



Bee Informed Partnership: Sentinel Apiary Program

End of Year Report 2020

[12/22/2020]

College Park, MD

Dear Sentinel Participant,

Thank you for participating with us in the 2020 Sentinel Apiary Program! We are excited about another successful year, and about what's to come in 2021!

New for 2021:

- A new mobile app will allow Sentinel participants to enter data on their mobile devices. We designed the app to work as a management tool for you, to help you keep track of your colony health and management all year. It will also streamline the data entry and report generation process, so the lab will be able to prepare your reports more quickly.
- A new online dashboard will allow participants to access their results directly online. You will be able to see the same reports that you are used to, as well as new visualizations as we develop them. All of your past data will be available to you. We also made it possible for you to download your raw data at your convenience in table (Excel, csv) format.
- A continuation of our partnership with the American Beekeeping Federation. In 2019, we launched a sponsorship program with ABF, who generously provides \$100 off a Sentinel kit for the first 50 ABF members who sign up using the discount code. We are pleased to continue this partnership in 2021. If you are an ABF member, please contact ABF so they can provide you with this year's promo code for online registration.
- The introduction of a 12 colony kit. Participants will be permitted to split this kit among apiaries (as they will with the 4 and 8 colony kits this year) if they choose.
- An online forum for our Sentinel community. Past and present participants will be invited to join.

This report is a summary of the *Varroa*, *Nosema*, and colony metrics we collected in 2020.

In the spring of 2021, we will contact you to assess the state of your Sentinel colonies over the winter. From this data, we will build a final 2020 report including colony loss and management information.

We would like to emphasize what a pleasure it is to work with all of you. We feel incredibly fortunate to have such involved stakeholders who are so passionate about keeping healthy colonies and contributing to science. The data you provide is entirely unique and very important to investigating colony health and management practices. We hope you enjoy this report and keep on the lookout for more updates about the program and future studies!

Once again, we want to thank you for participating in the program this year.

Happy Beekeeping,



Rachel Kuipers,
Sentinel Apiary Program Coordinator



Nathalie Steinhauer,
Research Coordinator

And the whole Bee Informed Partnership Team.



Sentinel Apiaries

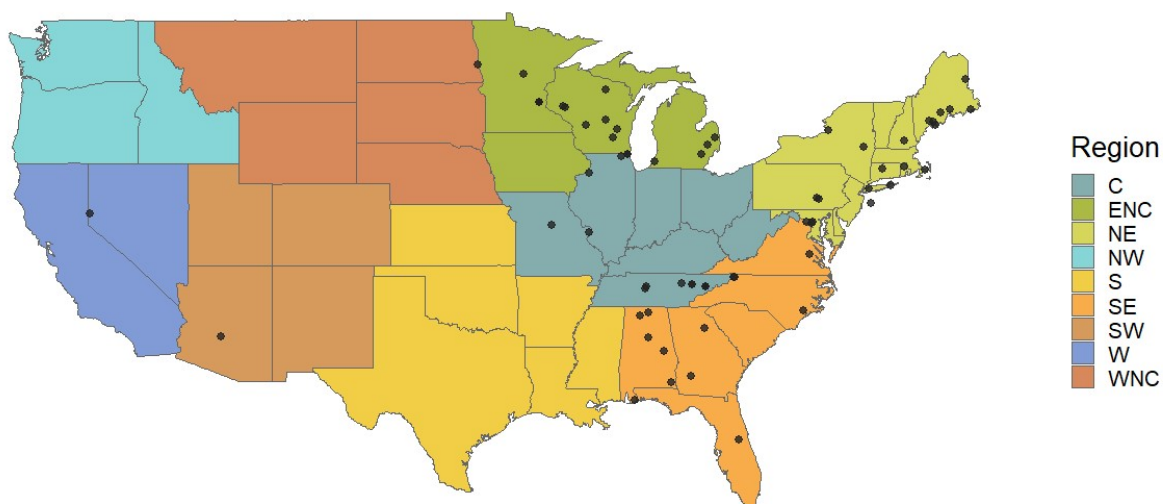


This year, 76 Sentinel apiaries were part of the program. They represented 394 colonies sampled throughout the active season. A total of 1,900 records were received and processed by the University of Maryland diagnostic lab between the months of April and November 2020.

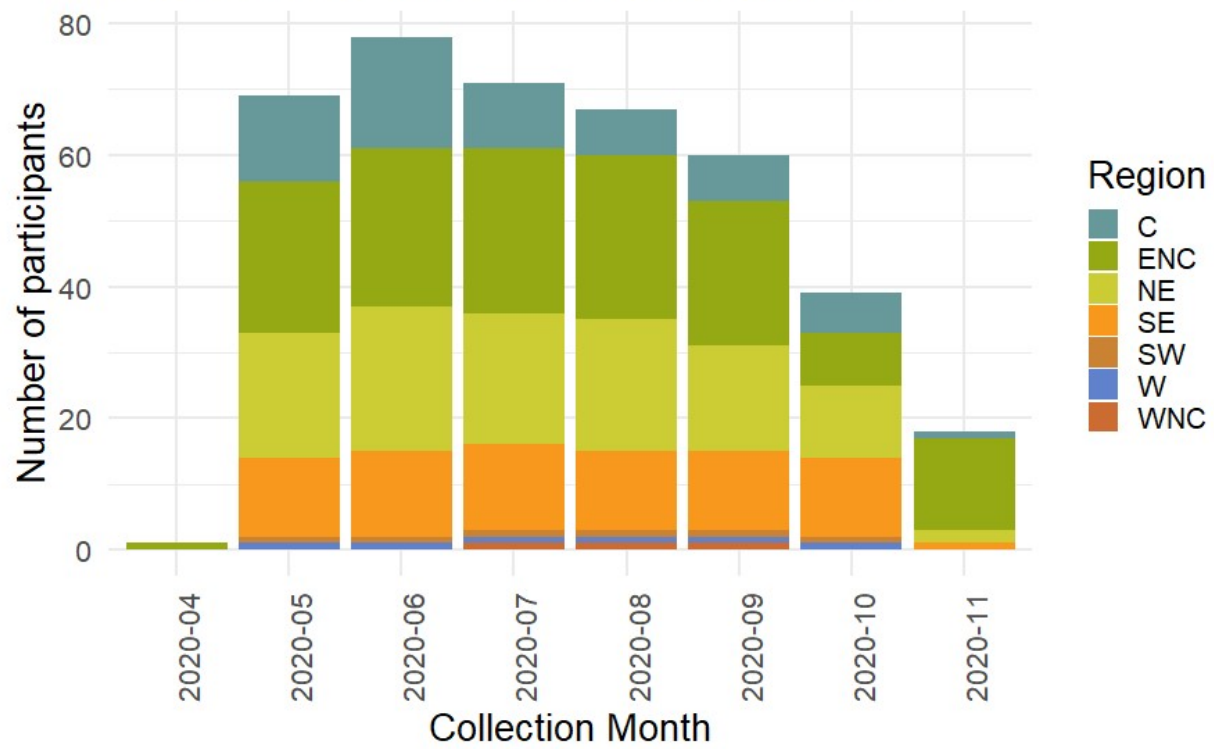
Most samples came from the East North Central and North East regions of the U.S. Still, we received samples from seven out of the nine NOAA climatic regions (<https://www.ncdc.noaa.gov/monitoring-references/maps/us-climate-regions.php>).

