



ASS Biology Presentation

Jenna Crabtree x Austin Vance



01

General Cave Biology

Definitions



Entrance Zone

Sunlight
Variable
Temperature
Green
Vegetation

Twilight Zone

Less Light
Minor Temperature
Changes
Minimal Plant Life

Dark Zone

No Light
Constant Temperature
No Plant Life

Cave Animal Taxonomy



Troglaxene

- Are Visitors to Caves/Cave Guests
- Utilize Caves for Shelter or Other Reasons but are NOT able to Complete an Entire Life Cycle Within the Cave
- Bats, Humans, Raccoons



Troglophile

- Able to Live on the Surface or in Cave (can complete full life cycles in either)
- Slight Adaptations for darkness/dampness
- Sometimes has Species Variations that are more Commonly Found on the Surface or in Cave
- Cave Crickets, some Beetles, some Frogs



Troglobites

- Fully Cave Adapted
- Special Mutations for Life Without Life
- Usually Smaller to Cope with Small Amounts of Available Nutrients
- Texas Blind Salamander, Cavefish, Olms, certain invertebrates, CHUDs



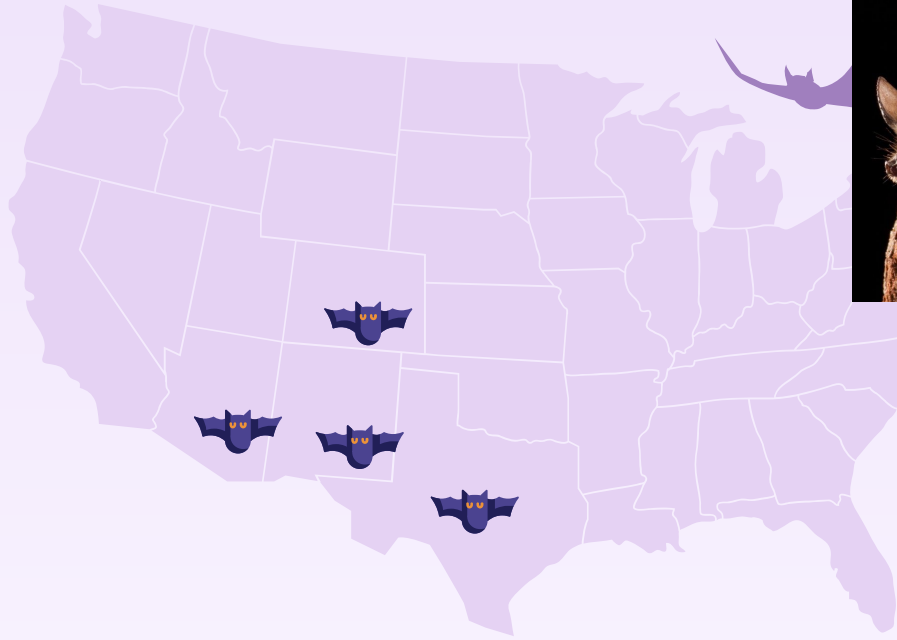
02

Bat Stats

Fun Facts & Characteristics of Bats



Migrating Bats...?





Size Matters...?



Also known as the Bumblebee
Bat!
**Kitti's Hog-nosed
Bat**



Can weigh up to 3 lbs and have
a wingspan of over 5 feet!
**Golden Crowned
Flying Fox**



Carl S. Bat
The actual largest bat in the
world



Tequila!

Bats are the sole pollinator of the agave plant. You know, the thing tequila comes from.



Bat Morphology & Myths

Bats are NOT blind!

Echolocation is complementary to their sight, and some can even distinguish between colors!

Bats have hands!

Bats utilize their hands for clinging, cleaning, and eating!



Bats HATE whispers!

Whispering around bats, hits a certain frequency which annoys them greater than speaking in a normal voice!

Flight Suit!

Wings allow bats to fly through the air with quick maneuvers.

Bats Worldwide



Bats are found on 6 continents!
There are over 1,500 confirmed bat species around the globe!

