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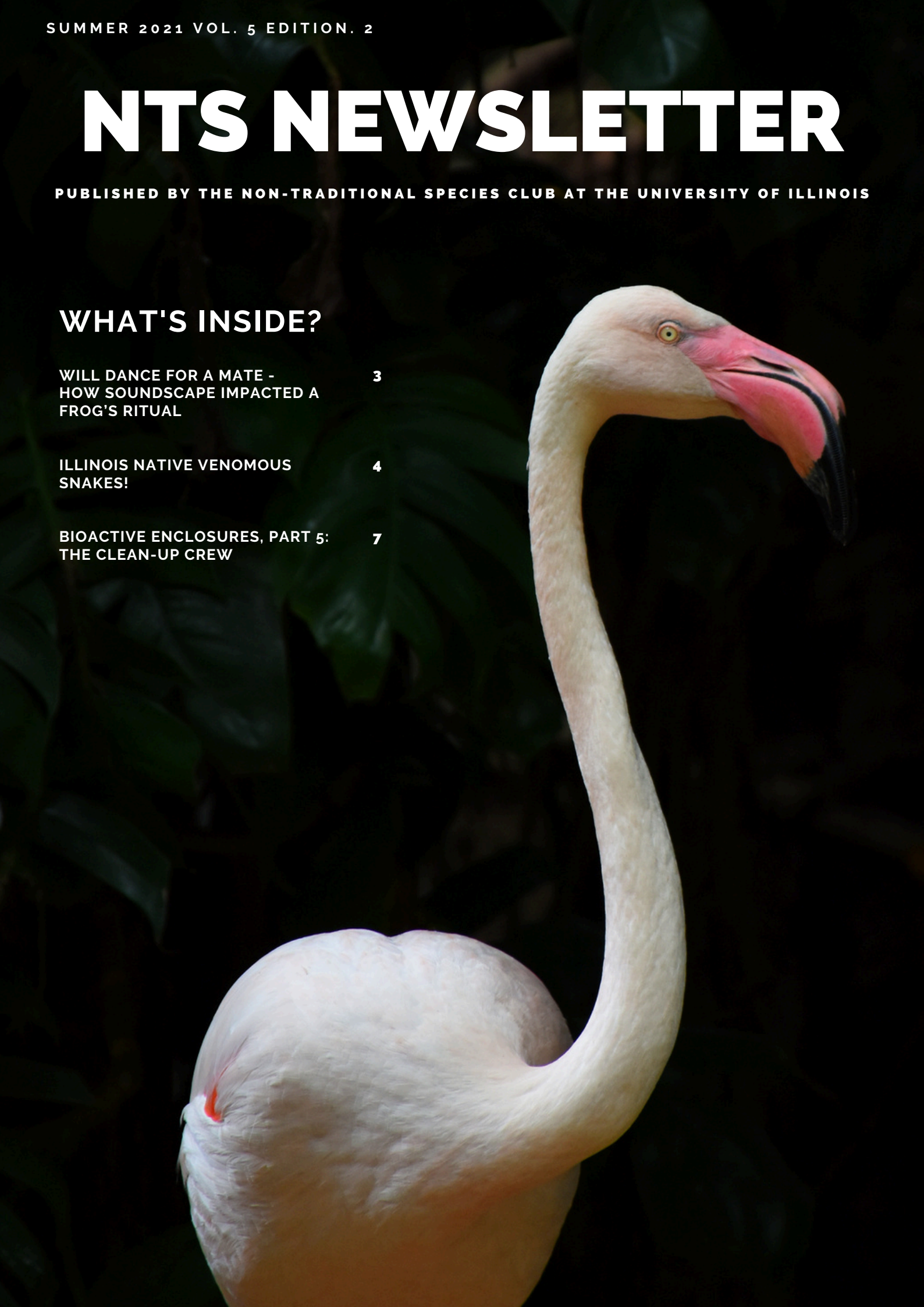
WHAT'S INSIDE?