	C Central	ENC East North Central	NE North East	SE South East	SW South West	W West	WNC West North Central	Total
Participants	14	25	21	13	1	1	1	76
Colonies	81	122	108	71	4	4	4	394
Records	312	634	526	368	24	24	12	1,900

2020 Sentinel Apiary Locations



2020 Sentinel Kits received and processed



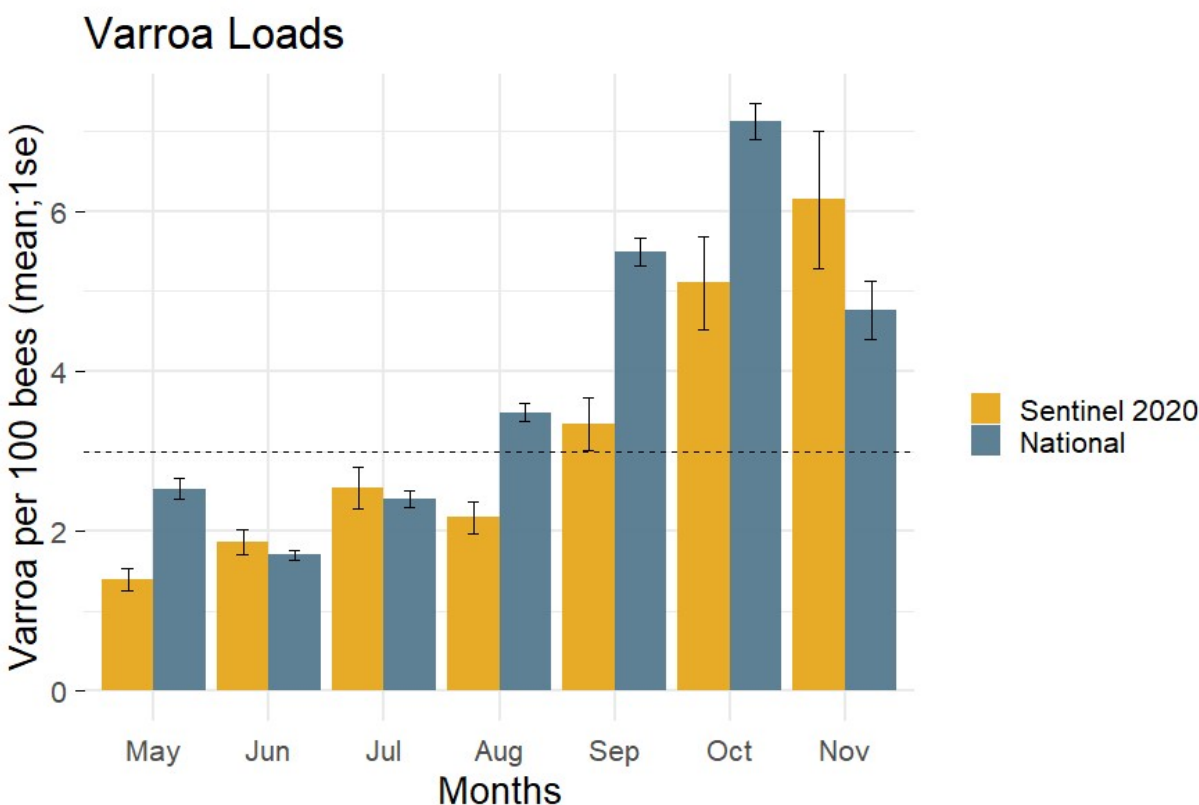
Varroa Summary



In 2020, the lab processed a total of **1,867 Varroa samples**. The graph below shows the average *Varroa* loads by month (*months with fewer than 30 samples are not represented*). Those monthly averages of Sentinel participants are compared with **historical national averages** originated from an independent survey effort: the **National Honey Bee Disease Survey**, funded by USDA APHIS, organized by University of Maryland in collaboration with the Apiary Inspectors of America.

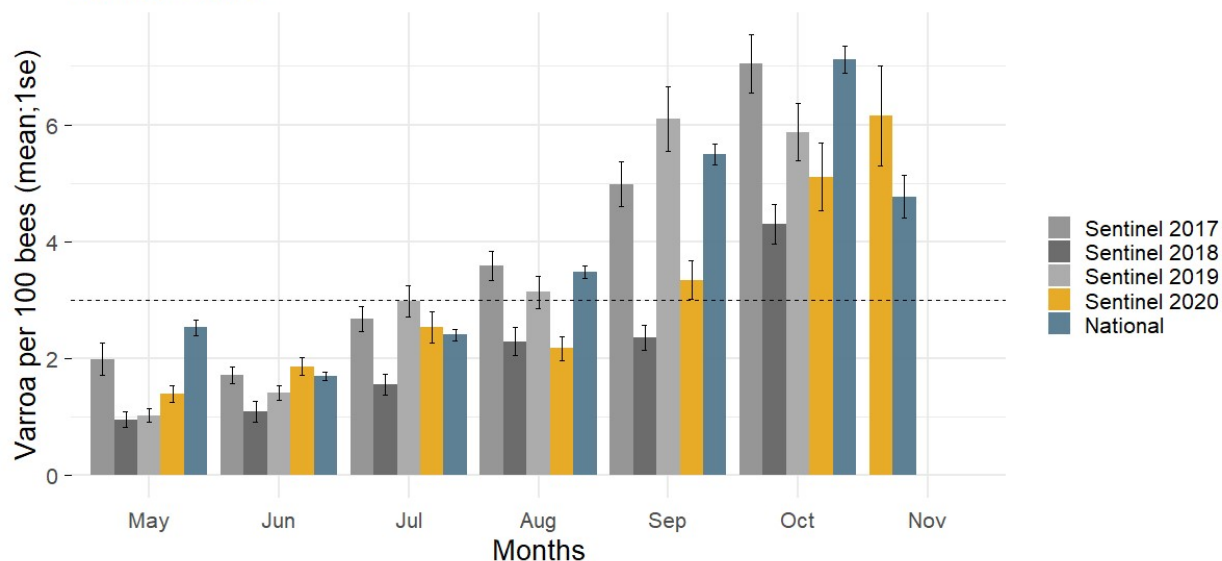
The dotted line represents the threshold of 3 mites per 100 bees, usually considered as the damage threshold of *Varroa* infestations. For more details about action and damage thresholds, please refer to the latest version of the Honey Bee Health Coalition Varroa Guide (<https://honeybeehealthcoalition.org/varroa/>).

This year's Sentinel Apiaries showed *Varroa* loads on par with the trend of increasing *Varroa* pressure over the season. We noted a slight delay in the rise of *Varroa*, with August, September, and October Sentinel averages lower than the respective historic national averages.

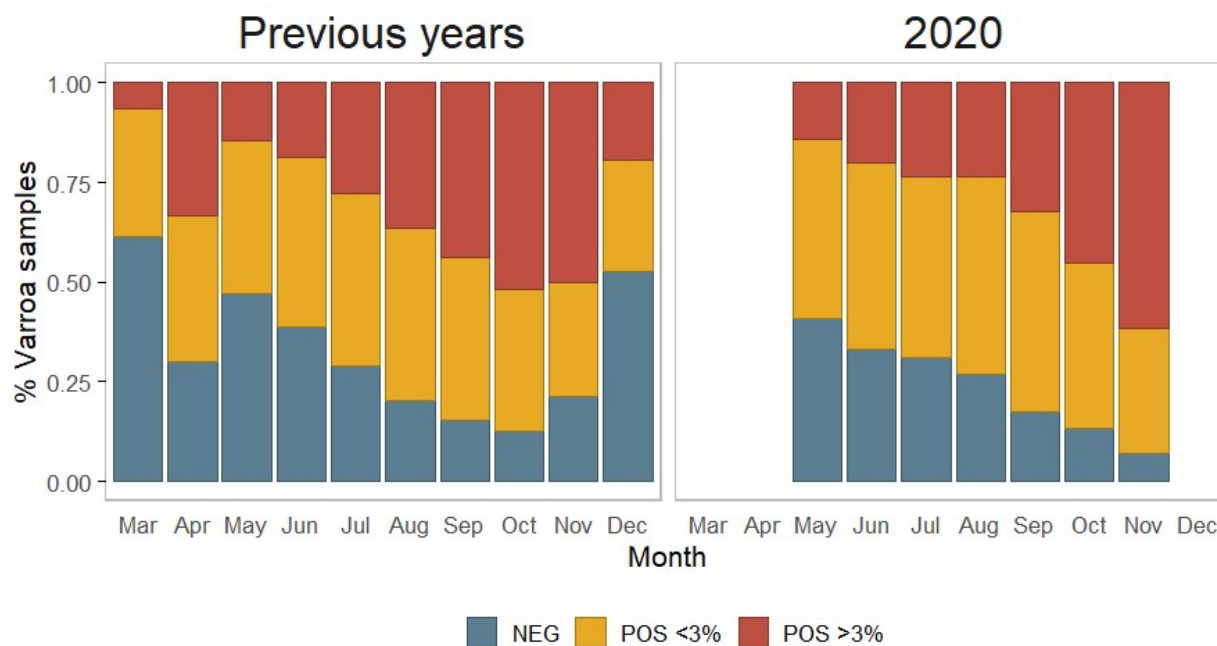


For more information about the National Honey Bee Disease Survey:
<https://ushoneybeehealthsurvey.info/>
https://research.beeinformed.org/state_reports/

