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NTS NEWSLETTER

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LUMPY BUMPY SEA TURTLES

BY ALEC COLOSI

Veterinarians who deal with stranded marine animals will likely treat sea turtles that present with a plethora of ailments, be it trauma, cold shock, or infectious disease. Among the most interesting conditions sea turtles can have is fibropapillomatosis or FP for short. FP is a disease caused by a herpes virus that affects every species of sea turtle except leatherbacks, with a majority of cases being green sea turtles. This disease can be extremely debilitating and is one of the larger challenges that aquatic veterinarians face with wild sea turtle populations. Fibropapillomas can be found externally on the flippers, scutes, skin, eyelids, and even on the cornea. This disease could present as mild as a solitary wart-like tumor on the body of a turtle or as severe as several grapefruit-sized masses covering the animal's face, flippers, and shell. It isn't hard to imagine that these tumors can dampen a turtle's ability to see, swim, and eat, making it the most significant infectious disease veterinarians deal with in these species. It is even possible for sea turtles with FP to develop masses on their internal organs, causing secondary complications that are life-threatening.

FP is caused by chelonian herpesvirus 5 (ChHV5), and usually affects younger sea turtles when they migrate to warmer coastal waters. This virus is more common in polluted water near areas of a higher human population. Research has shown that turtles will shed the virus into ocean water from the tumors that develop on their bodies. The virus replicates more rapidly in the early stages of tumor growth, so individuals with smaller lesions will shed it more readily. There is also evidence of ChHV5 on the skin of infected turtles who do not have any growths, suggesting these individuals may also serve as vectors for disease. ChHV5 can be spread by marine parasites that pass between individuals as well. All this to say, it is very easy for only a few infected individuals to spread FP, putting entire populations at risk.

Now let's get to the fun part: the medicine. Before anything can be done about the tumors on a severely affected sea turtle, as with any very sick patient, the animal must be stabilized. Sea turtles with FP can present with severe emaciation and secondary infections due to a suppressed immune system. Once the turtle is healthy enough to be a surgical candidate, action can be taken to remove the tumors. Surgical removal is the preferred choice for the treatment of this disease, but there is a high incidence of recurrence with simple excision. Other options include photodynamic therapy, where the turtle is given a systemic or local photosensitizing agent and the papillomas are exposed to specific wavelengths of light. This is repeated until the tumors necrose and fall off or until they become detached enough to be easily removed. Another promising therapy is removal with a CO2 laser. Using a laser to excise the tumors provides excellent hemostasis and improves healing compared to scalpel excision. Unfortunately for turtles with internal FP lesions, the best option is euthanasia due to a poor prognosis.

FP in sea turtles is a hot topic in aquatic animal medicine and current research is focusing on finding better ways to treat these sick turtles and reduce the recurrence of the disease. Sea turtle veterinarians all over the world work hard to care for and rehabilitate these animals and our knowledge of this disease is only growing. There may even be a day in our lifetimes where we may find a cure for this debilitating disease.

Test Your Trivia Knowledge!

BY: RYAN PATTERSON

1. How many hearts does an octopus have?

- a. 0
- b. 2
- c. 3
- d. 4

2. What is a rhinoceros horn made of?

- a. Ivory
- b. Bone
- c. Keratin
- d. Ossified Cartilage

3. What is the name of a group of penguins in the water?

- a. Raft
- b. Waddle
- c. Colony
- d. School

4. What is the only surface a gecko's toe pads can't stick to?

- a. Steel
- b. Teflon
- c. Plastic
- d. Polyester

5. Which group of primates has been in existence the longest?

- a. Simians
- b. Lemurs
- c. Tarsiers
- d. Marmosets

(answers on p.12)

ENDANGERED SPECIES OF FERRET SUCCESSFULLY CLONED

BY DREW CADWELL

The black-footed ferret has been on the ropes for some time now and at one point, in 1979, was even believed to be extinct. However, due to good luck and some conservation efforts, there are now around 350 of these animals in the wild. Unfortunately, a significant genetic bottleneck occurred in the latter half of the 20th century due to their near extinction which has made conserving this species so challenging. The decline of their population in the nineteenth and twentieth centuries was largely due to hunting of their natural prey, prairie dogs, but both distemper and plague have played central roles as well.

