



Compendium  
of the  
11th Annual  
March Mammal Madness

2023 Tournament

“A Decade of Learning”

Proceedings of the  
Noble Zoological Society

Series C Performance Sciences

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‘Describing at Large

**Their True and Lively Figure, their several Names, Conditions, Kinds, Virtues (both Natural and Fanciful), Countries of their Species, their Love and Hatred to Humankind, and the wonderful work of Natural Selection in their Evolution, Preservation, and Destruction.**

Interwoven with curious variety of **Creative Narrations** from Academic Literatures, Scholars, Artists, Scientists, and Poets. Illustrated with diverse Graphics and Emblems both pleasant and profitable for Students of all Faculties and Professions.’

The above description satirically adapted from, and with apologies to: Edward Topsell. 1658. History of Four-footed Beasts and Serpents. Collected out of the writings of Conradus Gesner and Other Authors. Printed by E. Cote for G. Sawbridge, T. Williams and T. Johnson. London. Available in 2023 at [PublicDomainReview.org](https://PublicDomainReview.org)

*For Nature*



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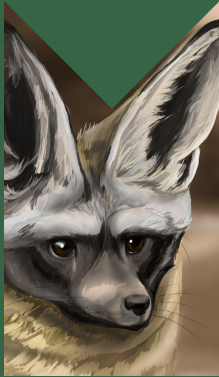
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**2023 MARCH  
MAMMAL  
MADNESS**  
*"If you're learning, you're winning!"*





# 2023 HIGHLIGHTS

- **Global interest from 115 countries across 6\* continents** (*We're coming for you Antarctica!*)
- **>1 Million pageviews of the ASU MMM LibGuide with player, educator, & learner portals.**
- **>6,400 Educators requested materials to use with N>640,000 Learners**
- **MMM reached ~1.4% & ~2.3% of all public high school and middle school students in the USA**
- **60+ volunteer scientists, artists, librarians, & educators create MMM annually**



14k Likes  
16k Followers



33.5k Followers



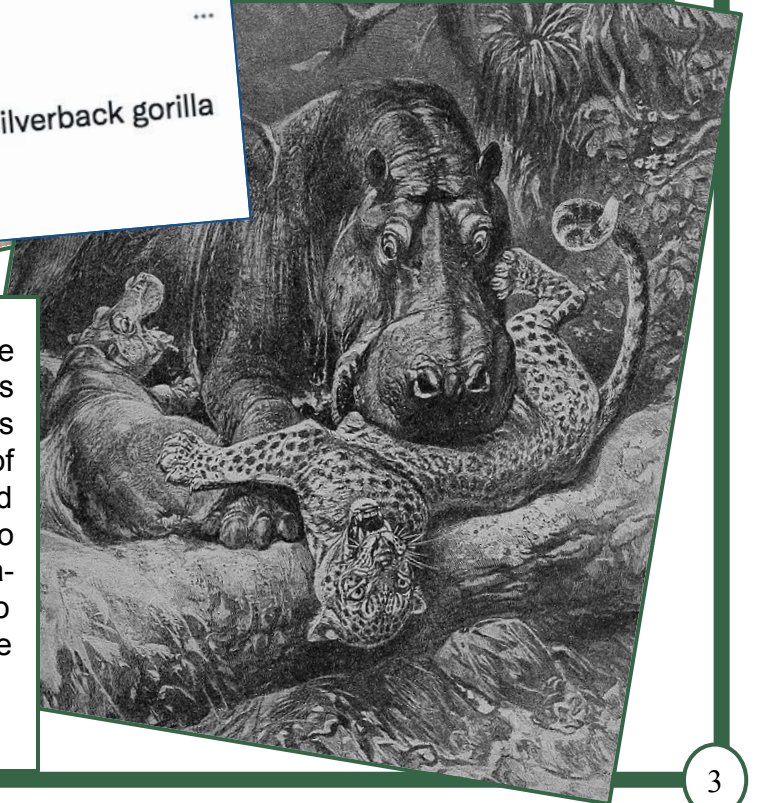
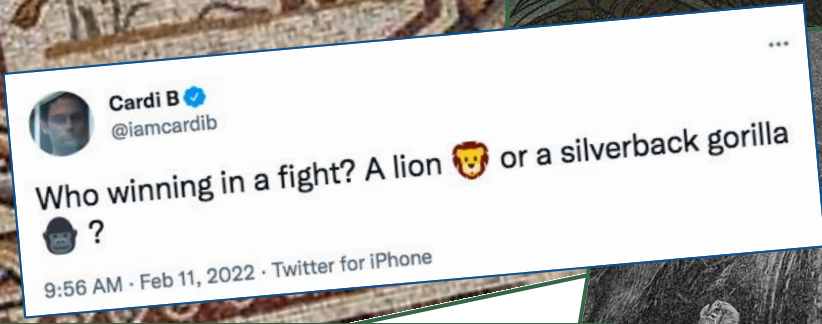
YouTube

12.4k Subscribers  
1.8 Million Views



Bat-Eared Fox • Mary Casillas  
Sea Otter • Olivia Pellicer  
Siamang • Valeria Pellicer  
Dik-dik • Charon Henning

# 2023: IT'S ABOUT TO GO DOWN



March Mammal Madness poses the age-old-question “WHO WOULD WIN?” Humans have depicted and debated the relative strengths and abilities of various animals for tens of thousands of years. Animal “battles” are found across human cultures - from ancient rock art, to tattoos on paleolithic people preserved in permafrost in Siberia, to Anansi folklore of West Africa, to mosaic art from Antiquity in the Middle East, to the social media musings of contemporary artists. (Hinde et al. 2021)



March 13, 2023

If you're learning, you're winning!

Since 2013

**WELCOME TO MARCH MAMMAL MADNESS 2023!** This year the tournament turns double digits y'all! For the past decade we have been delving into the natural history and science of animal encounters, turning scholarly science into stories.

In coming weeks we will share in a journey across our world, and occasionally through time, in a celebration of animals, adaptations, ecosystems, and our community. The philosopher, and natural historian, Aristotle once said "In all things of nature there is something of the marvelous."

Remember, March Mammal Madness features 65 species, but only one will be crowned 2023 Champion. Prepare yourselves for heartbreak, hilarity, and horror as fortunes and fates rise and fall, in a glorious narrative of science. We will bring you cliffhangers, surprises, "non-player characters," plant carnage & SO MUCH MORE!

Sometimes, rarely, a much less likely combatant triumphs. We have built in some randomization into the tournament generating improbable outcomes. This is why we write battles with unexpected, but evidence-grounded plot twists, and other narrative techniques such as deus ex machina. This is part of the suspense, surprise, and collective experience of March Mammal Madness.

As we wrote in our eLife paper in 2021, "March Mammal Madness upends the stereotype of science as dry, prescriptive disciplines and shows that science and scientists can be, and should be, creative and fun. Scientists situate ourselves in the domain of data collection framed by hypotheses and predictions as we speculate about the world(s) around us.

But fundamentally these are just grown-up words for ideas hewn from imagination and the creative combination of what is known to journey into the unknown. March Mammal Madness is collective, "performance science" – the stories of animals, told creatively with awe for the natural world.

We celebrate species and the ecosystems they inhabit, the scientists who conduct studies, and the funders who make the research possible. For a few weeks each year, a vibrant and diverse March Mammal Madness community comes together to collectively marvel at our living planet's beauty, harshness, and fragility. We acknowledge that humans are at the root of many of the problems we highlight, but also recognize that the communities we reach are essential branches of any solutions. By fostering a greater love and respect for biodiversity, we hope that engaged students and curious publics will be inspired to transform their affection into action and reverence into protection."

Hinde et al. "March Mammal Madness and the power of narrative in science outreach." *Elife* 10 (2021): e65066.





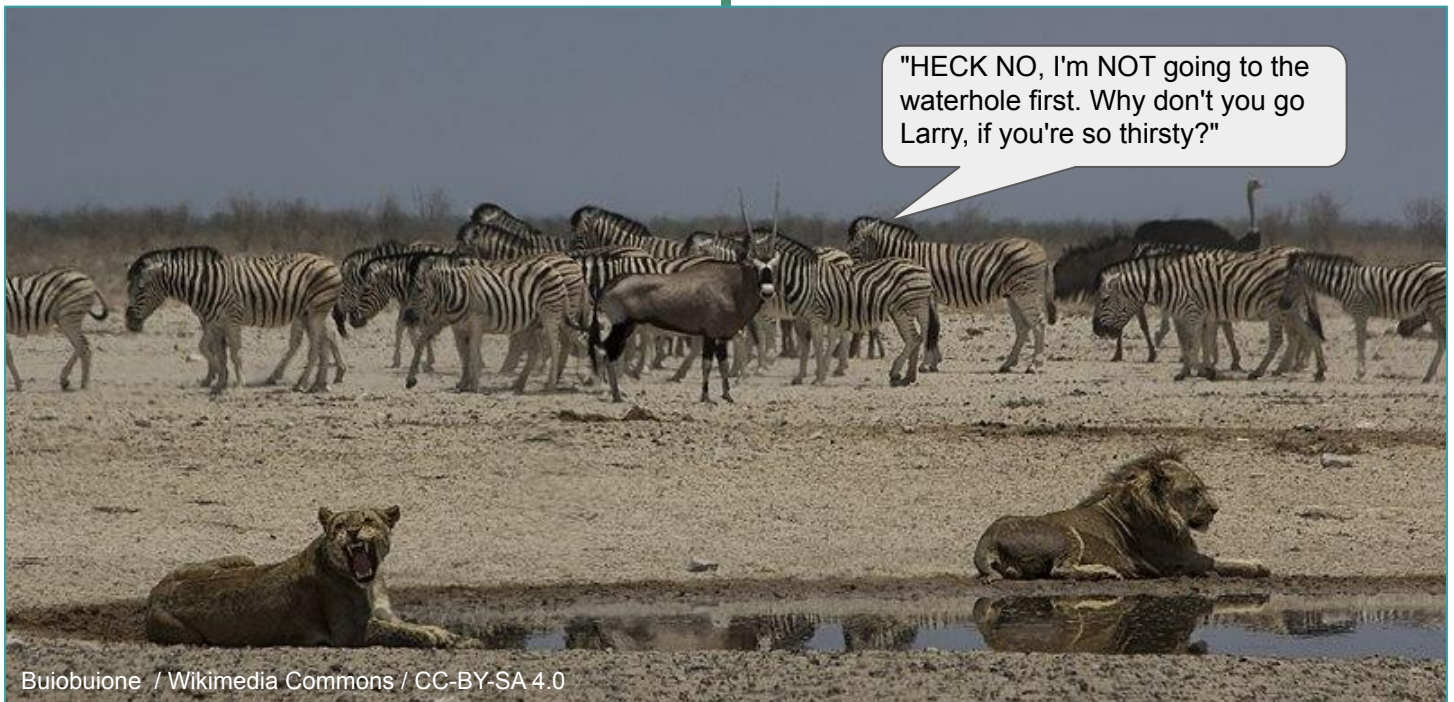
# SCIENCING MMM

**THIS IS THUNDERDOME!** Just kidding, March Mammal Madness does not force the animals to BATTLE like Gladiators, but rather contrives simulated encounters where the animals arrive with their full suite of physical and behavioral traits... and that includes adaptations to AVOID combat.

Fighting is RISKY for animals. Fights can cause immediate death, slow death from infection, or slow death from starvation if an injury interferes with hunting, foraging, or chewing. The more closely matched combatants are, the greater their risk of losing. Even the winner can be injured. Animals have adaptations to choose their battles wisely.

AND everything takes energy— chasing prey, running away from predators, battling competitors— sometimes A LOT OF ENERGY! And yes, for herbivores energy grows on trees, BUT the time of chewing & enzymes for digesting are limited & finite.

Across many animal species, natural selection has favored animals whose traits enable them to smartly respond to the situation - cognition capacity for rapidly weighing risks, benefits, & costs of a contest, conflict, context, or predator-prey situation. This is even the case typically for species with combat weaponry.



Buiobuione / Wikimedia Commons / CC-BY-SA 4.0



# SCIENCING MMM

"Species that bear weapons almost always perform displays before engaging in physical contact" (Palaoro & Peixoto 2021).

Anti-predator vigilance interferes with foraging, fleeing takes energy, & anti-predator strategies account for short-term risk in places of high long-term risk, like water holes (Dröge et al 2017; Stankowich & Blumstein 2005).

Among carnivores, myriad adaptations for avoiding direct competition for prey (niche partitioning) or suppressing competition (competitive exclusion) can dramatically shape ecosystems (Karanth et al. 2017; Hunter & Caro 2008). And when animals are fighting (& romancing)... **DISTRACTIONS INCREASE THIRD PARTY ATTACKS!** (Ota 2018).

Natural selection has favored awesome adaptations to fight, flee, hide, peek, retreat & sneak away to live another day. Or rather, natural selection has favored traits that improve survival and reproductive success, thereby individuals pass on genes to the next generation, again and again over evolutionary timescales.

Or in a well known idiom *discretion is the better part of valor*; which Merriam-Webster describes as "better to be careful than to do something that is dangerous and unnecessary." So...

**BUCKLE UP BUTTERCUPS**, this is March Mammal Madness! Sometimes it's **CARNAGE**, sometimes it's **BORING**, sometimes it's **UPSET CITY** where the grass is green & gulls are petty...

But always, as we sleuth the B-sides & dusty deep tracks of natural history, March Mammal Madness is here, from tangled bank to misty mountains to salty shore, to trip the LIFE fantastic through the splendor of our natural world. **If you're learning, you're winning.**

## CITATIONS:

Dröge E, Creel S, Becker MS, M'soka J. Risky times and risky places interact to affect prey behaviour. *Nature ecology & evolution*. 2017. 1(8):1123-8.

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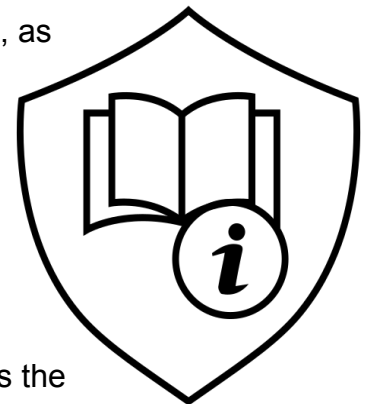
# MMMotivations

Institutions and individuals globally, from the the World Health Organization (WHO) to the World Economic Forum, have identified **CLIMATE CHANGE** as a significant threat to human health, resilience, economic production, and security.

The Pew Research Center's recent Global Attitudes Survey across 19 countries found that "Climate Change" was viewed as the greatest threat facing countries today. Even the US Department of Defense has elevated climate change as a national security priority.

Climate Change is both a contributing cause and emerging consequence of widespread environmental degradation from pollution and resource extraction, pushing many species toward extinction and catastrophic loss of biodiversity. A global assessment of 32,000 populations of mammals, birds, reptiles, fish, and amphibians revealed average declines of 69% since 1970 (Living Planet Report 2022). "Biodiversity supports human and societal needs, including food and nutrition security, energy, development of medicines and pharmaceuticals, and freshwater, which together underpin good health. <Biodiversity> also supports economic opportunities, and leisure activities that contribute to overall well being." World Health Organization, 2015). Human Impacts of natural systems are now a core theme in US Next Generation Science Standards for Earth and Life Sciences, but forging meaningful connections for learners remains challenging.

The 21st Century has experienced an exponential growth of information, as new technologies have enabled researchers to investigate more global phenomena than ever before. Although the world wide web, artificial intelligence, and social media algorithms deliver unimaginable amounts of content, these same systems contribute to a counter-intuitive **INFODEMIC** as users and algorithms can be vulnerable to confirmation biases, in-group & out-group biases, and myriad other quirks of human cognitive architecture. In the Pew Research Center's recent Global Attitudes Survey across 19 countries discussed above, "Spread of Misinformation Online" was second only to climate change as the greatest threat facing countries today.



From politics to pandemic, humans must navigate a landscape of information overload, misinformation, disinformation, and information voids and need skills to evaluate the quality, reliability, and authenticity of information. Infodemic Surveillance, monitoring of the mosaic information landscape, is now viewed as a public health and national security priority. Providing students and the general public better tools, resources, and access to expertise for evaluating information is a core contribution of US institutions of higher learning, but require greater effort by researchers to build connections that transcend the university and professional networks.

*Top Image:* Climate Change Icon, Public Domain, Wikimedia Commons; *Bottom Image:* Protection from misinformation & disinformation icon; Public Domain; Wikimedia Commons



Compounding the accelerating crises of climate change and misinformation are numerous additional challenges and obstacles:

- Educators are overburdened and burning out, with an increasing percentage of educators leaving the profession annually.
- Socioeconomic disparities widen education gaps as some districts have limited resources.
- Underfunded schools have fewer opportunities for student experiences in nature, with animals, and with scientists.
- Many members of the general public struggle to name a scientist; have worsening distrust of science and scientists.
- Many people are unfamiliar with the diversity of species in the tree of life, their evolutionary relationships, and ecosystem interactions.
- Children essentialize scientists as a very narrow set of identities (although this is improving!).
- Most scientific publications are hidden behind paywalls and even when published open access is still behind a “paywall of jargon.”

At the core, March Mammal Madness aims to motivate people to value and protect nature and appreciate and trust evidence. MMM is designed to address & overcome each of the above challenges and obstacles. Through annual assessment, we have continuously refined this program to effectively support learners where they are, guide their navigation of curated information, generate, inspire appreciation for the scientific endeavor, and inspire awe for our natural world (Hinde et al. 2021).

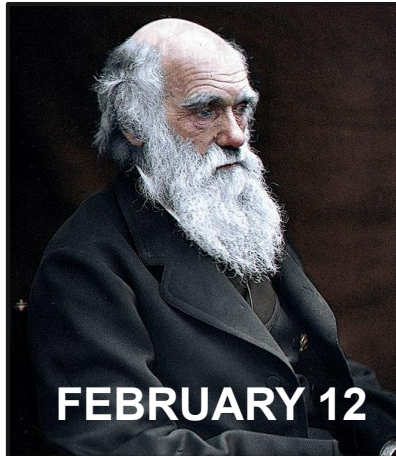
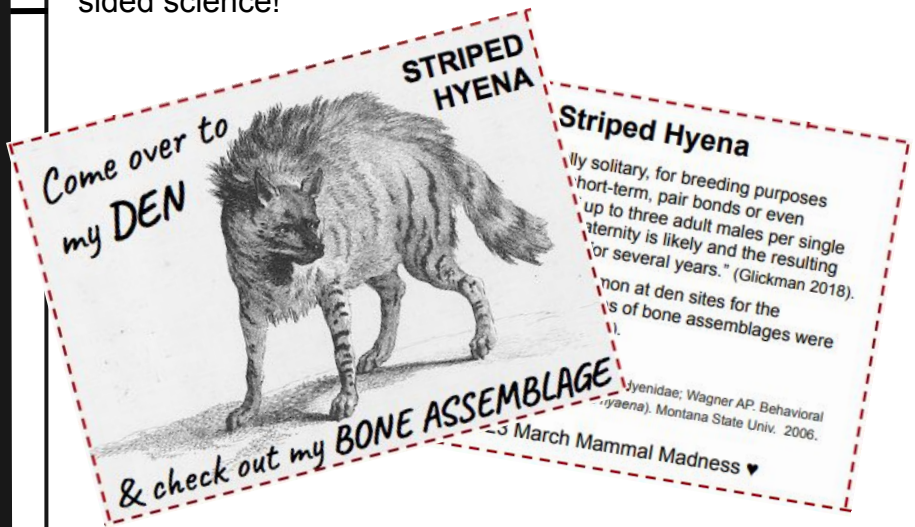
# 2023 PRE-SEASON TOURNAMENT HYPE!



Each Groundhog's Day, the most holy of mammal holidays, the **tournament webpage launched**, and the **Educator Request Form** & optional **Survey** went live at the LibGuide

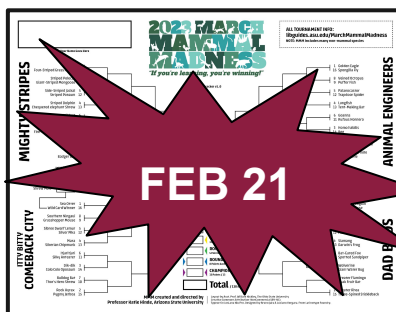


Science-based Valentine's to impress your colleagues, classmates, & consort(s). New & Improved with double-sided science!



## DARWIN DAY DIVISIONS ANNOUNCED!

In 2023 the Divisions were Mighty Stripes, Itty Bitty Come Back City, Dad Bods, & Animal Engineers. Everyone was very excited about these divisions and there was no drama or concerns about any of them in any way.



**BRACKET DROP DAY!!!** MMM provides multiple versions of the bracket: English, Spanish, Latin binomial, JUMBO (for little learners), & screenreader compatible for vision-impaired players. This provided players ~3 weeks to research the combatants and pick their champion before tournament action. The Bracket Drop was released with a hype trailer in 2023. **Educator materials released just ahead of the public bracket drop.**

*Bracket layout by graphic design Prof Will Nickley, Ohio State University; Screenreader bracket by Prof Jessica Light, Texas A&M; Spanish Translations provided by Prof Alejandra N  nchez de la Mora, Universidad Veracruzana and Dr. Miguel Rubio-Godoy Instituto de Ecolog  a.*

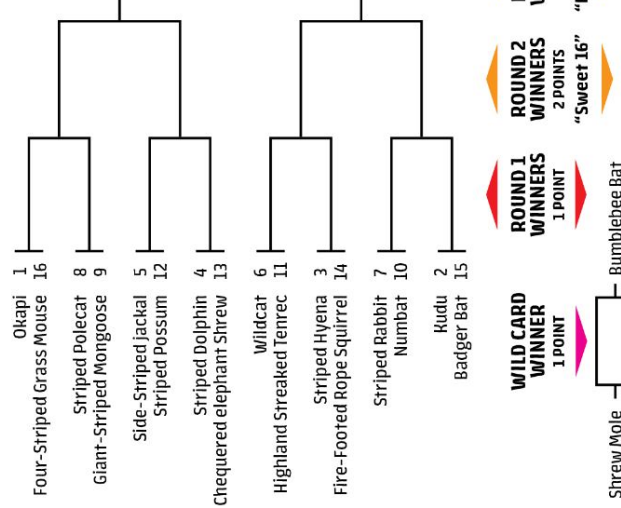
# 2023 MARCH MAMMALS MADNESS

*"If you're learning, you're winning!"*

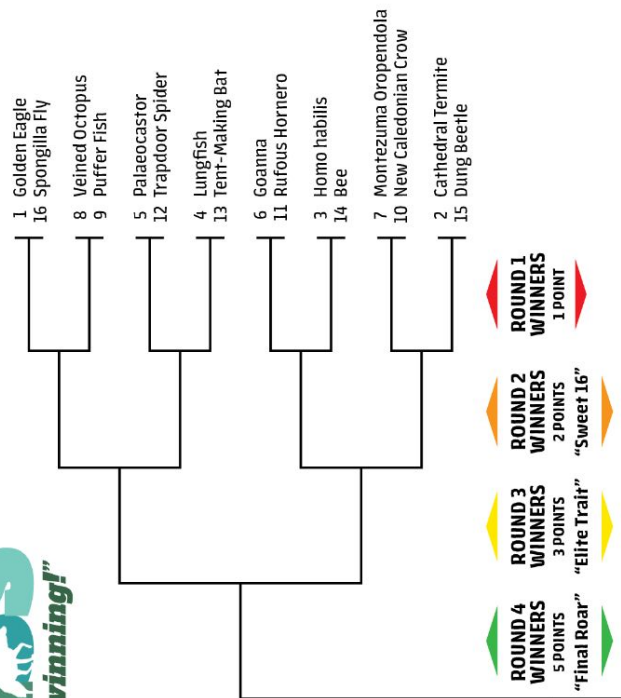
**ALL TOURNAMENT INFO:**  
[libguides.asu.edu/MarchMammalMadness](http://libguides.asu.edu/MarchMammalMadness)  
 NOTE: MMM includes many non-mammal species

Your Name Goes Here

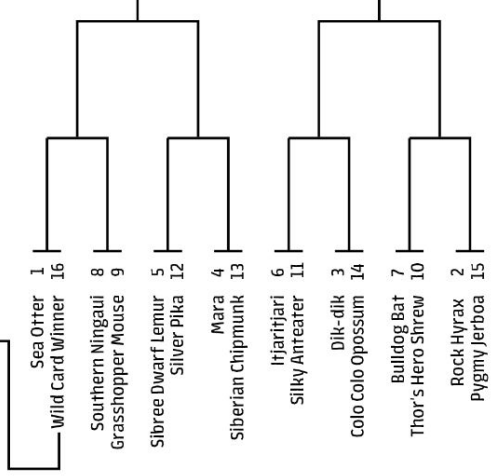
## MIGHTY STRIPES



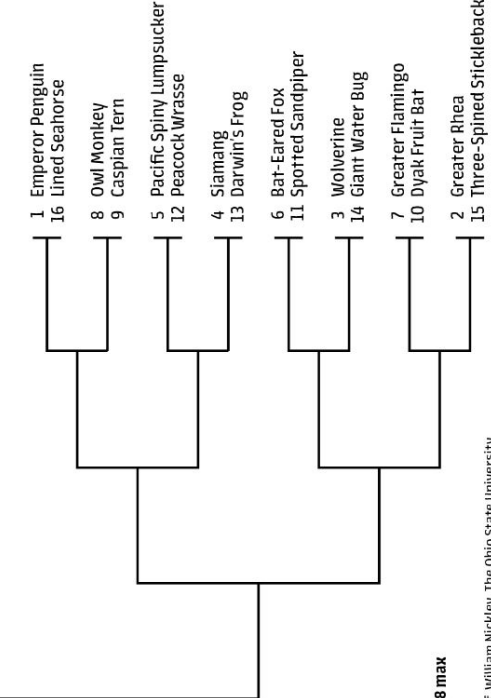
## ANIMAL ENGINEERS



## ITTY BITTY COMEBACK CITY



## DAD BODS



**Total / 138 max**

Layout by Asst. Prof. William Nickley, The Ohio State University  
 Creative Commons Attribution-NonCommercial (BY-NC)  
 Typeset in LosLana Nlu Pro. Designed by Bruno Jara & Luciano Vergara. From Latinotype Foundry.

MMM created and directed by  
**Professor Katie Hinde, Arizona State University**

# RESOURCES



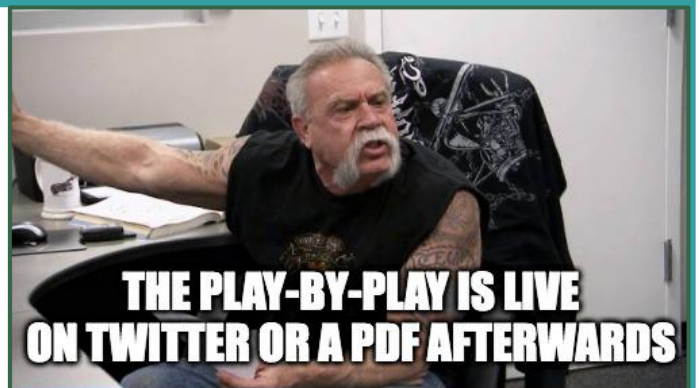
# MANY WAYS TO PLAY MMM

Played across nearly 4 weeks from Mid-March to Early April, the tournament progressed from the Wild Card, through Rounds 1 & 2, the Sweet Sixteen, the Elite Trait, and Final Roar. The number of combatants halved in each full round until culminating in the Championship April 5th, 2023.

Once the 2023 tournament began, players could learn about the combatant encounters according to their preferences. Many players “attended” tournament events by following the announcement of the play-by-play delivered “live” on Twitter by the MMM team. This live event had the raucous dynamics of a sporting match with spectators actively engaged in cheering, jeering, and exclaiming as their picks triumphed, floundered, or bravely ran away. Spectators self-report strong emotional and physical engagement - laughing, crying, shouting, sweating, and even jumping up-and-down in response to the twists and turns of some of the “battles.”

Importantly, folks playing MMM did not have to be on social media to follow MMM. After the “live event,” the battle play-by-play was archived into an **“ALL THE DETAILS”** pdf, summarized like print sports reporting in a newsletter **“READ ALL ABOUT IT”** pdf, and highlighted in a youtube video recap by the brilliant minds over at the **RODENT ROUNDTABLE**, providing an animal puppet show tailored to younger players.

All of these resources were curated and linked from the ASU March Mammal Madness LibGuide maintained by the ASU Library and cross-posted in multiple social media platforms.





# MMM LIBRARY RESOURCES

Beginning in 2017, Arizona State University (ASU) Librarian Anali Perry and colleagues created a March Mammal Madness Library Guide (LibGuide) to provide links to freely available, reliable online sources of animal information for students and others as they make their bracket predictions. LibGuides are a standard platform used by libraries to provide information, collect resources, curate content, and track user traffic around a theme or subject. Importantly, the MMM LibGuide provides a stable location for the tournament information year-to-year to aid educator and student use and the .edu URL is not typically blocked by school or library public computer browser filters.