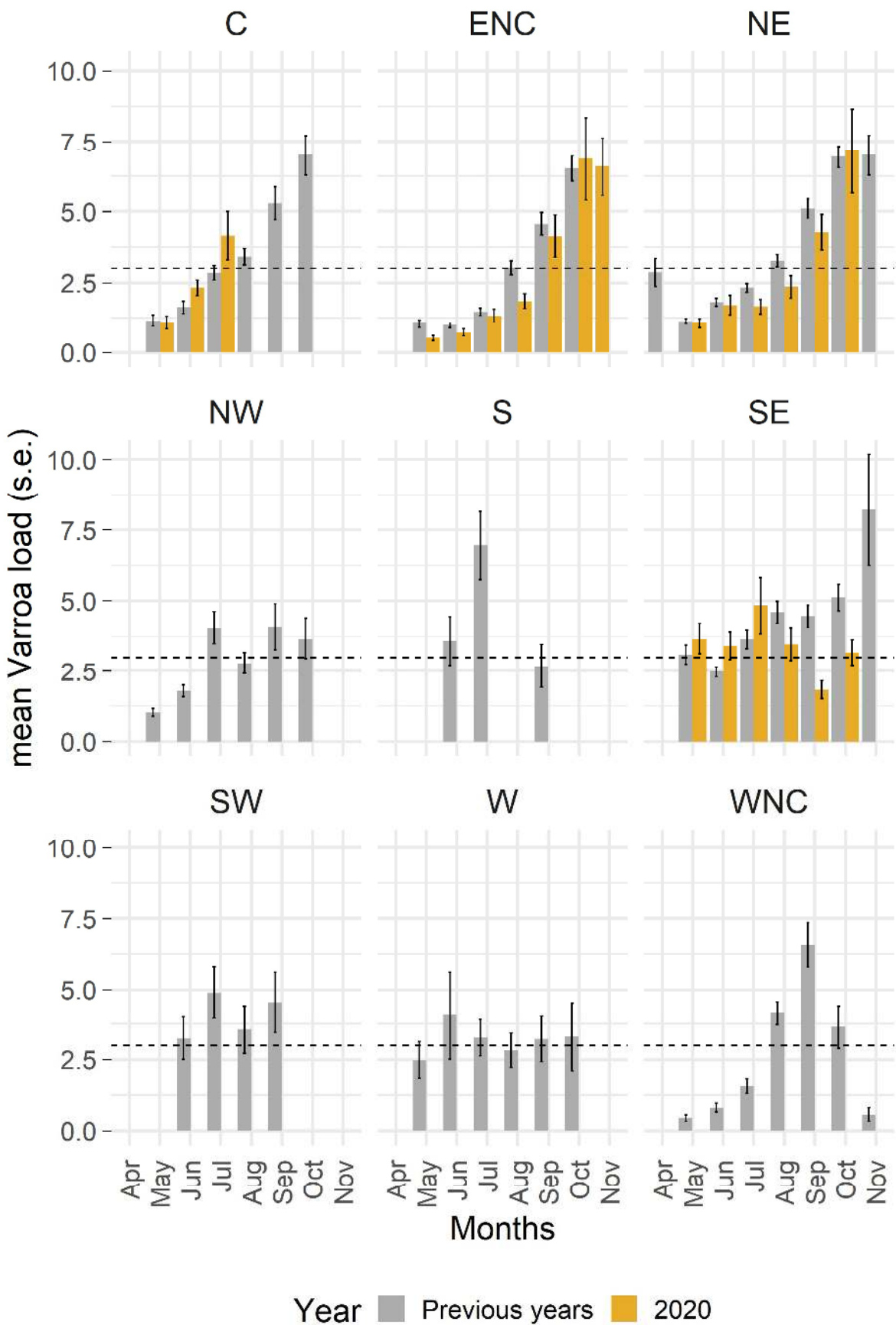
Varroa Loads



We detected *Varroa* in **over 70% of the Sentinel samples** received in 2020. The percentage of samples (POS) containing *Varroa* increased throughout the season. From those positive samples, the fraction of those reaching the threshold value of 3 mites per 100 bees also increased over the months. This trend is on part with previous years of Sentinel data.



Over the years, we have noted different seasonal trends of *Varroa* loads by region. In 2020, we had multiple participants from four out of the nine NOAA regions (C, ENC, NE and SE). Below is the region-specific monthly averages of *Varroa* loads for those four regions, compared with the monthly average *Varroa* loads observed in previous years of the Sentinel program. *Months with fewer than 30 samples are not represented.* We hope that future participation throughout the nine regions will allow us to fill the gaps of our regional baselines.