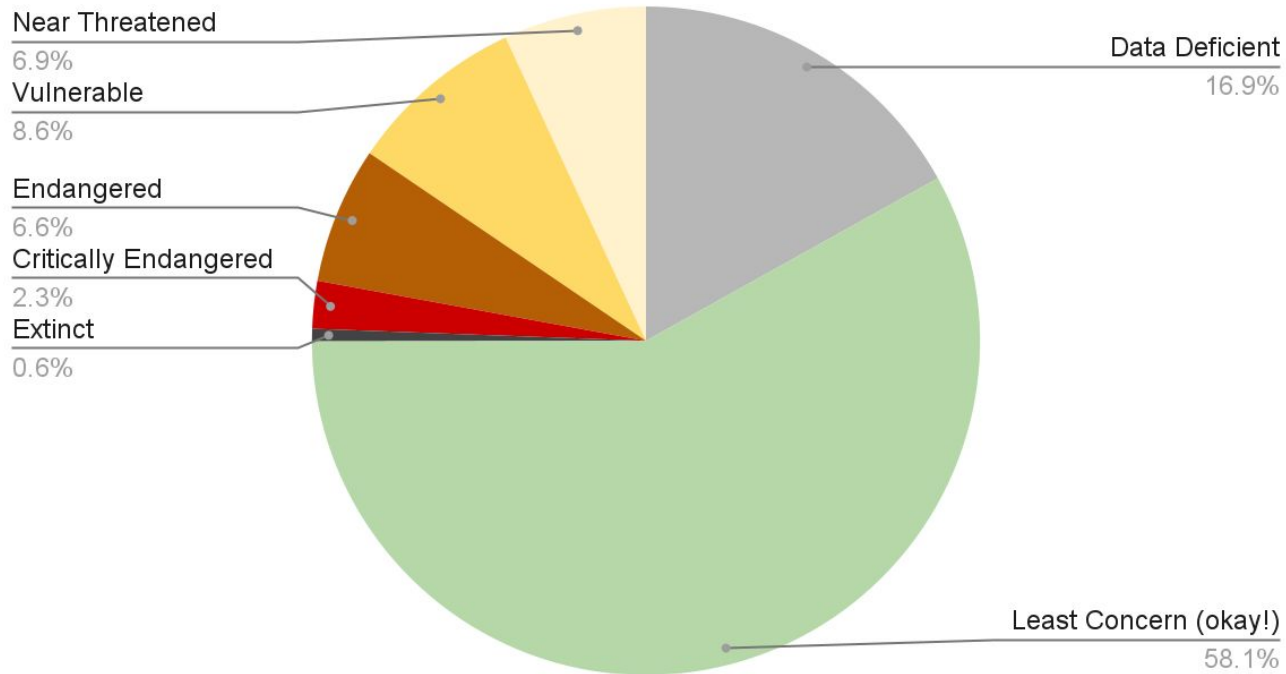


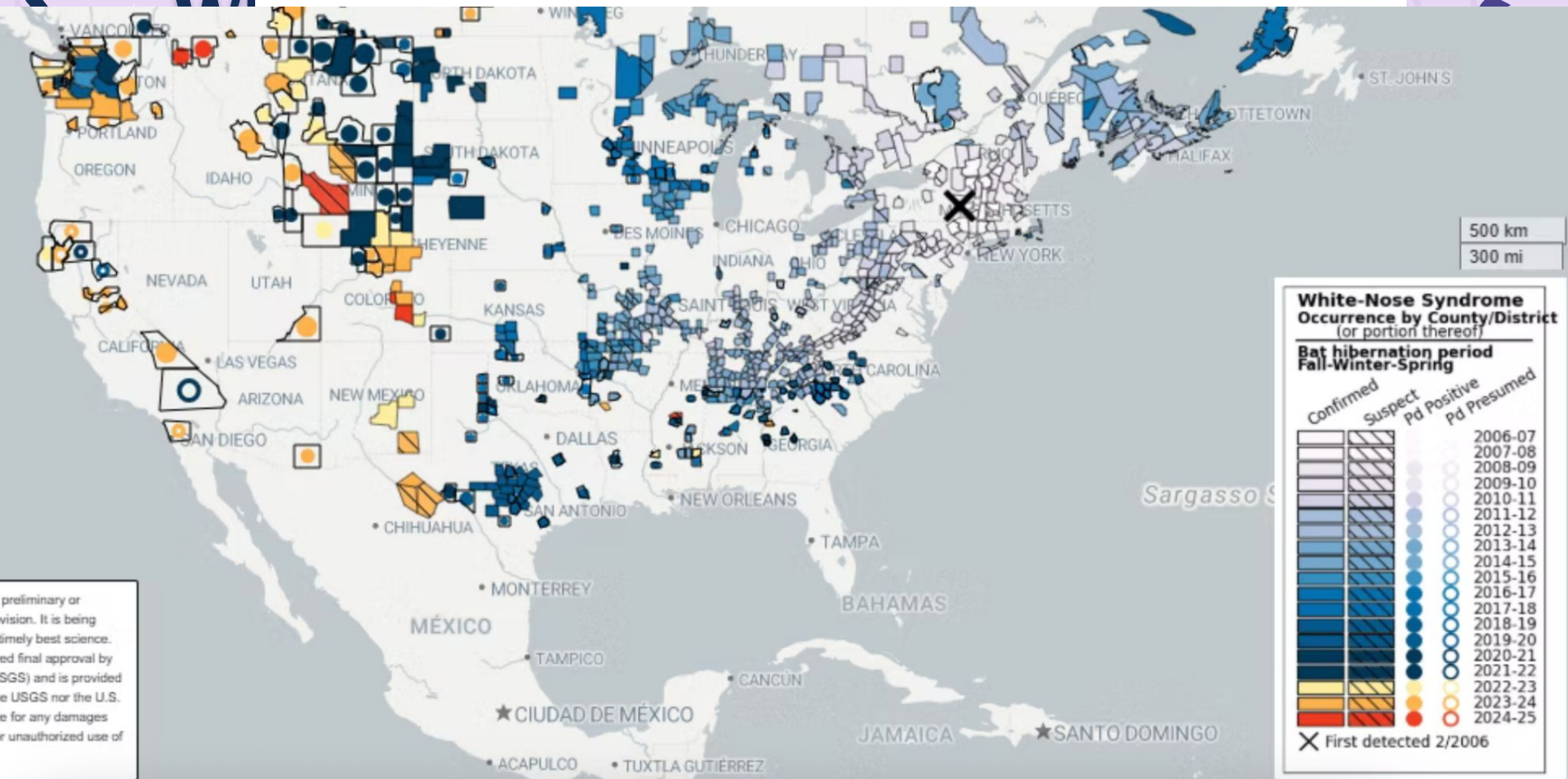
03

The Facts of Despair and Regret

A story more dark than what Bram Stoker could hope for

1,500 Species by Their Status Classification on the IUCN Red List





preliminary or
vision. It is being
timely best science.
ed final approval by
SGS) and is provided
e USGS nor the U.S.
e for any damages
r unauthorized use of

Why are bats declining globally?



year. Gestation takes 6-9 weeks, depending on species.

d

Collisions with wind turbines cause millions of bat deaths each year, as wind turbine farms continue to increase so does bat mortality rates.

Effects



#BatAppreciationWeek

Most bats give birth to a single pup at a time, for good reason.

Baby bats can weigh up to one-third of their mother's body weight.

Dobson's slit-faced bat
Nycteris macrotis
Photo: MerlinTuttle.org

batcon.org
BAT CONSERVATION
INTERNATIONAL





04

Hope...?

Can we save the bats or do we face certain doom?

BAT WEEK OCT 24 - 31

Bat Week is an annual international celebration dedicated to raising awareness about the critical roles bats play in maintaining healthy ecosystems around the world. Held from October 24-31, Bat Week is organized by a diverse group of representatives from conservation organizations and government departments across North America. The event strives to highlight the importance of bats and the ongoing conservation efforts needed to protect these incredible creatures.

<https://batweek.org/>



YOUR VOTE MATTERS

Protection of bats, their environment, and mitigation of negative impacts to bats is largely affected by the US administration. Vote for those who have the same values!



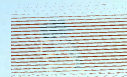
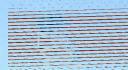


Questions?

Please find me after if you want to talk more! This was literally $\frac{1}{6}$ of the information I have on bats and bat related issues!

Welcome
to...

