

A stylized, bold, white letter 'B' with a black outline, positioned in the top left corner of a dark green vertical bar.

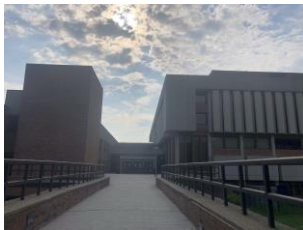
Buggin Out

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The Binghamton University Libraries would like to acknowledge with respect the Onondaga Nation, firekeepers of the Haudenosaunee, the indigenous peoples on whose ancestral lands Binghamton University currently stands.



Binghamton's 4 Libraries



The Binghamton Libraries are housed in 4 buildings, with a collection of about 2 million print circulating and a Special Collections. The building you see in the top left corner is the Downtown Campus that is fairly new and with young materials. It has little to no bug problem. This building has a newer HVAC unit with the ability to control humidity which is something none of the others can do. The second building pictured on the top row is our annex. It's a warehouse ridiculously split in half to contain our library collections and unorthodoxly, a fruit and veg storage company for local grocery stores. That fruit and veg supplier is the owner of the building and chooses to spray the perimeter with permethrin due to his produce, so there are no bug issues there. In the next 3 years, that entire collection will be moved to a new annex that will hopefully not be storing food and will have a brand new HVAC system. So those 2 buildings on the top row can be eliminated as a whole with regards to our data. They don't really play a role at all. The 2 buildings on the bottom of the screen are our problem children. The building on the left is our main library, and the right is the science library. Both of these are old and have old HVAC units that don't allow for controlling the humidity except through temperature changes, and even those changes are minimal. The science library has a double whammy in that they not only store collections in the basement, but have a leaky roof directly over the third-floor collection and leaky ceiling in the basement.



Project details



In January of 2019, we started a weekly program of checking and recording trap findings using ZPest Tracker. You can see one of our traps purchase in bulk from Amazon. This first year was an intensive data gathering mission to determine if we had any issues. When I was hired in 2017, I was assured we did not have a bug issue. But call me jaded; I didn't believe it. The buildings were old and the HVAC is 30+ years old and can barely control the temperature much less the humidity. So that weekly check was intended only to be for the first year of our study, with the expectation of moving to once a month in 2020 and beyond.

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Arabic Room



The first room that had issues is our Arabic Room. The images highlight various issues within the room. 2 of the 4 walls being windows, a reoccurring water and mold issue, the beautiful books themselves and the table picture indicates the library's policy that food and drink are welcome. This room had a massive issue with booklice, to the tune of 119 in that year, mainly in July and August. There were many other random critters in this room, but the booklice had by far the highest numbers. In researching why that might be, the use of wheat starch is heavily used in Arabic books and papers which might account for their preference for those materials. The environment is also appealing to them as it has terrible air flow. It's a thin, rectangular room, with windows along the entire eastern and southern walls. It gets very hot and muggy early in the morning. And due to the poor circulation; that doesn't dissipate throughout the day. It is also a very closed off room. The water and mold issue has been handled by simply using an antifungal paint. The reason for no further work is due to the asbestos in the ceiling. The good news is that starting later this year, the floor above will be completely renovated beginning with asbestos abatement and the underlying water issue between the 2 floors will be handled then.

Another room with book lice was the Science Basement map room, there were 108 of them throughout the year, but primarily in July/August. Even with 4 years working

here and many consultations with the facilities department, I have no explanation for why this room leaks. Instead of it being a functional room with map cases lining all the walls, it looks more like an abandoned old house with sheets over the furniture, but with plastic sheeting...not the most classy look. Like the Arabic Room, it also has very poor air circulation and tends to have all doors shut. For both of those areas, facilities is unable to make changes, because the walls, ceilings and floors contain asbestos. Due to abatement currently underway, I was unable to get a picture of the map room for this presentation.