THE YEAR THE EARTH CHANGED

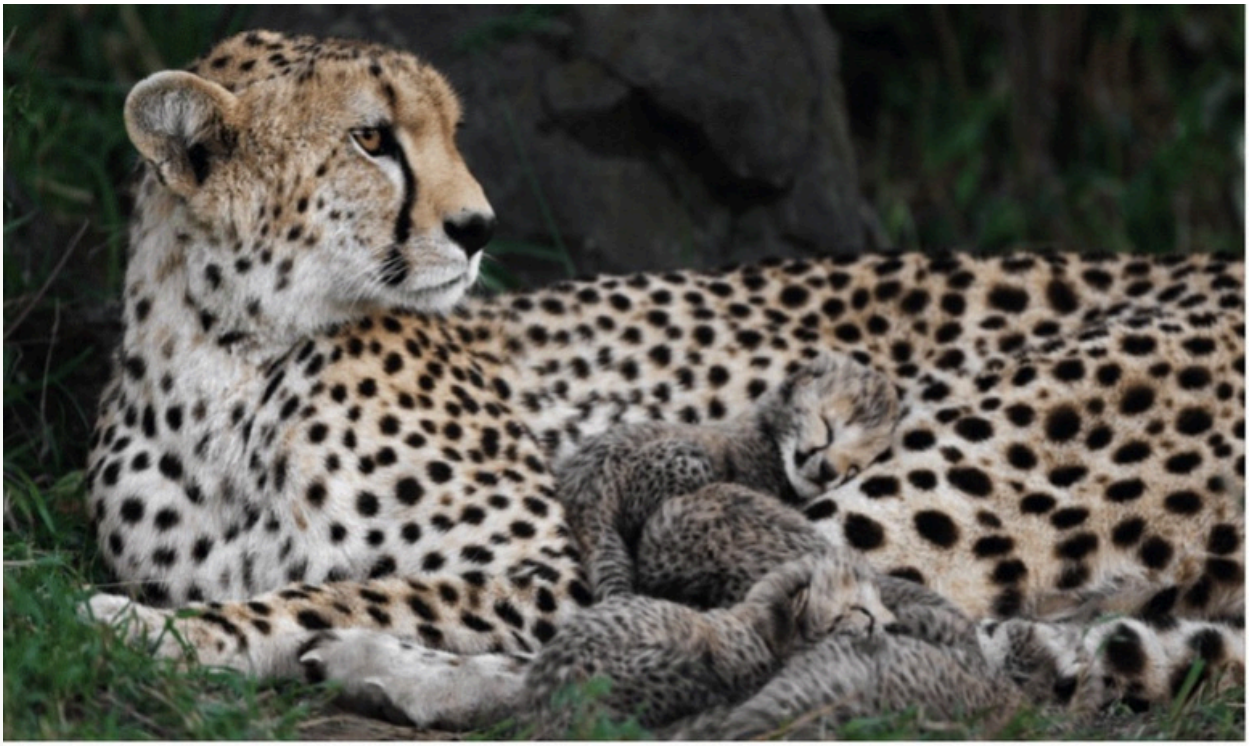
BY ELLE DONNELLY

The Year the Earth Changed is a new documentary on Apple TV+ that covers nature's reaction to the time humans spent in quarantine during the COVID-19 pandemic. Beloved narrator, David Attenborough, details countless uplifting instances of the natural world healing in the absence of human interaction. It truly makes the audience reflect on humanity's detrimental impact on our world, but also reminds us of the resilience of Earth and its creatures.

We learn that humpback whales traveling from Hawaii to Alaska to feed were able to dramatically increase their communication, due to the waters being 25 times quieter without cruise liners. The whales' calls to other adults increased feeding efficiency as the whales worked together to corral fish. Mothers were even able to leave their calves alone while feeding with the increased ability to communicate.

Humpback whales hunting together

In Kenya, with only 7,000 cheetahs left in the wild, conservationists were pleased that the fall in tourism has also improved cheetah cub survival rate. Normally, safari vehicles and tourists create a lot of noise that can drown out a mother cheetah's calls to her cubs. The mothers then must choose between calling louder and risk attracting their enemies, or not being able to signal to her cubs that food is available. With less noise to interfere with the mother's calls, cubs can easily find their mothers and eat safely.