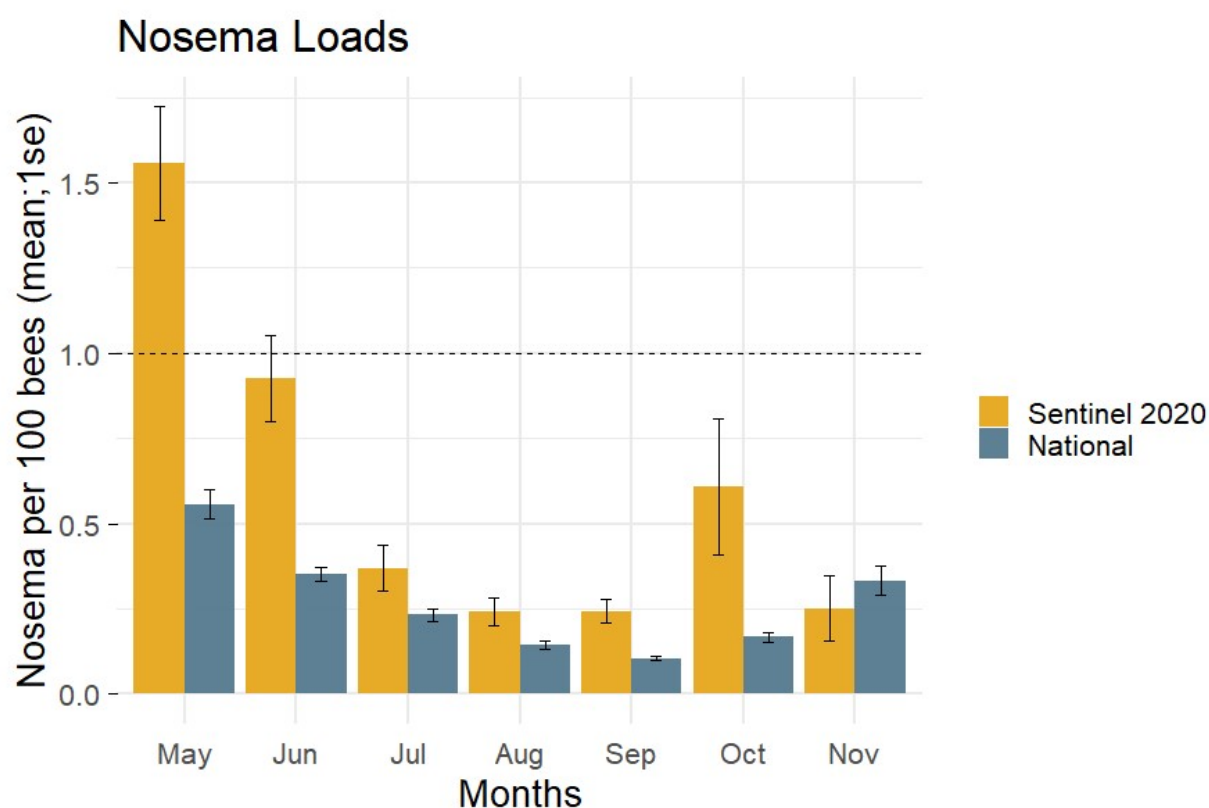
Nosema Summary

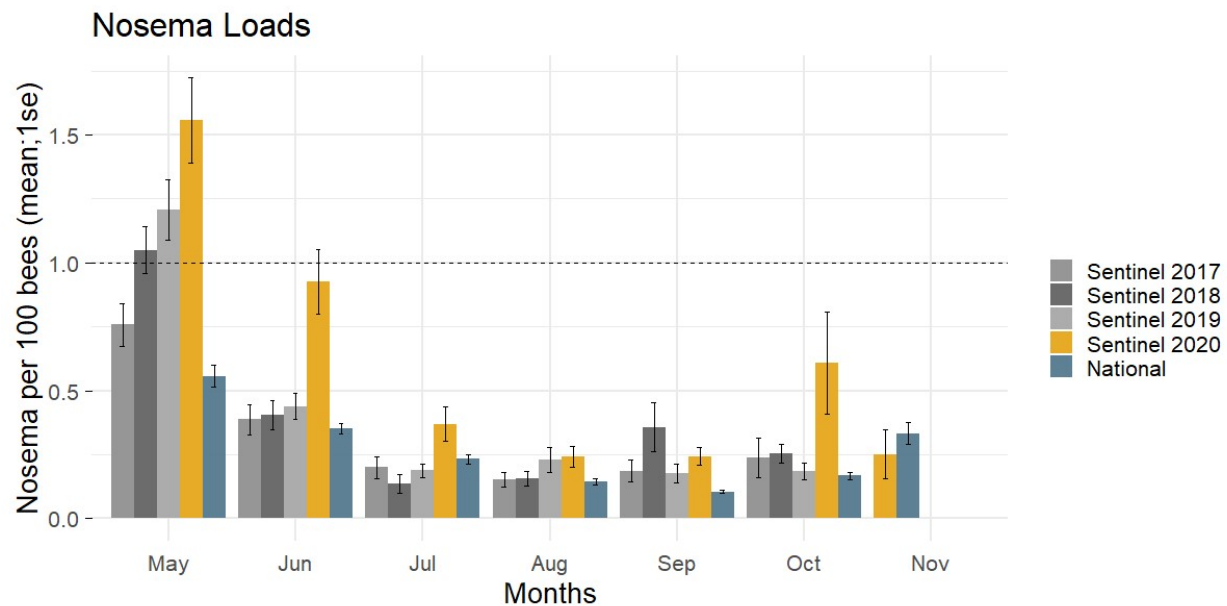


In 2020, the lab processed a total of **1,866 *Nosema* samples**. The graph below shows the average *Nosema* loads by month (*months with fewer than 30 samples are not represented*). Those monthly averages of Sentinel participants are compared with **historical national averages** originated from an independent survey effort: the **National Honey Bee Disease Survey**, funded by USDA APHIS, organized by University of Maryland in collaboration with the Apiary Inspectors of America.

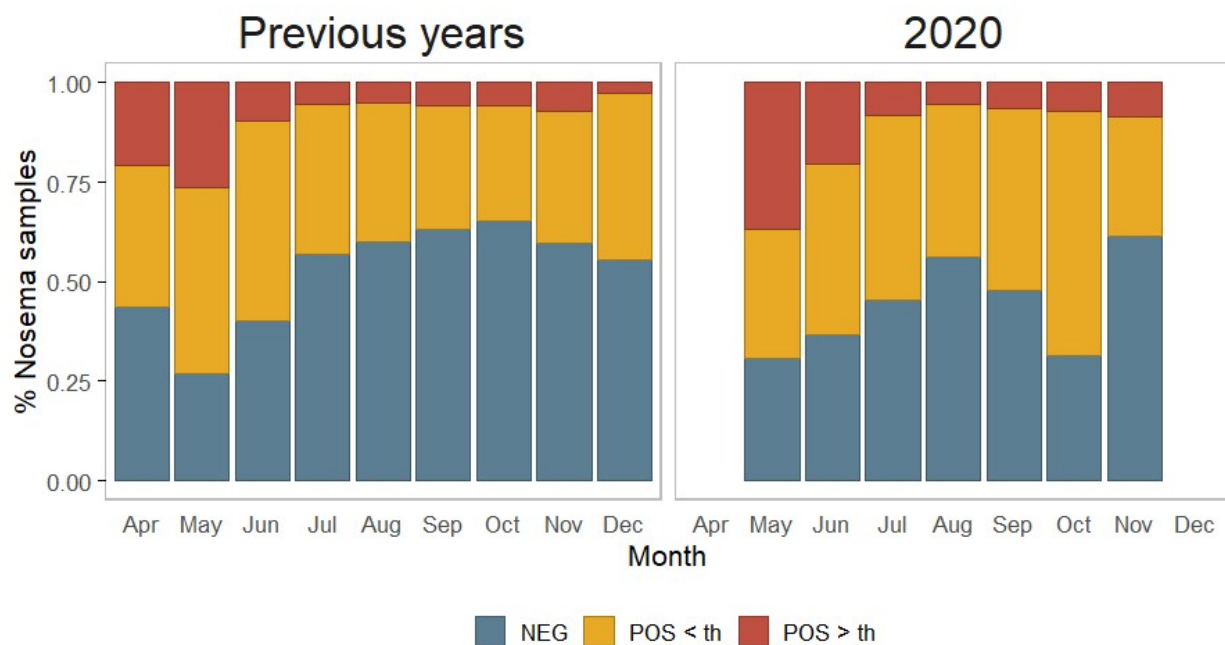
The dotted line represents the threshold of 1 million spores per bee, sometimes considered the action threshold of *Nosema* infestations.

This year, Sentinel participants showed elevated levels of *Nosema* compared to the historic national average. This year's monthly averages were also higher than previous years of the Sentinel program.