The new black-footed ferret clone, born back in December, is a genetic copy of a wild female named Willa, who died in the mid-1980s in Wyoming. Her cells were part of the Frozen Zoo program, an endeavor of the San Diego Zoo Global that has samples from some 1,100 rare and endangered species from around the world. She was brought into this world using a domestic ferret foster mom in Fort Collins, CO. Researchers hope to breed Elizabeth Ann and introduce her offspring into the wild to introduce desperately needed genetic diversity into the population. Scientists are hoping that this will reduce inbreeding in the wild population while allowing the ferrets to better cope with diseases such as plague which have historically been so problematic. Experts are excited about the degree to which this will potentially be achieved since Elizabeth Ann's genome has roughly three times more genetic diversity than other black-footed ferrets currently in the wild.

This scientific triumph will hopefully pave the way for scientists to be able to do similar with other endangered populations in the near future. (Pictured below is Elizabeth Ann, the cloned ferret)



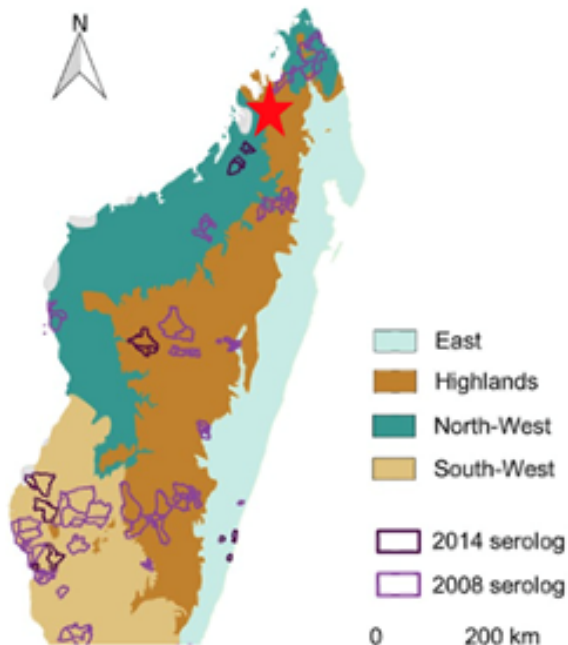
SMOL LIZARD IS ~SMOL~

BY CARLY CLARK

New species alert!!! The handsome fellow on the right officially holds the title for the world's smallest reptile. Coming in at just 15mm from snout to tail for males, and 19mm snout to tail for females, these little guys could rest comfortably on the surface of a penny. To go along with its adorable size, this species was given the name *Brookesia nana*, abbreviated to *B. nana* ♀, which is equally adorable.



Discovered in the highland rainforest of northern Madagascar on a German research expedition in 2012, this nano-chameleon was officially classified as a genetically unique species at the beginning of this year. The research team was able to collect a male representative with prominent hemipenes and a female representative with fully developed eggs internally (confirmed by CT) verifying that both specimens collected were adults. This was important because like many nano-chameleon species, *B. nana* is paedomorphic, meaning that adults will retain their juvenile appearances. These paedomorphic traits include large heads and eyes relative to their body size and an underdeveloped skeletal structure












At 10mm smaller than the next member of its genus, why would a chameleon evolve to be this tiny? Evolutionary biologists have many theories on what causes micro-species, but in many cases, it is believed that species miniaturize due to environmental pressures forcing them to adapt to extremely scarce and niche resources. Madagascan rainforests have historically been under immense pressure from deforestation for agriculture and urbanization, including the region where *B. nana* was discovered. Since the expedition in 2012, the nano-chameleon's habitat has been formally protected with the creation of a national wildlife preserve. With these new protections, hopefully, the *B. nana* species will continue living under their blades of grass and eating mites off the rainforest floor undisturbed for years to come.

