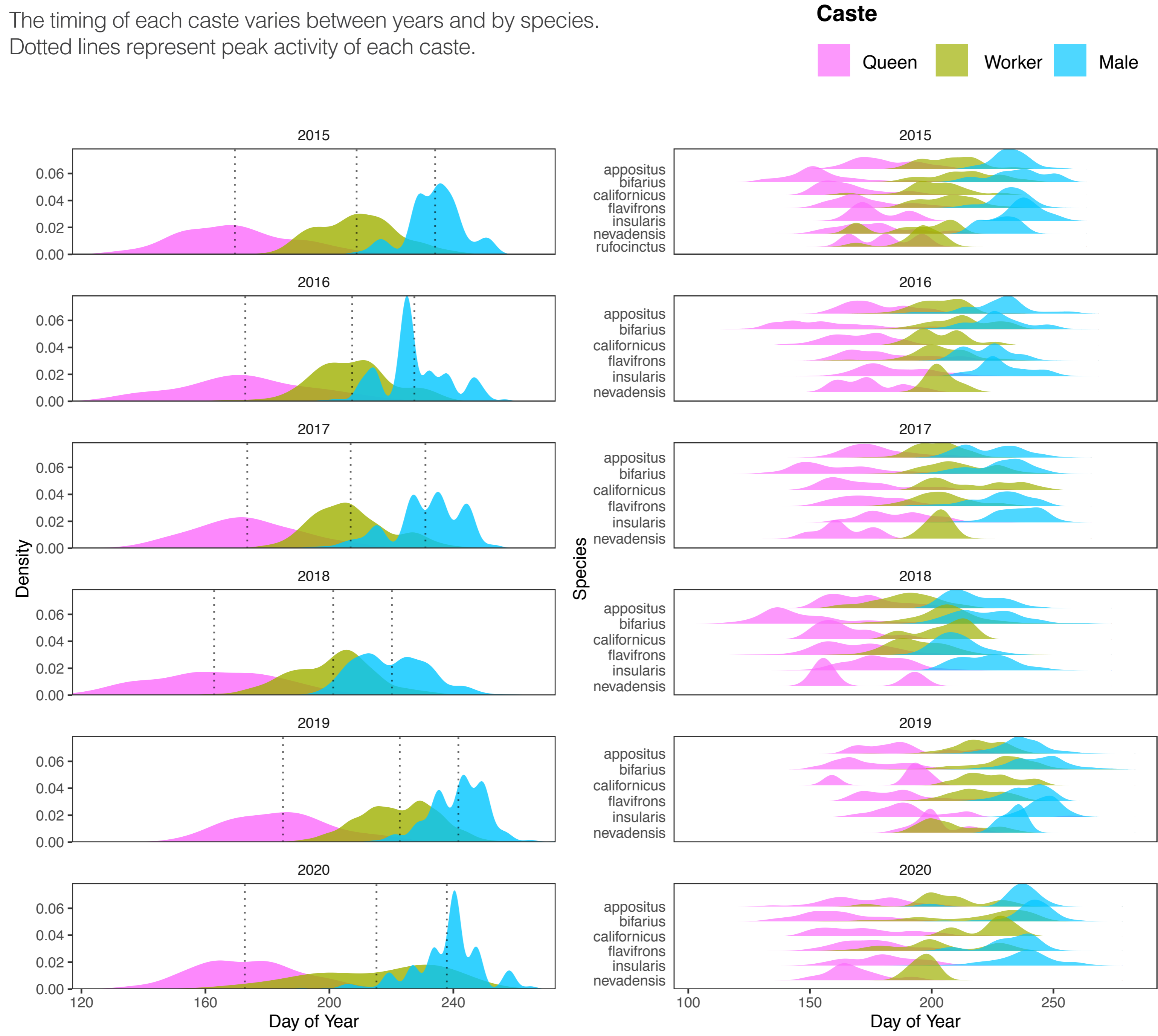
## Focal species

The seven most common bumble bee (*Bombus*) species in the East River Valley, CO. These species represent a wide range of body sizes, timings, and behavior.