ASU Library  
Library Guides

[libguides.asu.edu/MarchMammalMadness](https://libguides.asu.edu/MarchMammalMadness)

[Login to LibApps](#)



[Arizona State University](#) / [LibGuides](#) / [March Mammal Madness](#) / [Learners](#)

[Search this Guide](#)

How to Play

Tournament Results

Players

Learners

[Choose your adventure!](#)

High School

College Students

Middle School

K-5th Grade

Educators

MMMultimedia

Archive

Team

## Choose your adventure!



You are a:

- [College student](#)
- [High school student](#)
- [Middle school student](#)
- [Elementary school student](#)

# MMM LIBRARY RESOURCES

The **ASU March Mammal Madness LibGuide** was redesigned by Katie Hinde and Anali Perry for the 2023 tournament in response to feedback from different user communities. The redesign created specifically curated portals for Players (general public), Educators, and Learners, with Learners able to have specific portals for College, High School, Middle School, and K-5. This allows much more effective navigation to relevant resources by the different users' purposes, particularly for Educators to navigate to numerous resources for lesson planning.

<b>How to Play</b>	<b>How to Play</b>
<b>Tournament Results</b>	<b>Tournament Results</b>
<b>Players</b>	<b>Players</b>
<b>Learners</b>	<b>Learners</b>
<b>Educators</b>	<b>High School</b>
2023MMM Bracket	<b>College Students</b>
Online Bracket Scoring	2023MMM Bracket
2023MMM Tournament Schedule	2023MMM Videos
2023MMM Videos	Research the Combatants
Getting Started Resources	Illustration & Image Resources
Lesson Plans, Presentations, & Worksheets in English	SPOTLIGHT Wild Animal Research
Lesson Plans, Presentations, & Worksheets in Spanish	More Animal Info Resources
Even Moar Educator Materials	More Science Resources
Crowd-Sourced Educator Resources	More Scholarly Resources
Other Resources for Educators	
Example Play by Plays	



## ASU Libraries KEEP Repository March Mammal Madness Collection

This collection consists of related publications, presentations, phylogeny posters and other educational materials associated with the tournament that have particular scholarly content. To date, the collection includes 22 items.

**ASU** Arizona State University ASU Library

**Research Data Repository**

🏠 Terms of Use User Guide

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[Dataverse](#)

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March Mammal Madness

## ASU LIBRARY DATA REPOSITORY

Datasets associated with the annual March Mammal Madness tournament for science education and outreach.

Our use of these repository platforms model **open science** practice and provide a stable home for broad archiving and sharing of MMM research and scholarship.

# EDUCATOR RESOURCES

ALL March Mammal Madness brackets & materials are provided freely as an **OPEN EDUCATIONAL RESOURCE** including multiple Lesson Plans anchored to a STEAM (Science, Technology, Engineering, Arts, & Mathematics) approach and tailored to US Next Generation Standards for Life Science, Language Arts, and Social Studies.

Lesson Plans include teacher instructions, slide decks, and student worksheets. These lesson plans are designed to support content knowledge (such as animal traits, food chains) and skill learning (research, arguing from evidence, presenting).

## Life Sciences Lesson Plans

Pre-Tournament Combatant Research\*  
Tournament Outcomes Worksheets\*  
Ecosystems: Dynamics, Interactions  
and Resilience for Middle School  
& High School

## Humanities Lesson Plans

K-12 Visual Arts Tumbling Blocks\*  
K-12 Combatant Hype Poster  
K-12 Language Arts HAIKU\*  
Science Writing – The Championship Battle  
that SHOULD HAVE BEEN\*  
4th Grade Every Kid Outdoors  
Science & Writing

\*Also available in Spanish

STEAM work by students,  
shared by their teachers



# MOAR EDUCATOR RESOURCES!

Introduced in 2021, the **Combatant Info Slides** provide key info to help young learners, special education learners, and learners with limited access to the internet. The teaMMM created these in response to feedback from the general public via social media and via the educator survey. Available in English & Spanish.

1

## Okapi

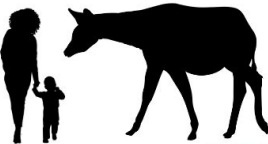

*(Okapi johnstoni)*

**TRAITS:** Oily coat to wick away moisture from the rainforest. Solitary. Have many vocalizations. Wide home ranges.

**BIOME:** Tropical Rainforest

**HERBIVORE:** Leaves, roots, tubers, wood, bark and stems

**POSITION IN FOOD CHAIN:** Primary Consumer



Info Sourced from [Animal Diversity Web](#); Okapi silhouette sourced from [PhylPic.org](#) by T. Michael Keesey  
human silhouette(s) clipart purchased via etsy, photo Rautl0641 from [Wikimedia Commons](#)

CC-BY-SA 3.0

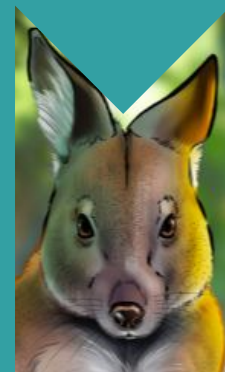
The slides provide key info:

- Common Name & Scientific Name
- Key Physical & Behavioral Traits
- Diet/Nutrition
- Position in Food Chain
- Source of Info
- Photograph of the Animal
- Silhouette of the Animal compared to adults & kids!

## EDUCATOR HUB

Since 2021, March Mammal Madness has provided infrastructure for a **crowd-sourced database** for educators to link and share MMM resources they have created for use with their learners. In 2023, educators shared >75 resources they had created, including

- Assignments
- Aniwordle Game
- Auto-Scoring Brackets
- Vocabulary EduProtocols
- Quizzes
- Games
- Posterboard Labels
- Combatant Collector Trading Card Game
- Notetaking Worksheet to Fill Out while watching the MMM “How to Play” video
- Templates for Student Research



# TOURNAMENT ACTION



## WILD CARD

SHREW-MOLE (*Neurotrichus gibbsii*) vs. BUMBLEBEE BAT (*Craseonycteris thonglongyai*) in the battle that determined a berth to the "Big Show." Shrew-mole looks like a mole, is the size of a shrew, has the lower body temperature of a mole, & faster metabolism of a shrew #HangryLikeAShrew. Shrew mole lives on the west coast of North America, from the Fraser River in British Columbia, Canada south to Monterey County, California USA.



US National Park Service / Wikimedia Commons / Public Domain

Bumblebee Bat weighs 2.0 grams in length & 33 millimeters in weight, coming in ~80% lighter & ~75% shorter than shrew mole. This teensy bat lives in Thailand & Myanmar, and was first collected by eminent Thai biologist Kittu Thonglongya, who sadly passed away before describing the bat. Colleagues named the species in his honor. Genetic evidence suggests BUMBLEBEE BAT's range could be explained by "Sweepstakes Dispersal" events "via storms,

cyclones or typhoons". It's unlikely they got to where they currently live on those teeny little wings alone!



Niran Anurakpongsothorn / iNaturalist / CC-BY-SA 4.0

Tonight's BATTLE LOCATION was determined by COIN TOSS, giving Shrew-Mole #HomeHabitatAdvantage on Destruction Island, WA, Quillayute-Needles National Wildlife Refuge, home to the Quileute Nation. Shrew-mole scurries along the forest floor searching for worms, insects & isopods to eat. Dusk approaches as rain patters leaves.

Meanwhile, on the other side of the globe, dawn approaches in Myanmar. Bumblebee Bat flies toward the roost in its limestone cave after a night of mediocre hunting due to wetter and windier conditions from the La Nina cycle. M M Magic whooshes Bumblebee Bat, in an UNPRECEDENTED sweepstakes dispersal, to a wilderness island on the outer coast of Washington State! Shrew-mole has just settled in for a nap, as it does every 2-18 mins, under a fallen maple leaf.

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Destruction Island, where Bumblebee Bat destroyed Shrew-Mole's chance at MMM glory.

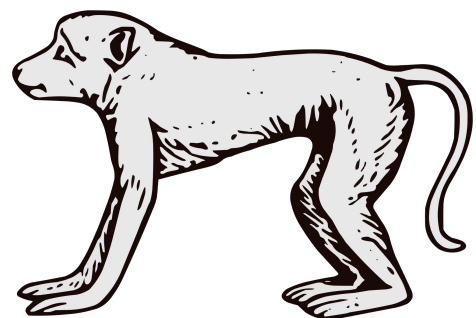


Carmen Bubar, NPS / Wikimedia Commons / Public Domain

THWACK! The wind tumbles Bumblebee Bat to the ground, cartwheeling the bat across the napping Shrew-Mole and dislodging the maple leaf blanket! Shrew-mole dives back under its sleep leaf, and freezes motionless, a minute later sniffs the air for #StrangerDanger. Bumblebee Bat needs food, the rain keeps the flying insects down, but this bat has several hunting strategies, including catching invertebrates from the ground. Shrew-Mole can't stay still for long, has to get calories, and resumes hunting too. Bumblebee Bat begins munching on a familiar food source... Daddy Longlegs (harvestman, an arachnid) while Shrew-Mole is hot on the hunt for beetle grubs running along a fallen log... Shrew-Mole runs off the field of battle! BUMBLEBEE BAT OUTLASTS SHREW-MOLE! Narration by Dr. Tara Chestnut.

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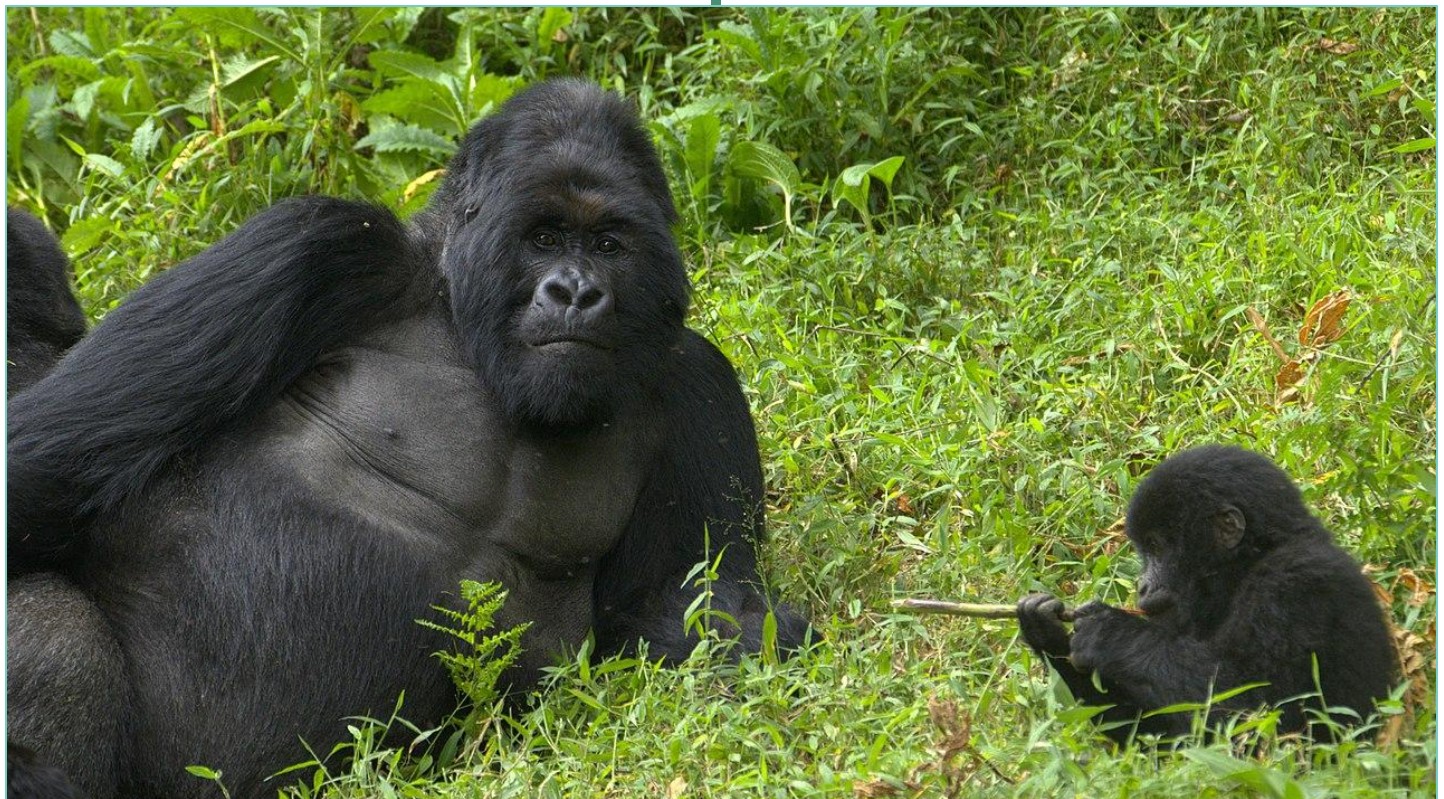
## R1: Dad Bods

Although March Mammal Madness routinely considers animal traits for combat, for some species, males play really important roles in nurturing young. Here we showcase some AMAZING ANIMAL DADS! Some featured combatants have adaptations for behavioral care, some with anatomy for protecting young, some that can nourish young, and some Dads that, unrelated to their Dad behavior, will haunt my nightmares.

We also welcome NEW NARRATOR Dr. Mallika Sarma. As a PhD student, Dr. Sarma studied

physiological changes in fatherhood among humans with her advisor & leading expert on the Biology of Fatherhood Professor Lee Gettler. In many families & cultures around the world, human dads do awesome amounts of kid care. Humans have biological traits of fatherhood, such as hormonal changes, that have an affect on body shape, hence Merriam-Webster Dictionary adding "Dad Bod" in 2021. Importantly, the term "Dad Bods" is about NORMALIZING normal bodies, centers body positivity, and honors caring Dads.

Because as always, March Mammal Madness is here to celebrate how natural selection shapes adaptations - from tooth and claw to dad bods.



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# Round 1 Dad Bods

**Emperor Penguin (1) v. Lined Seahorse (16)** -- Emperor Penguins (*Aptenodytes forsteri*) are the largest species of penguin (100 lbs/45 kg and 3.3 ft/100 cm) and 5th heaviest bird overall. While males and females have the same yellow and black markings, males are about 30% bigger than the females. This extra bulk helps them incubate their eggs against two months of harsh Antarctic winter until the chick is ready to hatch. The Lined Seahorse (*Hippocampus erectus*) are named for the white lines that help them camouflage themselves into their seagrass-based habitats. The Lined Seahorse is small (15.3cm and 14.3g), with males being slightly bigger than females. Lined Seahorse dads are responsible for the care of seafoals. The females deposit the eggs into the male's "brood pouch", where they're fertilized and incubated for about two weeks. Lined seahorses typically have just one partner in their life (monogamy) with whom they engage in complex bonding behaviors.



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In Verleger Point, West Antarctica, Emperor Penguins live in some of the harshest and remote environments on the planet. Scientists from the British Antarctic Survey use satellites to look for emperor penguin poop stains (guano streaks) on the ice to identify new colonies! Right now is the start of the Antarctic Autumn and a huge male emperor penguin is bulking up for the winter breeding season. Penguin has been diving for krill and silverfish, but he's nearly had his fill for the day when he spots something drifting closer to the surface. The Lined Seahorse is struggling in these cold waters -1C around Antarctica. Lined Seahorse is swimming towards the sea ice, hoping for warmer shallows when Penguin swims from below... and swallows Seahorse whole! **EMPEROR PENGUIN SWALLOWS LINED SEAHORSE!** Narrated by Dr. Mauna Dasari.



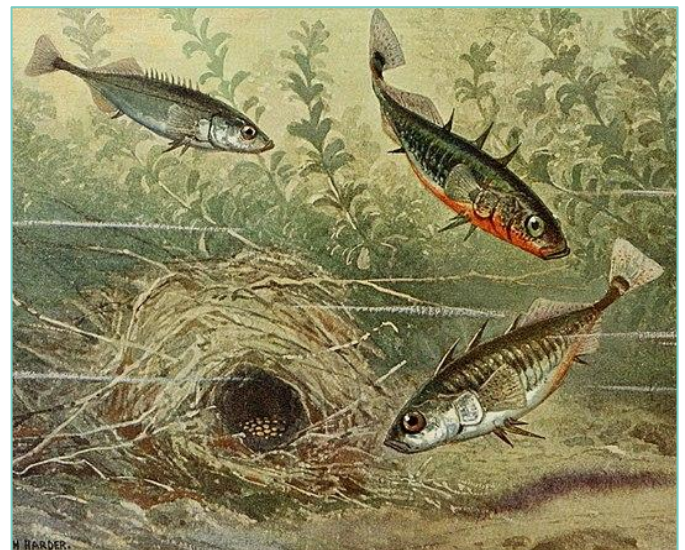


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## Greater Rhea (2) v. Three-spined Stickleback (15)

– As a flightless bird, the male Greater Rhea (*Rhea americana*) stands at 5 ft tall and 85lbs, with glorious black and gray plumage. Rhea's extra-long wings and legs are great for balancing, pivoting, and running away from trouble. Rheas are devoted dads and provide all care for chicks, moms peace out after producing and laying the eggs. Dads build the nest, incubate the eggs, and care for the nestlings after hatching (Fernandez & Reboreda, 2003). The Three-spined Stickleback (*Gasterosteus aculeatus*) is a little fish, only 3-10 cm long, but gets its name from its 3 dorsal spines. Breeding males have a red belly, blue sides, and iridescent green or blue eyes. Male Sticklebacks also do all the care of the young – Dads defend their territories, construct nests, and then watch out for their newly hatched and vulnerable babies (also called "fry"). Evolutionary biologists LOVE the Three-spined Stickleback because their repeated adaptation from the ocean to freshwater is a great model for parallel evolution.

In Buenos Aires, Argentina, the Greater Rhea roams a temperate grassland which gradually changes from flat, low marshes surrounded by short grasses to some woodland at higher elevations. Greater Rhea scans vigilantly for predators as his 3-month old chicks drink from one of the many little streamlets running through the marsh. M M Magic transports Three-spined Stickleback into the streamlet amidst the chicks. Sticklebacks are great at adjusting to changing saltiness of water between sea and stream (high tolerance for fluctuating salinity), as long as the water is clear the Stickleback can still forage for food. Greater Rhea's chicks tromp-slosh playfully in the steam and Greater Rhea begins to herd his chicks back to the nest. Chick tromping has churned up mud, ruining the water for Stickleback foraging. Stickleback swims and flops furiously in the streamlet to escape the playful rhea chicks and muddy water. CHOMP! Greater Rhea makes a fast snack of the fish. GREATER RHEA DEFEATS STICKLEBACK! Narrated by Dr. Mallika Sarma.



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# Round 1 Dad Bods

**Wolverine (3) v. Giant Waterbug (14)** – Giant Waterbug (*Belostoma lutarium*), found in aquatic habitats in the Eastern half of the US, are ambush predators adapted for "extra-oral digestion" (Swart & Felgenhauer 2003). Or said another way: Giant Waterbugs grab and hold underwater prey with their grasping front legs while impaling prey with a mouth syringe to inject liquifying spit so waterbug can slurp up through a mouth siphon dissolved tadpoles like a milkshake. After a lady Giant Waterbug deposits an egg pad onto the Dad's back, male Giant Waterbugs keep the eggs away from predators and keep the eggs moist by doing push-ups at the water line, known as brood pumping. Wolverine (*Gulo gulo*) walks on snow to scavenge the carcasses of lynx kills across his circumpolar range and is the heaviest terrestrial mustelid (30kg). Wolverine has brownish-black black fur that is often crossed by a gorgeous golden band from their crown, across shoulders, to their rump. Wolverine Dads sometimes visit dens of females with young and have been found to roam around with their kids after kids move out of their mom's den. This time with Dad, on the cusp of adulthood, may be an important time of learning or may improve survival.

In the spring-snow covered Rocky Mountains of Western North America, the Wolverine's loping gallop covers wide distances across his large



USFWS Mountain-Prairie / Wikimedia Commons / CC 2.0

territory searching for winterkill carcasses. Mid-March, the Giant Waterbug has just emerged from over-wintering in an inactive state, protected in the leaf litter clumped in the shallows of a shoreline in the Shawnee National Forest in Illinois. Hungry and with breeding season around the corner, Waterbug needs calories. Waterbug submerges into the water, assuming an ambush position, extending his abdominal breathing snorkel (respiratory siphon) beyond the water for air... tiny BONK! Waterbug's snorkel has hit ICE?! MMMagic has transported Giant Waterbug to the frigid Rockies, but luckily there is some gap between water and ice so this air-breathing insect is in no danger of suffocation except... Wolverine's wide paw bursts through streambank ice, crushing Giant Waterbug. WOLVERINE DEFEATS GIANT WATERBUG! Narrated by Prof Katie Hinde.



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**Siamang (4) v Darwin's Frogs (13)** - Siamangs (*Symphalangus syndactylus*) are about twice the size of other gibbon species (adults ~26lbs/12kg). These guys stand ~1m tall... if you can find them standing! Siamangs prefer to swing from branch to branch using their extremely long arms (and their 1.5m armspan) in a type of movement called brachiation. Siamangs are the greatest of "lesser apes" at being Dads, carrying their offspring through the forest. Males are the main carriers of young once babies are a year old and have become really heavy for mom to carry and are not nursing as often. Darwin's Frogs (*Rhinoderma darwinii*), are funny little guys with an average body length (or snout-to-vent length- SVL- for all you budding herpetologists) of ~27mm or ~1 inch. In Darwin's Frogs, Dads carry their tadpoles in their vocal sacs. Darwin Frog Dads transport and nurture the fertilized eggs and tadpoles in their big cheek pouch (gran saco bucal aereo) for 6-8 weeks before they come out as fully metamorphosed froglets (neomelia).



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Early morning in the tropical rainforest of Gunung Leuser National Park, Indonesia, in the Tropical Rainforest of Sumatra, a UNESCO World Heritage Site. Darwin's Frog finds itself MMMagicked to a slightly warmer, more tropical environment than the temperate rainforests of Chile and Argentina. While the temperature difference is not too bad, this frog is not a fan of being so high in the canopy! Darwin's Frog blends into the environment thanks to their ability to camouflage as a leaf. He's looking around for any predators when he hears a tentative whoop... whoop... whoop... WHOOPWHOOPWHOOPWHOOPWHOOP.



suneko / Wikimedia Commons / CC-BY-SA 2.0

Then a deep inhale and scream reverberates through the forest! Darwin's frog is panicking as the entire tree starts shaking! The Frog grips his branch as other leaves drop around him! A black fuzzy figure seems to be flying through the tree branches- it's Siamang brachiating while calling (vocalizing)! The deep reverb is coming from his

# Round 1 Dad Bods

throat sac - it's the size of a grapefruit when fully inflated. Suddenly, Darwin's frog's branch is yanked down by a lesser ape swing and the frog plummets toward the forest floor as a small siamang family's unique territorial song reverberates throughout the forest. SIAMANG DEFEATS DARWIN'S FROG! Narrated by Dr. Mauna Dasari.

**Pacific Spiny Lumpsucker (5) v Peacock Wrasse (12)** - Good evening from the Aleutian islands in the North Pacific, tonight we feature a fishy combat between the Pacific Lumpsucker and the visiting East Atlantic Peacock Wrasse. The Wrasse is a *swell* dad, pun intended, spending over a month on his carefully constructed algal nursery mat. During this time the big ones stay and defend the structure. Medium sized wrasses (12-20 cm) will sometimes wander, looking for mating opportunities. Peacock Wrasse live along the coast of Spain and this fine fellow is a bit



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confused to be in Alaska. The Wrasse, out of place, recognizes some of the food options, there ARE octopuses and sea urchins here in the Aleutian Islands. Meanwhile, our Pacific Spiny Lumpsucker is living his best paternal life, stuck to a rock crevice and defending his brood of 202 eggs, on average. The rocky intertidal zone of the North Pacific isn't the easiest place in the world to make a living, especially if your body shape can be kindly described as "Ping-Pong ball," so the Lumpsucker is bedazzled in a series of overlapping armor plates. The hungry Wrasse prods around the cold waters, looking for food.

The water is cold, the terrain strange, and the predators unknown. The 3-cm Lumpsucker is enjoying the sensation of flushing cold, highly oxygenated water over his eggs. The Wrasse, no stranger to biting highly ossified things, sees this bright orange and white ping-pong fish...



JUST CHILLING THERE, I mean, does he not know about predators?! The wrasse strikes! Lunging after the lumpsucker, trying to dislodge it - the Wrasse strikes but the lumpsucker isn't called a sucker because he was born yesterday - NO! Lumpsucker's pelvic fins are fused to create a powerful suction cup! The Wrasse is unable to bounce the lil' guy off his perch. Thwap! Again, the wrasse strikes and, this time, scrapes his face on the SPINY Lumpsucker's tooth-like armor. Frustrated by this little fish nugget who refuses to budge, the Wrasse swims off PACIFIC SPINY LUMPSUCKER DEFEATES EAST ATLANTIC PEACOCK WRASSE! Narrated by Prof. Josh Drew.

**Bat-Eared Fox (6) vs. Spotted Sandpiper (11)** – Bat-Eared Foxes (*Otocyon megalotis*), named for their enormous ears, are a small 12-lb canid and mostly sandy-coated with yellow-brown colors, except for some black on their legs, tail, and a black Zorro-like mask across their eyes. While moms extensively forage during peak lactation, Bat-Eared Fox Dads spend significantly more time near den sites protecting young from predators (like jackals), huddling with young, and grooming parasites from the fur of young. Fox babies are variously called kits, cubs, and pups. For Bat-Eared Foxes, Dads spending time near dens is important for survival of the young. The Spotted Sandpiper (*Actitis macularius*) is a widespread migratory bird throughout North America living along lakes, streams, and wetlands. The Spotted



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Sandpiper gets its name from the prominent dark spots that develop on their plumage during the breeding season. Spotted Sandpipers with the fewest feather mites, healthy immune system, and heavier body weight have the largest, most impressive plumage spots. Female spotted sandpipers especially signal quality through plumage spots, a role reversal from most other



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# Round 1 Dad Bods

birds. Male Spotted Sandpipers incubate ~4 eggs in ground nests for 21 days and then provide all the chick care after nestlings hatch. Dads will even use the "broken wing display"- behaving as though they are dragging a broken wing along the ground, flapping their tail feathers while piteously squealing to tempt predators away from the nest and vulnerable young.

In the Laikipia Plateau of central Kenya, March marks the beginning of a rain season that will stretch into July, and ephemeral ponds begin to appear in the parched semi-arid grasslands. Spotted Sandpiper is migrating from Mexico toward northern breeding grounds in Canada... with dusk approaching, the Spotted Sandpiper begins circling down to seasonal ponds amidst sandy dunes in a Western Red Desert in the US. MMMagic transports Spotted Sandpiper to semi-arid highlands of Kenya that look almost similar at a glance. Bat-Eared Fox Dad is on a brief foraging excursion from the den, while the Spotted Sandpiper lands on the shore of a pond, darting his head back and forth in the muddy flats catching termites with his little beak. The Spotted Sandpiper's walks with a distinctive teetering, bobbing the rear half of its body rhythmically. In 1892, C.C. Abbott wrote "How aptly they have caught the motion of the rippling water"

speculating this as a possible tactic for camouflage. BUT the Bat-Eared Fox has spotted a most tasty morsel...The Spotted Sandpiper's fast beak speedsnaps a termite on wing as the Bat-Eared Fox darts in! With quick, short wing beats, the Spotted Sandpiper is aloft over the water, fleeing the canid disturbance! (PSA: Please leash your dogs where shorebirds nest). As Spotted Sandpiper departs the field of battle, the Bat-Eared Fox gorges on what he'd dashed in for... termites. Bat-Eared Fox is a termite specialist, you know. BAT-EARED FOX OUTLASTS SPOTTED SANDPIPER! Narrated by Prof. Katie Hinde.

**Owl monkey (8) and Caspian tern (9):** The Caspian tern (*Hydroprogne caspia*) is the largest tern in the world (~21 inches long, 27.5 oz, wingspan of about 50 inches) and is found in parts of North America, Europe, Asia, Africa, and Australasia because they have the furthest migration of any animal. Caspian terns prefer to live and nest in coastal and wetland habitats. Like many other tern species, they hunt fish by flying over shallow water, looking down, and diving to catch their prey. "In 2022, Caspian tern populations in the N. American Great Lakes region were devastated by avian influenza (H5N1), which has been in the news recently for making the jump to





*Aotus zonalis*

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some mammal species...” (Graham, 2022). Male and female owl monkeys (*Aotus azarae*) show no differences in size or coloration (called "sexual monomorphism"). Both sexes weigh about 1 kg and have a head/body length of 14.5 inches, plus another 15.7 inches of tail. Sometimes called "Azara's night monkey" or "southern night monkey" and known locally as "mirikinà", owl monkeys make their home in the trees of South America. Their range includes Brazil, Bolivia, and Paraguay, as well as small parts of Peru and Argentina. Unlike the rest of the species in the genus *Aotus*, which are all nocturnal, Azara's owl monkey may be active during the day and night, a pattern scientists call "cathemeral."

Tonight's battle takes place in the semi-deciduous gallery forest of the Argentinian Chaco, where Actual Living Scientist Eduardo Fernandez-Duque founded The Owl Monkey Project in 1996.