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Work Room



The third and final area with a pest problem is the Special Collections work room. These stats are unlike the rest in that they are only for the final 6 months of 2019. We initially chose to only put traps in the collection areas, not in workrooms and offices. Half way through the year though, one of the Special Collections librarians came to us saying there was a problem. This room ended up being the worst space in terms of pest numbers of any room in all 4 buildings, even with only having half the amount of time to get these numbers. This room is the smallest by far of the 3 problem rooms, doesn't house collections, and there were 165 book lice. We really didn't have a rationale for the high numbers at the time. With these numbers, you see I've focused on book lice. We do have other wicked step children in the form of silverfish in a basement as well as varied carpet beetles in these same 3 rooms; however, not in significant quantity.



So we blissfully moved into 2020, planning to check traps once a month. Then March happened. For 4 months, we were unable to enter the buildings without security involvement. Our traps sat there coming onto peak season of bugs living their best life among our copy of Florian's *Heritage Eaters*. In late July, we were able to come back to campus with limited capacity, max 30% staff and no students. This is how we finished out 2020.

So looking back at those 3 problem spaces, the Arabic Room had an alarming upswing in varied carpet beetles. I didn't even mention those earlier in the 2019 data as I wasn't tremendously concerned with just 17 of them for the entire year, but apparently, I should have been. We went from 17 to 86 in this one room. The good news was in the decrease of book lice not only in the Arabic Room, but also the Map Room.

The biggest change was in the Special Collections work room. The numbers plummeted, so much so that I wondered if we were even still checking those traps. That led us to brainstorm why there would have been a sudden infestation which just as suddenly disappeared. Construction seems to be the answer. In the rooms below, there was relocation of many massive microfilm cases, asbestos abatement,

and then construction in the area. There must have been an entry point into that workroom from the lower floor, because the other rooms in Special Collections didn't have the same spike. Construction is known to annoy bugs and make them want to migrate to a quieter place.



Environment

	2019	2020		2019	2020
January			July		
Temp	70	70	Temperature	70	75
Humidity	18%	21%	Humidity	58%	54%
Book Lice Count	9	37	Book Lice Count	192	115
February			August		
Temperature	72	71	Temperature	74	69
Humidity	17%	20%	Humidity	58%	46%
Book Lice Count	5	8	Book Lice Count	106	44
March			September		
Temperature	71	71	Temperature	74	70
Humidity	25%	26%	Humidity	52%	55%
Book Lice Count	5	NA	Book Lice Count	50	40
April			October		
Temperature	69	69	Temperature	72	71
Humidity	35%	29%	Humidity	42%	42%
Book Lice Count	17	NA	Book Lice Count	83	15
May			November		
Temperature	70	73	Temperature	71	68
Humidity	44%	33%	Humidity	26%	34%
Book Lice Count	24	NA	Book Lice Count	36	4
June			December		
Temperature	70	73	Temperature	69	67
Humidity	53%	48%	Humidity	23%	26%
Book Lice Count	43	NA	Book Lice Count	34	12

So now I want to compare and contrast our bug data between 2019 and 2020 as it relates to the environment. My expectation was that our numbers in 2020 would massively increase with having such a long period of no people or even lights on. I was able to keep the temperatures in the same ballpark thanks to wi-fi data loggers. So while not ideal, they never are, our temperatures of 70-75 remained consistent as you can see in this chart. Because our biggest pest is the book lice, I included just their numbers in this same chart so you can see the correlation between temperature/humidity/pest. So based on this chart you can see that in January the temperature averaged 70 degrees with an average of an 18% humidity and only 9 book lice found in traps across all 4 buildings. You can see the connection between a spike in bugs with the humidity reaching 50%.