Mother cheetah with cubs

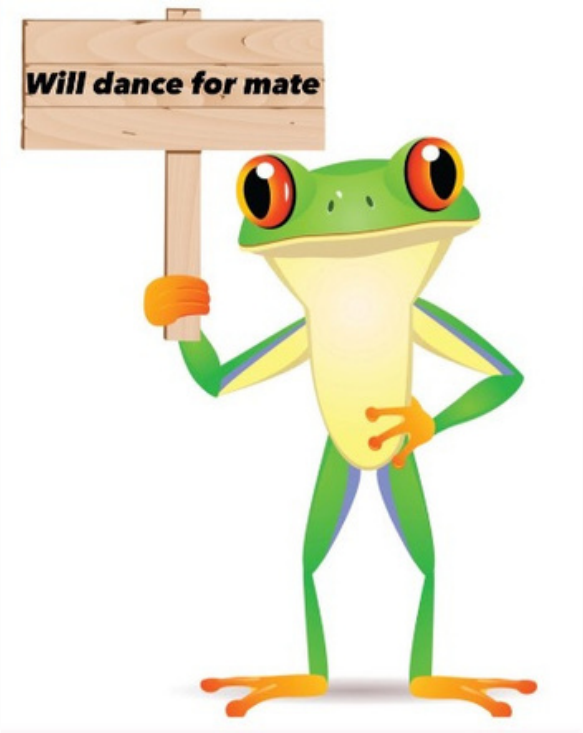
One of the most encouraging stories comes from Assam, India, where conservationists have healed the disconnection between humans and the local wildlife. Asian elephants are often found feeding on local farmers' crops and are considered a nuisance for the villagers. In order to end this problem, locals returning from city jobs (due to COVID restrictions) were hired to plant fast-growing wild rice and grasses solely for elephants to feed upon. Since then, elephants have stopped entering the village and eating their crops. This model could potentially be a huge breakthrough for other parts of the world where humans and animals closely interact.

This documentary provides a much-needed reprieve from the mainly negative news of 2020 and is certainly a worthwhile watch. If you are not currently an Apple Tv+ subscriber ($4.99/month), the service offers a 7-day free trial, which can be accessed from the Apple Tv+ app on devices including Roku, Amazon Fire TV Stick, Google TV, smart TVs, PlayStation, and Xbox.

WILL DANCE FOR A MATE - HOW SOUNDSCAPE IMPACTED A FROG'S RITUAL

BY FAYTH KIM

Most of us are familiar with loud croaking of frogs and toads, especially during the mating months. The male frogs call with the hopes of attracting a nearby female. With the goal of breeding, males will often call near bodies of water where eggs are laid and the tadpoles can then development.



However, in ecosystems with possible distractors (i.e. loud streams, waterfalls, etc.), simply croaking is not enough to attract a mate. Rebecca Brunner, a conservation ecologist at UC Berkeley, discovered that glass frogs (Sachatamia orejuela) exhibit additional cues during their mating rituals. Glass frogs can be added to the growing list of species that use visual cues to communicate in loud environmental settings. S. orejuela are native to southern Colombia and northwestern Ecuador, and have only been observed in the spray zones of waterfalls. It is believed that thriving in such an ecosystem provides the species extra protection from predation. Studying bioacoustics in different environments, Brunner observed glass frogs waving their limbs and bobbing their heads as they high-pitched vocalized. These visual cues may increase their chances of attracting a mate, and the high-pitched calls allow communication over the low roar of the waterfalls.

The emergence of frog species that utilize visual cues points to convergent evolution, as the species are not closely related. These behaviors most likely evolved independently as a response to similar environmental factors. This discovery reinforced how environmental soundscapes have the ability to affect species.

Test Your Trivia Knowledge!