Owl Monkey is foraging for fruit alongside his mate. Unlike most mammals, owl monkeys form long-lasting monogamous pair-bonds and genetic studies show little evidence of extra-pair paternity (Huck et al 2014). Owl monkeys give birth in the spring (Oct-Dec). Sure enough, this pair of monkeys has a 3-month old baby with them, clinging securely to... DAD's back. Male Owl Monkeys put their Dad Bods to good use by carrying infants full-time from 3 weeks-5 months of age. Male Owl Monkeys aren't the only dads who help their offspring get around: Last year a team of researchers found that among Caspian terns, male parents primarily migrate with young. Tonight, M M Migration has brought Caspian Tern to Owl Monkey's home turf, although with no young tern in tow: Caspian Terns don't breed until late May or early June each year. Startled to find himself in unfamiliar surroundings, Caspian Tern vocalizes loudly. Owl Monkey pauses his foraging and looks around for the source of the foreign sound, a potential predator, perhaps? Caspian Tern IS hungry... But owl monkey is not his typical prey, and Caspian Tern sees no opportunities for shoreline hunting in this dense, dark, INLAND environment. Rising into the sky above the tree canopy, Caspian Tern takes wing to search for less enclosed spaces than this forest. OWL MONKEY OUTLASTS CASPIAN TERN! Narrated by Dr. Lara Durgavich.



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# Round 1 Dad Bods



**Greater Flamingo (7) Dayak fruit bat (10)** - Like TSwift sings, greater flamingos (*Phoenicopterus roseus*) have got that "red feather classic thing" the ladies like and NEVER go out of style. Looking that good in both males and females takes work. Flamingos apply preen oils (from gland secretions) to their bodies like makeup, enhancing their natural beauty with brighter colors. Brighter flamingos tend to nest earlier than dull individuals, a potential advantage that could mean getting the best nesting spots in the colony. While both male and female greater flamingos take care of chicks, flamingo dads can spend more time incubating and defending the nest from potential threats than females.

[Charles J. Sharp / Wikimedia Commons / CC-BY-SA 4.0](#)

Dayak fruit bats (*Dyacopterus spadiceus*) live in the rainforests of Peninsular Malaysia and Borneo, where they are quite rare. Weighing about 70-80 grams, they feed on hard fruits in the forest canopy. Among mammals, Dayak fruit bats are particularly interesting because multiple males captured in Malaysia produced milk from their mammary glands. But these dads make very little milk and their skin texture suggests pups aren't nursing, so dadbat milk production (galactorrhea) may be more a byproduct of hormones from behaviorally caring for pups than nourishing pups.





Naveedanjumkhan / Wikimedia Commons / CC-BY-SA 4.0

The late afternoon sun glows golden over Laguna Fuente de Piedra in southern Spain. Home to the second largest greater Flamingo colony in Europe, the breeding party is just getting started in mid-March. Our father Flamingo has been sitting on the nest for the past several hours. He shifts slightly, revealing the single precious brown speckled egg perched on the mud mound nest. Father Flamingo gives a big stretch, showing off his full height (187 cm) and preens his bright pink feathers. Thanks to those lovely feathers, our pair managed to get one of the best nesting spots in the colony. Our Dayak Fruit Bat, having been roosting cozily in a cracked tree trunk in Malaysia, is unceremoniously dropped into the sky above the noisy flamingo flock. SQUAWK! The bat twirls as a yellow-legged gull swoops down, landing just to the side of the flamingo on his nest. The gull side-eyes the flamingo, looking for an opportunity to grab that tasty egg. Seeing the gull, our Flamingo stretches his neck out to its full length, ruffling his feathers while swiping his hooked beak towards the approaching gull. The gull hops closer and the Flamingo's hooked beak clamps onto the gull's beak. BINGO! The gull yanks upwards, pulling the flamingo up and away from the egg.

Quick as a flash, the gull breaks free and slips under the flamingo's legs to swipe at the egg. Egg in beak, the gull takes off, with the flamingo hot in pursuit. That leaves our bleary-eyed fruit bat still circling above the glimmering lake on the field of battle! DAYAK FRUIT BAT OUTLASTS THE GREATER FLAMINGO!  
 Narrated by Dr. Alyson Brokaw.

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*Canis familiaris* chewing on *Bos taurus* mandible  
Bridger-Teton National Forest / K. Hinde

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READ ALL ABOUT IT Prepared by Katie Hinde, Margaret Janz, Melanie Beasley, Anali Perry, & Abbie Thacher



## R1: MIGHTY STRIPES

Round 1 of the Mighty Stripes Division featuring mammal combatants that have... wait for it... STRIPES! Stripes can be adaptations for warning, camouflage, temperature control, individual identity, or possibly to confuse biting insects!



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**Okapi (1) vs Four-Striped Grass Mouse (16)** - Introducing our Mighty Stripes top-seeded combatant, Okapi! Okapis (*Okapi johnstoni*) are the closest living relatives to giraffes. But instead of the spots or patches that cover a giraffe's body, Okapis are sporting stripes, resembling zebras. White or cream colored horizontal stripes line the upper parts of the rear & front legs to their solid white ankles. To our eye, these stripes are in stark contrast to the dark, velvety body of Okapis. In the African rainforests where Okapis occur, these stripes work as camouflage, looking similar to the streaks of light penetrating the forest.

# R1: MIGHTY STRIPES



Derek Keats / Flickr / CC-BY 2.0

Seeded last in the Mighty Stripes division is the Four-Striped Grass Mouse, named for the four, longitudinal, dark stripes down the back of these small rodents. There are currently 5 species of Grass Mice in the genus *Rhabdomys* recognized, all occurring throughout southern Africa with different species often having different social systems & habitat preferences. Four-Striped Grass Mice (*Rhabdomys pumilio*), as currently recognized, prefer arid & grassy habitats along coastal South Africa. This rodent species is highly abundant & social, with a bold & inquisitive personality.

Today's battle occurs on the Okapi's home turf, Maiko National Park in the Democratic Republic of the Congo. Okapi are active during the day (diurnal) and females are larger than males. Our

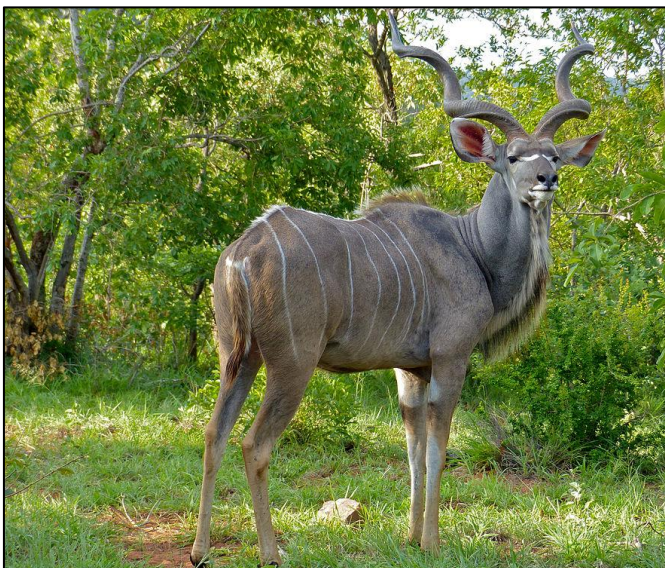
large, female Okapi is walking slowly while feeding. Four-Striped Grass Mouse finds himself in an unfamiliar & intimidating habitat. Too many plants! Too humid! No frens! Male Grass Mice, however, are bold & curious. Our male Grass Mouse starts sniffing around, exploring. Okapi chomps on some plants following a trail that encompasses her home range. As Okapi steps, scent glands near her feet release a tar-like discharge onto passing plants, marking her passage through the dense vegetation of her territory. Four-Striped Grass Mouse detects a presence nearby, not through his sense of sight but SMELL! The discharge from the Okapi's scent glands has a distinct smell, one that Four-Striped Grass Mouse has picked up and finds noxious. Four-Striped Grass Mouse can't take the novelty and flees from the field of battle! OKAPI REPELS FOUR-STRIPED GRASS MOUSE! Narrated by Prof. Jessica Light.

**Greater Kudu (2) vs Badger Bat (15)** - Float like a butterfly, look like a...badger? Also called the pied butterfly bat & panda bat, tonight's bat contestant is a striking beauty of dark fur patterned with light yellow stripes similar to the European badger. This bat makes its home in the tropical moist lowland and dry forests of Africa, with most specimens recorded from the Democratic Republic of Congo and South Sudan. With long, narrow



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wings, the Badger Bat (*Glauconycteris superba*) is likely a canopy species, flying at high speeds to catch insects in flight above the trees. "Based on morphological characteristics, the Badger Bat was briefly reclassified as a new genus Niumbaha, meaning "rare" or "unusual" in Zande, the language of the Azande people - the primary ethnic group in South Sudan. Greater Kudus (*Tragelaphus strepsiceros*) are one of the world's largest antelope. They have a dark head and are grey-brown with 4-12 light stripes along their mid-section that camouflage them from predators like spotted hyena, wild dogs, and big cats in the forests, savannahs & shrublands in southern & eastern Africa. Their legs are long & overall body shape is narrow. Adult male Kudus can be twice the size of females, reaching nearly 700 lbs! Their striking twisted horns are the largest of any antelope and are attached to the skull permanently. Antlers shed, horns do not.



[Bernard DuPont / Wikimedia Commons / CC-BY-SA 2.0](#)



[Reeder D, Helgen K, Vodzak M, Lunde D, Ejotre I / Wikimedia Commons / CC-BY 3.0](#)

Tonight's battle takes place at Etosha National Park in northern Namibia, where it is currently the middle of the night. Most of the park is a lake bed. The recent rains mean there's plenty of water & new vegetation growth for browse. Our Kudu is a massive male with nearly 3 full twists to his 4.5-foot-long horns. In the darkness, he is browsing on the sweet, new growth of Mopane leaves. Our Badger Bat, a mature female, is transported by MMMagic to the field of battle. She flits along where the forest meets the open grasslands, switching between different echolocation calls to learn about this unfamiliar place. Badger Bat detects a large hatch of insects flying above kudu's head, she swoops by his ear, catching insects in her tail membrane & pitching them into her mouth, like a butt spoon. WHAMMMM!!!! A barn owl snatches Badger

# R1: MIGHTY STRIPES

Bat out of the air, lands and gobbles the bat down in less than 2 minutes, removing Badger Bat from the field of battle. KUDU OUT-SNACKS BADGER BAT! Narrated by Dr. Tara Chestnut and Dr. Alyson Brokaw.

**Striped Hyena (3) vs Fire-Footed Rope Squirrel (14)** - Both of tonight's competitors display Mighty Stripes, are found across the African continent, and lead solitary lifestyles - but their similarities stop there. Striped Hyenas (*Hyaena hyaena*) tip the scales at 55kg (121lbs) with stripes adorning their torsos and legs, and are active during dawn, dusk and into the night. Don't confuse Striped Hyena with its Spotted cousin nor the hairier Brown Hyena or Aardwolf. Striped hyenas stripes are most visible during the summer when their hair is shorter.



Rushikesh Deshmukh DOP / Wikimedia Commons / CC-BY-SA 2.0



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Fire-footed Rope Squirrels (*Funisciurus pyrropus*) weigh 243g (1/2 lb) and are diurnal tree squirrels with a fabulously striped tail. Fire-Footed Rope Squirrels will eat discarded bark from the *Ceiba pentandra* tree that's been ripped by chimpanzees foraging for the inner bark richer in sap.

Tonight's battle takes place in the Loisaba Conservancy in the Laikipia Plateau of central Kenya. Fire-Footed Rope Squirrel, however, is feeling less than fabulous on the home turf of Striped Hyena. Squirrel prefers moist savannas and lowland tropical forests, not this much drier grassland. The sun is setting and Fire-Footed Rope Squirrel is darting between the grasses, trying to find a nice tree to climb and make its home for the night. Not too far away, Striped Hyena is standing alone and still, surveying the landscape. Striped Hyena is hungry and normally would scavenge the





savanna for a good meal, but nearby Spotted Hyenas are protecting a fresh carcass, so Striped Hyena selects food foraging option 2: hunt for small mammals. Fire-Footed Rope Squirrel stands on hind legs - completely still - attempting to scan the surroundings, but the high grasses limit visibility, and the grass isn't strong enough to support the weight of the squirrel to get a better view. Fire-Footed Rope Squirrel hears a rustle in the grass before Striped Hyena snatches the squirrel with hyena jaws! Striped Hyena shakes head violently from side-to-side, snapping small squirrel bones. STRIPED HYENA CHOMPS FIRE-FOOTED ROPE SQUIRREL! Narrated by Prof Patrice K. Conners.

**Striped Dolphin (4) vs Chequered Elephant Shrew (13)** - Striped dolphins (*Stenella coeruleoalba*) get both their common and scientific names from the striking blue-gray and white stripes and blazes which fan out from eye to tail. Striped dolphins are more robust than most dolphins: Individuals can get up to 2.5m long and weigh 157kg. While Striped dolphins will sometimes travel alone or in small groups, they can be very social and form schools of several thousand. Elephant Shrews (*Rhynchocyon cirnei*), also called Sengi, are distantly related to elephants but even less related to shrews. The animals get their Elephant name because although small, they have a long and dexterous proboscis they use to help find insects within leaf litter. What the common name does get right is these Elephant Shrews are “checked,” with several black and

white alternating squares in distinct stripes running along the length of the back. While the schnoz of Elephant Shrews is outstanding, they do not have extraordinary smelling abilities. Analysis of their nasal structures suggests olfaction is less refined than dogs.



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It's a beautiful day in the lush forests of Tanzania when MMMagic transports the Chequered Elephant Shrew into the Mediterranean Sea, home habitat of the higher-seeded Striped Dolphin. Striped Dolphins occur in deep waters away from the continental shelf. Nearby, a male Striped Dolphin is moving steadily through the warm, pelagic waters. Dolphin “streaks” through the waves with minimal drag because of his tapered body shape. Panicked Elephant Shrew frantically swings its long limbs. Adapted for running rather than deep water, the little mammal flails, making tiny splashes. Struggling more and more to keep above the swells, the Elephant Shrew grows exhausted. Soon only the tip of the Elephant Shrew's long nose is above the water,

# R1: MIGHTY STRIPES



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on prey. Common Striped Possum (*Dactylopsila trivirgata*) are white with three black stripes: one along the back and two on each side, running from a distinctive "Y" pattern on the head and merging together on the long tail. For marsupials, the Striped Possum has the largest brain compared to its mass (423g). It isn't exactly clear why Striped Possums have such large brains, but it's possible they evolved large brains to cognitively deal with unexpected environmental change.



Thomas A. Hermann / Wikimedia Commons / Public Domain

still providing precious air. WHOOSH!!! Deepwater red shrimp trapped in nets are hauled up by a fishing trawler... but there's bycatch! Sengi is saved! For once bycatch rescues a life. The fishing vessels sails on, leaving behind the dolphin on the field of battle! STRIPED DOLPHIN OUTSWIMS CHEQUERED ELEPHANT SHREW! Narrated by Prof Brian Tanis.

**Side-Striped Jackal (5) v. Common Striped Possum (12)** – Side-Striped Jackals (*Lupulella adustus*) are one of three species of medium-sized canids native to Africa. They are easy to identify by the prominent white and black stripe along the sides of their body, separating their gray back from brown belly. The Side-Striped Jackal is small (13kg and only 95cm long) and stocky with shorter legs, so they do not chase prey. Instead they hide in dense vegetation and ambush pounce

In Gabon, Africa, just outside the town of Gamba, a Jackal is searching its home habitat for food. MMMagic transports a large Possum, who is native to tropical forests of Australia and New Guinea, outside the town and feels fairly at ease in the habitat.





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Sniffing the wind, the Possum detects some ripened figs that have fallen to the forest floor. While it does occasionally eat figs, Stripped Possums will often forage for insects around fruits and flowers, so the ripe figs are a rich foraging patch for insects. The Jackal has also smelled the delightful aroma of fallen figs! Jackals are opportunistic feeders that consume other small mammals, but as much as 1/3rd of their diet can consist of figs and other fruits. Excited for the prospect of a quick meal, both mammals simultaneously converge on the fig pile. Emerging from the dense vegetation, they see each other- Jackal lunges while the Possum turns to flee! Pouncing, the Jackal slips on some rotten figs!



Naveedanjumkhan / Wikimedia Commons / CC-BY-SA 4.0

With paws and jaws landing just to its side, the Possum darts up a nearby tree trunk & disappears into the canopy. Unable to climb after its prey, the Jackal settles for a fig dinner. **SIDE-STRIPED JACKAL DISPLACES STRIPED POSSUM!** Narrated by Prof. Brian Tanis.



Peter Trimming / Wikimedia Commons / CC-BY-SA 2.0

**Wildcat (6) v. Highland Streaked Tenrec (11)** – Tenrecs (*Hemicentetes nigriceps*) are small mammals endemic to Madagascar that range greatly in shape and size. Highland Streaked Tenrec weighs 160g and is covered with a mix of hairs and spines with three distinctive white stripes along its back. Wildcat (*Felis silvestris silvestris*) is a big felid (6.5kg /14lbs) that has stripes along its whole body. Wildcats are found on three continents and are divided into multiple subspecies. Our Wildcat combatant is from the woodland lineage of Scotland that is on the brink of extinction.

# R1: MIGHTY STRIPES

In the wooded Highlands of Northern Scotland, the Streaked Tenrec of the Madagascan Highlands feels right at home in the habitat of the Wildcat because of the similar humid forests amongst the mountains. Tenrec starts foraging, stirring the leaf litter and soft ground for earthworms. Suddenly, Tenrec stops digging with its enlarged forelimbs. From head to rump, it raises its spines and starts a "buzzing" vocalization - classic Tenrec defensive maneuvers (Marshall & Eisenberg, 1996).



Giant Eland / ZooChat / CC-BY-SA 4.0

Wildcat has been watching this strange looking creature through the leafy undergrowth and the felid adjusts itself, centering its body over paws, leaving a forepaw raised, eyes concentrated on the Tenrec. Spines still raised, Tenrec moves its head in short bursts, trying to locate the nearby threat. CRUNCH! THRASH! HISSSSS! REEEEEOOOOOW!! An equally-sized, big feral domesticated cat jumps into the scene! Cat tussle

ensues!! Domesticated cats are one of the biggest threats to Scottish Wildcats due to direct competition for space and food, disease transmission, and hybridization. Tenrec watches as the two cats tumble apart, one felid fleeing, one felid chasing into the forest, both felids leaving the field of battle. TENREC OUTLASTS WILDCAT!! Narrated by Prof. Patrice Conners.

**Sumatran Striped Rabbit (7) v. Numbat (10)** – Numbat (*Myrmecobius fasciatus*) is a medium-sized (700g), endangered marsupial found only in two naturally occurring populations in SW Australia. Numbats are reddish-brown near the head, have a black mask with white spots near the shoulders and transitions to dark brown toward the tail with bright stripes in the middle and a bottlebrush tail. The males can be twice the size of the females. Numbats have simple, conical teeth that are barely visible above the gum and an exceptionally long tongue ideal for eating termites.



Martin Pot/ Wikimedia Commons / CC-BY-SA 3.0





Indonesia covers only 1.3% of the world’s total area, yet contains 12% of mammals of the world, including two native and one introduced rabbit. Sumatran Striped Rabbit (*Nesolagus netscheri*) is the only native rabbit to the island of Sumatra. Sumatran Striped Rabbit is endangered and known only from a few museum specimens and camera trap records. The Sumatran Striped Rabbit range and status has been difficult to determine by confusion with invasive European Rabbits that were pets that now live wild in urban and suburban areas. Sumatran Striped Rabbits are similar size to European Rabbit (~1.5kg) but the Sumatran Striped Rabbit has black/brown stripes on a yellow-gray background and short black ears.

It is morning in Bukit Barisan Selatan National Park, South Sumatra, Indonesia, our adult male Rabbit is nestled in at the base of a shrubby tree on the edge of the forest where local coffee growers recently saw Striped Rabbits. Numbat is transported by MMMagic to this unfamiliar humid habitat with dense vegetation. He snuffles around, taking in all of the new scents when he takes a big whiff around the shrub where Rabbit is tucked in to sleep for the day. Nearby, a Sun Bear is tearing into a partially rotten log on the forest floor to get at the fatty and nutritious termites inside. Rabbit remains still but gives Numbat as much side eye as an animal with lateral orbits can give. Numbat's raised snout detects the siren scent of termites! Skittering to the far side of the log to avoid the Sun Bear, Numbat joins the line of tromping termites, tongue-lassoing the tasty treats while toddling off the field of battle! SUMATRAN RABBIT OUTLASTS NUMBAT!!! Narrated by Dr. Tara Chestnut.

**Striped Polecat (8) vs Giant Striped Mongoose (9)** – Striped Polecat (*Ictonyx libycus*) is mostly black, with white stripes running down the body and a black head with a white ring around the face and white areas near the nose. The coloration is an “aposematic” warning to tell other animals not to mess with it. Polecats can release a stinky foul-tasting fluid from their anal scent glands, which lingers on their fur. Striped Mongoose (*Galidictis fasciata*) is beige or tan in color with 5-8 dark-colored stripes on its back that run the length of the body to help with camouflage.

# R1: MIGHTY STRIPES

Striped Polecat



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Scientific names sometimes change due to new evidence. The Latin binomial species name for the Striped Mongoose has been split to include two subspecies: *G. f. fasciata* and *G. f. grandidieri*. Both of our combatants are medium-sized carnivores (mesopredators) found in Africa. Polecat has a somewhat odd distribution throughout northern Africa (but not the Saharan Desert) and Striped Mongoose is found only in Madagascar. Taxonomically and evolutionarily, Striped Mongooses are cat-like carnivorans in family Eupleridae (~900g), while Polecats are distantly-related and dog-like in the family Mustelidae (~600g).

In Taourirt Province, Morocco, in North Africa, the semi-desert with low grasses and bushes attract small vertebrate prey and provide excellent cover for the nocturnal hunting of the Striped Polecat. Transported by MMMagic, Striped Mongoose blinks at the disappearance of his mountain forest home replaced by scrubland.

Giant Striped Mongoose



Thierry Cordenos / iNaturalist/ CC BY-NC 4.0

In the darkness, both medium-sized predators hunt for small rodents, slinking across the open ground in the faint light cast by the waning crescent moon. Striped Mongoose dives at a rodent and comes up with a fat-tailed jird! Crunch-munching on the foreign delicacy, Striped Mongoose is interrupted as Striped Polecat steps into the moonlight with a piercing stare. Within animal communities, predator-on-predator attacks happen to eliminate the competition, such that "killing is common between <related> predator species and of not dis-similar body size" (Ritchie & Johnson 2009). The two stare at each other as a rivulet of jird blood runs onto Mongoose's chin. "In intact predator communities in Africa, a carnivore may be at risk of attack from as many as 14+ species of other carnivores" (Ritchie & Johnson 2009). Striped Mongoose has never before encountered a mustelid, but has no misapprehensions that he has encountered an aggressive competitor in Striped Polecat.



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Striped Polecat launches at Striped Mongoose! Tumble-rolling to the base of a shrub, the two predators grapple, scraping claws and biting teeth! Striped Mongoose attempts to flee into trees, but uselessly snaps fragile twigs of the scrub-brush available in the semi-desert, escaping nowhere as Striped Polecat closes in! Striped Mongoose, now fighting for his life, twist-grapples against the Polecat! The mesopredators are the same body length (70cm), but the Mongoose's heavier weight begins to give the advantage, tiring the Polecat whose clawing and biting becomes feebler... Rolling clouds cast shadows on the locked combatants, as Striped Polecat's eyes fade to unseeing. "Overall, mortality rates in carnivore populations due to attacks by other predators may be in the range of 40–80%" (Ritchie & Johnson 2009). STRIPED MONGOOSE ELIMINATES THE COMPETITION... STRIPED POLECAT!! Narrated by Profs Jessica Light & Katie Hinde.



**Jessica Popescu**  
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#2023MMM

MIGHTY STRIPES EMOJI BATTLE



### Okapi vs. Four-Striped Grass Mouse

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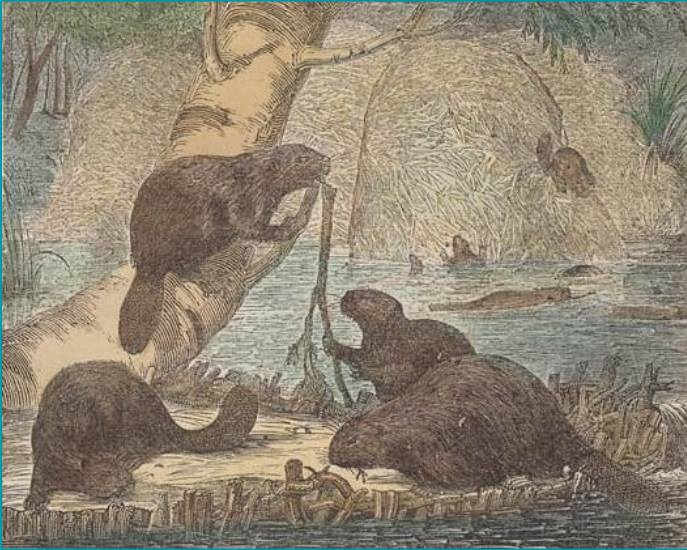


# 2023 M M M M M

March 20, 2023

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## R1: ANIMAL ENGINEERS

Tonight's combatants are all crafty engineers that build homes, reshape items to move across the landscape, create & use tools, build or secrete protections for themselves, or construct elaborate installations to attract the ladies. In doing so they also often reshape their environment and the ecosystem in which they live.



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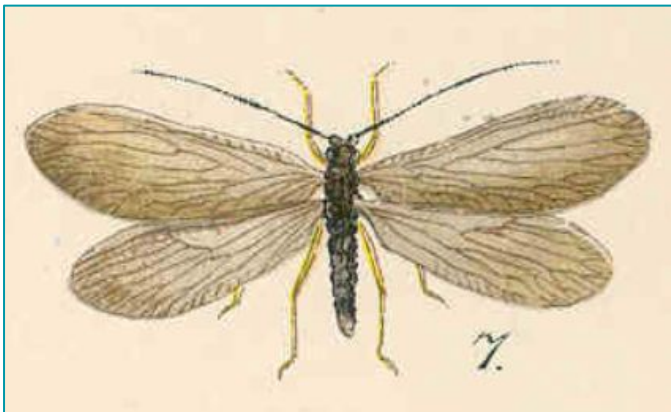
**Golden Eagle (1) vs. Spongilla Fly (16)** - Golden Eagles (*Aquila chrysaetos*) are widely distributed in the Northern Hemisphere and are North America's largest raptor with an up to 7 foot wingspan. Females are larger than males, and adult eagles are largely brown, with golden coloration on their heads, neck, & nape. Golden Eagles build incredible nests, sometimes building on top of nests of previous generations of Golden Eagles, with long-time use of the most preferred nest locations. A seven meter (21 foot) tall Golden Eagle nest on a basalt wall was studied near Sun River, Montana. The oldest, most foundational nest was radiocarbon dated to the early 1400s.



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# R1: ANIMAL ENGINEERS

Spongilla flies (*Climacia areolaris*) are widely distributed living within freshwater ecosystems from Mexico to Canada. After hatching & going through two stages of underwater development (one parasitizing freshwater sponges), the larva emerge from water, spin a protective net for a cocoon for their transformation into an adult stage. The little larvae selects a spot, fixes legs to surface, and then dabs their abdomen to the surface so "viscid, semi-liquid silk oozes out" swinging their abdomen in wide arcs to create fiber threads in a systematic pattern over 6-8 hours (Brown 1952).



Louis Hippolyte Joutel / Wikimedia Commons / Public Domain

Tonight's battle takes place in the Scottish Highlands where Golden Eagle populations have persisted even as their White-Tailed Eagle brethren were extirpated from the United Kingdom. In March, the Spongilla Fly has been

overwintering in suspended development in a larval stage (diapause). Currently a 2nd Instar, this insect is only about 1mm wide & 3mm long. Adult Spongilla Flies died off after breeding at the end of last summer. MMMagic transports Spongilla Fly Larva to Scotland directly onto the base of Golden Eagle's talon! Spongilla Fly Larva at this developmental stage should be under the water and the larva's gills flutter uselessly. The Golden Eagle, preening the feathers that reach down to her toes incidentally consumes Spongilla Fly Larva, without even noticing. GOLDEN EAGLE INCIDENTALLY EATS SPONGILLA FLY! Narrated by Prof. Katie Hinde.

**Cathedral Termite (2) vs Dung Beetle (15)** - The Cathedral termite (*Nasutitermes triodiae*) is native to Northern Australia and their colonies build mounds over 15 feet high. Like all termites, Cathedral termites are eusocial - with three types of castes - workers, soldiers and reproductives. Cathedral termite soldiers are called "nasute soldiers" because of the frontal projection (nasus) on their head. The whole termite colony cannot compete in March Mammal Madness, so our combatant is a single nasute soldier weighing in at a grand total of 10 mg. *Kheper larmarki* is a dung beetle species native to South Africa. Dung is used as a food source. In 2019, Dacke and colleagues





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found that South African dung beetles can navigate using both celestial and wind cues. *Kheper larmarki* is a model system for navigation studies in Dung beetles. When ready to roll a dung ball, *K. larmarki* does an orientation dance on top of the ball.