TEST YOUR KNOWLEDGE: MATCH THE BEAKS N' BILLS TO FUNCTIONS!

BY FAYTH KIM

There is an incredible variation in bird beak form and size. Many species have evolved specialized beaks to efficiently feed on their natural diets. Test your knowledge and match the beak/bill to a function. The answers can be found at the bottom of the page.

A.		1. Chiseling
B.		2. Grain eating
C.		3. Nectar feeding
D.		4. Dip netting
E.		5. Probing
F.		6. Insect catching
G.		7. Raptorial
H.		8. Surface skimming
I.		9. Filter feeding

ANSWERS BELOW!

[KEY: A4, B7, C8, D9, E6, F5, G2, H1, I3]

WATER DINOSAURS

BY COLLEEN ELZINGA

If you've seen Jurassic World, you may have been curious about the mysterious water creature that becomes the unsung hero. So were there really water dinosaurs? Not exactly. The animal in the movie is based on the Mosasaurus, which really did exist at the time of the dinosaurs. Mosasaurus was one of several similar species in a huge family of warm-blooded marine lizards now known as the mosasaurs.

Many of the earliest mosasaur fossils were discovered in Badlands National Park in South Dakota. Mosasaurs would have lived in the Badlands area from about 75-69 million years ago. Mosasaur fossils have been found in the Pierre Shale, a rock unit laid down in the Western Interior Seaway. The Western Interior Seaway was a shallow inland sea that stretched from the Gulf of Mexico all the way to the Arctic Ocean, cutting the North American continent in two. It would have covered the Badlands in the Late Cretaceous when dinosaurs roamed the earth and mosasaurs inhabited the waters. The Mosasaurus itself was very successful and so widespread that its fossils have been found from Russia to North Dakota to Morocco to Antarctica. This worldwide distribution highlights just how adaptable these creatures were.



MOSASAURUS

Mosasaurs generally lived in the ocean, but some had adapted to freshwater environments by the end of the Cretaceous Period. They evolved from a terrestrial lifestyle to a marine one, developing webbed paddles for swimming. They had cylindrical bodies, long jaws, and a powerful tail for propulsion. In some mosasaurs, the tail made up more than half of the body length and could contain 100 vertebrae. Skin impressions from fossils indicate that they had scales designed to reduce the drag forces in the water. Their scales were slightly smaller than those of the prairie rattlesnake. The Mosasaurus was the largest carnivore of its day, reaching more than 17 meters long and 15 tons. Additionally, they were so well adapted to life in the oceans that they gave birth to live young.

Mosasaurs were top predators of the oceans and would eat anything they could catch, even other mosasaurs. They became the biggest predators of the Cretaceous oceans in just 25 million years, a short period in geologic time. About 92 million years ago, an extinction event occurred due to large-scale underwater volcanic activity. It wiped out several groups of marine animals, leaving a big opening for a new animal group to dominate the ocean. The rapid evolution of mosasaurs led to the long-term domination of the oceans and paved the way for some of the most diverse ancient marine reptiles. Never before had a marine reptile group reached such diversity in such a short time. Thus, the mosasaurs were one of the greatest success stories of the Mesozoic Era. It took the mass extinction at the end of the Cretaceous Period to wipe them out completely. The modern relatives of mosasaurs are snakes and monitor lizards.

I HEARD SOMETHING WILD THE OTHER DAY...