Invert City

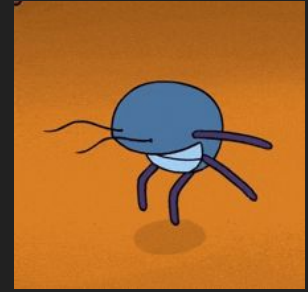


NO SPINE ZONE
VIOLATORS WILL
BE SHOT

POPULATION
45784368789039
36763049870348

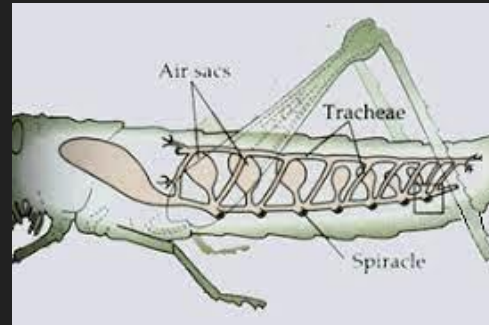
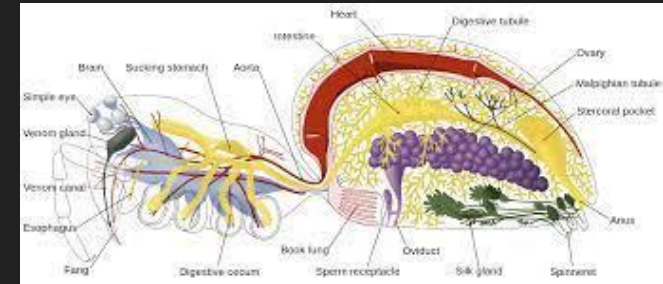
Brief intro to me

- Senior, been in ASS since my first semester
- Horticulture major (plant guy) hopefully going into Plant Pathology for grad school
- I took a few entomology classes as part of my major (and for fun) and have been the Bug Guy ever since
- Had a pet beetle for 6 months
- Generally a big fan of critters and creatures, and rambling about obscure biology facts



Insects vs Arthropods

- Fucked up little guys
- Arthropods: Exoskeleton, bilateral symmetry, segmented body and appendages, open circulatory system
- Insects: all of the above, plus 3 pairs of legs and 2 pairs of wings, open respiratory system, 2 compound eyes + ocelli
 - there are exceptions to these rules
- All insects are arthropods, not all arthropods are insects



Crayfish

- Class Crustacea, Order Decapoda, Family Cambaridae
- Cave variants are stygobitic- live exclusively in groundwater
- Some troglophiles, but mostly troglobites
- Very reduced, energy efficient metabolism to help them survive off of very little food
- Potential to get old as fuck
- Tend to be only a couple of inches long
- Eat dead organic material, bat guano, other invertebrates



Caleb found this little guy in the river at Powells!

Cave pseudoscorpion

- Class Arachnida, Order Pseudoscorpiones
- Closer relation to camel spiders than actual scorpions
- 2020 USA Cave Animal of the Year (Tooth Cave)
- Typically found in southeastern US, many in Alabama caves
- 40 species labeled as imperiled, all labeled as threatened to some degree
- Range from 2-12 mm long
- No tail or stinger, use their large front claws to catch prey– small arthropods like mites, springtails, and small insects/larvae



Tooth Cave Pseudoscorpion



Pseudoscorpion spotted in Tumbling Rock Cave

Harvestmen

- Are they spiders??? NO
- Are they Arachnids??? YES
- Can't make webs
- Non-cavers have 2 eyes, troglobites have none
- Troglobites also have longer legs, paler color, more sensory structures
- Like other cave creatures, their metabolism is slow to help them survive on little food
- Eat mostly decaying organic matter and smaller cave critters
- Sizes range from a few millimeters to a few inches

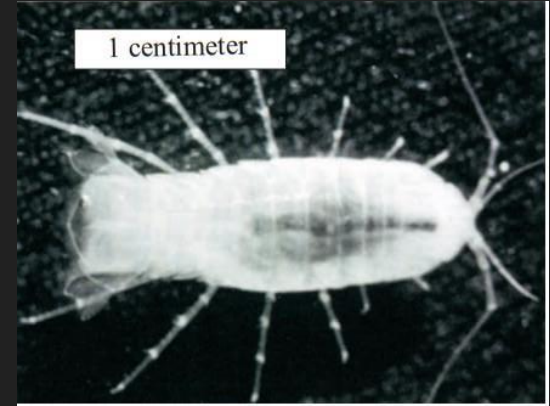


Bone Cave Harvestmen



Isopods

- Class Crustacea, Order Isopoda
- Lots of variety
- Over 330 species are known to live at least part-time in caves, with more being discovered as cave faunal surveys continue
- Most species eat decaying plant matter
- Cave-obligate species have no/reduced eyes and longer antenna
- Madison Cave isopods: largest cave-dwelling species, 15 mm