Jochen Smolka / Flickr / CC-BY-NC-SA 2.0

Our battle begins at midday in Litchfield National Park in northern Australia (aka "Top End"), home of some amazing Cathedral termite mounds. Dung beetle finds itself transported adjacent to a cathedral mound, and next to an unusual but welcome olfactory delight - dingo droppings! Dung beetle makes short work of the dingo dung - molding the feces into a ball- and does a little dance as the Dung Beetle prepares to roll the dung ball away. The beetle rolls the dung up the cathedral mound, mounting the alarm response of the colony. As the termite soldiers arrive at colony entrances, gravity overcomes the dung ball and it rolls off the mound. The beetle chases after the ball of feces and off the field of battle! CATHEDRAL TERMITE OUTLASTS DUNG BEETLE!! Narrated by Prof. Chris Anderson.

**Homo habilis (3) vs. Pueblo Bee (14)** - *Homo habilis* is a member of the group of fossil species closer to humans than to any other living primate. This group, called hominins, all walked on two legs. The earliest claimed *Homo habilis* is ~2.8 million years old and was found by Chalachew Seyoum in Ethiopia. Paleanthropologists estimate that a male *Homo habilis* would have stood about as tall as a 4th grader (about 1.5 meters). Hominin height is estimated from fossil limb bones and their stride length as seen in fossilized footprints. *Homo habilis* made what is known as the "Oldowan Industrial Complex"-tools, like choppers and flakes, made out of stone. These tools were used

# R1: ANIMAL ENGINEERS

for removing meat from bones and to break open animal bones to get marrow. *Homo habilis* made stone tools by knocking rocks against each other. While the tools might not look fancy, it takes some practice to get the hang of making them.

*Anthophora pueblo* is a bee species with some buzzworthy news: *be*lieve it or not, using their strong jaw they excavate nests in sandstone. The long-lasting durability of these nests, and ability to reuse them, may be why natural selection has favored these bees making this kind of nest. This nesting in stone, though, is not without costs: "Mandible wear is consistently seen in older females, a consequence of excavation that likely limits their further use." (Orr et al. 2016). It is important to know the role all bees play in their niche: There are over 20,000 bee species and they provide "vital roles in ecosystems and agriculture around the globe." (De Jong & Lester, 2023).

Late afternoon at Naibor Soit, a quartzite outcropping at Olduvai Gorge, Tanzania 1.7 million years ago. The savannah grassland with scrub and bush is home to giraffe, antelope, hyena, and other MMM favorites. *Homo habilis* is selecting raw materials for tool-making. Pueblo Bee finds itself transported by MMMagic from the desert shrublands of Utah to the same spot where *Homo habilis* is making tools, *be*wildering



William Daniel Snyder / Wikimedia Commons / CC-BY-SA 4.0;  
USDA / public domain; Bee & *Homo habilis* not shown to relative scale

*Anthophora pueblo*. Pueblo Bee beelines to the rocks, looking for a soft sandstone to excavate a nest, but the quartzite rock here is harder than the soft sandstone at home. The Pueblo Bee's mandibles have trouble making any scrapes to start the nest. WHACK! WHACK! WHACK! *Homo habilis* is striking rocks and assessing break patterns for the perfect flake. Pueblo Bees, unlike many some other bee species, are not aggressive. The *whacky* action and hard stone motivates the Pueblo Bee to fly away from the field of battle. **HOMO HABILIS DIVERTS PUEBLO BEE!**  
Narrated by Prof. Marc Kissel.



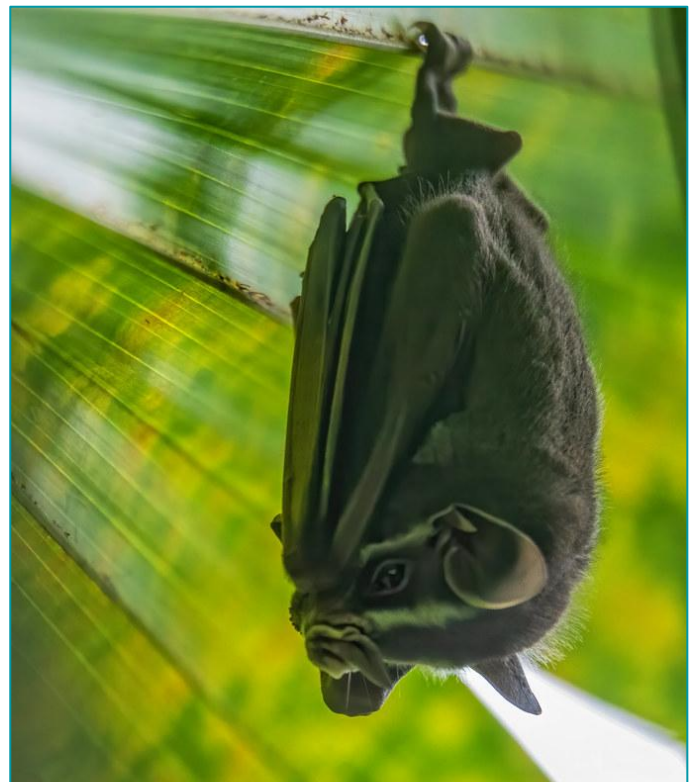


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**Lungfish (4) vs. Tent-making Bat (13)** - Most species of lungfish can "terrestrialize" during droughts or dry seasons. The Lungfish will secrete a protective mucus cocoon in a mud nest, lowering their metabolic rate & changing their waste processes (aestivation) to survive months or even years. Our Lungfish combatant, *Protopterus dolloi*, living in a habitat that retains moisture year-round, does not typically "terrestrialize" but can under extreme conditions. Lungfish could have been in Dad Bods Division as males build the mud nest and protect eggs during the summer breeding season.

The Tent-Making Bat (*Uroderma bilobatum*) is common in lowland forests of Central America and eats fruit (frugivorous) with a particular fondness for figs, and typically lives in social groups of 2-59 individuals. Mostly greyish-brown, this combatant could have also been in the Mighty Stripes Division due to the two white stripes that run from behind its ears and down its face, and one white racing stripe down its back.

Tonight's battle takes place on the muddy floodplains of Lake Nkuna of the Congo River in central Africa. Recent heavy rains have drenched the region, creating many muddy pools and braided streams. An obligate airbreather, Lungfish "walks" in shallow, muddy water hunting small vertebrate and invertebrate prey. Tent-making Bat, although alone, immediately begins to make a tent to have an out-of-the-rain sleeping site.



Jonas Juodišius / Flickr / CC-BY-NC-SA 2.0

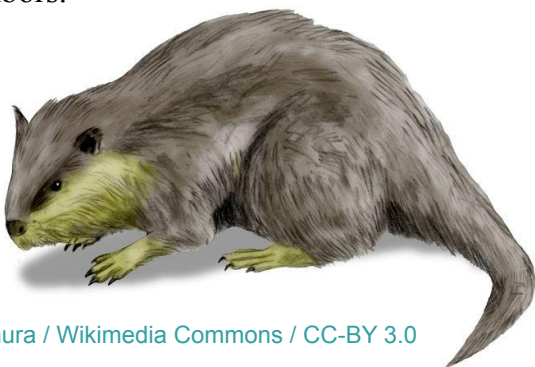
Laboriously making dozens of bites and chewing along the structural veins of a large tree leaf, the Tent-Making Bat weakens the leaf so it droops in a way that protects from wind, rain, and other weather, so the bat stays warmer. In the shallow muddy waters below, water sluices across the

# R1: ANIMAL ENGINEERS

Lungfish. Without family or friends to help, the tent-making is slower-going than usual for the 16g Tent-Making Bat. Repositioning to bite a structural vein, a gust of wind blows the bat into the muddy puddle below. Omnivorous 8kg Lungfish is already at the surface, breathing air. Lungfish ravenously closes in on the struggling, floating bat. LUNGFISH DEVOURS TENT-MAKING BAT! Narrated by Katie Hinde.

## **Palaeocaster fossor (5) v. Trapdoor Spider (12)**

– *Palaeocaster fossor* was a fossil beaver, but unlike the wetland associated beavers of modern beavers, *Palaeocaster fossor* lived in a dry grassland. *Palaeocaster fossor* excavated corkscrew burrows that could be 8+ feet deep, fossilized versions of these structures were termed ‘Daimonelix’ meaning "Devil's Corkscrew" when originally described. These burrows are found in high densities, with many burrows clustered together in towns, but the burrows did not connect with neighbors.



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Sydney Brown Trapdoor Spider (*Arbanitis rapax*) is typically found year-round waiting in ambush at the entrance to its burrow. These spiders will silk-tether a fallen leaf to close the entrance to their burrow or silk tether to fallen needles to detect steps of prey passers-by. Once prey are captured, Trapdoor Spider will back up a bit into the burrow to consume their prey, dropping uneaten bits into a carcass pit at the bottom of the burrow, or as scientists say "a midden of uneaten prey remains near the bottom of the burrow" (Bradley 1996).



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About 22 million years ago, the Harrison Formation of Western Nebraska was a semiarid, upland paleoenvironment of sandy substrate where *Palaeocaster fossor* lived in many Devil's Corkscrews. MMMagic transports the arid-adapted Trapdoor Spider who feels nearly at home in the sandy soil. Trapdoor Spider readily begins excavating a new silk-lined burrow.



The surrounding grasslands are a veritable smorgasbord-orgesboard-orgesboard for the Trapdoor Spider with the beetles, ants, and other insects the spider prefers. Periods of dispersal from the natal nest and the construction and establishment of their own burrow is a time of high mortality for Trapdoor Spiders from numerous predators. WHAMPF! *Palaeocaster* moving quickly into the only burrow entrance tumble-tramples over the Trapdoor Spider that had not yet crafted enough of a depression to avoid *Palaeocaster*'s stride. *PALAEOCASTOR TRAMPLES TRAPDOOR SPIDER!* Narrated by Prof. Katie Hinde and Dr. Yara Haridy.

**Goanna (6) vs. Rufous Hornero (11)** - Goanna (*Varanus panoptes*) is also known as the yellow-spotted monitor. At about 150 cm they are one of the largest of the Australian lizards. Like many monitors, they eat fish, rodents, and other lizards. And like another contender in this bracket, they make helix-shaped burrows that are then used by other animals! Rufous Hornero (*Furnarius rufus*), aka the red ovenbird, is the national bird of Argentina and Uruguay. Their domed nests weigh about 4 kg and are made out of mud and dung, to which they add straw, hair, etc to make a mortar. Some scientists think the nests help to keep the baby birds warm, freeing the parents to forage for food, but this is debated. While they rarely reuse old nests, other birds might use *Furnarius rufus*' abandoned nests. While recently fledged chicks will try to help build nests, even carry mud &



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dung to help, adults often chase them away from the nest site (n.b. much like young kids helping to bake, it probably takes 3 times as long to do anything with the kids around).

Tonight's battle is the rocky eucalyptus woodland near Townsville, Queensland, home to many lizards, skinks, & snakes. The Ovenbird is transported by MMMagic to Townsville and, while not too distressed by the environment, the Ovenbird is none too happy that the nest he had begun to build for the upcoming breeding season has disappeared! Goanna emerges from the opening of a burrow deeper than almost any other vertebrate: the average depth is 2.3 meters (but some are as deep as 3.6 m) with a brief sloping section, followed by the helix, and then a nest chamber deep below. Ovenbird begins collecting materials to build a new nest. Vfovfovfovfovfovfo! The rhythmic drum vocalization of the poisonous cane toad. Cane toads, intentionally released by colonizers in 1935

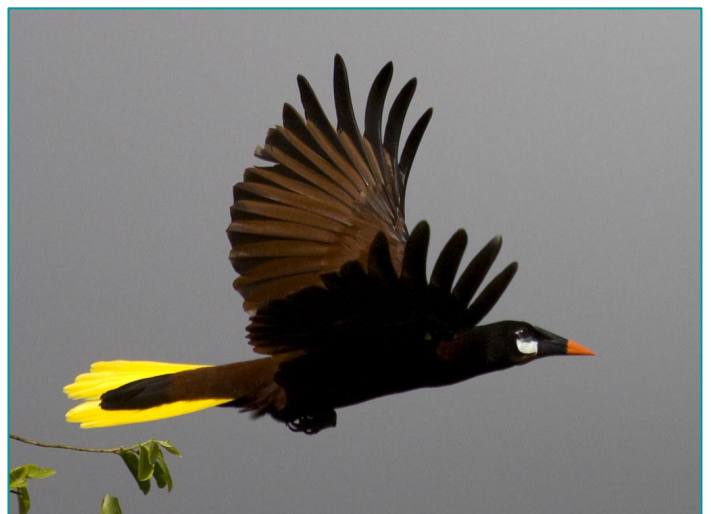
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for pest control in sugarcane fields, were lethally poisonous to many of Australia's native vertebrates. Eating adult cane toads has up to a 90% mortality risk for Goannas. Goanna approaches the cane toad, tongue flickering the air. The Ovenbird, as it often does, "utters a peculiar, loud, shrill, & quickly reiterated cry," as described by Charles Darwin in *Zoology of the Voyage of H.M.S. Beagle* (1842). The Goanna's flickering tongue tastes cane toad. But Goanna has a learned taste aversion to cane toads from a non-lethal exposure to a juvenile cane toad previously. Ovenbird watching from a perch now sees Goanna climbing the tree toward Ovenbird. Wasting no time, Ovenbird flies to a less active part of the forest. GOANNA DEFEATS RUFOUS HORNERO! Narrated by Prof. Marc Kissel.

**Montezuma Oropendola (7) v. New Caledonian Crow (10)** – Montezuma Oropendola (*Psarocolius montezuma*) are in the icterid bird family (the group that includes orioles and grackles) found in lowland Mexico and parts of Panama. These strikingly colored birds have a very distinctive call. The Females build pouch-like nests made from plant materials such as palm fronds and roots with the bottom of nests having leaf material for cushion. New Caledonian Crow (*Corvus moneduloides*) are ~40 cm long and found on the Pacific archipelago of New Caledonia. They eat a wide range of food but are most famous for their technique of obtaining insects hidden in crevices by using sticks as tools. They even will work the end of the stick into a hook, which makes it much faster for them to grab an insect snack.



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In La Selva Research Station, Costa Rica, New Caledonian Crow has been transported by MMMagic to the base of a tree with a large Oropendola colony. Seeing a dead limb on the ground, the New Caledonian Crow begins to scan for a stick to forage for insects. The Montezuma Oropendola swoops to investigate the novel Crow, who looks somewhat similar to a Giant Cowbird. Giant Cowbirds are common brood parasites of Montezuma Oropendolas - they lay eggs in Oropendola nests and rely on Oropendolas to raise their young. Mistaking the New Caledonian Crow for a Cowbird, the Oropendola attacks! The New Caledonian Crow is an agile flyer - it evades raptors in its native range - and escapes the diving Oropendola. Banking in midair, the New Caledonian Crow rounds on Montezuma's Oropendola in a counter-attack and drives it from the field of battle! NEW CALEDONIAN CROW DEFEATS MONTEZUMA'S OROPENDOLA!! Narrated by Prof. Chris Anderson.



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**Veined Octopus (8) v. Pufferfish (9)** – The Veined Octopus (*Amphioctopus marginatus*) is a relatively small cephalopod with a body sac (mantle) ~5.5cm long. Veined Octopus is named for the branching dark lines present over the body that extend down onto the arms that have a 25cm span. The Veined Octopus lives in the Indian Ocean occupying the muddy, sandy seafloors where the octopus hunts for shellfish. Divers observed long mysterious 2-meter geometric sand circles in the waters near Ryukyu Islands, Japan, which are now known to be made by 10-cm male white-spotted pufferfish. The white-spotted Pufferfish (*Torquigener albomaculosus*) has a muted grey-blue body with mottled white spots.

In the "subtidal soft-sediment substrates to 18 meters deep off the coasts of Northern Sulawesi, Indonesia" (Finn et al. 2009), home habitat of Veined Octopus the combatants will encounter each other. Pufferfish is often found only a bit deeper at the transitions to the mesophotic zone, waters where sunlight still penetrates.

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Pufferfish immediately begins constructing a geometric circle by rapidly moving fins to plough a trench in the sand toward what will become the center of the geometric circle. Pufferfish swims out to the perimeter of the radial design he is constructing and is just about to flutter-flap another trench when... SON OF A SAND DOLLAR! A floating coconut is... walking... through the radial circle messing up the design!? Holding two halves of coconut, the

Veined Octopus is striding along the ocean floor with its legs. The Pufferfish begins to reconstruct the trench as a shadow passes above the scene... The Veined Octopus grasps the two coconut halves tighter to its body to camouflage itself from predators while bobbing in the water. Pufferfish industrially continues its installation mating project as Veined Octopus coconut strolls off the field of battle. PUFFERFISH OUTLASTS VEINED OCTOPUS! Narrated by Prof. Katie Hinde.



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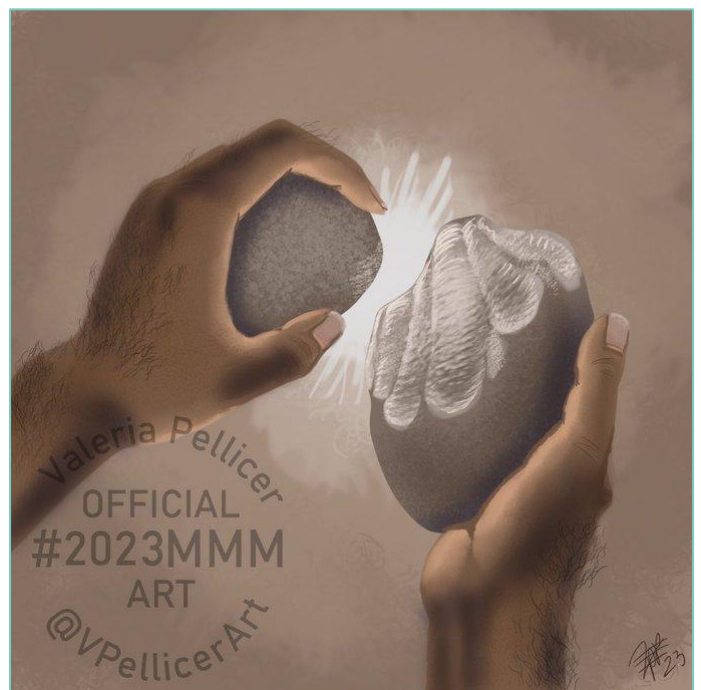
Jessica Popescu

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## #2023MMM ANIMAL ENGINEERS EMOJI RECAP



7:04 PM · Mar 20, 2023 · 25 Views



## R1: ITTY BITTY COME BACK CITY



Goldstein Lab Tardigrades / Wikimedia Commons / CC-BY-SA 2.0

Bringing back some beloved littles that were 14, 15, & 16 seeds early departed from tournament contention. These mini mammals are back for another chance at March Mammal Madness glory.

**Sea Otter (1) v. Bumblebee Bat (16)** – Sea Otter (*Enhydra lutra*) was a 16th seed in 2014's Marine Mammal Division, losing in the first round, as Sea Otter is the 2nd smallest marine mammal living in the world today. Found along the Pacific coast of North America to Russia, they're capable of living exclusively at sea with their dense coat and ability to float. The Sea Otter uses its cohesive black paw pads to keep slippery prey, like octopi, squid, and fish, from getting away. They use loose folds of skin as pockets to store their favorite mussel-smashing rock.



David Menke USFWS / Wikimedia Commons / Public Domain

The Bumblebee Bat (*Craseonycteris thonglongyai*) won a berth to this Division in 2023 making it a 2-time WILD CARD Winner! Bumblebee Bat also defeated Pygmy Jerboa in the wild card in 2015. Although the Bumblebee Bat is about 1/20,000th of the Sea Otter weight (2g), the sagittal crest on the skull indicates they pack a big

# R1: ITTY BITTY COME BACK CITY

bite. Nigerian scientists at Ibrahim Badamasi Babangida University found that Bumblebee Bat guano improves the nutritional quality of red amaranth and antioxidant concentration in false sesame.



Puechmaille et al. 2009 / Wikimedia Commons / <https://www.int-res.com/articles/esr2009/8/n008p015.pdf>

Bumblebee Bat is heading back to its limestone cave in Thailand after a night of hunting. When Bumblebee Bat enters the cave, the temperature drops about 20°F and the sound of crickets is replaced by slapping waves. MMMagic has transported Bumblebee Bat off the shore of one of the Aleutian Islands near Alaska. Unfortunately, the middle of the sea isn't a great place for a bat to sleep. Sea Otter, meanwhile, yawns below

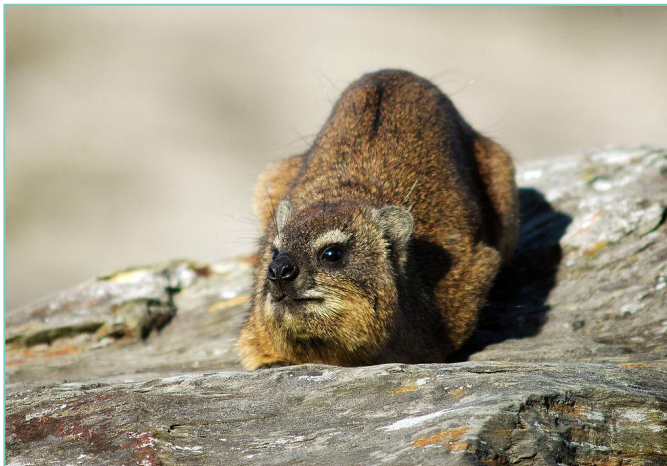
Bumblebee Bat. Sea Otters are diurnal (active during the day), so when the bat is just getting ready to bed, Sea Otter is waking up. Bumblebee Bat uses their echolocation to scan its surroundings, fluttering about making its "characteristic tweets" (Hill & Smith 1981). No cave to be found, Bumblebee Bat flutters away intent to find land while Sea Otter begins to groom himself. SEA OTTER OUTLASTS BUMBLEBEE BAT! Narrated by Dr. Asia Murphy.

**Rock Hyrax (2) v. seed Pygmy Jerboa (15)** – Hopping into the ring at a whopping 3.5 g is the Pygmy Jerboa (*Salpingotulus michaelis*) who LOST its 2015 wild card battle as Bumblebee Bat chased it from contention. These tiny rodents have elongated hind limbs like a mini kangaroo and a long tail that provides balance as they zig-zag run through sand. Known only from desert regions of southwest Pakistan, Pygmy Jerboas do not need to drink water because they get their daily water from eating seeds and leaves. Rock Hyrax (*Procapra capensis*), weighing about 10lbs, was a #16-seed back in 2014. But even getting to compete as a social group in the Social Mammal Division, Rock Hyrax was no match for the stomping power of a fully armed and operational Musk Oxen herd. Unlike Pygmy Jerboa, the Rock Hyrax has a



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broad geographic range, occurring through most of Africa and parts of the Arabian Peninsula. They can easily scamper in and among their rocky dwellings thanks to their large, soft footpads. Although they look like large rodents and are sometimes referred to as 'rock rabbits', Rock Hyraxes are neither. Rock hyraxes are most closely related to elephants and in their own Order: Hyracoidea.



Amada44 / Wikimedia Commons / Public Domain

Stocky formations of the Hoggar mountains pierce the skyline in Ahaggar National Park in southeast Algeria. This otherworldly landscape is most notably home to the critically endangered Saharan Cheetah. Our male Hyrax is sprawled out on the edge of a large rock, basking in the Algerian sun. Rock Hyraxes are notoriously lazy, spending 95% of their day just lounging. Other hyraxes are scattered nearby, with a handful piled all on top of each other in a heap. Having been snoozing away in a cozy burrow moments ago, our nocturnal Jerboa blinks against the setting sun. Jerboa takes a cautious hop on the

rocky surface where our Hyrax is sprawled. TRIIIIIIIIIIIIIIIIIIIII. Our Hyrax jerks his head up as the high-pitched alarm of another, nearby hyrax echoes across the rocks. With a grunt, the Hyrax bounds into its nearby crevice just as the elegant haunches and graceful tail of a Saharan Cheetah saunter into view. The Jerboa goes to bound into the rock refuge too... SMACK! The Cheetah whacks at the first sign of movement with a long, curious paw and sniffs at the unfamiliar rodent before consuming the tiny, stunned Jerboa in one swallow. Content with its snack, Cheetah continues on its way, while the Hyrax emerges from the rock crevice to resume foraging. ROCK HYRAX OUTLIVES THE PYGMY JERBOA!! Narrated by Dr. Alyson Brokaw.

**Mara (4) v. Siberian Chipmunk (13)** – In 2014, the Mara (*Dolichotis patagonum*), weighing 8.12kg, was the #15-seed rabbit-looking capybara relative that acts and moves like an ungulate in The Who in the What Now Division. With tiny, hoof-like feet, Mara spends the day walking through open environments, nibbling on just the very tops of uncommon grass, cacti, and fruits in the shrubby grasslands of Argentina. The Mara carefully watches for South American gray foxes and hawks. Like rabbits, Mara are hindgut-fermenters, with food mostly being digested in the cecum and large intestine. Things don't break down all that well, so Maras enjoy a meal twice, practicing coprophagy (i.e., poop-eating), even eating poop not their own!

# R1: ITTY BITTY COME BACK CITY



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Siberian Chipmunk (*Eutamias sibiricus*) is back after being a #15-seed first-round snack attack in 2016 for #2-seed Snow Leopard in the Cold-Adapted Division. At 150g, the Siberian Chipmunk is found in Russia and surrounding, northern countries, where it eats a variety of food, including birds, reptiles, fungi, and seeds. Siberian Chipmunks spend their days in the forest, stealing from the food caches of other chipmunks while carefully avoiding their own until there are no witnesses, ever-preparing for the coming winter.

MMMagic transports our Siberian Chipmunk to the warmth of a southern hemisphere late summer day and goes motionless where he stands to assess the yellow, nearly transparent grass. Nearby, the Mara male is carefully rubbing his butt against the ground marking his small, drifting territory that

centers around his female mate. The female does not pay attention; she's busy eating. The Siberian Chipmunk is determined to find the nearest hideyhole and the Mara male is marking his territory, so both are too preoccupied to notice the slinking predator... then Siberian Chipmunk alarms a shrill cry as a lesser grison slinks into the scene! The Siberian Chipmunk's shrill cry reveals its position and is abruptly cut off by the jaws of the lesser grison. MARA OUTLIVES SIBERIAN CHIPMUNK! Narrated by Dr. Asia Murphy.



Alpsdake / Wikimedia Commons / CC-BY-SA-NC 4.0





## Dik-Dik (3) versus Colo Colo Opossum (14) -

The Dik-Dik (*Modacta guentheri*) is one of the most diminutive ungulates, but a heavyweight in this bracket, weighing in at 3–5 kg (6.6–11.0 lb) or 12-23 stoats. Dik-Diks live in male-female pairs with dependent offspring in scrubby or woodland areas with some cover. Being a bite-sized snack to a multitude of predators means Dik Dik spend a lot of time being alert, always ready to dash for safety into the nearby bush. Females and males look very similar from a distance, though females are slightly larger and males have a modest pair of horns that are used to fight other males, not so much defending himself or family against predators.



Esin Üstün / Wikimedia Commons / CC-BY-SA 2.0



José Luis Bartheld / Wikimedia Commons / CC-BY-SA 2.0

The Colo Colo Opossum (aka *Dromiciops gliroides*, monito del monte & chumaihuén in Mapudungun, the language of the Mapuche in south-central Chile & west-central Argentina) lives in cool humid high-altitude forests and builds round nests where they cram together to retain heat during hibernation. This miniscule marsupial scarfs insects to store fat for hibernation in her tail, and by the end of the (southern) summer Colo Colo may get her energy reserves up enough to weigh an impressive 1/5th of a stoat (~42g). As a marsupial, the Colo Colo has a delightfully complex reproductive situation, consisting of two uteruses, two vagina, & a four-nippled pouch in which her minuscule offspring finish developing.

# R1: ITTY BITTY COME BACK CITY

Our scene opens in Meru National park in central Kenya. The park covers 870km<sup>2</sup> and "habitats that range from lush green vegetation on rich volcanic soils to semi-arid scrublands and open plains" (Africa Geographic). The nocturnal Colo Colo is rudely awakened by sunlight pouring onto the acacia tree she's in. She wraps her engorged but still grasping (prehensile) tail around a branch & wonders if her soon-to-be-weaned offspring are keeping warm back in their nest. Down below, the female Dik-Dik is resting with her family under the tree the Colo Colo is wedged in. Above all of their heads, a Central African Rock Python glides down a branch, flickering tongue sensing several potential mammalian targets. The python pauses and lifts her head to evaluate the distant but familiar scent of the Dik-Dik versus a closer but unfamiliar smell. Deciding not to try anything new, the python slithers down the trunk of the tree, heading towards the baby Dik-Dik. Though small, this delectable morsel would keep her satiated for quite a while. The snake's movement catches the eye of a White-bellied Go Away Bird perched in the top of a nearby tree. The bird's alarm calls are meant to warn members of her species, but Dik-Dik eavesdrops and takes heed, looking around for a predator. The Colo Colo on the other hand is far from home & the alarm call is not familiar. Colo Colo gets ready to move away from the Go Away Bird, but the python senses the

nearby movement and strikes. Wrapping a coil around the small Colo Colo, the python squeezes & waits for the Colo Colo to die of cardiac arrest. DIK-DIK OUTLASTS COLO COLO OPOSSUM!! Narration by Dr. Anne Hilborn.