BY: SIOBHAN MEADOWS

Looking for something to fill the silence while you're washing the dishes? Or, maybe you need some cognitive entertainment while you're sitting at your crafting table or working on a puzzle. Could be that you have a long commute ahead of you and don't feel like listening to the same old playlist. Well, we've got something for you Vet Med! Below you'll find a list of zoologic, aquarium, exotic, aquatic, and wildlife podcasts. This series features guests from around the globe and from various professions within the world of non-traditional species. Follow the links or look them up on your favorite podcast streaming service. Either way, sit back, relax, and listen to something wild.

- **All Creatures:** <https://www.allcreaturespod.com/>

Although not a veterinary-based podcast, All Creatures features...all creatures! This podcast spreads a message of conservation with its belief that education is critical for a healthy and stable planet. With over 200 podcasts of a vast array of species, there's something for everyone

- **AquaDocs:** <http://www.aquadocspodcast.com/>

AquaDocs is an aquatics-based podcast series run by 2nd year Cornell veterinary student Michelle Greenfield. As "A Place to Talk about Aquatic Medicine", this podcast features experts in the field and covers everything from sea turtle cancer to algal blooms.

- **Keeper Chat:** <https://www.keeperchatpodcast.com/>

Keeper Chat boasts itself to be a zookeeper comedy podcast. Hosted by two zookeepers, this series features weird animals and adds in a bit of humor. To put it their way, "learn about animals in a way you never have before, with all the dirty details from two people who aren't afraid to call animals out on their junk".

- **One Wild Place:** <https://pghzoo.libsyn.com/>

One Wild Place allows you to go behind-the-scenes of the Pittsburgh Zoo & PPG Aquarium. It gives listeners a hands-on perspective from those working directly with wildlife and conservation.

- **Wild for Life:** <https://www.torontozoo.com/tz/podcasts>

In this podcast series produced by the Toronto Zoo, the "hidden zoo" is unveiled and information on critical conservation work is discussed. In the spirit of helping to protect wildlife around the world, this series features guests from nutritionists and ecologists, to wildlife biologists and veterinarians.

- **Wildlife Health Connections:** <https://wildlifehealth.org/podcast/>

Wildlife Health Connections is a wildlife podcast series that features veterinarians, biologists, ecologists, epidemiologists, and more. This podcast "gives a voice to those who have dedicated their career to the advancement of wildlife health around the world".

- **ZooLogic:** <https://zoologic.libsyn.com/>

Hosted by Dr. Grey Stafford, ZooLogic is a podcast series surrounding all things zoo, from training and health to welfare and sustainability. Dr. Stafford talks to guests from around the world to share stories, behind-the-scenes experiences, and some humor. With going on 4 years-worth of podcasts, this series is sure to keep you occupied for quite a while.

SMALL MAMMAL RESTRAINT IN PRIVATE PRACTICE

BY RACHEL ANGLES

Small Rodents (Mice, Rats, Hamsters, and Gerbils): Use one hand to gently hold the base of the tail*, and use the other to scruff or cup the animal. Animals that are more used to being handled will require less restraint. These animals are usually more compliant if they are handled for a few minutes before the physical exam to get them used to your scent.

*Do not hold gerbils by the base of the tail, as this can cause a degloving injury.



Guinea Pigs: Always provide support for both the thorax/shoulders and for the hind end when holding a guinea pig. Well-socialized guinea pigs may be gently corralled on a table for a physical exam. Poorly socialized guinea pigs may be more compliant when wrapped in a towel.



Chinchillas: Support the body with one hand under the thorax and use the other hand to grasp the tail base. Do not scruff chinchillas as it can result in degloving (aka fur slip). Wrap the chinchilla in a thin towel or blanket to maintain restraint for a physical exam.



Rabbits: Always support the rabbit from underneath both in the front end and in the hind end. Vertebral fractures can easily occur if the rabbit struggles and kicks with its hind legs, so ensure that it is well supported. Rabbits can be held one hand behind the front legs and the other underneath the hind end, keeping it firmly against your chest. Alternatively, you can place one arm under the ventrum and one over the animal's back, again holding it firmly against your chest. A towel wrap can be used for less cooperative patients.