## Bumble bee timing varies by year and species

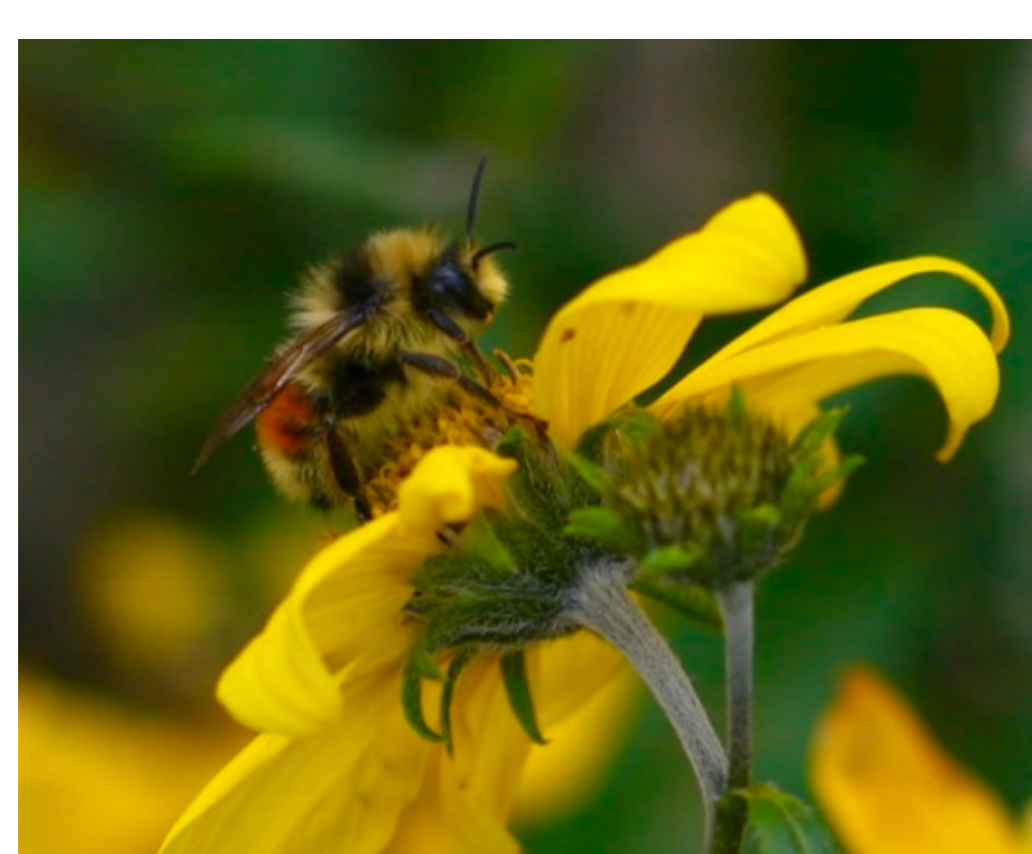
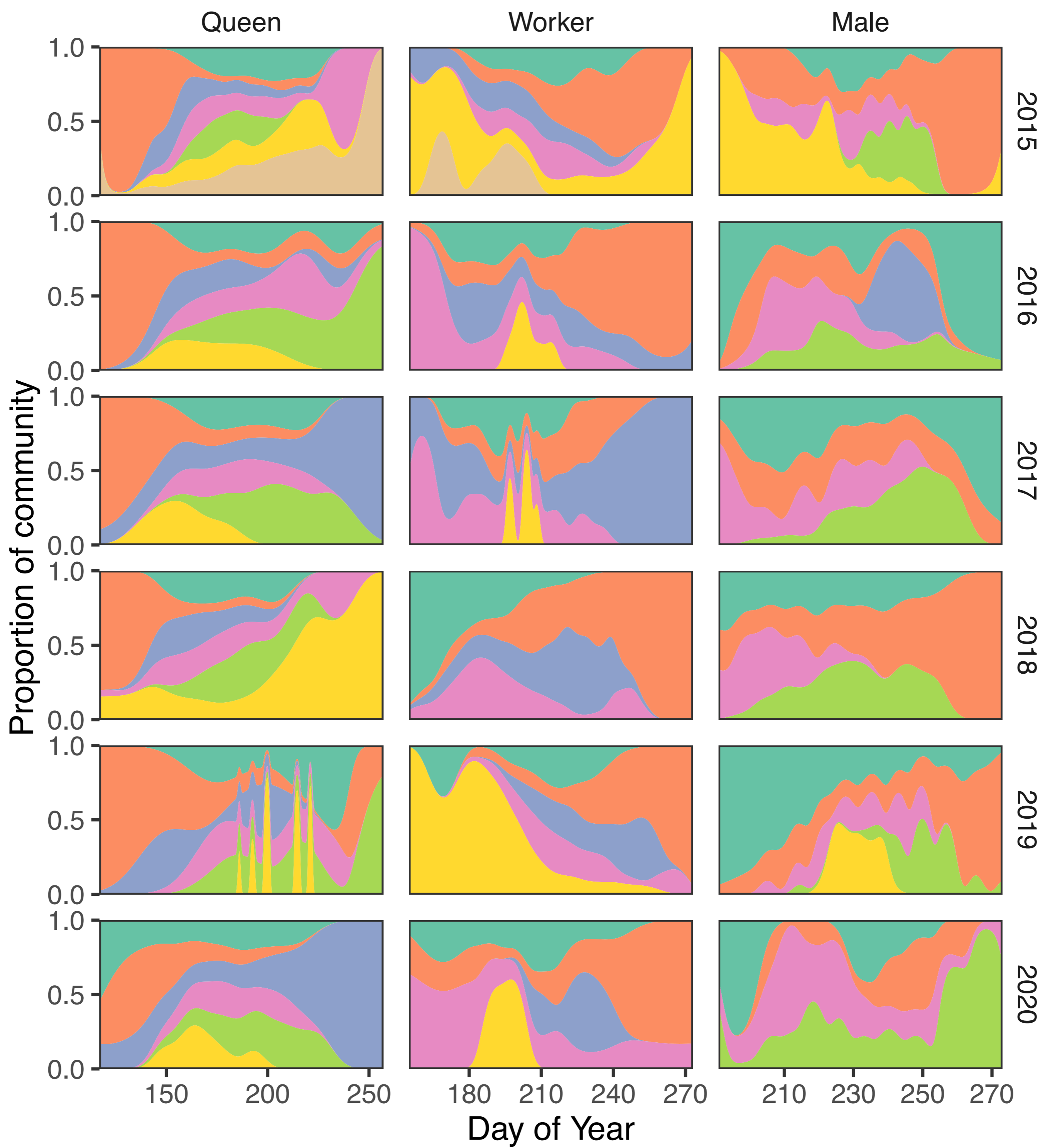
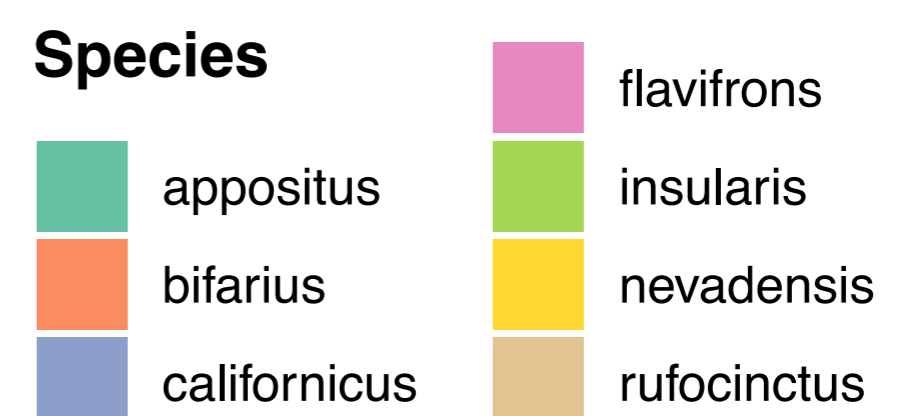
The timing of each caste varies between years and by species. Dotted lines represent peak activity of each caste.



## Bumble bee community composition varies by year

In early spring when the Rocky Mountains are largely under snow, the first bumble bees emerge. *Bombus bifarius* is the earliest species, and the most common species until mid-June when later species emerge.

The relative abundance of species is highly variable from year to year and within caste. Although the species in the bumble bee community remain the same, the timing and relative abundance of those species changes.



## Conclusions

There are more than 250 bumble bee species worldwide<sup>4</sup>. Each of these species are unique and may respond differently to climate changes<sup>5</sup>. Even within species, each caste may respond differently<sup>6</sup>.

In order to predict future changes to bumble bee populations, we must first understand how bumble bees live their lives. By better understanding the basic ecology of bumble bees, the better we are able to protect them from extinction.

### References

1) Potts, S. G. et al. Trends Ecol Evol 25, 345-353 (2010); 2) Soroye, P., et al. Science 367, 685-688 (2020); 3) Arbetman, M. P., et al. Proc Biol Sci 284, (2017); 4) Michener, C. D. The bees of the world. Vol. 1 (JHU press, 2000); 5) Williams, P. H. & Osborne, J. L. Apidologie 40, 367-387 (2009); 6) Ogilvie, J. E. & P. J. CaraDonna, in preparation