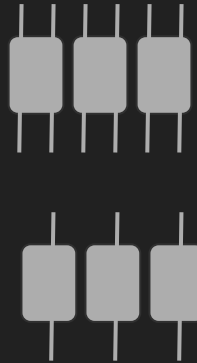
Madison Cave Isopod



Rubber Duckie Isopod

Millipedes and Centipedes

- Millipedes: Class Diplopoda, 2 pairs of legs per body segment
 - Detritivores, eat fungus and decaying plant matter
 - MANY cave dwelling species- over 150 just in China
-
- Centipedes: Class Chilopoda, 1 pair of legs per body segment
 - Centipedes are predatory, eat smaller invertebrates
 - Significantly fewer species known to live in caves, less than 10 discovered



Cave millipede spotted in Maple Run during our September 2023 trip, found by Pat Calabrese (UT Grotto)

Cave crickets!!!!

- 2023 USA Cave Animal of the Year
- Found in many caves but not limited to them
- VERY common in Powells aka Cricket City
- No wings, eyes are functional but adapted for low light environments
- Use long antenna more for navigation
- Can't chirp! But could you imagine tho
- Eat fungi, plant material, other crickets & insects



Cave beetles



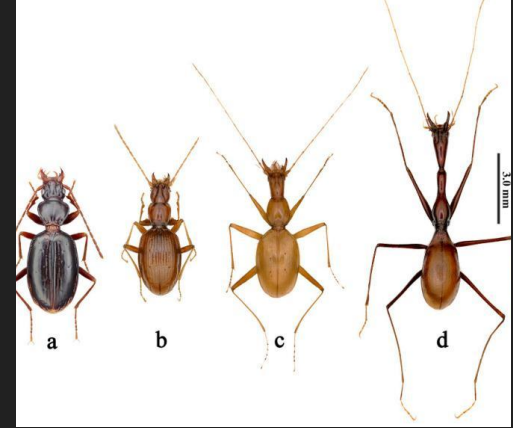
Narrow necked cave beetle:

- discovered in 1831 by a cave guide named Luka Čeč in Slovenia
- the first creature to be labeled as a troglobite
- Proved that caves were able to support life



Cave ground beetle:

- common cave beetle in the eastern US
- 2021 Cave Animal of the Year



Trechini:

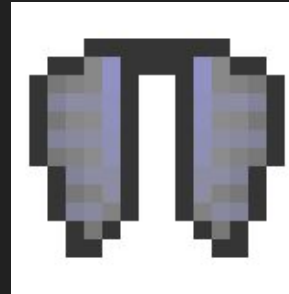
- large group of ground beetles
- over 170 species live in caves all over the world

Rhadine:

- beetle genus which has mostly subterranean species
- very widespread but often found in Texas

“Pringles”

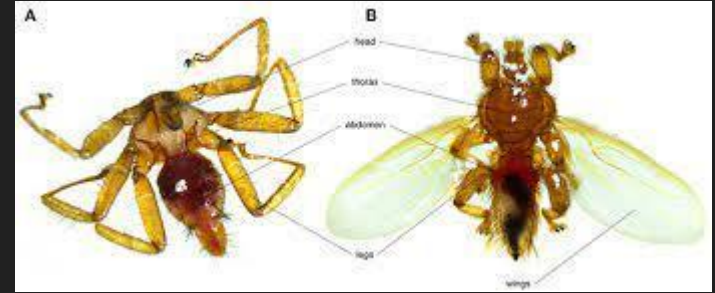
- *Embaphion muricatum*
- Trogloxenes found in caves on the Edwards Plateau
- Lives terrestrially throughout the southern US and northeast Mexico
- Eat various plant materials, dead or alive
- Very little information on the internet about these guys
- No wings- elytra are fused
- Also known as pie dish beetles- not to be confused with the Australian pie dish beetles, which are not trogloxenes



NOT this guy ⇒

Batflies & Fleas

- Parasites of bats
- Technically only cave dwellers by association- they live where the bats live
- Both flies and fleas feed on bat blood
- Some batflies have lost their wings via evolution- other shed them once they find a host
- Have weak light-sensing eyes, or no eyes at all
- Good examples of exceptions to the insect rules



Bat flies, wingless and winged varieties



Bat flea

Cave Silverfish

- Silverfish are the second oldest order of insects, developed before the evolution of wings so they have never been able to fly
- Characterized by their 3 'tails'
- Cave variants are eyeless and pale white, as opposed to silver like on the surface
- Relies on its antenna and senses of touch and smell to navigate