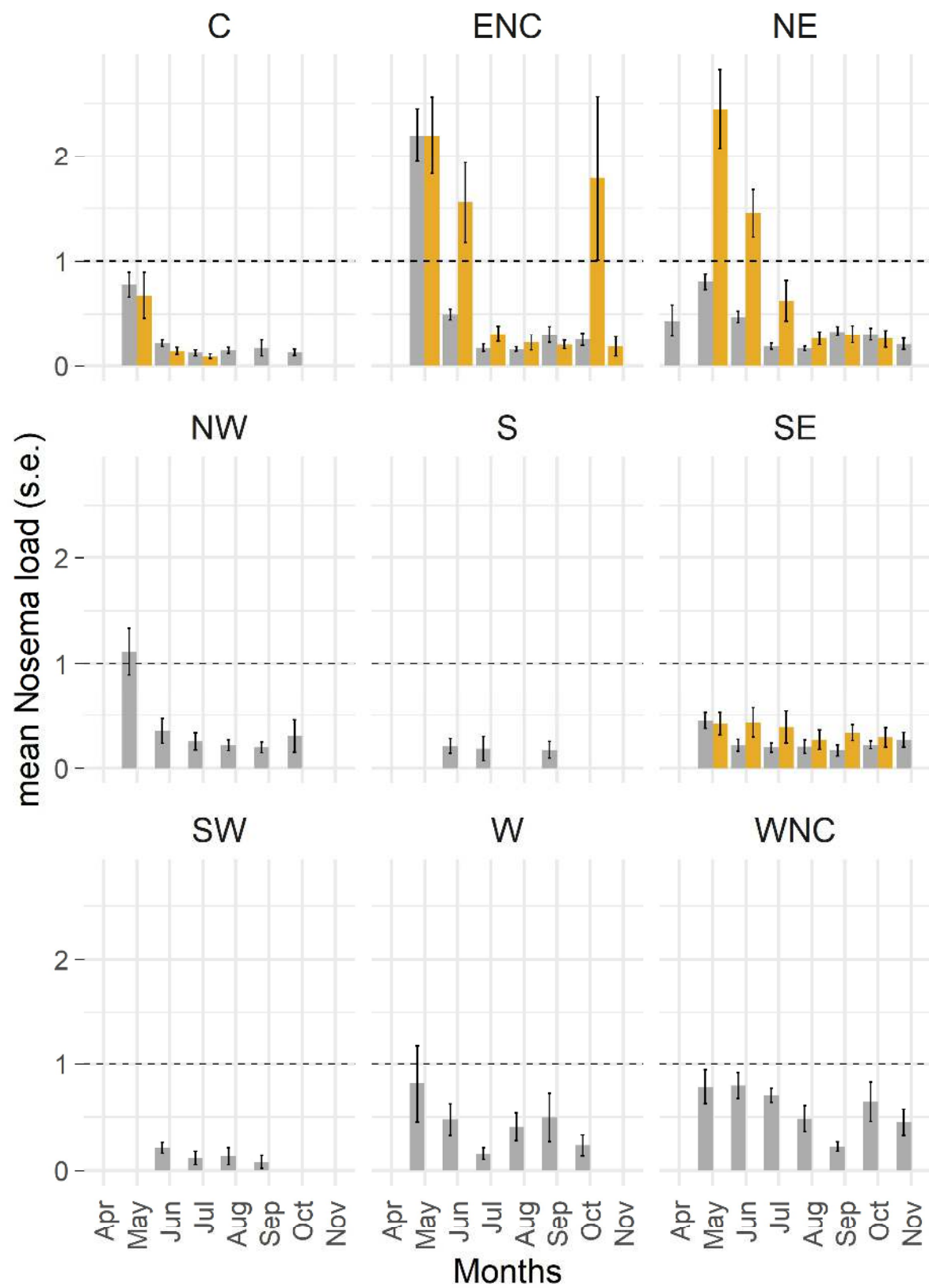




We detected *Nosema* in **about 58% of the Sentinel samples** received. In previous years, the percentage of samples (POS) containing *Nosema* peaked early in the year (April-May), and then decreased throughout the rest of the season. This year, the percentage of samples infected with *Nosema* remained higher than usual throughout the season. Still, the fraction of samples over the threshold of 1 million spores per bee was highest in spring.



Over the years, we have noted different seasonal trends of *Nosema* loads by region. In 2020, we had multiple participants from four out of the nine NOAA regions (C, ENC, NE and SE). Below is the region-specific monthly averages of *Nosema* loads for those four regions, compared with the monthly average *Nosema* loads observed in previous years of the Sentinel program. *Months with fewer than 30 samples are not represented.*