**Sibree Dwarf Lemur (5) vs. Silver Pika (12)** – The Sibree Dwarf Lemur (*Cheirogaleus sibreei*) is one of ~25 species of dwarf/mouse lemurs, which are tiny primates found only in the rainforests of Madagascar. The Sibree Dwarf Lemur weighs in at ~270g and is back after a 2015 1st-round "RUN AWAY!" from Tamaraw in the Critically Endangered Division. Long thought extinct, Sibree Dwarf Lemurs were rediscovered in 2008 in central Madagascar.



mammalwatching.com



# 2023 M M M M M



People's Daily, China / Twitter

The Sibre Dwarf Lemur are omnivores, consuming invertebrates, flowers, leaves, and figs and they have strong hind legs and a long tail used for balance. This small, elusive, nocturnal species but they seem to be alpine specialists, with only 3 known populations isolated on a few mountaintops. Pikas (*Ochotona argentata*), on the other hand, are round, FLOOFy, rabbit relatives with no tails, typically found in alpine habitats. The Silver Pika weighs about 240g. That's double its American cousin *O. princeps*, but smaller than its opponent. As a #16-seed in the Critically Endangered Division in 2015, Round 1 saw Silver Pika SQUISHED by #1-seed Sumatran Rhinoceros. Silver pikas are actually among the least-studied of the pikas and have the tiniest range of any pika in China: they are only found in a few small areas of rocky habitat totaling ~50 square kilometers on Helan Mountain. In spite of its name, the Silver Pika is only silver in the winter: its fur is actually bright red in summer! Perhaps it is also named for the fact that most of its occurrences are in the entrances of disused mine shafts.

Sidebar: Did you know that there is a WHOLE SOCIETY devoted to FLOOFY pikas? The North American Pika Consortium even has ENTIRE CONFERENCES devoted to pikas every few years!

Our battle happens in the rainforest of Tsinjoarivo, Madagascar, the only home habitat for the Sibre Dwarf Lemur. It's dusk and there is a light rain. Due to a bit of MMMagic, the Silver Pika finds itself in a most unusual place: scurrying along a warm forest floor. Suddenly leaves rustle overhead. It's the lemur rousing from daytime slumber and beginning to hunt for an insect breakfast. Its large forward-facing eyes give it excellent depth perception and night vision, so it easily spots the floofy pika. It LEAPS from a branch... And lands SQUARELY ON THE PIKA! The lemur desperately clutches the pika's thick fur, trying to get a good grip. The pika, meanwhile, darts among branches in the forest floor, lighting fast, trying to shake the lemur from its back. CLONK! Sibre's Dwarf Lemur gets clocked by a low branch in the understory as Silver Pika runs away unharmed. But the heat of the Malagasy rainforest has taken its toll. As an alpine specialist, the Silver Pika can't handle the tropical heat, over 75F, even after dark. As the lemur shakes head, the pika turns tail (so to speak, since it has no external tail) and dives into an abandoned gold mine shaft in the forest to cool off, departing the field of the battle. SIBREE DWARF LEMUR "SEES STARS" BUT OUTLASTS SILVER PIKA! Narration by Prof. Jo Varner.

# R1: ITTY BITTY COME BACK CITY



marsupial mole / Encyclopædia Britannica / CC-BY-SA 3.0

**Itjaritjari (6) vs. Silky Anteater (11)** - The Itjaritjari (*Notoryctes typhlops*), also called the marsupial mole, is very small (head & body length 121–159 mm, weight 40–70 g), has big digging claws on its front feet, and a thickened "rostral horny shield" to protect its nose and front of its face (Bennison et al. 2014). Itjaritjari is a marsupial whose babies spend time in a pouch after birth. Living underground, the Itjaritjari's pouch opens backwards so it doesn't fill up with sand and soil from mom's tunneling movements. The Silky Anteater (*Cyclopes didactylus*) is a teensy tree-living, ant specialist that consumes 700-5000 ants per day year-round. The 225-gram Silky Anteater has combination coloring of grey, brown, tan, and yellow hairs that are long and dense with a silver gloss. When threatened in the tree-tops, Silky Anteater takes a defensive stance, clinging to the branch with back feet and grasping tail and holding its front feet to protect its face, a

tactic, incidentally, that was not effective in 2017 March Mammal Madness when Silky Anteater was a #15-seed against the #2-seed Clouded Leopard.



Sylvère Corre / Flickr / CC BY-NC-SA 2.0

MMMagic transports Silky Anteater from its nocturnal ant foraging in the green, lush South American forest along river corridors... to daytime in the red sands of Uluru-Kata Tjuta National Park in central Australia. In 1985, Kata-Tjuta National Park was returned to the Yankunytjatjara & Pitjantjatjara people, the traditional stewards/owners of the land (cough, contingent on an immediate 100-year lease to the Australian govt). Today in the joint-managed Uluru-Kata Tjuta National Park, "Tjukurpa – Anangu traditional law, knowledge & religious philosophy – guides everything that happens in the park, just as it has for tens of thousands of years", and Tjukurpa guidance includes "using



# 2023 M M M

traditional methods to conserve the park's plants, animals, culture & landscapes" (Parks Australia). Terrified to find itself terrestrial in a sandy desert, Silky Anteater begins moving toward a massive rock in the distance. Seasonal rains pour and pool in the massive rock habitat, watering groves of Bloodwood trees at Uluru's base, an arboreal oasis for Silky Anteater. FWWWW! Itjaritjari emerges from the sand after a lizard. CLONK! The lizard collides face-first with Silky Anteater. BOING! Lizard bounces backwards into Itjaritjari's grasp to be RRRRRRFT ripped open! SLOSH! Itjaritjari noisily eats lizard's insides... POOF! Silky Anteater leaves behind only a puff of sand dust as he races toward the only tree in sight, leaving this nightmare scene of battle. ITJARITJARI SCARES SILKY ANTEATER!!!  
Narration by Prof. Katie Hinde.



Muchaxo / Flickr / CC BY-NC-SA 2.0

**Bulldog Bat (7) vs. Thor's Hero Shrew (10)** – Greater Bulldog Bat (*Noctilio leporinus*) was first seen on the MMM scene in 2019, as a #16-seed against Moose in the Waterfalls Division and was sadly exited from the tournament by hypothermia in a Bomb Cyclone that ripped through Rocky Mountain National Park. Strikingly orange with short, velvety fur, the Bulldog Bat is nicknamed for its square head and droopy, bulldog-like lips. While it may be itty-bitty to some, this Bat's 70 cm wingspan is nothing to scoff at. Most distinctive are the Bat's long feet and curved nails, which it uses to catch fish in freshwater streams and rivers in Neotropical forests. In addition to fish, Bulldog Bats regularly feed on aerial insects like beetles and moths, though in Puerto Rico, Bulldog Bats are even reported to hunt other smaller bats. First described by science in 2013, Thor's Hero Shrew (*Scutisorex thori*) has a backbone as impressive as any superhero and emerged from the 2016 wildcard against King Midas Bat, to be sadly defeated by #1-seed Panda's powerful Sits-and-Persists strategy. Thor's Hero shrew has relatively massive backbones (vertebrae) complete with interlocking bony tubercles, making it ~4x stronger than that of a human (adjusted for size). Known only from the village of Baleko in the Democratic Republic of Congo, Thor's Hero Shrew has grizzled brown and grey fur, a long bicolored tail, and weighs about 47g. Exactly why their spine is so strong remains to be seen, but it's thought to be related to their

# R1: ITTY BITTY COME BACK CITY

foraging habits, based on observations from local residents who commonly see these shrews when collecting beetle larvae.



Dr. William T. Stanley (c) Field Museum of Natural History

The silvery thread of moonlight just brushes the tops of the ancient stones of High Temple, the tallest of the ancient Mayan ruins part of the Lamanai Archeological Site in northern Belize. Nearby, the waters of the New River lap softly against the bank. A shadow glides about a foot above the waves. It's our Bulldog bat, out for a night of fishing in its home habitat. Transported by MMMagic from its central African home, our shrew finds itself on the banks of the river. SNIFF. SNIFF. The air smells different, but is warm and humid like what the shrew is used to. Hungry, the shrew scuffles along the edge of the water looking

for a snack. The bat swoops by, opens its mouth wide and emits a loud SCREEEE (140 dB SPL to be exact, like standing next to a jackhammer)! A soft splash echoes against the night sky. With the bat's calls outside of the shrew's hearing range, the shrew does not notice. Shrew is busy trying to wedge its body against a hefty tree branch to look for grubs, using its strong back as leverage. Despite the shrew's best effort, the tree branch will not budge. The shrew withdraws its body from the branch scuttling away from the river's edge in search of easier hunting. A second splash follows as the bat's slippery fish prey slips through its claws. Bat circles back, ready to try again. BULLDOG BAT OUTLASTS THOR'S HERO SHREW! Narration by Dr. Alyson Brokaw.

**Southern Ningai (8) vs Grasshopper Mouse (9)** - This is a battle of teeny terrors! Welcome to the arena the Southern Ningai, 12g of complete fury from Southern Australia. "While Southern Ningai only get up to 5.7 cm long, they are known for going after prey that is double their size, attacking in a "lunge-bite-retreat" style." (Bos 2001). Like many other marsupials, female Southern Ningai have a pouch in which to carry their babies, which are born in November and December. Ningai was a #16-seed that ran away from #1-seed Pygmy Hog in the first round of Tiny Terrors in 2020. On the other side of the





Belinda Copland / iNaturalist / CC BY-NC

arena is the whopping 40g Grasshopper Mouse, found in the western parts of North America, from Canada to Mexico. With small, pointed teeth, much like the Southern Ningai, the Grasshopper Mouse is a carnivorous beast, eating invertebrates and other mice, including members of their own species. In 2017, in the Two Animals One Mammal Division, #15-seed Grasshopper Mouse became dearly departed after a lethal bite from #2-seed Leopard Cat.

It is just after sunset in the mallee habitat in Mungo NP, southern Australia. Mungo NP is a World Heritage site, home to some of the oldest ritual human burial sites, and co-managed by indigenous Aboriginal Australians. Our Southern Ningai leaps from the top of a stalk into a clump of vegetation, snagging a tasty moth! Still crunching on their prize, the Ningai continues its foraging walk, sniffing for more food as it weaves in & out of clumps of vegetation, unaware that something is stalking Ningai from the shadows.



Erika Jasmin Cruz-Bazan / iNaturalist / CC BY-NC 4.0

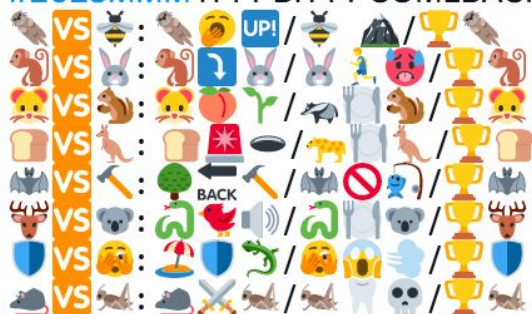
Only the shrill, bloodthirsty cry alerts the Ningai as the Grasshopper Mouse pounces! Grasshopper Mouse prefers insects when they are available, but with it March in the US, there are few bugs around. So now Grasshopper Mouse craves meat. "Ningai could outrun Grasshopper Mouse in the open," (Bailey & Sperry 1929), but Ningai prefer habitats that haven't burned recently with plenty of "narrow place(s) [where] they [can] catch & kill." (Kelly et al 2011). As the Grasshopper Mouse grasps the Ningai with strong paws, Ningai turns sharp teeth on Grasshopper Mouse! Grasshopper Mouse, used to tangling with lightning quick scorpions, dodges the bite. And lands a bite of its own... Right through the Ningai's skull! The Ningai's body twitches as the Grasshopper Mouse begins a long-awaited feast. **GRASSHOPPER MOUSE DEVOURS SOUTHERN NINGAI!** Narrated by Dr. Asia Murphy.

# Itty Bitty Come Back City Citations



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#2023MMM ITTY BITTY COMEBACK CITY



7:03 PM · Mar 22, 2023 · 135 Views

## Rock Hyrax vs. Pygmy Jerboa

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# Itty Bitty Come Back City Citations

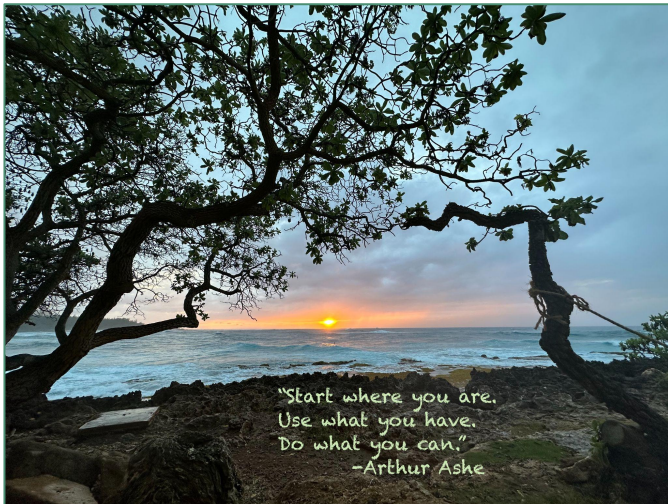
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READ ALL ABOUT IT by Katie Hinde, Margaret Janz, Melanie Beasley, Chloe Josefson, Anali Perry, & Abbie Thacher.

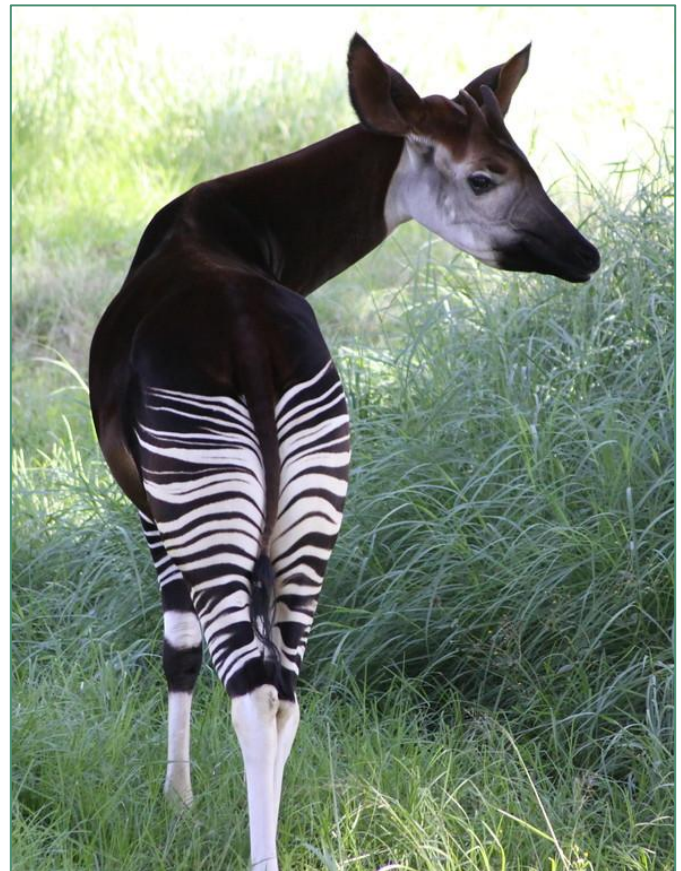


## R2: MIGHTY STRIPES

**Okapi (1) vs. Giant Striped Mongoose (9)** – Okapis (*Okapi johnstoni*) share many similarities with their giraffe relatives & are often referred to as forest giraffes. One notable similarity: both are herbivores with an extra-long, prehensile bluish-gray tongue to grasp vegetation. Although Actual Living Scientist WHAPA Lab at Virginia Tech members, including MMM scientist-narrator Dr. Asia Murphy, have detected Striped Mongooses (*Galidictis fasciata*) and other carnivorans with camera traps...Very little is known about the behavior of Striped Mongooses and other Madagascar meso-carnivorans (family Eupleridae). Consensus is that Striped Mongooses are nocturnal, generally solitary, and eat small vertebrates and large invertebrates.

Our two striped combatants are both from Africa! Home habitat advantage goes to Okapi and tonight's battle is back in Maiko National Park, Democratic Republic of Congo. Okapi is ruminating, literally. Herbivorous Okapi have fore-gut digestion: bacteria are in their stomach to help digest cellulose, the structural components of plant cells. As part of rumination, Okapi "cough" up food boluses, rechew, and swallow again to break down cellulose and get lots of nutrition. There are no native artiodactyl mammals on Madagascar where Striped Mongoose has been

MMMagicked from, but there are a few introduced & naturalized species (goats, zebu, sheep, pigs, & deer). Striped Mongoose is on the move & detects the vague smell of artiodactyl but is not overly concerned. Stripes as camouflage work both ways, to hide the predator AND the prey... Striped Mongoose continues his hunt and... stumbles into ruminating Okapi. Striped Mongoose is rather catlike in some of his movements, and Okapi does not like cats! Leopards are predators of Okapi, attacking adults from above. Okapi sounds off a distress whistle. This female Okapi is big- 300kg,



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# R1: MIGHTY STRIPES



Thierry Cordenos / iNaturalist / CC-BY-NC 4.0

nearly 2m tall, and 2.5m in length, and a bit smaller than an asteroid the size of half a giraffe. Striped Mongoose is, uh, substantially smaller: ~900g and 70cm. Craning his neck upward and taking in the full size of Okapi, Striped Mongoose weighs his options, spins on his heels, fluffs his tail, and takes his hunt elsewhere. OKAPI INTIMIDATES GIANT STRIPED MONGOOSE! Narrated by Prof. Jessica Light.

**Greater Kudu (2) vs. Sumatran Striped Rabbit (7)** – Rabbits, hares, and pikas are globally widespread. They are important as ecosystem engineers, pets, pests and food. In fact, the March Madness name is a hat tip to European rabbit male-male battles during the spring mating season. Animal behavior often changes during the breeding season. Testosterone levels in male European hares peak in March. Males box each other to establish dominance. The Sumatran

Striped Rabbit (*Nesolagus netscheri*) may be the world's rarest lagomorph. In 31,032 hours of camera trapping it showed itself 2 times for 8 seconds, though camera height may have reduced detection rates. Actual Living Scientist Anh HQ Nguyen from the World Wide Fund for Nature - Vietnam was part of a team that used invertebrate-derived DNA (blood collected from leeches!) to assess the genetic diversity of one of Sumatran Striped Rabbit's closest relatives, Annamite striped rabbit. Remember that leech iDNA paper the genetics team tweeted about in R1? Actual Living Scientists from World Wide Fund for Nature - Vietnam performed that research! Animal behavior also changes in response to disease. For example, Kudu, like people, reduce their activity and rest when they have a fever. Some kudu populations are highly vulnerable to rabies, though disease dynamics are



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still being studied. All mammals are susceptible to rabies but bats, dogs, foxes, and other canids are the typical host. Diseases like rabies change host behavior to promote its spread. Hosts may foam at the mouth, snarl, and bite. In Namibia, rabies outbreaks in kudu have claimed up to 40% of a kudu population. How do scientists obtain population estimates? Actual Living Scientist Lineekela Nauyoma, PhD student at the University of Namibia is using non-invasive methods like camera traps to assess the conservation status of roan and sable (antelope related to kudu) in Mudumu National Park.



A. Cambone, R. Isotti / Edge of Existence / used under fair use

Tonight's battle is in the far southern edge of the Rift Valley in Malawi, Africa, where Kudu (*Tragelaphus strepiceros*) has Home Habitat Advantage. The sound of drumming is faint in the distance. Kudu strolls down a dry stream bed that has lots of shrubby cover on the edges. He's going

toward the aroma of Camel Thorn Tree seed pods (*Acacia eriolobia*), his favorite food. The trees are short and bushy, suggesting frequent, low level disturbance. M M Magic has transported Sumatran Rabbit into the scene. Sumatran Striped Rabbit spies Kudu from its hidey-hole in the brush. The patterned drumming can now be heard downstream too. Drumming is a way villages in Malawi pass information to each other. KA-CLICK! A monitoring camera-trap snaps pics of Kudu eating the bait; Camel Thorn Tree pod flour combined with a rabies vaccine. The drumming from the village upstream becomes more urgent. What was a trickle of water in the stream had risen to become a churning, muddy flow with large branches being carried downstream. Rabbit remains motionless except for its nose twitching at the smell of water. WHOOSH! Water fills the stream channel! Drumming from the upstream village was warning those downstream about the coming flood so people went to safety. Kudu gracefully steps up on the bank chewing seed pods while Rabbit is swept downstream. KUDU SWEEPS SUMATRAN STRIPED RABBIT! Narrated by Dr. Tara Chestnut.

**Striped Hyena (3) vs. Highland Streaked Tenrec (11)** – The Striped Hyena (*Hyaena hyaena*) is an omnivorous scavenger, content to eat all sorts of edible items - the remains of large-bodied prey like wildebeests or smaller insects of the invertebrate variety or even the occasional fruit. Like their Hyaenidae brethren,

# R1: MIGHTY STRIPES

Striped Hyena is known to ingest and digest bones, usually when other food is scarce. We know a lot about Striped Hyena diet, but we don't know much about their current distribution. Paolo Strampelli and colleagues recently surveyed large African carnivores and found Striped Hyena data particularly lacking. Like other small-bodied mammals, Streaked Tenrecs (*Hemicentetes nigriceps*) enter periods of torpor to save energy - similar to turning the heat down in your home when you're not there - these small mammals turn down the heat when food is scarce and they can't access the calories it takes to keep themselves warm when active. Tenrecs will sleep like a dormouse, curled up with their forelimbs held



Dop Rushikesh Deshmukh / Wikimedia Commons  
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close and their hind legs further away, usually from May-October. They may wake up briefly to re-adjust their position and scratch an itch.

But it's not Tenrec torpor season yet - tonight, we find both combatants within the Serengeti National Park of Tanzania, stomping grounds of Striped Hyena. Striped Hyena has found leftover zebra from a lion kill, disarticulated bones scattered about the Serengeti. Tenrec is again transported with MMMagic away from Madagascar and finds the dry savanna of the Serengeti less than pleasant. In an attempt to find its family members, Tenrec starts rubbing together special spines on its rump and creates a sound somewhere between a scratch and a chirp. Striped Hyena pauses bone crunching a tibia, raises its head and listens motionless... Striped Hyena isn't concerned by Tenrec spine chirping. Striped Hyena hears spotted hyenas chattering as they triangulate in on the aromatic zebra carcass! Striped Hyena is a loner and does not want to tussle with the cousins, so grabs zebra tibia to-go, trotting at a good clip (8-10 km/hr, 5-6 mph). CLONK-PALUNK! The zebra tibia hanging from Striped Hyena's jaws strikes Highland Streaked Tenrec skull! Tenrec's scratch-chirping attempt to phone home to his family is silenced... forever. STRIPED HYENA ENDS HIGHLAND STREAKED TENREC! Narrated by Prof. Patrice Connors.





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## Striped Dolphin (4) vs. Side-striped Jackal (5) -

Striped Dolphins (*Stenella coeruleoalba*) are highly acrobatic and frequently jump into the air. One unique behavior to Striped Dolphins is called “roto-tailing” where they rapidly circle their tails while arcing through the air. When feeding, Striped Dolphins will regularly dive to depths of 700m. At these depths the water pressure can squeeze their thorax and compress lungs and trachea. Striped Dolphins have special trachea which can fill with blood to resist this pressure. Side-Striped Jackals (*Lupulella adustus*) are very vocal. They regularly communicate with other individuals or when threatened with unusual hooting-sounds rather than barks or howls. Side-Striped Jackals often occupy territories w/other canids, such as black-backed and golden jackals. The larger canid is usually competitively dominant, but Side-Striped Jackals will always be displaced, even if encountering a smaller species. Because they are so easily dominated by other carnivores, Side-Striped Jackals are highly adapted to opportunistic foraging and will habituate quickly in highly varied habitats.

Tonight’s battle takes place in and around the Mani peninsula, in the southern Peloponnesus region of Greece. Here the narrow shelf gives way to deep waters of the Ionian Sea very close to shore. Here, where the cool, deep water meets warmer currents, there is an abundance of marine life. Striped Dolphins frequently hunt these waters, taking advantage of large numbers of squid and small fish. Out for a hunt in the forests of coastal Africa, our Side-Striped Jackal has suddenly been transported into the surf of the Mediterranean. From the coastal region of Gabon, Jackal is somewhat familiar with the scent of the ocean. But jackals are not really the swimming type, and this Jackal starts doggy-paddling towards the siren scent of land. When something brushes against its fur... Under the water below Side-Striped Jackal, Striped Dolphin grabs a mouthful of squishy food. Slurp! Dolphin swallows several squid, its favorite food. Unfortunately, those shrimp are filled with chemicals run off the land! The Mediterranean is among the world’s most polluted oceans. The United Nations estimates that 650 million tons of sewage, >120,000 tons of oil, 60,000 tons of mercury, almost 4,000 tons of lead, and 36,000 tons of phosphate are dumped into the Mediterranean... annually! Ocean health improves with both personal & political actions. Cleaning the Mediterranean is ongoing. Research from PEW Charitable Trusts shows it takes multiple avenues to curb pollution. One of the best ways is to stop the source.

# R1: MIGHTY STRIPES

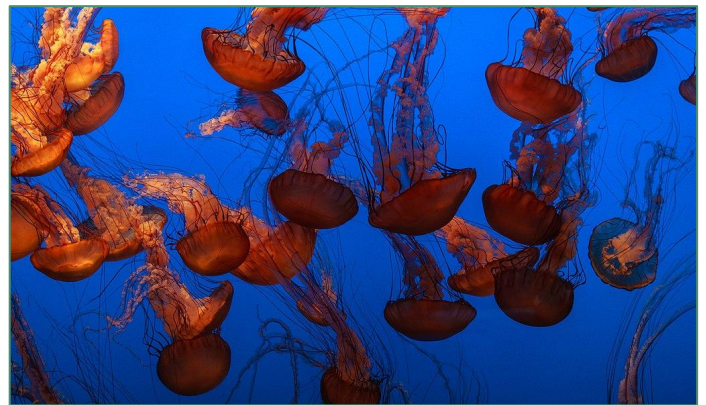


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Years of eating contaminated prey has resulted in bioaccumulation of many toxins in the body of Side-Striped Dolphin. However, the levels of toxins are not causing any adverse physical effects... for now.

But what was tickling at Jackal's fur? Paddling toward shore, Side-Striped Jackal has accidentally swam into the drifting tendrils of a Portuguese Man O' War!! These siphonophores have 30 meter-long tentacles made of stinging polyps. Stings are normally multiple, painful, and severe, usually stunning & killing fish. The tentacles wrap around the tail & back of our Jackal! Hydrozoan and jellyfish stings are quite common in the world's oceans (> 150 million jellyfish stings per year!). But it doesn't take much (pantyhose, diving suits, etc.) to protect oneself against irritating and painful stings. But tentacles also drape across the

Jackal's belly, where the fur is less thick to help shed heat and more skin is exposed. Here the Man O' War tentacles penetrate canid skin and stinging nematocysts deliver powerful jolts of venom to the Jackal! The venom is evolved to kill small fish, not a 14kg Jackal. But the stings are enough to cause our Jackal to yelp with pain and panic! Seawater & tentacles rush into Jackal's open nose and mouth, delivering more venom to those sensitive areas. Wracked with intense pain, the airway of Side-Striped Jackal swells and he goes into shock. Unable to breathe and struggling for air, Jackal slips beneath the waves. STRIPED DOLPHIN OUT-SURVIVES SIDE-STRIPED JACKAL! Narrated by Prof. Brian Tanis.



Learn from the Jackal folks: Never go far from shore without a personal flotation device, and if you are swimming in regions of high jellyfish activity, be sure to wear a rash guard, stinger suit, & bring reef-safe sting lotion and sunblock!