Sugar Gliders: Examine a very tame sugar glider by holding it gently within a small towel in cupped hands. For a fractious sugar glider, hold the head between the thumb and middle finger while placing the index finger on top of the head, after which the body can be supported in the hand. Use the other hand as needed. Leather gloves are recommended for some of the more fractious animals. Never restrain a sugar glider by holding it by the tail.



Ferrets: Restrain a ferret by holding the thorax with one hand while allowing the caudal end of the body to rest in the other hand. Ferrets may need to be scruffed if more restraint is indicated. The body should be kept slightly stretched. Ferrets may yawn immediately after being scruffed, which is a great time for an oral exam.



Hedgehogs: Place the hedgehog on a towel on the exam table. Gently grasp hind legs and lift them slightly off the ground. The hedgehog will grab the towel and can then be examined. Very tame hedgehogs may also tolerate scruffing. More fractious animals may need to be handled using leather gloves or a heavy towel.



CARING FOR YOUR BACKYARD DUCK

BY KAYLA LADEZ

Backyard poultry has grown in popularity over the last decade. Ducks are less common than chickens but are becoming more popular because they are friendly and produce flavorful, nutritious eggs. Ducks can live 8-12 years with an appropriate diet, husbandry, and protection from predators.

A duck's diet should be made up of 50% types of grasses and other vegetation and 50% pellets. Species-specific grower pellets should be offered to ducklings until they are 24 weeks old. Grower diets are high in protein and contain niacin (B3). Mature, non-laying ducks should be fed a game bird diet without added protein or calcium while laying females require a layer diet that is high in protein and calcium. Corn and bread should not be offered as they can lead to obesity. Ducks should always have access to bowls of clean water.

Ducks should not live exclusively indoors because hard surfaces can contribute to bumblefoot. Instead, they should spend time on grass and dirt areas that are turned over or re-sodded at least 1-2x a month to avoid parasite or bacterial overgrowth. They also need a swimming water source that is at least 2 feet deep and has filtration or can be drained to clean. Tall grasses, platforms, and huts can serve dual purposes as enrichment and protection from predators. Ducks can peacefully coexist with other members of the same species, but overcrowding can lead to increased aggression, injury, or disease.

Other topics we should discuss with future clients are any local toxic plants that could be found while foraging, additional predator protection with netting or fencing when necessary, and where to find information about applicable state and county regulations. We should also educate clients on the importance of necropsies after unexpected death to rule out infectious diseases in a collection. The Association of Avian Veterinarians has great client and member resources if you are interested in practicing medicine on backyard poultry.

BIOACTIVE ENCLOSURES, PART 2: HOW TO BUILD YOUR OWN

BY EMILY GRZEDA

Hopefully last week I got you excited about bioactive enclosures, so next in the series is how to build one yourself. There are plenty of alternate methods, but this is the one that has worked best for me. The tank I am building for this example is a 12x12x18" front-opening tropical enclosure for a juvenile gargoyle gecko. Arid enclosures are also possible, but the substrate and plant choices would be different from the ones shown here. I recommend looking into the natural behaviors of your species; how they perch, bask, dig, climb, etc. That way you can include appropriately sized sticks or features for your species.

First, start with your tank. Put it in the shower and wash it out with dish soap. You always want to start with a clean slate to ensure there are no remains of waste from animals who used it before, or manufacturing chemicals leftover on new tanks.



Next, get some black, waterproof spray foam, typically manufactured for outdoor window or pipe insulation. This is sticky, and the fumes can be carcinogenic, so spray this outside or near an open window with fans, and wear gloves. Lay the tank on its back and cover the back (and sides if desired). You can integrate cork bark or sticks into this and make some sections thicker/deeper than others to make outcroppings/ledges later.