BY RYAN PATTERSON

1. There are 7 species of sea turtle, with six being in the same family. Which species is the outlier?

a.Flatback
a.Leatherback
b.Hawksbill
c.Olive Ridley

2. What is the shape of wombat feces?

a.Tubular
b.Spherical
c.Cubed
d.Conical

3. Which of these species does not have a gallbladder?

a.Bearded Dragon
b.White-Tail Deer
c.Blue Shark
d.Black Panther

4. A fly's buzz is in the key of ___

a.F
b.C
c.G
d.Bm

5. What do you call a group of toads?

a.Sprocket
b.Knot
c.Colony
d.Fortitude

Answers: b, c, b, a, b

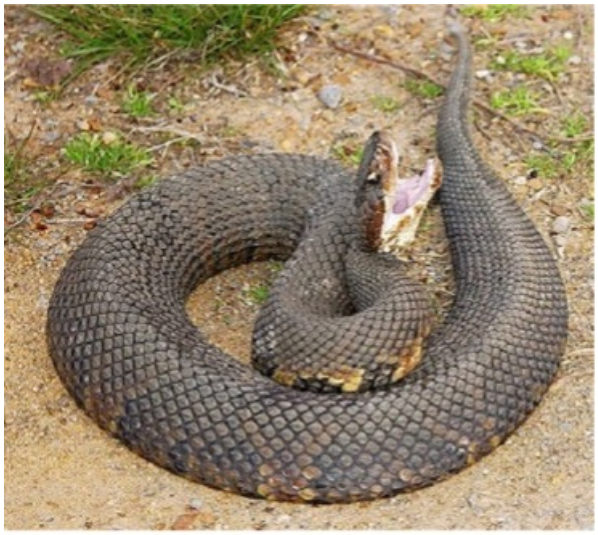
ILLINOIS NATIVE VENOMOUS SNAKES!

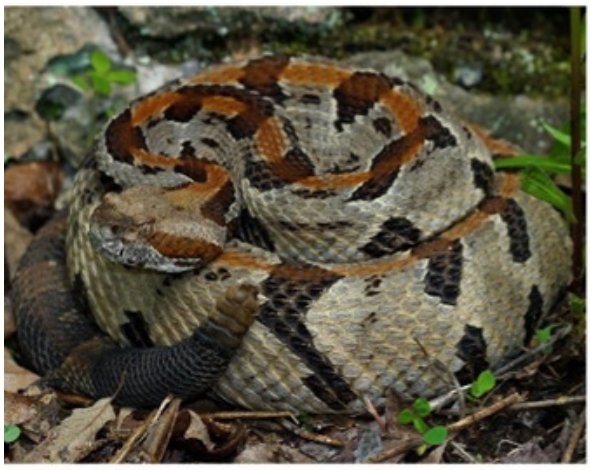
BY RACHEL ANGLES

The great state of Illinois is home to four different venomous snake species. These snakes are from the family Viperidae, which are heavy-bodied snakes with distinct heads and vertical pupils. Vipers have hollow fangs, which rotate from a resting position along the roof of the mouth to an erect position by the mechanical action of lowering the lower jaw. These fangs provide the functional means to inject modified saliva (venom) deep into prey. Their venom glands lie behind the eyes under the masseter muscle. Vipers regulate the amount of venom injected by their control over this muscle. The venom evolved primarily for the purpose of prey capture but can also be used as a defensive measure. All four native Illinois species are non-aggressive but still dangerous. All four Illinois representatives from the family Viperidae are pit vipers, which have a heat-sensing pit between the eye and nostril that is used to aid in prey location. The pit organ contains heat-sensitive cells that are responsive to changes in temperature of 0.001°C.

Eastern Copperhead (*Agkistrodon contortrix*): A species that is widely distributed and can be found inhabiting forests, fields, swamps, marshes, rocky areas, sand dunes, and urban and suburban areas. Copperheads are diurnal during cooler seasons and nocturnal during warm seasons and often overwinter in aggregations in dens. They can eat many types of prey, including invertebrates, amphibians, and small birds, mammals, and reptiles. Copperheads are viviparous, and mating is often preceded by male combat. They will vibrate their tails when disturbed.