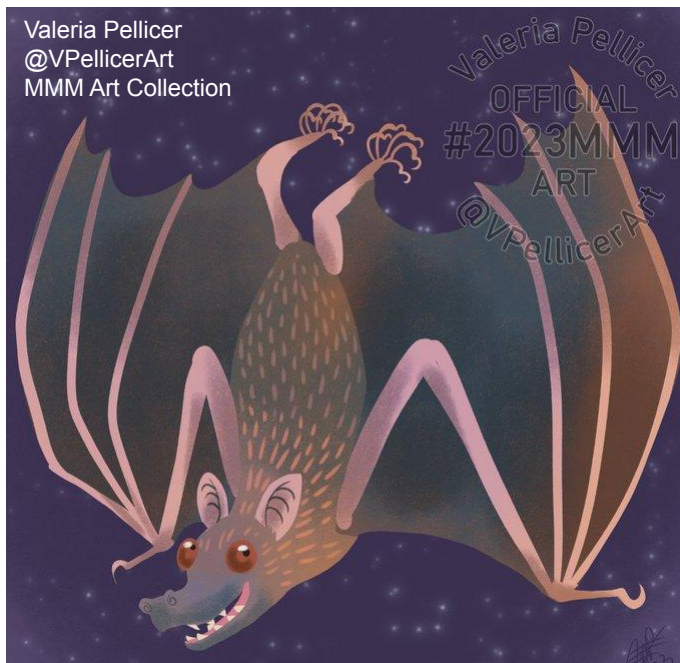


# Round 2 Dad Bods

**Greater Rhea (2) vs. Dayak Fruit Bat (10)** – Our Greater Rhea (*Rhea americana*) dad, hanging with his chicks, is making sure they don't get into too much trouble, but glad they're finally off his back (literally!). These chicks sometimes like to burrow themselves into their dad's plumage. Rhea Dad-life is energetically EXHAUSTING! Fewer than 20% of all males even attempt to nest during breeding season and then have to spend >20% of the day in vigilance until chicks are 4 months old. While there aren't too many natural predators for Greater Rheas as adults, crested and Chimango caracaras, foxes, and even ferrets are happy to make a quick snack of the chicks. Our Dayak Fruit Bat (*Dyacopterus spadiceus*) dad was left circling the



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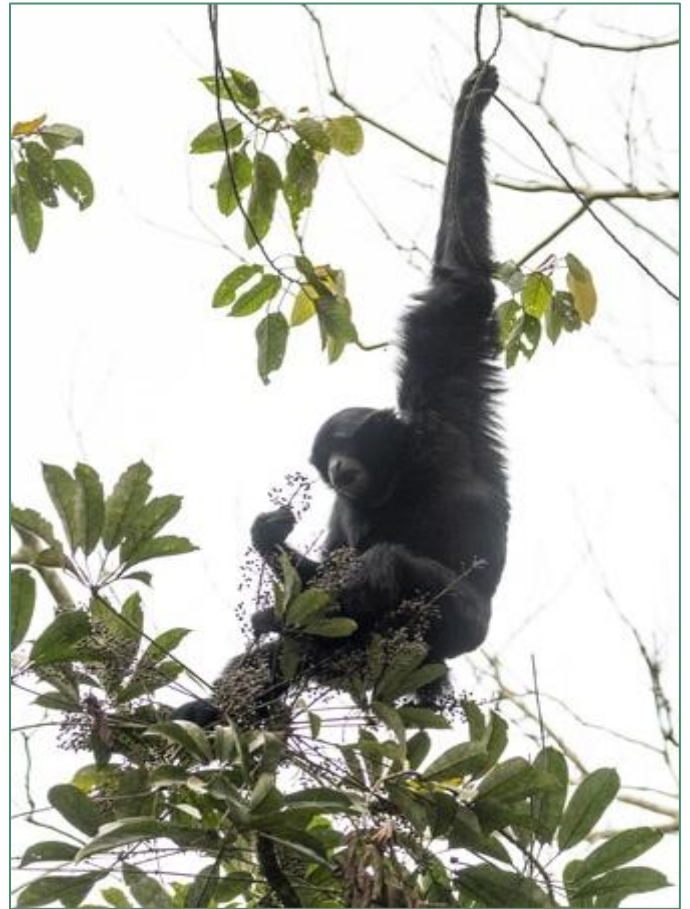
skies of Spain. Besides seeing the world from a different point of view, flight might be linked to lifespan in mammals and birds, with shorter lifespans in those who lost the ability to fly. Dayak fruit bats don't echolocate, instead relying on their large eyes and sharp noses to help them find food and get around the rainforest canopy.





# Round 2 Dad Bods

TONIGHT'S BATTLE is again in marshy grasslands of Argentina, Rhea Dad walks with his chicks, vigilantly scanning the horizon for predators. Head held high, Rhea keeps a sharp eye out for slinky, sneaky sneaks in the grass and in the sky and is on high alert. Dayak Fruit Bat is far from the sacred forests of Northern Indonesia he prefers and where he serves an important role in seed dispersing in the ficus-forward forest. Rhea seems to be straining where his throat meets his body, maybe slightly swollen in the area of the gizzard. The rhea chicks are foraging in the grass, moving toward a small shrub tree, and the Dayak Fruit Bat swoops with wide wings a bit. The Dayak Fruit Bat would prefer a much taller tree, but the small shrub tree is the only arboreal-ish option to make a roost. Greater Rhea Dad seems to be regurgitating while strolling in the wake of his chicks. Dayak Fruit Bat has settled into a sleep arrangement in the low shrub tree, only a bit out of Greater Rhea Dad's beak reach... The Greater Rhea stretches its neck, opens its beak and PROJECTILE VOMITS ALL OVER THE BAT!!! Dayak Fruit Bat crawls to a further branch, shakes out its wings and head, and takes off to fly far away from the Greater Rhea, abandoning the field of battle while the greater rhea opens and closes his beak. GREATER RHEA OUTLASTS THE DAYAK FRUIT BAT! Narrated by Dr. Alyson Brokaw and Dr. Mal Sarma.



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**Siamang (4) vs. Pacific Spiny Lumpsucker (5)** – Siamang (*Symphalangus syndactylus*) dad takes over caring for the offspring once the infant is about 1yr old. Dads carry juvenile siamangs, share sleeping sites with them, and play with them. As Siamang dads provide more care, siamang moms recover quicker from the high body costs of pregnancy and lactation (i.e., physiological and



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energetic). Siamang moms with more help from dad can have another baby sooner (shorter interbirth intervals). The Pacific Spiny Lumpsucker (*Eumicrotremus orbis*). He's round. He's sticky. And he glows. Males are usually a deep red color under the visible spectrum, but fluoresce bright red under UV and blue light. While the green females don't glow the same way, the Dad's glow does match the red glow of algae found around their nesting areas.



Sara Thiebaud / iNaturalist / CC-BY-NC 4.0

We're back in the tropical rainforest of Gunung Leuser National Park, Indonesia, which is the only place left on earth where tigers, elephants, orangutans, and rhinos still live together in the wild. The Leuser ecosystem is 6 million acres (~3x the size of Yellowstone). It's one of the last remaining intact rainforests and is becoming

fragmented due to deforestation fires. But organizations like The Orangutan Information Center and the ASEAN Centre for Biodiversity are informing management in this fragile forest. Our siamang competitor is hot off an unwitting battle of the throat sacs with Darwin's frog taking the fall, and Siamang is showing his kiddo the ropes to foraging. Foraging has become a little harder since the recent fires, but siamang groups don't really have the option to change their territory like other primates might due to their range needs in an ever shrinking forest. The siamang family are seeking out their favorite foods when dad sees something promising in a puddle below! Dad, kiddo on back, swoops down to investigate... Our Lumpsucker is not having a great time. MMMagic has put him in a swampy pool in the middle of the forest. The muddy silty pool bottom is impossible for Lumpsucker to stick his bottom to! Bright reddish-purple Lumpsucker bobs pathetically. Looking so much like a ripe... round... FIG! Siamang carefully dips his hand into the water... Siamang's hand comes up with sticky fish! A brief sniff & yuck! and Siamang begins shaking his hand to dislodge the sticky fake fig... and launches Lumpsucker INTO THE AIR! Pacific Spiny Lumpsucker plops back into the puddle and Siamang returns to the canopy to follow his frugivorous family to a richer foraging location off the field of battle! LUMPSUCKER DEFEATS SIAMANG!!! Narrated by Dr. Mauna Dasari.

# Round 2 Dad Bods

**Emperor Penguin (1) v. Owl Monkey (8)** – Emperor penguins (*Aptenodytes forsteri*) live in the coldest environment of any bird species withstanding the  $-40^{\circ}\text{C}$  air temperatures and 89 mph winds due to a combination of dense, downy feathers that trap air close to their body and a sub-dermal fat layer that provides baseline insulation. While taking care of their eggs during May and June, Emperor Penguin Dads group together into huddles that can raise the ambient temp to over  $20^{\circ}\text{C}$  inside the huddle with up to 10 birds per square meter! Huddles make movement nearly impossible but "Emperor Penguins move collectively in a highly coordinated manner to ensure mobility while at the same time keeping the huddle packed" (Zitterbart et al 2011).



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Owl monkeys (*Aotus azarae*) don't have feathers or a sub-dermal fat layer, but they do sometimes huddle while sleeping, which typically occurs at sites 6-25 meters above the ground. Both male and female owl monkeys have scent glands on their chest (pectoral) and beneath their tail (subcaudal), which they use for territorial marking and other communication. Although male and female owl monkeys look the same, their vocalizations can be different with only the males producing "graff hoots" and only females producing "tonal hoots" (sexually dimorphic calls) (Garcia et al., 2020).

The combatants meet at Pointe Géologie in Antarctica where the emperor penguin colony, which has ~3500 breeding pairs, was featured in the 2005 documentary "March of the Penguins." Emperor Penguin has been filling his belly with



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fish in the Antarctic waters and has turned toward home. Owl Monkey is transported by MMMagic onto the Antarctic ice between the sea and the penguin colony with his 3-month old baby still clinging to his back. Owl monkeys aren't strangers to modulating their behavior and activity levels in response to cold weather, but not the extreme cold of Antarctica. Emperor Penguin is swimming sleekly through the water when suddenly he sees THE OPEN JAWS OF A LEOPARD SEAL CLOSING IN ON HIM! Emperor Penguin "rockets out of the water at high velocity" (Thelen 2021)! Emperor penguins store a layer of air in their feathers before diving into the water. When they ascend toward the surface the penguins release these air microbubbles, allowing them to reduce drag and swim faster! Emperor Penguin "land[s] squarely on a patch of ice and continue[s] sliding toward safety," leaving leopard seal gnashing its jaws in the water (Thelen 2021). Emperor Penguin, now like a launched curling stone, careens into Owl Monkey and sends Owl Monkey skitter-hurling across the slick ice and off the field of battle. EMPEROR PENGUIN COLLISIONS OWL MONKEY! Narrated by Drs. Lara Durgavich, Mauna Dasari, & Katie Hinde.

**Wolverine (3) v. Bat-Eared Fox (6)** – Evidence is accumulating that Wolverine (*Gulo gulo*) Dads visit the dens of females with young in their territory, with the most visits occurring in March. Whether male wolverines are engaging in direct behavioral care is unknown, but researchers

speculate that increased visits of male may deter predators or stranger wolverines from approaching the dens. In the Pacific Northwest, the Cascades Wolverine Project monitors the population and distribution through elaborate bait, camera-trap, and hair sample set-ups. While mom forages for termites to sustain lactation, Bat-Eared Fox Dad (*Otocyon megalotis*) stays home to tend the pups, spending time cuddled in the den with young, grooming their ecto-parasites and cleaning their ears. Bat-Eared Fox Dads will carry very young pups gently in their mouths to move pups to new dens if predators encroach too closely. These dads forage near the den, bringing back small birds, rodents, and large insects when the pups begin to consume solid food.



U.S. National Park Service / Public Domain

On the Laikipia Plateau of central Kenya, Bat-Eared Fox Dad is chaperoning his pups on a termite-foraging excursion beyond the den, vigilant for any threats to his kin from black-backed jackals and African wildcats. Bat-Eared Fox Dad has previously co-reared three

# Round 2 Dad Bods

litters of pups in his adulthood. This 4th litter was born last fall, and the time is fast approaching when they will be fully weaned and disperse into "wide open spaces, room to make some big mistakes." One pup, "she trots this home range in the wild, wide-eyed and grinning, she never tired" as she scampers over playfully to Dad just as MMMagic transports Bat-Eared Fox Dad \*and\* daughter, *Dad precedes and puppy will follow*, to the Rocky Mountains of Colorado. *Scene takes the shape of a place out West, but what it holds for her, she hasn't yet guessed.*



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Wolverine has been surveying the landscape of his home range looking for a carcass to scavenge when a new scent drifts on the wind suggesting easy pickings may be near. Wolverine are "opportunistic feeders and respond quickly to temporarily abundant or easily procurable food" including fox (Pasitschniak-Arts & Lariviere, 1995). Bat-Eared Fox Dad spots the Wolverine coming in their direction and utters a soft contact call vocalization to bring his pup closer to him. But the bat-eared fox daughter is scampering after a recently returned fluttering mountain bluebird and doesn't hear her Dad's contact call. *Who doesn't know what I'm talking about.* With greater urgency, Bat-Eared Fox Dad vocalizes a high-pitched warning call that travels farther than the contact call, to warn his daughter of an approaching predator. *She sees new faces. She knows the high stakes.* As Wolverine closes in fast, the daughter only has enough time to look up and back up against tumbled rocks with a smattering of pines growing from them on the hillside... *A young pup's fears no longer callow.*

BAT-EARED FOX DAD RUNS IN SNAPPING AT WOLVERINE, in a valiant solo attempt to mob the mesopredator intent on making daughter fox dinner. Having successfully survived to this age, Bat-Eared Fox Dad is experienced, and is



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shaped by adaptations to invest more toward kiddos at this life stage according to life history theory that would suggest older animals increase effort in reproduction. Bat-Eared Fox Dad has successfully distracted Wolverine while the daughter finds a safe den-like hidey hole amongst the jumbled rocks. The Wolverine chases the Bat-Eared Fox Dad, who now rapidly switches directions to increase chances of escape, but the 4-kg Bat-Eared Fox Dad is no match for the massive mustelid Wolverine at 18 kg! Bat-Eared Fox Dad's last sight is daughter scampering back through the MMMagic portal to her siblings, safe from the Wolverine. *But now Dad won't be coming back to the rest, if these are life's lessons, she'll do her best.* WOLVERINE DEFEATS BAT-EARED FOX! Narrated by Prof. Katie Hinde, [with assist from The Chicks](#).



**Jessica Popescu**  
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#2023MMM MIGHTY STRIPES AND DAD



7:39 PM · Mar 23, 2023 · 223 Views

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READ ALL ABOUT IT by Katie Hinde, Margaret Janz, Melanie Beasley, Chloe Josefson, Anali Perry, & Abbie Thacher.





## R2: Itty Bitty Come Back City

**Rock Hyrax (2) vs Bulldog Bat (7)** - Rock Hyraxes are a sociable bunch, living in groups of up to 80 individuals, often made up of several families. Family groups within the larger group usually consist of a dominant male, several females and their offspring. Like many large families, Rock Hyraxes are **extremely** vocal. Male Rock Hyraxes perform complex songs both to attract females and to share honest information about their body size, condition, & social rank to potential rivals. These complex songs involve several different types of syllables, including harsh snorts which increase as the song goes on, resulting in a dramatic crescendo as they near the end of their song.



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Female Bulldog Bats roost in small groups, and often remain together for several years regardless of turnover in resident males or group movements. Females will assemble in small groups at the roost before heading out for a night of hunting and often forage close enough to eavesdrop on the best hunting spots. This female 'friendship' goes beyond the girls night out fishing: females also will scent mark themselves with the armpit secretions of other females.

We are back in Ahaggar National Park, Algeria. The mid-morning sun is beating down on the rocky slopes and our Bulldog Bat circles, confused by the sudden brightness of this new landscape. Our Rock Hyrax just emerged from his den and is making his way toward a particularly sunny bit of rock when he spots an unfamiliar male nearby. It is not uncommon for bachelor males to linger near established social groups, waiting for their chance to displace the dominant male. In no mood for games, our Hyrax moves towards this intruder, pushing him out of the way with his head. The intruder growls and opens his mouth wide, revealing sharp, white tusks. Our male bares his tusks in return and delivers a series of menacing, high-pitched grunts. WHOOSH. Our Bulldog Bat swoops towards the sound, desperate for the familiar sounds of a female roost-mate in this bright and water-less land. Our male Hyrax lunges for the intruder male, who had started to maneuver its rump towards our combatant male in a defensive posture. Combatant Hyrax nearly clips

# R2: Itty Bitty Come Back City

the bat's gaff-like claws. Just before combatant Hyrax tusks meet flesh, the intruder hyrax retreats, backing away and fleeing from our male Hyrax. Alone and uncomfortable in the light, the Bat rises away from the quarreling land mammals to seek shelter elsewhere. ROCK HYRAX OUTSTAYS THE BULLDOG BAT! Narrated by Dr. Alyson Brokaw.

**Mara (4) vs Sibree Dwarf Lemur (5)** - Incidental lesser grisson from R1 are just one of the predators that like to munch on Maras. Because Mara depend on their vision to avoid predators and on occasion, to deter predators, Mara stot, like impalas! And like impalas, maras prefer to live in large communities, which is another way to lower your chances of being killed and eaten: reduced risk in greater numbers. Unlike the Mara, Sibree Dwarf Lemurs do not live in huge communities. Like Mara, they are herbivores, although they do spice up their diet with fruit and insects. Sibree Dwarf Lemurs might eat **more** fruit than their cousin, the furry-eared dwarf (*Cheirogaleus crossleyi*).

Tonight we are back again in Península Valdés, Argentina. It is just hitting 6 p.m. in this UNESCO World Heritage site, the peak of Mara daily activity, and our Mara male is still dutifully following his female as she moves closer to the



Lady of Hates / Wikimedia Commons / Public Domain

empty communal burrows. There are a few other pairs grazing on the scrub near the burrows. They "remain separated from each other by at least 20 m" (Taber & Macdonald 1992). Our Mara male keeping a close eye on the other males as he nibbles at some grass. The Sibree Dwarf Lemur is blinking in the sunlight, understandably confused at being MMMagicked during his sleep from the warm, wet Malagasy rainforests to the lukewarm scrubland of Argentina. He lets out a little yawn, then attempts to find a tree to climb up. Of course there are no trees. As the Sibree Dwarf Lemur begins to make his way confusedly through the brush, his noise alarms the Mara male, who begins a teeth-chatter that puts all eleven mara on edge.



# 2023 MAMMALS

The Sibree Dwarf Lemur skirts a wide circle around the chattering Mara, stumbling upon a big dark hole. Aha! It looks just like the hole that he hibernated in from June to October last year! Dwarf Lemur slides into its dark depths and off the battlefield, planning to sleep until night-time. Our Mara male stops his chatter and returns to defending his lady & marking his lady by peeing on her. MARA OUTCHATTERS SIBREE DWARF LEMUR! Narrated by Prof. Asia Murphy.

**Dik-Dik (3) v. Itjaritjari (6)** – Dik-Dik (*Madoqua guentheri*) use a communal latrine that are used to delineate territory and can be “soaked with urine to a depth of 15 cm” (Estes 1991). Dik-Dik pairs are thought to be monogamous which is rare among ungulates. Generally, in monogamous species, the male provides resources and protection that help offspring survive. However, the benefit of the male Dik-Dik is a bit dubious as they do “not defend resources for their mates or offspring”, defend against infanticidal males, or warn their family against predators (Brotherton and Roads 1996). Not much is known about the behavior of Itjaritjari (*Notoryctes typhlops*). Like moles, they dig tunnels which researchers can count and set up listening devices to try to estimate how many there are. A popular method for keeping track of elusive species is to estimate abundance through analysis of animal poop. The poops of predators that have eaten Itjaritjari contain huge amounts of DNA from individuals so knowing how many Itjaritjari are

eaten helps scientists estimate abundance. Itjaritjari has a variable dental formula of 42-44 teeth but have 'degenerate' teeth- a loss of traits through evolutionary time so itjaritjari’s ancestors had ‘fancier’ teeth than itjaritjari does today.



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In Kenya’s Meru National Park, part of a larger Conservation Area centered around the Tana River system that protects ~5,000km<sup>2</sup> and is the second largest protected area in Kenya, is where our combatants meet. Itjaritjari finds himself above ground in an unfamiliar land. While most other fossorial mammals would be blinking in the sunlight, Itjaritjari has no eyes to blink and no optic nerve to be seen. Rather Itjaritjari only have a bit of pigmented skin where eyes would be.

# R2: Itty Bitty Come Back City

Itjaritjari immediately begins to try to dig into the soil with his cone-shaped head but the loose soil is not quite as sandy as he is used to. Itjaritjari's progress is going good, hind legs industriously throwing soil behind him, essentially filling in the tunnel as he goes, backfill tunneling is a rare technique among mammals. Meanwhile Dik-Dik is crouching on her little pencil legs, getting ready to urinate. As Dik-Dik starts to add her contribution to the odorific pile of family excretions, Itjaritjari tunnels closer encountering the wet soft soil of the latrine. Itjaritjari finds the intense unfamiliar and unpleasant odor of accumulated Dik-Dik feces and urine unpleasant and reconsiders his route. He angles sideways toward the surface but... BONK! A large unmovable rock blocks his passage, but his horned rostral shield blocks any damage. Reconsidering, Itjaritjari digs away again at a newer angle, re-emerging silently on the surface behind the Dik-Dik. Dik-Dik shakes the last drops of urine off and sniffs at the ground to make sure that her family scent is still as strong as ever. Behind Dik-Dik, the Itjaritjari trunks and shuffles away for better soils elsewhere, vacating the field of battle. DIK-DIK STANDS HER URINE-SOAKED GROUND AGAINST ITJARITJARI!! Narrated by Dr. Anne Hilborn.

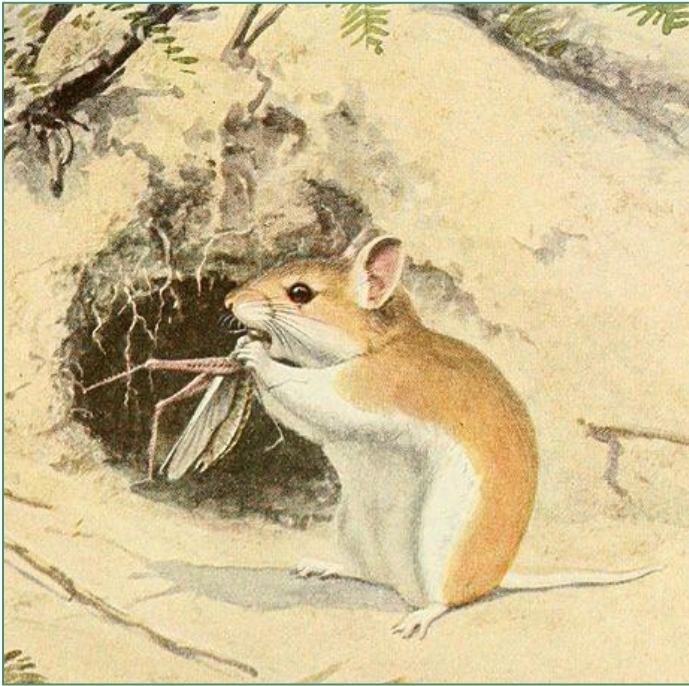


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**Sea Otter (1) vs. Grasshopper Mouse (9)** - One of the ittiest bittiest marine mammals of the order carnivora, Sea Otters (*Enhydra lutris*) are both predator and prey. Sea otter harvest of invertebrates recovers kelp forests, but otters face dangers from SEA and SKY - sharks, orcas, and bald eagles. <Checks updated notes> SEA OTTERS FACE DANGERS FROM SEA, SKY, & LAND! Long-term research of ecosysetms in Icy Straight, Alaska shows that the return of sea otters and wolves to the islands means wolves are now also hunting sea otters. One of the ittiest bittiest rodents and a carnivore, Grasshopper Mouse (*Onychomys leucogaster*) is both predator AND prey. Grasshopper mice primarily feed on insects



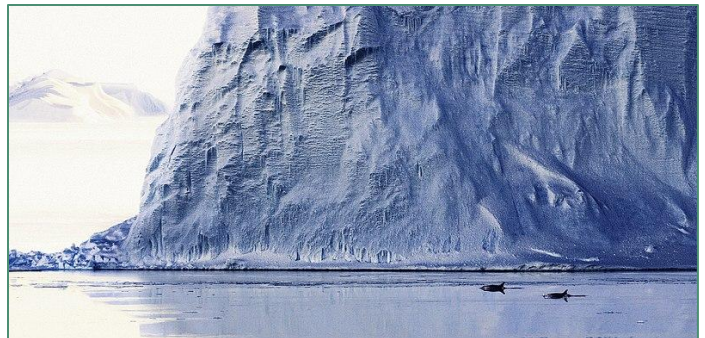
# 2023 M M M



and nocturnally hunt while trying to avoid dangers from the SKY & LAND such as owls and coyote. But luckily, Grasshopper Mouse has little to worry about from the SEA in their prairie terrestrial habitats in central North America. And in their terrestrial home, Grasshopper Mouse sings its heart out, as made famous by National Geographic WILD's segment on them and their musical massacring.

Grasshopper Mouse is abruptly M M Magicked 200ft offshore near Cold Bay, Alaska. Grasshopper Mouse can swim, although he'd rather not. The water is near freezing, an average of 36F in March. Ill-adapted for seafaring, hypothermia is a real danger. Grasshopper Mouse strikes out for the nearest thing it can see, a floating raft of brown vegetation right nearby... But that's no raft, it's the Sea Otter!

Just as Grasshopper Mouse stretches its arms for the safety of the "raft," Sea Otter begins to curl up into a ball... But a wake ripple in the water pushes Grasshopper Mouse away from the curled Sea Otter. THE WAKE RIPPLE OF AN ORCA! A raucous, whistling, clicking pod of 20 of the black and white orca are following a fishing boat gunning towards the harbor. Are the orca taking fish on the line or hunting pinnipeds taking fish on the line?! Are these orca the SALMON SPECIALIST RESIDENT ORCA or MAMMAL-MUNCHING TRANSIENT ORCA?! A slow response is a great way to end up being orca stomach contents, going the gruesome way of 2019 MMM Sea Otter. Sea Otter in the know, quickly dives away to hide deep below the canopy of the kelp forest, quitting the field of battle! Dislodged by Sea Otter's abrupt dive, the Grasshopper Mouse persists on the battlefield, struggling valiantly against the waves... his tiny limbs are shivering, & he's quickly burning through his remnant energy... when Grasshopper Mouse's tiny claws make contact with a real raft of floating kelp! GRASSHOPPER MOUSE OUTLASTS SEA OTTER! Narrated by Profs. Asia Murphy & Katie Hinde.



# R2: Animal Engineers

**Golden Eagle (1) v. Pufferfish (9)** – Within a territory, golden eagles (*Aquila chrysaetos*) will often have more than one nest, routinely building new nests or refurbishing nests before selecting which nest to lay their clutch. Construction and use of multiple nests in golden eagles may be an important part of bond formation in a breeding pair, allow eagles to make use of richer prey areas shifting across time, and switching nests may reduce parasitism. The skeletal remains of prey consumed in the nest can become part of the nest structure cumulatively over time or bones collected from grassland areas are added to nest structures when sticks are uncommon in the environment. The radial designs of the pufferfish (*Torquigener albomaculosus*) attract females and are the location of pufferfish spawning. After release and fertilization of the eggs, the eggs drift to the peaks and valleys in the sand of the radial design. Pufferfish ‘males stay at the nest site and care for eggs deposited on the sandy bottom until hatching... and drive away fishes that pass close to the nest site... Hatching occurs synchronously with the male flapping behavior around sunset.’ (Kawase et al. 2014).

In the Scottish Highlands, Golden Eagle already has talons out as it streaks earthward for a timid mountain hare to enjoy as an end-of-day lagomorph meal back at the nest. Golden Eagle



Aldis Garsvo / Wikimedia Commons / Public Domain

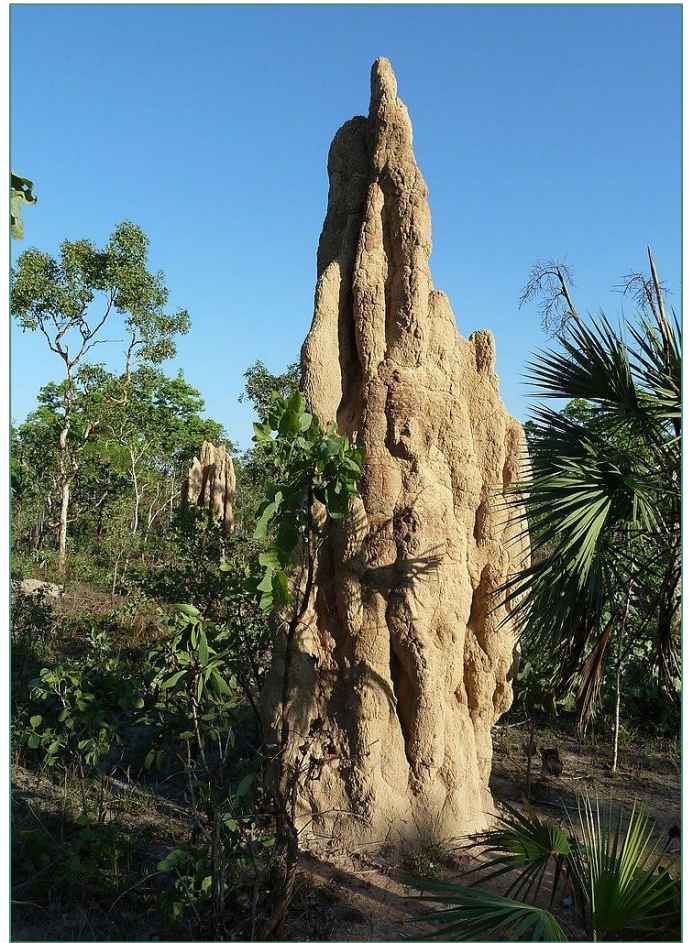
reaches her most preferred nest in her territory, one constructed intentionally, almost entirely, from the shed antlers of red deer! #SoMetal. Meanwhile, White-Spotted Pufferfish is focused on his radial design in the subtidal sands at a depth of 18m off the coasts of Northern Sulawesi. The geometric radial design has progressed from an "earliest-stage mystery circle <with> dozens of irregular depressions" to the "primitive circular form with radially aligned valleys and a circular depression in the central area on day 2" to the "radially aligned peaks and valleys with a central flat area" on day 8 (Kawase et al. 2017). Exactly the number of days since the Veined Octopus "walked" through the earliest design stages. Tomorrow, on day 9, Pufferfish will complete his art installation. As the MMMagic Portal opens to



transport Pufferfish, instead he flits away from the MMMagic portal to stay and complete his art installation. *‘I stay home spreading sands that are beneath me, working on my work, which no one understands’* (adapted from Sensitive Artist by King Missile). Golden Eagle rips strips from the mountain hare without even noticing that Pufferfish forfeited the battle. **GOLDEN EAGLE OUTLASTS PUFFERFISH!** Narrated by Prof Katie Hinde..