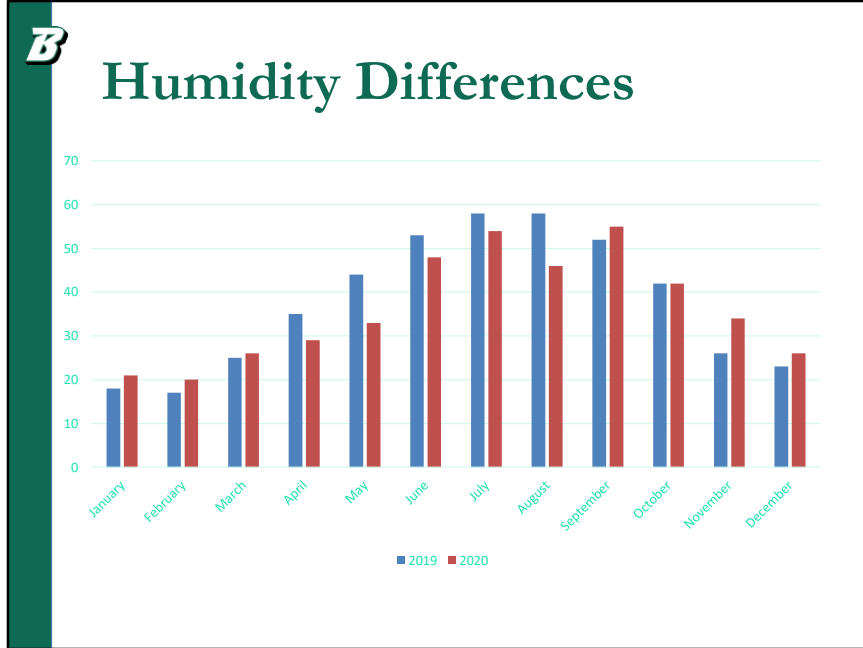


Just plain interesting...

	2019	2020
Grand total	1869	1502
Book lice	604	275
Silverfish	176	169
Varied carpet beetle	128	158
Most common predators	spiders-130/175	spiders-159/239
Destructive total	934 (50%)	641 (43%)
Incidental total	760 (41%)	622 (41%)
Predatory total	175 (9%)	239 (16%)

Because I think this is so interesting, I'd like to also include this chart of our findings for both years. Just remember that in 2020, there was a 4 month gap in trap checking; therefore, our predator bugs are in significantly higher numbers as they were trying to get to the carcasses of dead bugs in the traps. Typically, as the traps do not sit around for very long, this isn't the case.

The top line is the grand total of bugs whether predators like centipedes, incidentals like ants or houseflies and the destructive ones that eat our collections. Because we had an issue with the book lice, silverfish and carpet beetles, I was more aware of them in 2020, and gave them their own lines here. In all 3 cases, there was a correlation of active months. For all 3 destructive pests, July was the party month and January through March was pretty quiet. In both years, you can see our most common predator were various types of spiders. In the case of 2019, out of the 175 total predators, 130 were spiders. The final three lines are very interesting to see the breakdown of the destructive pests like carpet beetles, incidentals like gnats, or our predatory spiders. You can see our destructive pests went down dramatically while the predators took their place in 2020.



So as we've progressed, I have tried to give my own view of why our numbers are what they are. But I want to wrap up with why I think 2020 ended up smashing my hypothesis that we would have more bugs. First, we stopped taking gifts in March (due both directly to Covid contamination concerns and indirectly in that we had minimal staff to manage them). With 9 months of no students and limited staff, there were fewer hosts bringing the bugs in, or disturbing them depending on how you want to look at it. Both are probably accurate. Along the same lines as what was disturbing them, the predators really came to play, with almost double the number of predators in 2020 traps. And lastly, I have to thank mother nature. Looking at this chart, notice the difference in humidity between the 2 years. Upstate NY had significantly less rain and elevated humidity in 2020. As our nemesis is the book lice (and her nemesis is drier air) that lower humidity was probably the biggest factor. So while I'd love to take credit for something my team did to have this outcome, we can't. We really just got lucky in a year when luck was a bit low on the ground.

And finally, a massive thank you goes to Robin Hazen, Mien Wong and Clara Summa for their dedication to this project.