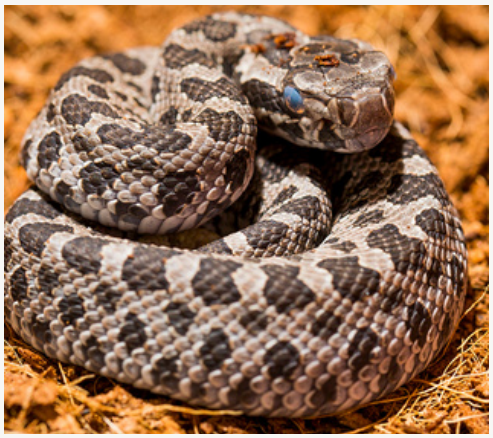
Northern Cottonmouth (*Agkistrodon piscivorus*): This is a semiaquatic species inhabiting swamps, marshes, ditches, streams, rivers, ponds, and forested and grassland habitats adjacent to wet areas. Northern Cottonmouths eat fish, reptiles, amphibians, small mammals, and inverts. Cottonmouths are viviparous and again, males are known to engage in combat prior to mating. Mating primarily occurs in the spring, but also sporadically in the fall. Northern Cottonmouths are not aggressive but will often remain in place when approached by humans, flattening their bodies, vibrating their tails, and opening their mouths, exposing the white interior (hence their name).





Timber Rattlesnake (*Crotalus horridus*): This is a terrestrial species that inhabits forests, fields, slopes, and ridges, and glades of swamps. Timber rattlesnakes commonly live in communal-ancestral dens (hibernacula) and birthing rookeries, with individuals returning to the same den each year. Snakes begin hibernation in the fall, which lasts ~204 days. Timber rattlesnakes are diurnal in spring and fall and nocturnal in summer. They are primarily predators of mammals but will eat some frogs and birds. Timber Rattlesnakes are viviparous and neonates stay with females for up to 2 weeks. This species is threatened, with wild populations at low levels.

Eastern Massasauga Rattlesnake (*Sistrurus catenatus*): This species lives in shallow wetlands and adjacent uplands. Populations are declining over the due to habitat loss and fragmentation, making this species endangered. Massasaugas usually hibernate in wetlands in crayfish or small mammal burrows. Massasaugas feed primarily on small mammals and occasionally birds, frogs, and other reptiles. Massasaugas are ovoviviparous and give birth in August or early September.



ZOO MED: YEAR IN REVIEW

BY BROOKE DUGAN

In March 2020, I interviewed our Zoo Med team about their COVID protocols and how life at the Veterinary Teaching Hospital changed. Now, over a year later, I talked with Dr. Krista Keller about how the Zoo Med service is operating.

COVID Protocols and Impact

For much of the past year, the Veterinary Teaching Hospital, including the VM South Clinic, has operated with curbside receiving where clients would come in only for drop off and pick up and communicating by phone from their car. With University COVID restrictions lightening, clients are now allowed into South Clinic and can stay in the room for part of the visit. Dr. Keller said that communication has been challenging but that the pandemic and social distancing requirements have allowed the hospital to have telemedicine appointments available. According to Dr. Keller, these appointments have been well received by clients. “We have targeted nutrition consultations, end of life discussions, and long term analgesia conversations for these telemedicine visits.”

Teamwork and Case Management

Zoo Med is back to having a high caseload and is at full receiving capacity between wellness exams, emergencies, and surgeries. In addition to zoo companion animals, the Zoo Med team also has an ambulatory service that visits local zoos twice per week. The Zoo Med service also welcomed Dr. Spencer Kehoe to the team earlier this year, and with his help, South Clinic has extended hours for most of the week. Zoo Med also welcomed Veronica to the team as a new technician. The additional hours combined with the extra hands have allowed for more learning opportunities for the fourth-year students, interns, and residents.

Looking into the Future

COVID restrictions have changed the way patients have been received, how doctors and students communicate with clients, and how cases are managed. While the VTH is slowly working back toward the traditional norm for appointments, Dr. Keller thinks that “a hybridized approach in the future would be ideal.” Telemedicine appointments have opened new opportunities for clients who may have difficulties coming to South Clinic.

Overall, the past year has been challenging and has forced students, doctors, and clients to adapt in order to receive the best patient care possible. The Zoo Med team has continued building client trust with quality patient care and communication, and the fourth-year students, interns, and residents have had a wealth of experiences with the growing caseload. A huge thanks to Dr. Keller for taking the time to answer my questions!