**Cathedral Termite (2) v. New Caledonian Crow (10)** – Cathedral termite soldiers can discharge defensive compounds from a pointy-head projection called the nasus to defend their territories. The nozzle-like nasus head projections have evolved multiple times in different termite families - in some termite groups, soldiers use mandibles, in some they have nasus projections, and in some they have both! New Caledonian crows are known for tool-making and tool-use. Turns out that engaging in tool use improves their mood! Like most birds (>75%), New Caledonian crows provide bi-parental care to offspring. However, Corvids (crows and relatives) average ~300 days before offspring independence, while other passerine bird species provide only care for a 1/3rd of that time.

In Litchfield National Park in northern Australia, MMMagic has transported New Caledonia Crow to the home habitat of Cathedral Termite. The New Caledonian Crow approaches the Cathedral Termite mound that is home not only to the



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termites but several other invertebrates such as ants and termitophile roving beetles. In fact, there is an entire group of termitophile roving beetles that specialize in living among termite nests. New Caledonian Crow loves beetle larvae! The mound appears to Crow as a buffet of arthropod appetizers. New Caledonian Crow grabs a stick and prunes it to fashion into a hook. Using the hook, New Caledonian Crow probes one of the entrances to the termite mound with its stick. With a well-aimed squirt, Cathedral Termite sprays

# R2: Animal Engineers

New Caledonian Crow right in its eye! Repelled by the attack, New Caledonian Crow flies from the field of battle. CATHEDRAL TERMITE DEFEATS NEW CALEDONIAN CROW! Narrated by Prof. Chris Anderson.

***Homo habilis* (3) v. Goanna (6)** – The species name '*habilis*,' means "able, handy, mentally skillful, vigorous" (Tobias 1979). *H. habilis*, on average, has a larger, expanded brain than our earlier ancestors and would have been ~20–37 kg. *H. habilis* is famous for its use of the Oldwan Industrial Complex, which had systematically made sharp-edged flakes, while earlier ancestors made large cores with relatively few flaking surfaces. Goannas engage in ritual combat, with displays of puffing, hissing, and head jerks before they take a bipedal stance, twisting and turning in a wrestling match to test each other's strength and endurance. Goannas dig deep, corkscrew underground nests. The soil moisture and temperature regulation may help with egg incubation and the helical structure might suppress predation and help nest defense, but researchers aren't entirely sure.

At the lakeshore of Lake Olduvai 1.8 million years ago, small birds and owls perch on trees, ducks swim in the water, a wildebeest wanders up to take a drink, and *Theropithecus oswaldi*, a massive

baboon (72kg) is plucking grass, as a small group of *Homo habilis* is foraging shoreside, scanning for signs of scavengable carcasses or prey they could capture. MMMagic transports Goanna behind a scrub brush. Goanna stands up on its hind legs "with the body held close to vertical and supported by the tail", in a tripod stance to better survey the lakeshore from the shrubbery (Turner 2019). Our male *Homo habilis* combatant is thirsty and considers an approach to the water for a drink but he knows that danger lurks in the water. Lake Olduvai is home to *Crocodylus anthropophagus*, a ~3m horned crocodile that was the largest predator encountered by *H. habilis*. As crocodile's Latin binomial makes clear, these reptiles had a taste for hominins. Goanna BURSTS from the shrub in a leg-swinging run, startled by an Allen's gallinule song, a small waterbird in the rail family. The alert male *Homo habilis* is initially startled by Goanna, but settles quickly on seeing its small size. Goanna begins walking the shoreline, sleuthing for waterbird nests with eggs, because in the dry season Goanna might walk 6.6 hours a day to get food. *Homo habilis* is hungry too, for more than eggs or scavenged meat he's scraped with a flake. *Homo habilis* is quietly, carefully approaching Goanna when A CROCODILE SURGES FROM THE WATER! Jaws snap closed with ~3000 Newton bite force (estimated). The crocodile's





conical teeth crush-puncture Goanna's belly and spine and with a quick head tilt & toss of the 4kg lizard prey, Goanna quickly disappears down a mighty maw. Guess monitor lizard should have hidden like young crocodile do to avoid cannibalism from larger adult crocodiles. HOMO HABILIS OUTLASTS GOANNA!!! Narrated by Prof. Marc Kissel.



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**Lungfish (4) vs. Palaeocaster (5)** – Combatant Lungfish's (*Protopterus dolloi*) "genus has been present in Africa for at least 100 million years when the continent separated from South America" (Otero 2011). But all kinds of living Lungfish, as a group, are found in Australia, South America, and Africa because the lineage arose before the supercontinent Gondwana began to break apart >180 million years ago. A now

extinct lineage of mustelids, *Zodiolestes daimonelixensis*, may have been a predator of *Palaeocaster fossor*, much like black-footed ferret is associated with prairie dogs today.

Several days without rain have allowed the waters to recede back within the banks and shores of Lake Nkuna (Pool Malebo) of the Congo River outside Kinshasa, Democratic Republic of Congo, leaving the Lungfish comfortably settled in a muddy water-bottomed burrow. Not until June will the slender Lungfish male defend the eggs in the protected chamber of a mud burrow, but the female Lungfish is the one who prefers open water in this species. Lungfish doesn't require food every day so Lungfish is mellow. The Lungfish had briefly writhed in muddy burrow, widening and deepening the chamber to have a bit more room. Lungfish is unfussy with his head extended above the shallow water line so it can breathe air. MMMagic transports *Palaeocaster* directly into the Lungfish burrow wedged between the back of the fish and the chamber ceiling! IMMEDIATELY the fossil beaver and Lungfish begin battling! Lungfish's side-to-side thrashing widens the chamber, compressing mud, and lowering the water level, but cannot dislodge *Palaeocaster*! *Palaeocaster*'s claws rake the Lungfish's back, making deep scratches! Lungfish arches head backwards as much as possible, attempting to bite chunks from the fossil rodent, but can't effectively maneuver its body in the tight quarters of the chamber! *Palaeocaster* is no novice at battling predators within its narrow "Devil's

# R2: Animal Engineers

Corkscrew" helix-shaped burrow! The lack of escape openings indicate "the beavers must have been willing to defend their burrows." (Martin & Bennett 1977). "In the spiral where the diameter of the shaft is only slightly greater than that of the beaver, they would have been very formidable opponents" (Martin & Bennett 1977). Although *Palaeocastor* is only "slightly larger than a black-tailed prairie dog" the fossil beaver has incisors with "a broad, straight cutting edge" (Martin & Bennett 1977). These teeth are the primary way *Palaeocastor* scrapes through earth to dig its burrow. Lungfish thrashes. *Palaeocastor* scrapes its incisors down the Lungfish's back, stripping off skin like an orange peel! In the same coordinated movements *Palaeocastor* uses to scrape earth and then with paws move earth backwards, the fossil beaver's clawed paws scrape away the torn skin! The pain of the injury compels Lungfish to surge OUT of the chamber, out of the burrow into the braided streams, shucking *Palaeocastor* from his back into the muddy sludge water at the bottom of the burrow chamber... where the rodent slips below the surface. GASP! *Palaeocastor* rises up from out of the muddy water, standing on back legs, "arms" raised, WINNING THE FIELD OF BATTLE! PALAEOCASTOR DEFEATS LUNGFISH! Narrated by Prof. Katie Hinde.



Jessica Popescu  
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## Lungfish vs. *Palaeocastor*

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**READ ALL ABOUT IT** by Katie Hinde, Margaret Janz, Melanie Beasley, Chloe Josefson, Anali Perry, & Abbie Thacher.

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March 27, 2023

If you're learning, you're winning!

Since 2013

# Blank Tweet

BY THE ONE RNG

Orders, genus, species- dream!  
I can pen you incredible scenes.  
MMMagic, mammals, madness, spin.  
Did research & I thought  
"oh Taxon, that's the one!  
Fast & slash, a fan favorite  
they'll become!

Gore, battles, landscape, kin.  
Follow as we explore it all.  
Tough choices, who can win?  
And will they perish,  
go for broke, or bolt in fear?  
Become the best  
and who we cheer!?

We can't wait to watch it goooooo!o!  
Then it's mowed down by a fast auto.

The Madness is a cruel game,  
some won't get very far.  
You could lose your Champion,  
to something that leaves a scar.  
So much death in the four divisions,  
go ahead & complain.  
But I've got a blank Tweet baby,  
& I'll write its name.

Denial, sorrow too,  
how could she just up & die?  
Makes you rethink what you knew  
about the rules in this world.  
Yes, it's true, no one's safe.  
But isn't that what makes it great?  
Slay those you love, save those you hate?

Stompings, smashes, dissolvings, stings;  
Many ways for a gruesome fate.  
Red carnage, wildlife rage!  
Chomp the head & crush  
the brain to slush, grind bones to dust.  
Carnassials are a must.  
In R.N.G. you've gotta truuuuuuust!

They can die from a canine,  
or become someone's prey.  
Just when you think it's alright,  
a hero runs away.  
So much death in the four divisions  
go ahead and complain.  
cause you know I love good stories.  
and you love the game!

Parody of Nerdist's Blank Page Parody  
of Taylor Swift's Blank Space, Special  
thanks to the Random Number Generator,  
our very own The One RNG.

## Sweet Sixteen Itty Bitty Come Back City

**Mara (4) vs. Grasshopper Mouse (9)** - The Mara (*Dolichotis patagonum*) found himself once again triumphant when facing the sleepy and surprised Sibree Dwarf Lemur. Of course, he did not have to do much but chatter warningly at noisy rustles in the shrub. The week before that, a lesser grison took care of the Siberian Chipmunk. Is this the battle where the mate-focused Mara will have to actually get his cute little hoof-like paws dirty? The Grasshopper Mouse (*Onychomys leucogaster*) has had a rougher go of it. The Ningauí was easily devoured, but last week's battle in the Alaskan ocean had the Massacring Mouse struggling to keep his head above water. While the Mara is only 203x bigger than the Grasshopper Mouse, will the Mouse's chilly dunk in the sea make it hard for him to find the inner fire to fight?

Once again, we are on the Península Valdés, Argentina. We find our Mara male still(!) following his wifey, rather close to a sheep ranch. Surprisingly, Mara seem to like living near ranches, likely due to humans scaring away other predators. It's late afternoon and the Maras are resting among the shrubs away from any other couples, digesting their mainly grass-and-forb based diet. Sneezing cutely, the Grasshopper Mouse scampers into view. He's happy to be away from the cold of Alaska and takes a moment to

stand on his hindfeet and groom, allowing the sun and heat to sink into his fur. The Mara's fur begins to rise at the sound of a sneeze. He remembers the strange rustling noise and the lesser grison from two weeks ago and immediately sits up, on alert. The Grasshopper Mouse, a shrub away, sneezes again, rubbing its nose. The Mara begins to chatter. His female gets up, her fur on the rise. Since they are alone at the moment, they know that if a predator is stalking them, it won't go for anyone else but them. SNEEZE! SNEEZE! SNEEZE! Hearts racing, both maras stand. They stop chattering, ears up, eyes scanning. Is it another grison? A gray fox? One more sound, and they'll bolt. The Grasshopper Mouse's nose twitches and wiggles... And.... The Grasshopper Mouse comes back down to four feet. He scampers off the battlefield: it's too early for him to be active. The Mara couple remain on alert. MARA OUTLASTS GRASSHOPPER MOUSE!!  
Narrated by Dr. Asia Murphy.



Joachim S. Müller / iNaturalist / CC BY-NC-SA 2.0

# S16: Itty Bitty Come Back City



**Rock Hyrax (2) vs. Dik-Dik (3)** – Rock "Rocky" Hyrax (*Procavia capensis*) has prevailed through uppity hyrax young bloods and diving bulldog bats! Pre-battle, the Tusked Tyrant currently using the uh...yo, can we even show this? We can? Alrighty! He's in the latrine. Like Dik-Dik (*Madoqua guentheri*) was last battle! Looks like we are facing a battle in the bathroom, a clash in the comode, a joust in the jakes, a head to head in the head, if you will... Ok, Hyrax latrines are generational, so imagine using the same toilet as your ancestors. What? No cleaning between generations?? Nope, the pee eventually...\*peers at notes\* petrifies into something called hyraceum. Hyraceum is, um, used to add musky notes to...perfumes. It has also been used as traditional medicine for centuries. Got a mouse bite? Got epilepsy? Throw some 'eaux de hyrax' on it! Dik-Dik has used her considerable antipredator skills to evade multiple real or perceived predators

to get to this round of battle. And good for her! Dik-Diks are snacks for everyone from jackals to eagles, not to mention cheetahs. That's a high snackability stat. Speaking of urine, as far as we know Dik Dik's isn't used in human perfume. Dik-Diks have some of the highest urine concentrations in mammals, going up to a dangerous (for humans) 4762 mOsm/L, all to lower water waste. That's some potent pee! No wonder Itjaritjari didn't want to tunnel through that. However, concentrating your urine is a useful adaptation for living in dry environments.



Bernard DuPont / Flickr / CC BY-SA 2.0

Tonight we are in gorgeous Ahaggar National Park, Algeria. Interestingly, while Hyrax are found on Dik-Dik's home turf in Kenya, our Dik-Dik is very far out of her range, and the landscape is a lot





drier than she is used to. She is looking a little hot and bothered, or at least bothered since there isn't much shade, few bushes or shrubs to hide under - that is nerve-wracking for a wee antelope! And where's our friend the Hyrax? The Tusked Tyrant is currently laid up on a rock near his lair. And it looks like the Darling Dik-Dik is headed over there. Only spot around that's got some shade. It's near dusk, so things should cool off a bit soon. The temperatures, I mean, because it's looking like things might be heating up between our two contestants. Hyrax has noticed the Dik-Dik and maybe it's the heat, maybe he's just in a bad mood, but it seems like he's not liking her approach. Standing up and, yep, there goes the menacing squeaks. Dik-Dik hesitates. Will she let this miniature bundle of fur back her off from the only shelter miles around? She definitely seems to be rethinking things. Honestly, I was wondering how bloody a battle between these two could... She's going for it! Dik-Dik is advancing on the rocks. Hyrax is coming forward to meet her. They seem to be sizing each other up. Now, Dik Dik definitely has the size advantage. But she (usually) doesn't have the fighting spirit like the Hyrax. Hyrax is like the chihuahua version of an elephant. All Dik-Dik has is running away on those pencil legs and some "loud breathy zik-zik alarm calls" (Estes 1991). Maybe she'll put those little sharp hooves to good use. Or...What is that??? Is that a... WOOF! [CINEMATIC FLASHBACK] We come upon a group of American and European tourists following a local

guide, Khalil. Khalil gives tours in the NP to make money. And right now, Khalil has a problem... One of the Americans has a pet dog. The American pretends not to understand Khalil when he tells her she can't bring the dog with them, despite him knowing French and English. The other tourists support her. After a moment, Khalil backs off, not wanting to lose his salary. The American feels sorry for her dog. He's used to running free back at home in the states! He needs exercise! So, she unleashes him. And despite her calls, he does what he usually does once off leash. He runs off. [BACK TO BATTLE] WHERE DID THAT DOG COME FROM? No clue, but it is going straight for the Hyrax! Hyrax doesn't even see it! The Dik-Dik just bolted towards the Hyrax omg she's trying to hide in the rocks oh [BLEEP]! Bad move! The dog just noticed her and she's much closer. Run Dik-Dik! Run! \*CRUNCH\* Well.. Um. I've seen some horrific kills (RIP cheetah vs. hippo in 2018) but I dunno, dog's shaking her like a doll. Dog is dropping the Dik-Dik. Dik Dik is dead, I repeat, Dik-Dik is... Dog is running towards the Hyrax but Hyrax is gone. ROCK HYRAX OUTLIVES DIK-DIK!!! Narrated by Dr. Asia Murphy and Dr. Anne Hilborn.



# Sweet 16: Mighty Stripes

**Greater Kudu (2) vs. Striped Hyena (3)** – Greater Kudu (*Tragelaphus strepsiceros*) is sympatric with elephants, baboons, lions... and humans. A recent survey of farmers found that empathy was a big reason for humans living peacefully with the kudu. During austral summer rains (winter in the US), Greater Kudus are widely dispersed over most of their range. In the cold season (April/May), Kudus move to higher ground. Striped Hyena (*Hyaena hyaena*) is no stranger to human-dominated landscapes. In India, higher Striped Hyena density was not maintained by higher livestock density. Dens were associated with hilly terrain. Although Striped Hyena is adaptable to landscapes modified by people, they require habitats that are free of human disturbances to reproduce enough to maintain or increase their populations.



ucumari / Flickr / CC BY-NC-ND 2.0

Tonight's battle is in Sioma-Ngwezzi National Park, a 5,000 sq.km park in Southwest Zambia and part of the Kavango-Zambezi Transfrontier Conservation Area. The goal of this 5-country partnership is the sustainable coexistence of people and wildlife. A wide diversity of animals call Sioma-Ngwezzi National Park home, including but not limited to leopards, duikers, hippos, crocodiles, porcupines, monkeys and bushpigs. Transfrontier Conservation Areas like this one provide strategies to locals to live sustainably with nearby wildlife, which can be challenging - greater kudus & spotted hyenas can cause ~\$125K in damages here in Zambia. MMMagic transports Striped Hyena into the shadows of an acacia tree, upwind from a grazing Greater Kudu. Kudu lifts his head, looks directly at the Striped Hyena... and continues chewing. Greater Kudu is no stranger to hyenas. But Kudu's typical foe is the predatory and social spotted hyena. Striped Hyena stares back at the Greater Kudu. Striped Hyena's scat reveals that he definitely consumes large ungulate species such as wildebeests, elands and topis... but Striped Hyena is first and foremost a scavenger - no way he took down one of those Big Bois by himself. Striped Hyena begins sniffing the wind and sets off to scavenge at a kill-site - off the field of battle! **GREATER KUDU INTIMIDATES STRIPED HYENA!** Narrated by Dr. Tara Chestnut and Dr. Patrice Connors.





Stephanie Rutan / Wikimedia Commons / CC BY 2.0

**Okapi (1) vs. Striped Dolphin (4)** – Okapi (*Okapi johnstoni*) are well-known to indigenous peoples in the Congo region. The name 'Okapi' is from the local Lese tribes, o'api: oka (to cut) and kpi (design made on arrows that looks like stripes). Okapi leg stripes resemble the stripes on arrows. Okapis are endangered, at risk due to threats such as logging, encroachment of human settlements, and hunting. Their populations are believed to be declining. The Okapi Conservation Project is working hard to conserve this species and their rainforest habitat. Mark your calendar for 18 October, World Okapi Day, to bring recognition and awareness to the steps needed to conserve this rare species.

In the early 90s a massive outbreak of morbillivirus led to thousands of deceased Striped Dolphins washing ashore. Necropsies showed high toxins which suppress the immune systems and reduce locomotion were likely to blame. Yet Striped Dolphin (*Stenella coeruleoalba*) populations remain very high. Females only give birth to 1 calf every 4 years - a year-long gestational period plus another 1.5 years of nursing takes a lot of resources. Females give birth throughout their lifespan, which can last 48+ years.

Tonight, we find Dolphin not swimming the deep blue but beached on the shore! Bioaccumulation of toxins and an illicit pulse of low-frequency sonar from a ship have disoriented Dolphin and he became stranded high above the tidal line along the Mediterranean Sea. Meanwhile, Okapi is living her best life in the Okapi Wildlife Reserve along the Ituri River. Ruminating by the banks of the river, Okapi casually uses her tongue to flick at annoying gnats buzzing near her muzzle. Concerned people, NOT aware of the Marine Mammal Protection Act and how to help animals in distress, have gathered around Dolphin, crowding him and adding to his stress. They SHOULD call and wait for qualified aid and give Dolphin lots of space! In the hot sun, the skin of stressed Dolphin is drying out. His thick blubber layer traps in heat and each labored breath causes evaporation of more precious water and further dehydration. He desperately flexes his back to wriggle to water, but only digs deeper into sand.

# Sweet 16: Mighty Stripes

The MMMagic portal transports Striped Dolphin to the tangled banks of the Ituri river! The humid jungle air offers some relief... And Dolphin is much closer to life-giving water. Startled at the sudden appearance of our Dolphin, Okapi is taken aback – nose wriggling to assess. Cautiously, Okapi approaches Striped Dolphin, still sniffing intently. Then Okapi lowers her head...opens her mouth... and starts licking the Dolphin's skin! Because the Dolphin is SALTY from sea water! Salt is an essential mineral needed for this organism's survival. Okapi will even eat riverbed clay to get salt. In captivity, salt licks are crucial for healthy diets of many species. Striped Dolphin

is NOT INTO IT. Nope nope nope to the slurps of a long, prehensile Okapi tongue. Dolphin shimmies into the FRESHWATER Ituri River. While most saltwater cetaceans can handle limited exposure to freshwater, long-term exposure can lead to lesions and slow wound healing and starvation due to limited availability of preferred prey. Striped Dolphin swims away from the scene of battle, hoping the river reaches the ocean... while Okapi watches from shore, swatting at flies with her prehensile tongue. OKAPI OUTLASTS STRIPED DOLPHIN!!! Narrated by Dr. Jessica Light and Dr. Brian Tanis.



Alexandre Roux / Flickr / CC BY-NC-SA 2.0

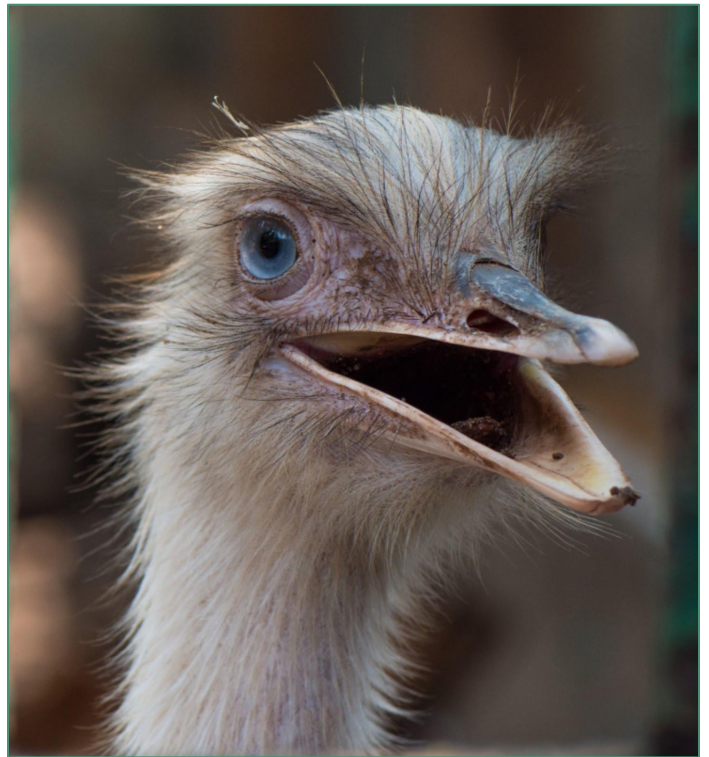


# Sweet 16: Dad Bods

**Greater Rhea (2) vs. Wolverine (3)** – Rhea (*Rhea americana*), like many other domestic and wild animals, can develop muscle weakness from overuse, known as "exertional myopathy", the most extreme version of this is when muscles breakdown and poison the kidneys, a condition called Rhabdomyolysis. Sea turtles can develop exertional myopathy from trying to escape fishing nets, or coyotes after sustained fights with a conspecific, or in Rhea after being chased by a conspecific. An analysis of pooled data from 12 studies in North America across tundra, boreal forest and montane forests revealed that outside protected areas, humans are the primary cause of Wolverine (*Gulo gulo*) mortality, through trapping or vehicle collisions. In protected populations, the leading causes of death are starvation and predation from wolves, cougars, and other wolverines.

Tonight's battle takes place outside Buenos Aires in mosaic agricultural and grassland, home habitat of the Greater Rhea and his several-month old chicks. Rhea is not looking good, he has evident "weakness, drooping wings, ruffled feathers" (Batista et al. 2021). Although as vigilant as ever, the Greater Rhea has only deteriorated since his vomit incident with the Dayak Fruit Bat from the Ficus-Forward Sacred Forest. Crossing a streamlet, he laboriously bends down to get a biteful of

mud and sand. MMMagic transports Wolverine from his Rocky Mountain home, Colorado, to the downright BALMY 60s weather of Argentina. At least the rain and wind make it feel slightly cooler to the mesopredator fur bearer! But not by much; Wolverine's dense and wooly undercoat remains winter thick at 2cm. Although many predators are no longer common in this human-influenced habitat, Greater Rhea has the anti-predator smarts of his kind and a long memory. He remains vigilant for large felids & canids, scanning repeatedly. BOOOOOOM!!!



Deepgun / Wikimedia Commons / CC-BY-SA 4.0



# 2023 MARCH MAMMAL MADNESS

Greater Rhea spots the Wolverine & boom calls, something more typically done during the breeding season but causes the Wolverine to pause and reassess. Greater Rhea begins jogging with his chicks away from the Wolverine, who now follows at a slow lumbering trot... but Wolverine is heating up fast. Wolverine slows and looks to lie down in a streamlet to lower his body temperature, when the Greater Rhea stumbles to the ground! The chicks scatter away as the re-interested Wolverine closes in on the shaking, vomiting Greater Rhea. Wolverine bites into the Greater Rhea's chest, and directly into an infected, swollen impacted gizzard! Is it a STICKLEBACK SPINE?! Out of the Wolverine's mouth from the bite of gizzard drops "screws and glass." Also inside the bird's gizzard are broken nails, bits of wire, bottle caps, and a piece of twine, human garbage dumped in the grassland. "Rhea need grit in the gizzard soon after hatching to help in the digestion of food... probably because of their keen eyesight, natural inquisitiveness, and willingness to ingest anything that fits in their mouths... juvenile and even older Rheas are to prone to impaction and hardware disease." (Sanford & Rehmtulla 1993). Wolverine lays down on the cooling ground and bites into a NOT junky hunk of Greater Rhea, while the now independent chicks trot away into the growing darkness. WOLVERINE DEVOURS PART OF GREATER RHEA! Narrated by Prof. Katie Hinde.



[Josh More / Flickr / CC BY-NC-ND 2.0.](#)

**Emperor Penguin (1) vs. Pacific Spiny Lumpsucker (5)** – Lumpsucker's specialized pectoral fins act as a suction cup to keep them in place. These fins need to be bigger because of their ping pong ball body shape and armor, which create more drag in the turbulent intertidal zone. Last battle, Emperor Penguin crash landed onto the ice at the expense of Owl Monkey. But sea ice is important for more than 2023 March Mammal Madness primate curling. Sea ice is getting to be less predictable due to human-induced climate change. Sea ice, or free-floating ice, is critical for most pops of emperor penguins, but it has to be consistent: too much sea ice means moms take too long to get back to feed chick and too little means there are no krill to eat. A big problem like climate change is scary - what can we do? In the US, we can call our congresspeople using templates from The Union of Concerned Scientists to urge them to act on climate change now and take individual steps to reduce our carbon footprint.

# Sweet 16: Dad Bods

Tonight's battle takes place on the West Ice Shelf. This area is pretty far north and warm relative to most areas emperor penguins are found in, and the sea ice here is... suboptimal. There's hardly any sea ice! But what's this? Remote sensing satellites are showing an Emperor Penguin colony on an ice shelf anyway?? Life finds a way! Breeding here is risky since the snow ramp could crack and strand penguins on either side of it. The Barrier Bay colony might make this trade off because the proximity to the water that makes it easier to feed the chicks. MMMagic has also pulled Lumpsucker into the cold Antarctic waters around the Barrier Bay colony. Lumpsucker's "rotund body shape makes them slow swimmers and susceptible to high drag forces" (Huie et al 2022), so he clings to the first available solid surface... SEA ICE! Pre-chick season, Emperor Penguin is still in his bulking phase that is supported by feasting on krill! Emperor Penguin finds the krill in short supply, and reorganizes his foraging plan for fish, acrobatically swimming toward his favorite fishing grounds when... In the water, a glimmer of a white patch has caught Emperor Penguin's eye... causing panic- AN ORCA! Emperor Penguin swims rapidly and reverse-turns to out maneuver the very large predatory orca... Normally a fish specialist, this type C orca routinely switches it up for penguins as an all in one surf 'n' turf meal. Penguin spots a hole in the crumbly ice, not even

noticing nearby lumpsucker attached! The penguin shoots through the opening... JUST AHEAD OF ORCA'S CLOSING JAWS! Penguin DISLODGES the Lumpsucker! While those pectoral fins are usually great suction cups, they're almost 25% less sticky on smooth surfaces. Lumpsucker has a brief moment of tumbling with nothing to grasp... about to be lost forever in the Antarctic Sea... When orca crashes through the crumbling ice after Emperor Penguin! Luckily, Penguin used his bubble rocket to launch himself to safety back onto the ice shelf. But a smear of red on a chunk of orca-crushed ice is all that reveals Lumpsucker's fate was much faster than tumbling in the ocean... EMPEROR PENGUIN DISLODGES PACIFIC SPINY LUMPSUCKER!!  
Narrated by Dr. Mauna Dasari.