Powell's cave silverfish

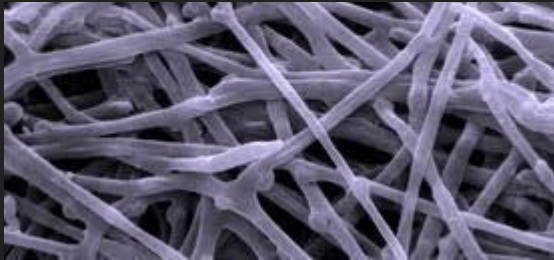


**Fungus Time!!!
Welcome the Rot into
your life :)))**



The Fungus Among Us

- Fungi don't photosynthesize, so they can easily grow in dark cave environments
- Anywhere with an organic substrate and sufficient moisture can support fungal growth
- Caves have historically been used to farm fungi
- The fungus used to make blue cheese was discovered by leaving food in a cave
- Hyphae: thin strand-like growing structure of fungi
- Mycelium: a mass of many hyphae



Mushroom farm in the Paris Catacombs

Significant Cave Fungi

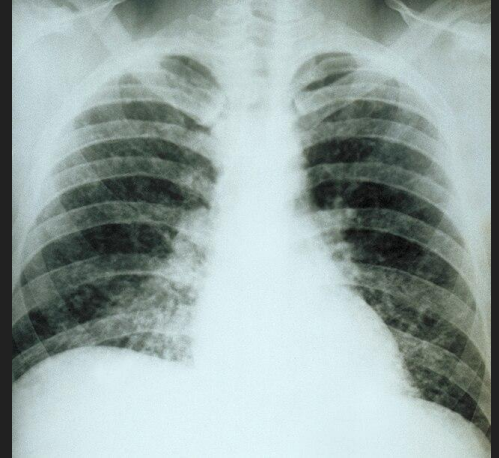
White Nose Syndrome: *Pseudogymnoascus destructans*

- Affects bats, spores germinate on the skin, mycelial mats grow on the nose and give the characteristic white appearance
- Infection wakes bats up from hibernation mid-winter, causing them to starve
- Increased spread is due to humans: ALWAYS DECONTAMINATE YOUR GEAR



Histoplasmosis: *Histoplasma capsulatum*

- Spores grow in bat droppings and disperse into the cave air
- When inhaled by humans the spores will germinate in the lungs
- Often causes only flu-like symptoms, but can become severe in immunocompromised people



References

1. (2020) "Cave Crayfishes." CALS Encyclopedia of Arkansas, *Zoology*. Jan 10 2020. Web.
2. (2023) "Cave Pseudoscorpions." Encyclopedia of Alabama, *Zoology of Alabama*. Oct 19, 2023. Web.
3. (2020) "Cave Harvestman." Graeme Kates NZ, *Arthur's Pass*. Sept 22 2020. Web
4. Glenn, C. R. (2006) "Bone Cave Harvestman." Earth's Endangered Creatures. Web.
5. Deerbák, Dávid. (2018) "Life history characteristics of a cave isopod (*Mesoniscus graniger* Friv.)." Pensoft Publishers, *ZooKeys*. Web.
6. (2008). "The Madison Cave Isopod (*Antrolana lira*)." Department of Conservation and Recreation, *Virginia Division of Natural Heritage Karst Program*. Web.
7. Dunning, Hayley. (2015) "Cave centipede from hell is the deepest-dwelling ever discovered." Natural History Museum. Web.
8. Liu WX, Wynne JJ. (2019) "Cave millipede diversity with the description of six new species from Guangxi, China." *Subterranean Biology* 30: 57-94. Web.
9. Krejka, Jean. (2023) "Meet the 2023 USA Cave Animal of the Year: Cave Crickets!" National Park Service, *The Midden - Great Basin National Park*, Vol 23 No 1. Web.
10. Entz, Chuck. (2007) "Species *Embaphion muricatum*." Iowa State University, *BugGuide Net*. Web.
11. Polak, Slavko. (2005) "Importance of the discovery of the first cave beetle *Leptodirus hochenwartii* Schmidt, 1832." *Endins: Publicació D'espeleologia* No. 28. Web.
12. Dodds, David. (2018) "A Brief Guide to Bat Ectoparasites." David Dodds Associates Ltd., Bat Conservation Trust. Web.
13. Duckek, Jochen. (2023) "Cave Fungi." showcaves.com. Web.