BIOACTIVE ENCLOSURES, PART 5: THE CLEAN-UP CREW

BY EMILY GRZEDA

Bugs are the key to bioactive enclosures – without them, the system doesn't work. For the most part, bugs are invisible guardians of your little ecosystem, but choosing the right ones is crucial: otherwise, they either may not survive or could even eat your plants and be a detriment instead of a help. Once you put them in, you hardly need to think about them – as long as conditions are correct, they'll reproduce among themselves. I have tanks that have been going for years without ever adding new bugs! Bugs are what allow your bioactive to not need to be cleaned by you – they recycle your animal's waste and manually move the top layers of soil around, and slowly degrade leaves and sticks into nutrients for your plants. To take care of them, all you should need to do is ensure the soil is properly watered so their environment is moist enough, and to provide more leaf litter when they've consumed it all.

**A note on leaf litter: you can go outside and find leaves yourself, which is great! We love free! Woody tree leaves such as oak work best. However, to ensure you aren't introducing new bugs or pathogens into your tank, it's a good idea to bake them in an oven at around 200 degrees for around 30-45 minutes after rinsing them off.

SPRINGTAILS: These are the bread and butter of your clean-up crew; technically, you could probably have JUST springtails without the need for other species, if the environment is consistent enough and your animal only produces a little bit of waste. These are very, very tiny white bugs that get their name from "springing" from place to place. Since then jump, they can reach the upper levels of the bioactive environment, which can be very helpful for reptile species that climb. There is no reason not to have springtails in your enclosure – they're inexpensive, reproduce quickly, and cause no detriment. The reason they usually are not used singly without isopods is that they can be sensitive. Some species require their living spaces to be very moist and will either die or just not clean dryer portions of the tank if it is unevenly watered. Additionally, since they are so small, it takes them a lot longer to consume feces, so their population can become overwhelmed by waste load, risking your animal's health.

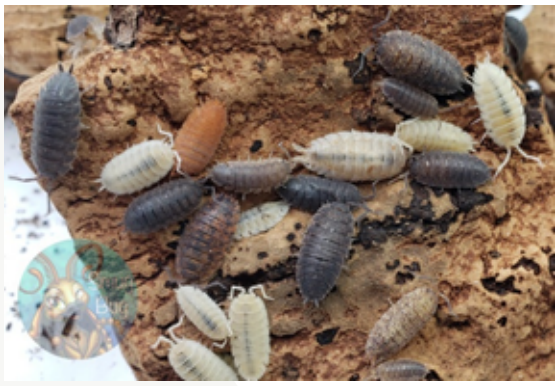
A note on buying springtails: they're so small, that you don't typically have a count of exactly how many you're getting. "1 culture" from a reputable source should be sufficient to get your setup going.

ISOPODS: This is where the fun really begins. “Isopod” is the sciency name for “roly-poly” or “pill bug”, so don’t worry, they’re nothing too fancy. Yes, you can theoretically go outside and collect some from your yard – BUT, you must ID what species they are because only the invasive ones can be legally collected (most endemic species are in the southwest, so in the Midwest, you’re probably fine. But CHECK!). Additionally, there’s a risk of biologic parasites/other tank invaders coming along for the ride, so purchasing them is a safer bet. There are TONS of species to choose from, so where do you start? Here are a few of my favorite, hardy species that are inexpensive. All of the species listed below are ones I personally keep in my gecko and snake enclosures. Additionally, all of these can co-exist together; you don’t need to just get one!

Dwarf Whites *(Trichorhina tormentosa):* These are the cheapest, easiest species there is, and some of my enclosures run solely on these and springtails. They are hardy, very small, reproduce quickly, and are absolutely safe to use with all species, including amphibians. They require a fairly tropical environment with moisture, so ensure there are plenty of damp hiding spaces for them.