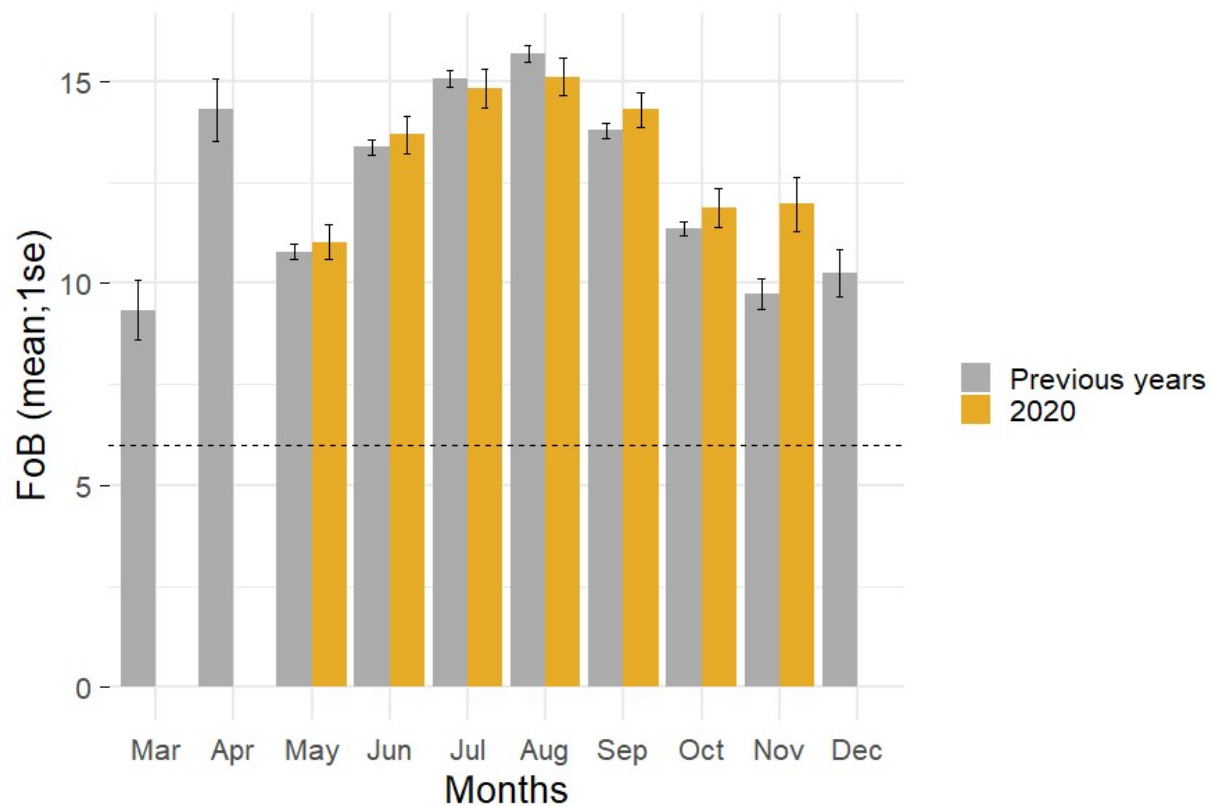
Colony Strength Summary

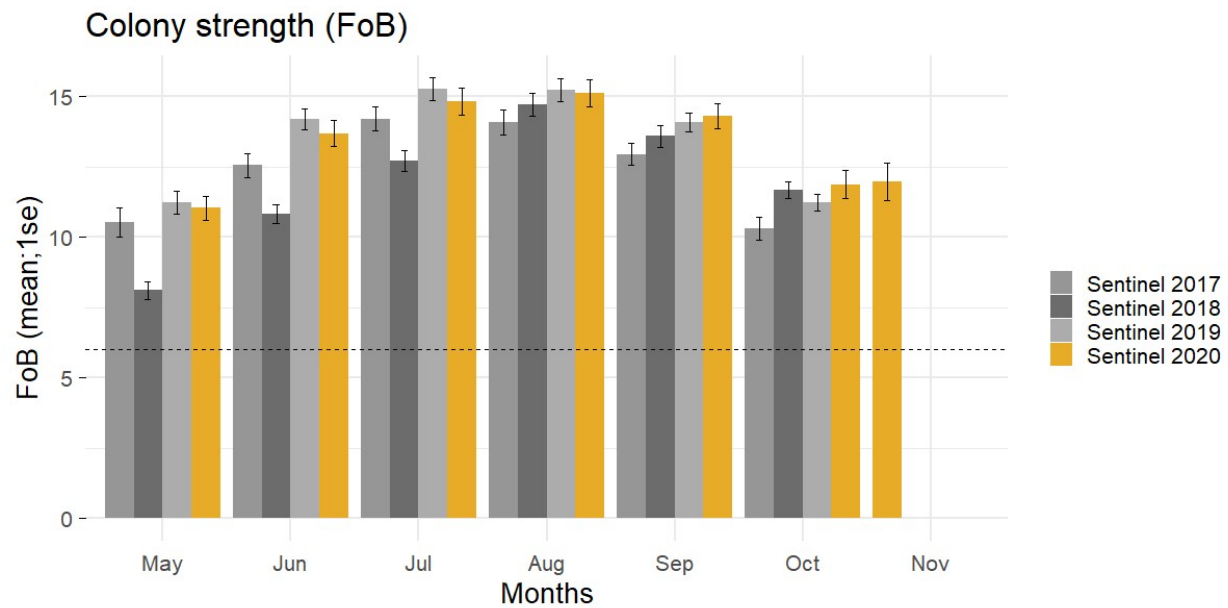


In 2020, participating beekeepers performing their own colony inspections reported **1,769 measurements** of colony strength. The graph below shows the average colony strength in frames of bees (FoB) by month (*months with fewer than 30 samples are not represented*). Those 2020 monthly averages of Sentinel participants are compared with **historical monthly averages** originated from past Sentinel participants (2013-2019).

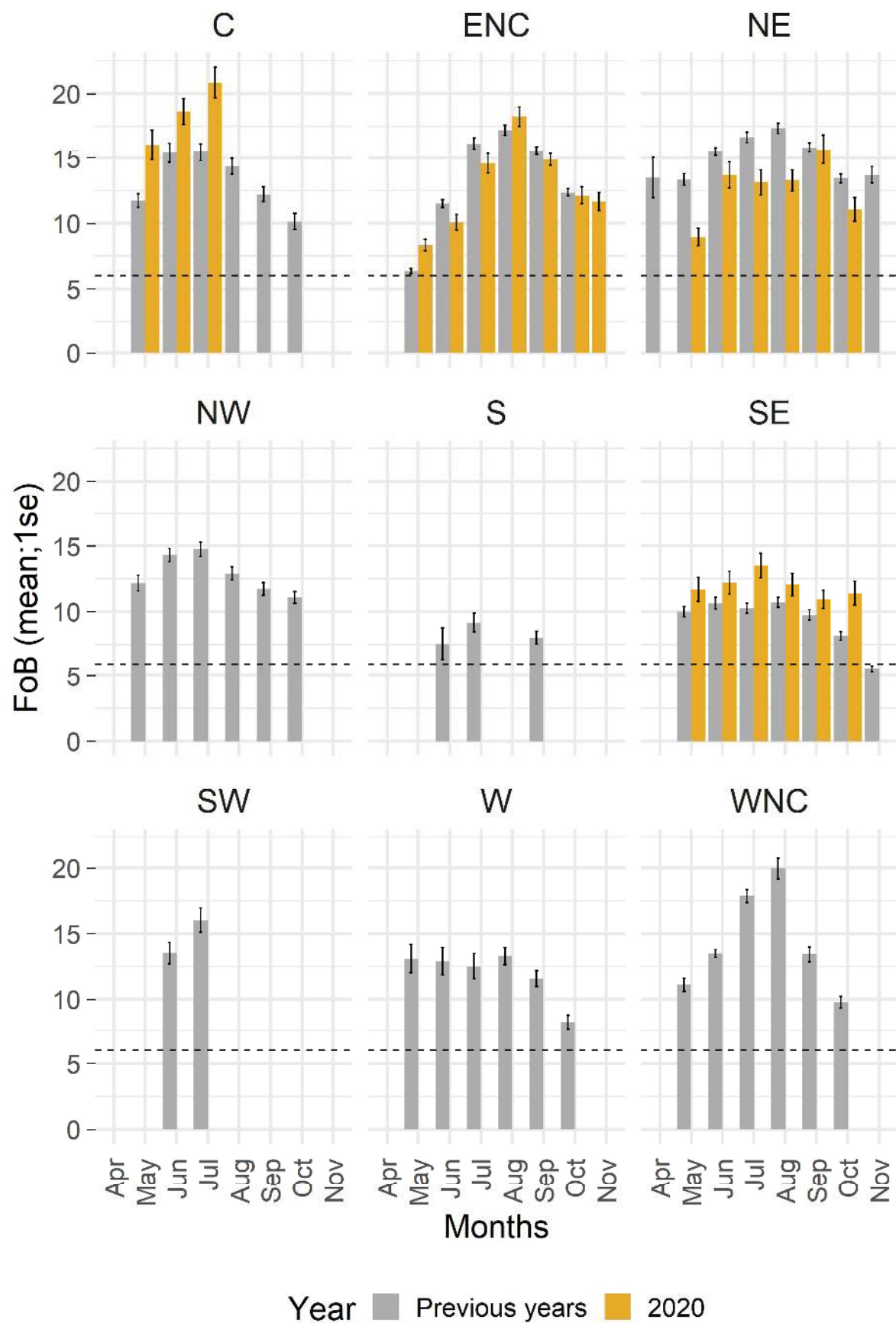
The dotted line represents a *tentative* baseline of 6 frames of bees (which represent the minimum unit in a majority of commercial pollination contracts).

2020 Sentinel colonies' strength peaked in August, with an average of 15.1 frames of bees (± 0.5 s.e.). This corresponds to past years of Sentinel data (15.7 ± 0.2).





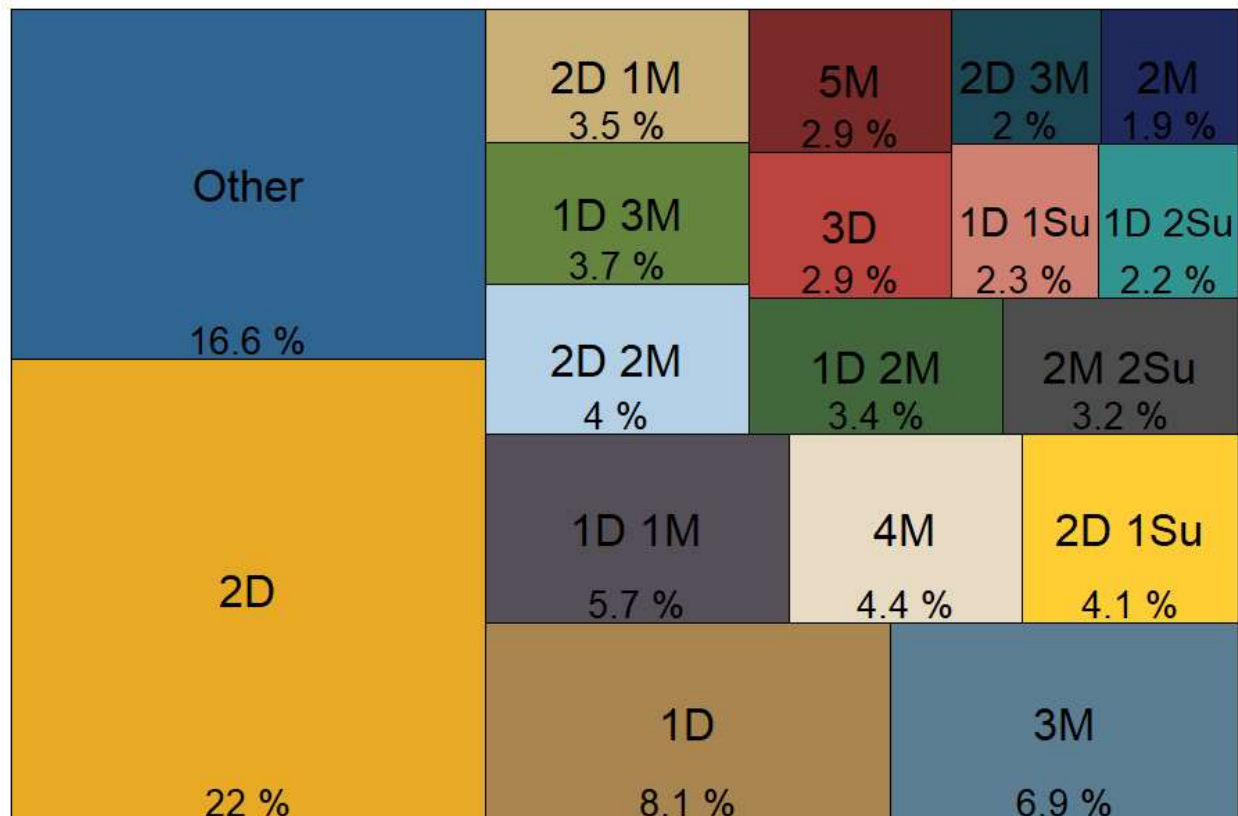
Thanks to multiple years of data collection in multiple regions, we are able to contrast variable seasonal trends in colony strength from region to region. Below is the region-specific monthly averages of colony strength by region, compared with the monthly average reported in previous years of the Sentinel program. *Months with fewer than 30 samples are not represented.*