This is what the foam looks like 24 hours later, fully expanded. I recommend waiting at least 48 hours before continuing to the next step to ensure that it has fully dried. For reference, I used 1 entire bottle of this spray foam for this build. This isn't an advertisement for this specific brand, it's just what I use.



The next step is the most tedious and has the greatest variety of methods. The goal is to peel away the shiny exterior of the dried foam to expose the texture underneath. This will allow for a more natural look, an opportunity for some species to climb the wall, and a surface for dirt to be easily adhered to. My method is to peel away the top layer with my hand; it creates the most natural-looking texture and I have the most control over how ledges turn out. Other options are to use an X-ACTO knife (which I actually find more difficult) or to use the wire drill attachment pictured. The drill attachment is very messy; you'll want to do it outside, and you will have less control over ledge placement and there is not as much final texture. This is the result.



You'll likely have excess foam that has smeared onto the glass in ways you didn't want it to, as shown here. A flat blade can easily remove it.

Next, the step that makes the tank look like it's starting to really come together. With the tank still on its back, use gloves to spread clear, waterproof silicon in sections over the textured foam. Press peat moss (or other dirt) onto the wet silicon, and work in sections until all black foam has been completely covered. Make sure you do this outside or in a well-aerated area, as you did for the foam. Allow this to dry for at least 24 hours before standing up the tank, shaking it a little to clear excess dirt. You may need to touch up with more dirt in sections that you missed or where it did not stick the next day, repeating the process. This is the result.



After waiting 24 hours, you're in the final stretch! It's important to include a drainage layer for excess water to go, so use pond gravel (often in gardening sections of hardware stores) to make about a 1/2" layer across the bottom of the tank. Cover this layer with a layer of window screen; this will keep the dirt layers you add above it from completely mixing with the stones.

The dirt layers you add varies on the species you are building for the enclosure, but this mix is a good start for most semi-tropical to tropical species: 80% topsoil, 15% peat moss, 3% damp sphagnum moss, 1% sand, and 1% carbon. Carbon can consist of shredded newspaper or charcoal. This is not an exact science – I just measure by eye. In an ideal world, your dirt mix should be 3-4" tall on top of the drainage layer, but some front-opening tanks are too short to achieve this. Something that can increase dirt height, in this case, is to have the lowest level of dirt closest to the door, but then angle more of it upwards so that it is 4" tall at the back of the tank.



Lastly: the fun stuff! Add plants first, then bark, dried leaves, and your bug clean-up crew (usually springtails and isopods) to the floor and add cork bark and/or climbing sticks for animal enrichment. (What plants, leaves, and bugs to add, you might ask? I'll go into that next month! 😊). Water your plants judiciously and make sure the soil is moist, but not damp.



I recommend waiting about a month for the ecosystem to establish before adding your animal. Animals are not always gentle on your plants, so giving them a chance to take root will improve their chances of thriving. Additionally, your clean-up crew will need a chance to reproduce to effectively numbers for digesting all the waste your animal produces, so this period will allow them to multiply. Plants will take time to grow; you don't want to overload your tank initially or they will eventually compete too heavily with one another. Until they grow larger you may want to supplement with some fake plants in the upper reaches of your cage for animal hiding places until your live plants fill those places themselves. I hope this has been a helpful guide; best of luck, and until next month!

Test Your Trivia (answers)

1. How many hearts does an octopus have?

- a. 0
- b. 2
- c. 3**
- d. 4

2. What is a rhinoceros horn made of?

- a. Ivory
- b. Bone
- c. Keratin**
- d. Ossified Cartilage

3. What is the name of a group of penguins in the water?

- a. Raft**
- b. Waddle
- c. Colony
- d. School

4. What is the only surface a gecko's toe pads can't stick to?

- a. Steel
- b. Teflon**
- c. Plastic
- d. Polyester

5. Which group of primates has been in existence the longest?

- a. Simians
- b. Lemurs**
- c. Tarsiers
- d. Marmosets

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photo credit: U.S. Fish and Wildlife Service

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