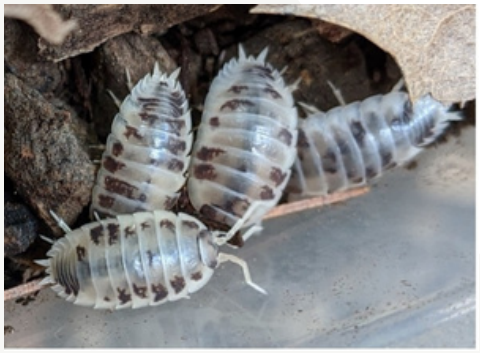
Current market price: At a reptile show, $5 per ~20 isopods. Online, $8-10 per ~20 isopods, plus shipping. I recommend getting 1-2 cultures to get started.

Porcellio scaber: These are larger, hardy isopods that come in a variety of color morphs. They also enjoy tropical bioactives but can tolerate slightly dryer conditions than dwarf species, but still require damp areas (as all isopod species do). Do not use these with amphibians: they have been known to bite and injure them.



Current market price: ~$0.75-1 per isopod. I recommend getting around 20 to get started.

Dairy Cows (*Porcellio laevis*): These are favorites – they’ve got fun “cow spots”, are hardy, and reproduce rapidly. Super fun! Don’t use with amphibians.



Current market price: ~$1 per isopod. I recommend getting around 20 to get started.

Giant Canyons *(Porcellio dilatatus):* Like the other Porcellio species, don't use these with amphibians. While they aren't as brightly colored, they're big – 3/4"! They like to burrow in the dirt a little more than the other species do, so turning up soil is a plus with these guys.

Current market price: ~$1 per isopod. I recommend getting around 20 to get started.

Purchasing isopods can be done online at various websites such as joshsfrogs.com or glassboxtropicals.com, or through smaller sellers on morphmarket.com (where you can also buy reptiles and amphibians from smaller-scale breeders).

If you think those isopods are expensive, those are the cheap ones. Here are some bonus species to blow your mind – they are typically kept in individual cultures, not as a clean-up crew, due to their expense (you don't want a gecko eating a $60 bug), more specific care requirements, and slower reproductive speed. Isopods can actually be great pets – they have easy care, will reproduce on their own (so essentially, are a pet you can have forever) and are fun to watch. Beginner isopod keepers should still start with some of the easier species, but here are some fun ones:

Zebras (*Armadillidium maculatum*): Self-explanatory name, really. $4-6 per bug

Clowns (*Armidillidium klugii*): ~$12 per bug

Rubber Duckies (*Cubaris* sp): They're adorable. Market price is around ~$20-25 per bug.

Cappuchinos (*Cubaris* sp): ~$100 per bug.

TANK INVADERS: There are some bugs you definitely want to keep out of your tank – primarily ants, snails, and some beetles. Ants will eat your animal, particularly if it does not have scales, and they are a pain that inevitably will infest your home. Snails and slugs will not likely injure your animal but will kill your plants, much as they destroy your garden plants outside. You want to avoid them because they're a massive pain to get rid of once you have them (ie, you really need to destroy the vivarium, throw out everything, and start over). Beetles will also bite your animal – be careful not to drop mealworms or superworms in the tank if you are tong-feeding. Some beetles are helpful, not harmful, but be sure to research a species before adding it.

Always make sure to allow for at least a month of plant and bug development before adding animals. A bug population will grow or shrink depending on the number of food resources the environment offers – in this case, that's your animal's waste, leaves, and sticks. There's no point in buying hundreds of isopods, just a couple of cultures (depending on the species, a culture is around 12-25 bugs) to get going. Provide plenty of leaf litter, add the bugs, and make sure you have plenty of bark/sticks on the ground for them to hide in, and you'll be good to go. In a month, your bugs won't be at full tank capacity, but they'll have had a chance to begin spreading out and reproducing, acclimated to their new environment before an animal comes crashing through. Any omnivorous reptile is likely to eat some of the isopods as well, which is perfectly safe (and healthy!), but you obviously want there to be a large enough population before they're picked away at.

I hope you've enjoyed this bioactive series; I had fun writing it! Bioactive enclosures are a passion of mine, and both enrich my animals' lives and my own. They provide great natural humidity, natural hides, and less time cleaning once the system is established, leaving you more time to just sit and enjoy your pets!

Sources and Acknowledgements

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