Colony Configuration



In 2020, participating beekeepers performing their own colony inspections reported **1,833 colony configurations** (in number of deeps, mediums, shallow and supers) over the course of the year. The graph below represents the frequency of the most popular entries.



This graph represent the most popular colony configurations. It's not a pie chart – it's a cake chart. The size of the piece represents the relative frequency of each answer.

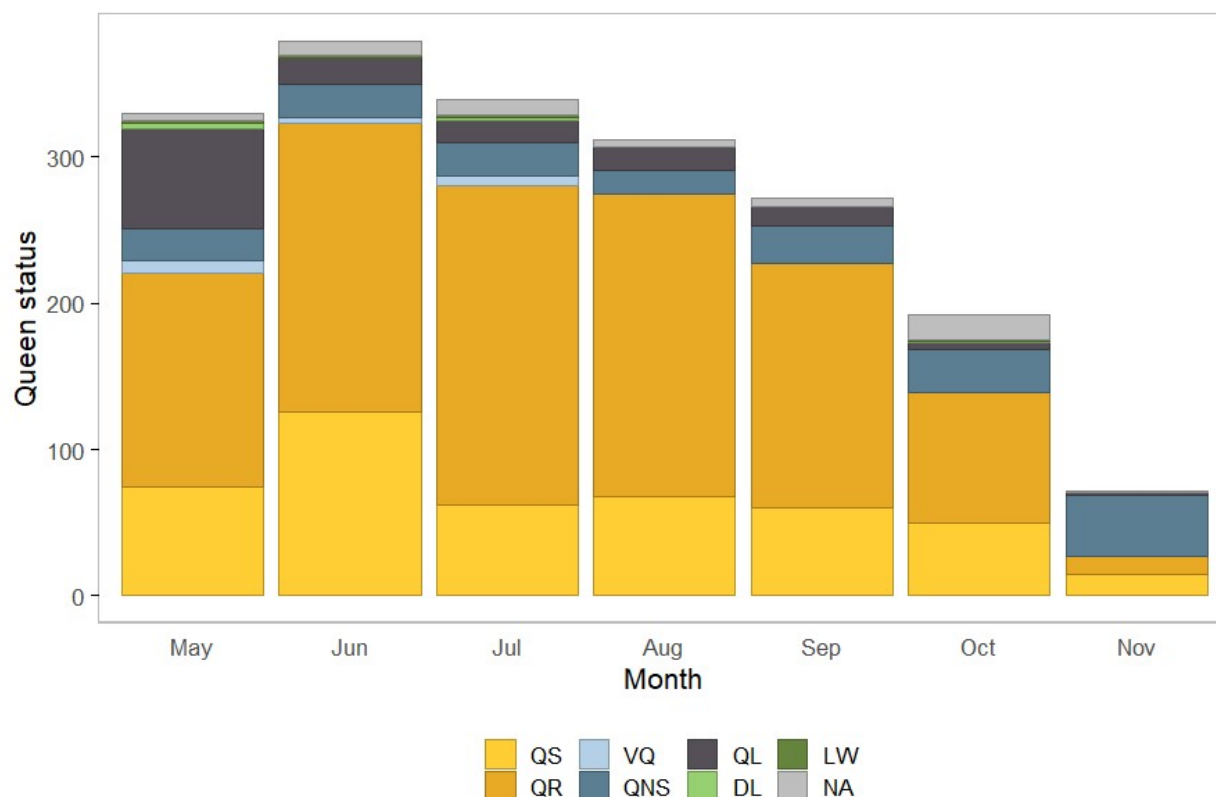
Legend: D = Deep; M = Medium; Su = Super.

Of the 1,242 records on the number of frames (5-10 frames per box) of the colonies inspected in 2020, 76.2% of records indicated the colonies were composed of 10-frames boxes, 18.6% were from 8-frames boxes, 3.6% from 9-frames boxes and a small 1.5% of records came from 5-frames nucs.

Queen status

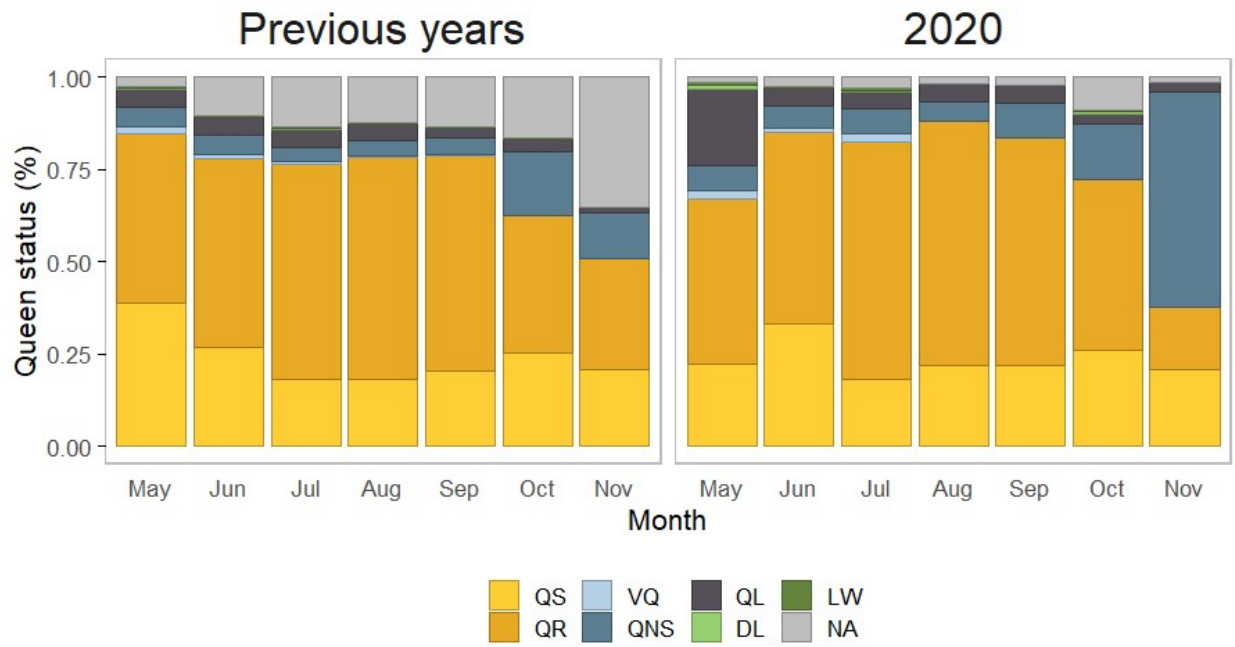


In 2020, participating beekeepers performing their own colony inspections reported **1,847 Queen Statuses** over the course of the year. The graph below represents the count and relative proportion of each by month.

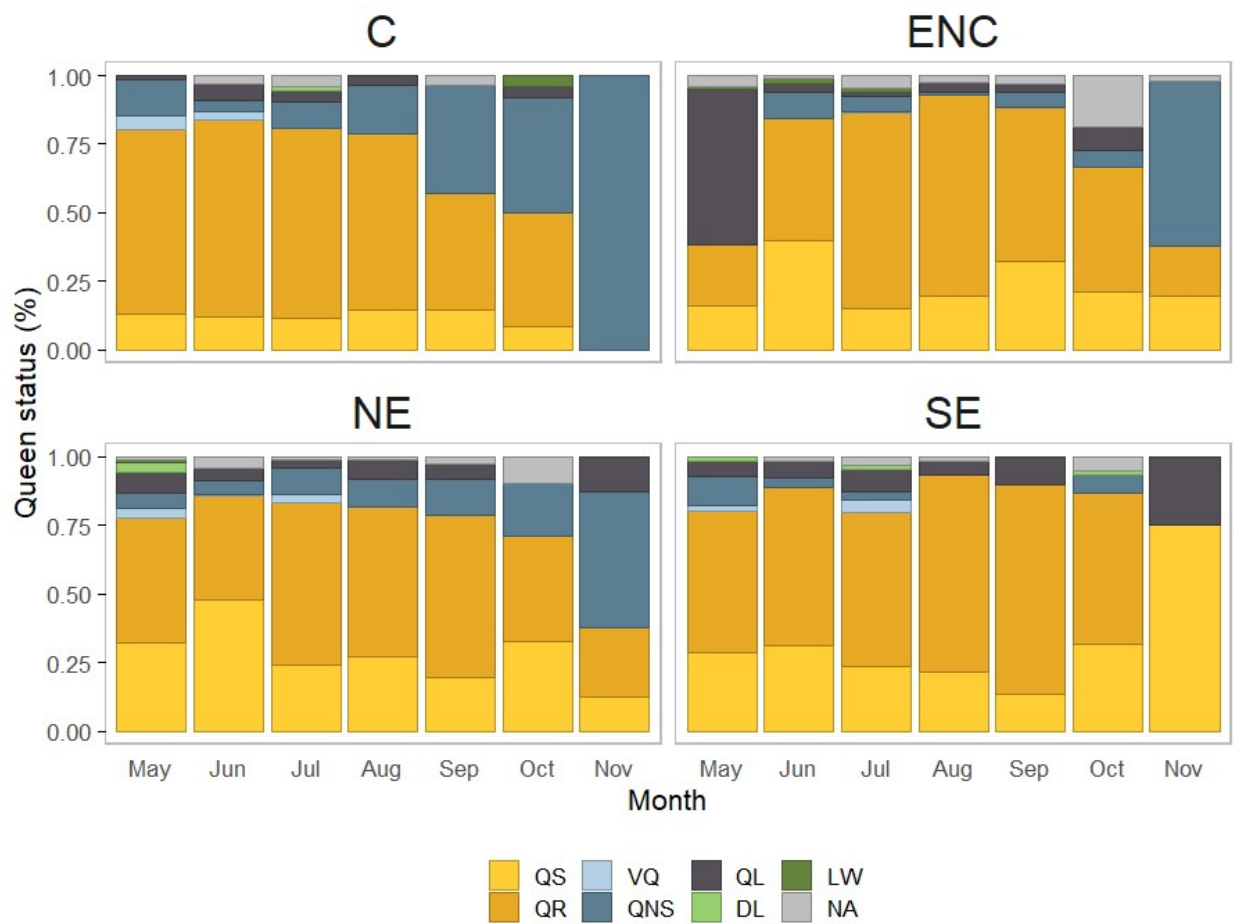


Legend: QS = Queen Seen; QR = Queen Right (queen not seen but presence of eggs); VQ = Virgin Queen, QNS = Queen Not Seen (nor eggs present, but colony not believed to be queenless); QL = Queenless; DL = Drone Layer; LW = Laying workers, NA = No information recorded.

In comparison with past years of the Sentinel program, 2020 participants noted more queenless colonies in May, though most occurred in the ENC (East North Central) region. We also noted a higher proportion of colony in which the queen's presence could not be confirmed in November.



2020 queen status records by regions

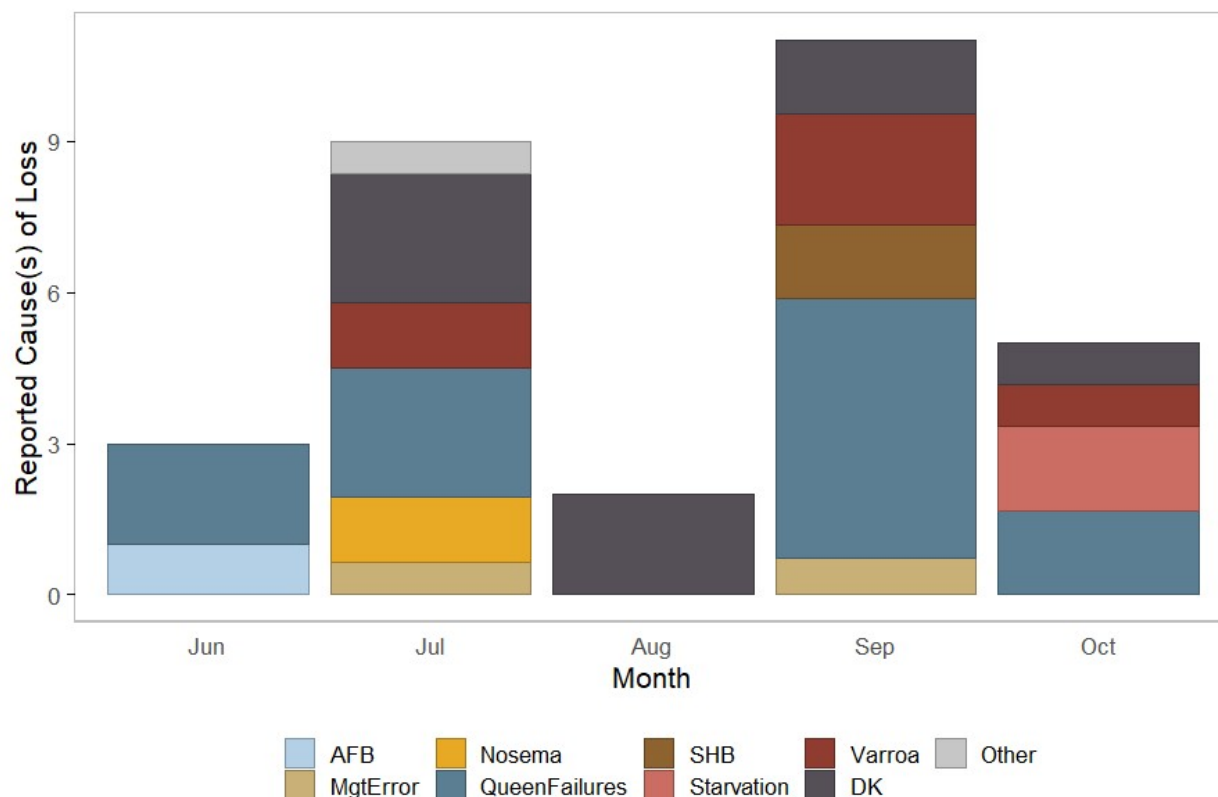


Colony mortality



In 2020, participating beekeepers reported **30 Sentinel colonies lost** during the active season.

The graph below represents the relative count of each **self-reported suspected cause of loss** by month.



Legend: AFB = American Foulbrood; MgtError = management error; SHB = Small Hive Beetle; DK = don't know; Other = uncategorized answer.