Diego Tirira / Flickr / CC BY-SA 2.0



# S16: Animal Engineers

**Golden Eagle (1) vs Palaeocastor fossor (5)** - Palaeocastor is an extinct beaver that lived in the North American badlands over 20 million years ago; they never overlapped with humans. A living relative of Palaeocastor, the Eurasian Beaver, is a conservation success story. The Eurasian beaver (*Castor fiber*) was once widespread in Europe and Asia but by the early 20th century was estimated to be less than 1200 individuals. Due to legal protection from hunting and at least 10 reintroductions starting as early as 1922, the Eurasian beaver now has a population that exceeds 600,000. Palaeocastor may be gone, but some of its relatives remain. Beavers once supported a

a widespread pond ecosystem in the Western US, but were hunted out of many places by the fur trade. Recovering these populations of ecosystem engineers helps support other species.

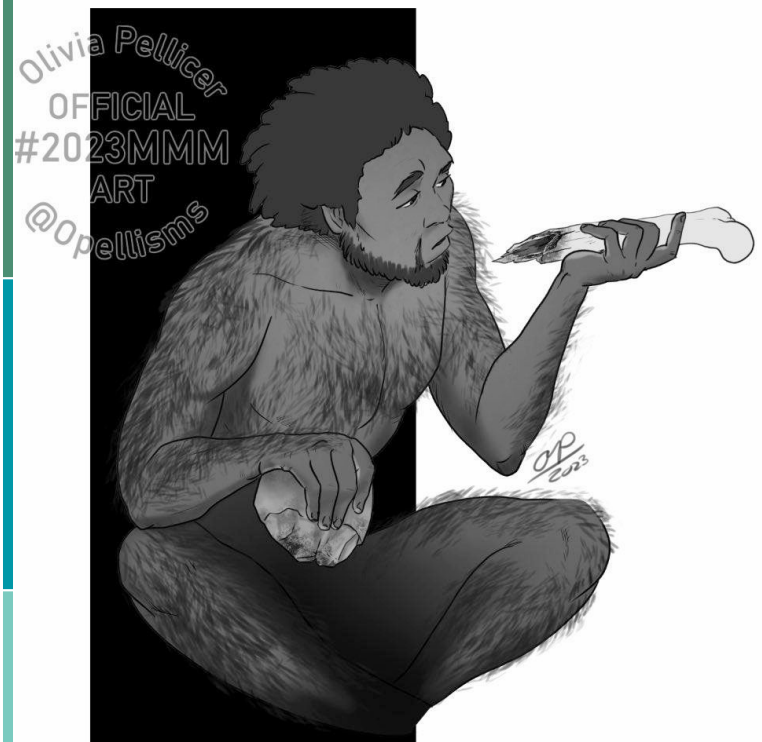
Although the IUCN lists the Golden Eagle as a species of "least concern" globally, the species receives legal protection in the United States from the Bald and Golden Eagle Protection Act. The predatory habits of the Golden Eagle, however, have threatened the recovery/status of other endangered species, including the Channel Island fox. Introduced feral pigs on the Channel Islands of California prompted mainland golden eagles to expand their range to the islands, and their predatory presence nearly drove the Channel Island fox extinct. Fortunately, island fox species are recovering due to managed conservation efforts since 2006 to (1) translocate golden eagles from the island to the mainland and (2) remove feral pigs from the island. National Park Service describes island fox recovery as "an instructive example of how a coordinated, organized and highly focused strategy was able to reverse the certain extinction of an endangered population" (U.S. National Park Service, 2022). Tonight's battle is in the Golden Eagle's home habitat of the Scottish Highlands. And our Golden Eagle combatant is hungry.



Recently, Eurasian beavers have been reintroduced to Scotland. Even more recently, MMMagic transports Palaeocaster into the upland grassland dominated by heath, gorse, and blaeberry. The prairie-like ecosystem has Palaeocaster thinking "Thistle do!" Palaeocaster is nearly as large as a European hare, Golden Eagle's preferred food. Gliding over the Palaeocaster, Golden Eagle spots the recent reintroduction and swoops talons out, slices the extinct beaver open with its straight and powerful talon. Amongst the yellow-buds of springtime whin, Palaeocaster fades away as Golden Eagle tucks in to dinner. GOLDEN EAGLE EATS PALAEOCASTOR! Narrated by Prof. Chris Anderson.

**Cathedral Termite (2) vs. Homo habilis (3)** - Cathedral Termites (*Nasutitermes triodiae*) "rafted" over to Australia in the last 20 million years. Once a tree-living taxon, mound-building emerged as an adaptive response to the hot, dry environment. Globally, N=45 species of termites are used as a traditional medicine and/or food across numerous human cultures. *Homo habilis* is one of the earliest known members of the genus *Homo*, of which humans (*Homo sapiens*) are the only living member. At many points in our lineage, multiple species of hominins were hanging out on the landscape. Over 2 million years, hybridization, gene flow, competition, cooperation, and climate change have produced the contemporary human phenotype and humans have become one of the ultimate niche builders.

*Homo habilis* has been transported to modern day Litchfield National Park in the Northern Territory of Australia. In the distance he spots what looks like a taller version of himself, But this hominin appears to be wearing something over its body and on its head. As *Homo habilis* strides up to the stranger he gets even more confused: it is not a hominin at all! Someone has dressed up a termite mound in the same way some people dress up a snowman. *H. habilis* assesses the termite mound as insects are a good source of protein, and this





# S16: Animal Engineers

termite mound looks much like the termite mounds *H. habilis* would have encountered in Africa two million years ago: "And insect protein likely played a key role in human evolution, argues Dr. Julie Lesnek and other paleoanthropologists. At the mound, the termites are preparing to rebuild their mound over the crappy clothes that interfere with water-shedding during rain. The termites definitely have better things to do than undoing human damage. Back at home, *Homo habilis* cached tools in various spots to grab when needed, but none of the Oldowan cores are nearby in this strange land to use to break into the mound. A stranger in a foreign land, *H. habilis*'s reliance on technology has made him less able to survive without this part of his extended phenotype. Inside the mound, worker termites are gathered prepared for their construction project outside the mound. CHWHACK CHWACK CHWACK!! *Homo habilis* found a dingo ulna and is driving the bone stake into the heart of the Cathedral Termite mound! Termite workers fall back into the recesses of the mound as a phalanx of soldier termites converge at the site of invasion! Through a small hole in the mound, a long, thin, leafless twig is inserted amongst the termite soldiers! Combatant Cathedral Termite is first up the twig racing toward the hole and deploys defensive compounds through the "nozzle-like nasus head

projections." But unlike New Caledonian Crow who leveraged his tool with his beak making him vulnerable to Termite's defensive "here's squirt in your eye!" *H. habilis* is using his **handy hands** to manipulate the tool, keeping his face far from the crack in the Cathedral Termite mound! The twig grows laden with agitated termites...and begins withdrawing from the mound...and combatant Termite leads the charge up the twig! *Homo habilis* withdraws the stick from the mound and with a rapid lip swipe and smooch movement gets a mouthful of insect nutrition, just like chimpanzees termite fish in the wild today! **HOMO HABILIS CHOMPS CATHEDRAL TERMITE!** Narrated by Marc Kissel and Katie Hinde.



**READ ALL ABOUT IT** by Katie Hinde, Margaret Janz, Melanie Beasley, Chloe Josefson, Anali Perry, Emily Rocha, & Abbie Thacher.



# Sweet Sixteen Citations



Jessica Popescu  
@JessPopescu

## #2023MMM SWEET 16 EMOJI RECAP



### Rock Hyrax (2) vs. Dik-Dik (3)

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# Sweet Sixteen Citations

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“If you will stay close to nature, to its simplicity, to the small things hardly noticeable, those things can unexpectedly become great and immeasurable.”  
-Rainer Maria Rilke

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## ELITE TRAIT & RANDOM HABITATS

TONIGHT an ELITE TRAIT battles for their Division Title to become the FINAL ROAR! And with this Elite Trait, home habitat advantage is no longer a guarantee for the better-seeded species! For March Mammal Madness 2023, the four possible habitats that are randomized with replacement for each battle are the Tropical Rainforest, Subtropical Desert, Ephemeral Wetland, and GHOST FOREST! Forest ecosystems between the 28th parallels N & S, also known as the Tropic of Cancer (N) and the Tropic of Capricorn (S), that experience rain throughout the year, are **tropical rainforests**. Urbanization, conversion to agricultural land, & demand for lumber threaten tropical rainforests worldwide. **Subtropical deserts** are dry, hot deserts that occur outside the tropics, North of the Tropic of Cancer and South of the Tropic of Capricorn. These are some of the hottest, driest areas on earth. **Ephemeral wetlands** are when water collects during rainy seasons and then persist for some period of time before drying up at some point during dry seasons. Ephemeral wetlands support myriad species & can be crucial habitat for developmental stages of amphibians & other species.



And my personal favorite... GHOST FORESTS! **Ghost forests** are the remnants of a once living forest. The carcasses of these trees can tell the tales of rare geological events (earthquake & tsunami!), cyclical processes (migrating sand dunes across barrier islands), or reveals the consequences of global warming and sea level rise (Eastern Seaboard). Inundations of saltwater kill the trees, such that ghost forests are the "relic forestland that has been replaced by intertidal vegetation" (Kirwan & Gedan 2019).

So sit right back ON THE EDGE OF YOUR SEAT, as we once again "trip the light fantastic" in this kaleidoscope celebration of our incredible natural world!

Citation: Kirwan, M. L., & Gedan, K. B. (2019). Sea-level driven land conversion and the formation of ghost forests. *Nature Climate Change*, 9(6), 450-457.

# Elite Trait: Itty Bitty Come Back City



Charles J. Sharp / Wikimedia Commons / CC BY-NC 4.0

**Rock Hyrax (2) vs Mara (4)** - Hyrax (*Procavia capensis*) spend up to 90% of their time resting, which takes three forms: 1) heaping; 2) huddling-similar to heaping, but animals do not lie on top of one another, and 3) solitary resting, in which there is no physical contact. "Twenty-five species of lice have been reported to infest rock hyrax." (Olds & Shoshani, 1985). That seems like a lot, but with all that heaping and huddling, there's lots of opportunity for lice transmission. The second rodent ever to make it to the Elite Trait, Mara (*Dolichotis patagonum*), it looks like a cross between a rabbit and a deer. In captivity Mara breeds like a rabbit too: Mara can have up to 4 litters a year. And like newborn fawns, mara young can walk almost immediately after birth. When running they move like tiny deer.

Tonight's random battle location is the GHOST FOREST, specifically, a palm tree ghost forest in Florida. A bit chilled, Rock Hyrax immediately finds a patch of sun and sand and stretches out, belly down. "Basking flat is when <hyrax> either lay on its side or belly, exposing the greatest area of its body to the rock surface and to solar radiation" (Brown & Downs 2007). Upon solo arrival Mara male makes an inflected 'wheet' vocalization attempting to contact his mate, but there is no sight nor smell of her; he is again a bachelor! Mara begins grazing on clumps of grass, stroll-grazing along. Hyrax is flat and sassy, soaking up sun rays until...Mara casts shade Hyrax's way. Hyrax stands up grumpily and repositions to be back in sunshine. **Harrumph!**



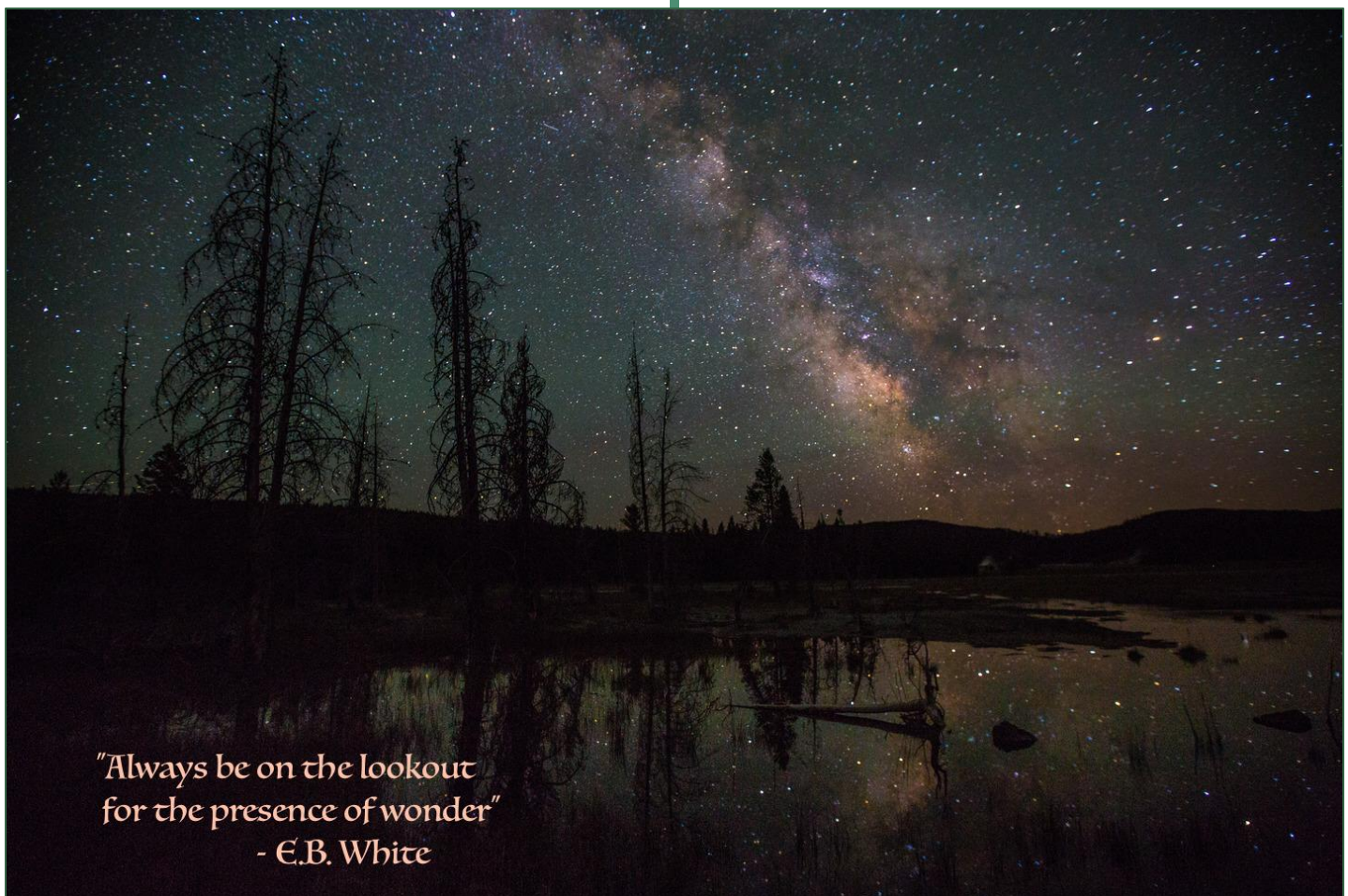
Carlos Schmidutz / iNaturalist / CC BY-NC 4.0



# 2023 M M M M M

Mara keeps grazing along and unwittingly shades Hyrax again. Hyrax assumes a threat position raising the hairs of his back "accompanied by a slight retraction of the upper lip" (Olds & Shoshani 1982) as though to say "WANT A PIECE OF THESE TUSKS!?" Mara finally notices the Hyrax. Mara looks at Rock Hyrax: is this an oversized tuco tuco mixed with a big hairy armadillo?! These two mammals use Mara burrows. Bird, reptile, & mammals make extensive use of Mara burrows suggesting that Mara are ecosystem engineers.

Among Hyraxes "there is a low threshold of... aggression in adults." (Olds & Shoshani, 1982). Some might call it quarrelsome, but I expect Hyrax prefers the term "assertive." The 4kg Hyrax bluff charges at the 8kg Mara! A male Mara with a mate is more aggressive, because he has something to defend, "but bachelor males lack aggressiveness." (Genest & Dubost, 1974). Mara runs away from the Hyrax! ROCK HYRAX DEFEATS MARA! Narrated by Anne Hilborn and Katie Hinde

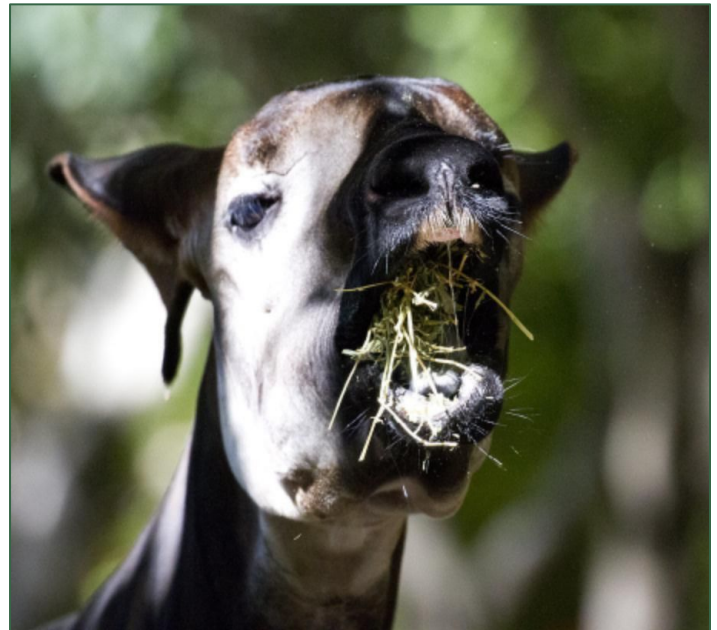


*"Always be on the lookout  
for the presence of wonder"  
- E.B. White*

# ELITE TRAIT: Mighty Stripes

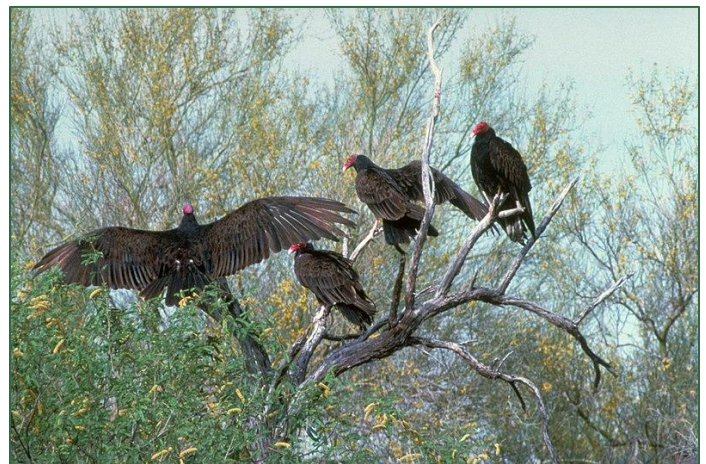
**Okapi (1) vs. Greater Kudu (2)** – Artiodactyls go HEAD to HEAD tonight! Speaking of heads, remember from Round 1: Kudu (*Tragelaphus strepsiceros*) have horns, which are not shed, and found only in males. Antlers, like in North American deer, elk, and moose, are shed. Our full-grown male Kudu horns have nearly 3 twists (4.5 ft long). Males primarily use these horns to assert dominance and win access to female mates. Kudu horns are so iconic that they are used as the logo for South African National Parks. Okapi (*Okapi johnstoni*) head ornamentation, also only found in males, does not shed. But, Okapi don't have true horns; they have ossicones. Ossicones are bony protuberances covered by skin and fur. But, tips of the ossicones are usually bare and not covered in hair, and can be used to fence with potential rivals for mates.

Tonight's randomly-selected battle habitat is... the Subtropical Desert! Our battle location is the Pitayal (a.k.a., Organ Pipe Cactus Forest, an endangered subtropical desert habitat). MMMagic brought Okapi and Kudu to the Navopatia Field Station in southern Sonora, Mexico, in an estuary of the Sea of Cortez. Okapi and Kudu are transported to the homeland of the Yaqui and Mayo people, now and since time immemorial. The Pitayal is home to ~1000 species of unique plants that collectively provide habitat for resident



Nathan Rupert / Flickr / CC BY-NC-ND 2.0

and migratory animals like shorebirds, songbirds, reptiles, and mammals. Pitayal is threatened by conversion to agriculture (row crops and cattle) and aquaculture.







L0k1m0nk33 / Wikimedia Commons / CC BY-SA 3.0

Both artiodactyls take in this strange, prickly habitat. Kudu hails from the Rift Valley of Malawi where it was warm and wet. Okapi is a rainforest specialist and our female Okapi has never experienced such a dry environment compared to the Congo Basin. Male Kudu detects an aroma....What's that smell? It smells... good... Kudu populations near the equator are reproductively active near the end of the rainy season, which is <checks notes> NOW!

Our male Kudu has detected the enticing scent of a receptive female. Okapi females can be reproductive every 15 days year-round and 'tis the season for our female Okapi. Her estrogen levels have been increasing and she shows signs of receptivity such as increased activity and posturing. Male Kudu breathes deeper, curling his

lip up to pull in all the scents. This is called Flehmen response and is a means of pheromone detection, especially scents indicating mating receptiveness, within a species. The smell isn't \*quite\* right, but male Kudu follows it right to female Okapi! She's a bit bigger than him, her fur is different in color and texture, and her stripes are in the wrong place. But male Kudu isn't picky.

The motivation to pass on his genes via reproduction, known as direct fitness, is compelling. Male Kudu, like many male mammals, are never certain of paternity or fatherhood. And since in mammals, males do not gestate or lactate, for many species the best way to increase fitness is to mate with as many females as possible (but check out the Dad Bods Division for other adaptive dad strategies!). Female mammals bear the major costs of reproduction: gestating, birthing, and lactating for months or sometimes years. Female Okapi gestation averages 440 days and young are weaned between 6 months and a year. Because of these high costs, female Okapi will be picky about her mate. Male Kudu faces female Okapi and slowly approaches her. Ruminating on her last meal from the Congo, Okapi turns and walks away. Male Kudu follows. As part of Kudu courtship, males follow females, issuing a low-pitched call as they pursue. Female Okapi, while receptive, knows the difference between an Okapi and a <whatever this is>, and she, of course, is quite picky about any potential mates.

# ELITE TRAIT: Mighty Stripes

Okapi kicks at male Kudu. Male Kudu is not deterred and continues to pursue female Okapi. Male Kudu comes up the side of Okapi and stands in front of her. He attempts to neck wrestle to form a pair bond. Female Okapi is having none of it. MMMagic did NOT bring them to the Yaqui Flower World where all animals are friends (or more than friends). Female Okapi throws her head side-to-side as a warning, then HEAD-SLAPS

male Kudu with the side of her head to give a full contact blow to his neck!! To shut down the Kudu fully, female Okapi lays down on the ground. FINALLY getting the message, Kudu retreats into the cactus forest to forage and await a lady more receptive to him. OKAPI BEATS GREATER KUDU!!! Narrated by Profs. Jessica Light, Patrice Connors, Brian Tanis, Tara Chestnut, and Katie Hinde.



# ELITE TRAIT: Dad Bods

**Emperor Penguin (1) vs. Wolverine (3)** – These contenders may be in the Dad Bods division, but don't forget it takes two to tango! Though male Emperor Penguins (*Aptenodytes forsteri*) shoulder all egg incubation duties, females return around hatching time to relieve the fasting male and care for the newborn chick. Faced with a large group of similarly tuxedoed males, female penguins rely on vocalizations to find their mate and chick. Emperor Penguins' "two voice" system increases call complexity and allows individuals to recognize each other. In female Wolverines (*Gulo gulo*), reproductive success in a given year is shaped by a combination of winter food availability and the energetic cost of reproductive effort during the previous year. The average wolverine litter has 3 kits, which are born in a snow den. Kits are weaned around 3 months of age and become independent around 6 months. Wolverine have longer fur in winter. Longer hair insulates better against colder temperatures, but insulates a bit too well in warmer climates. This is one reason why many mammals molt their fur seasonally.

Tonight the random battle location is... GHOST FOREST! Specifically, the Neskowin Ghost Forest on the Oregon Coast that is best viewed in January, February, and March at low tide... which is happening **right now**. Wolverine pads along the



Samuel Blanc/ Wikimedia Commons / CC BY-SA 3.0

beach amongst all that remains of a Sitka Spruce temperate rainforest inundated by saltwater 1300 years ago. A "megathrust earthquake" in the "Cascadia Subduction Zone" caused a "Holocene Paleotsunami" that sent "catastrophic marine inundations" 1km inland & 27 feet above sea level, leaving behind salt and sand that killed the forest (Peterson et al. 2010; Nelson et al. 2020).



# 2023 MARCH MAMMAL MADNESS

Wolverine is very comfortable in today's mid-40s misty weather... Especially as Wolverine's body temperature is a bit higher than usual from the extra energy he's burning to digest a full belly from gorge-feeding on Greater Rhea only last night (Diet-Induced Thermogenesis, meat sweats is real). Emperor Penguin is also thermally comfortable in this haunting remnant forest. Standing still, beak turned upward in the late afternoon mist, the Emperor Penguin is barely distinguishable among the ancient spruce stumps. Until his waddling Emperor Penguin walk gives his location away to the Wolverine, 100m away.



Due to Wolverine's circumpolar distribution in the Northern Hemisphere and Emperor Penguin's circumpolar distribution in the Southern Hemisphere, each has pretty much no frame of reference for the other. But Wolverine is no stranger to shorebirds and their eggs, and with the great curiosity of his mustelid kind, Wolverine ambles toward the Emperor Penguin to see what

it's all about... Closer... Closer... Closer... CLOSER! WOLVERINE IS 30m AWAY! Emperor Penguin just stands there watching the Wolverine approach. "Because emperor penguins are not threatened by any predators on land and do also not compete against each other for territories, evolutionary development of energy-consuming threatening behaviours would be of no use for the species" (Rümmeler et al. 2021). But now that Wolverine is only 20m away, Emperor Penguin is getting a bit concerned and he starts agitatedly flipper-flapping! The flipper-flapping causes Wolverine to slow his roll, but stays on curious target... Wolverine is now 10m away. TOO CLOSE! Emperor Penguin waddle walks away from the intruder, flipper-flapping as he heads for the breaking waves of the Pacific Ocean! Wolverine watches with bemusement at the ocean-bound waddling and flipper-flapping Emperor Penguin, but is little inclined to give chase. Kill frequency in predators is determined by the size of a recent meal and the "gastric capacity" of the predator. Wolverine is still digesting rhea and has no room tonight for another avian meal. **WOLVERINE DISPLACES EMPEROR PENGUIN!** Narration by Dr. Lara Durgavich & Dr. Katie Hinde.



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# Elite Trait: Animal Engineers

**Golden Eagle (1) vs. Homo habilis (3)** – In urban, suburban, and agricultural settings, humans may use rat poison (rodenticides) to control rodent populations, but accumulating exposure up the food chain can cause fatal illness (toxicosis) in Golden Eagles (*Aquila chrysaetos*) and other predators. Golden Eagles may bleed out - aka experience "life-threatening hemorrhage following minor trauma or exertion during routine activities" due to how "anticoagulant rodenticides interfere with the activation of vitamin K-dependent clotting factors in the liver" (Niedringhaus et al. 2021). *Homo habilis* emerged as a species during a time of global cooling & drying that expanded the grassland habitats of east Africa. Cooler, and more variable climates, had an effect on the evolution of early *Homo*. *Homo habilis*' ancestors have been targets of raptor attacks! The Taung baby (*Australopithecus africanus*) fossil skull shows



Jarkko Järvinen / Flickr / CC BY 2.0

puncture marks in their eye sockets (orbits) in the same place that modern eagles have left their talon marks in monkeys.



Tonight's randomly-generated environment for this battle is... Subtropical Desert! Specifically, Uluru Kata-Tjuta National Park, at the juncture of the Great Sandy and Tanami deserts. Yankunytjatjara and Pitjantjatjara people have been the stewards of this land since time immemorial. Although Golden Eagles live in subtropical deserts like the Sonoran desert in Mexico, combatant Golden Eagle is a non-migratory resident in Scotland and has no familiarity with this landscape. Golden Eagles are fascinating as these birds can demonstrate very different behaviors with some being migratory, resident, or nomadic. But the openness of this desert works well for Golden Eagle who soars using less energy on an updraft of sweet thermals, using her eagle eyes to look for a tasty treat. Golden Eagle spots some movement near a jumble of rocks... a rabbit?



# 2023 MARCH MAMMAL MADNESS

Having just been at the Top End of the Northern Territories eating Cathedral Termite, MMMagic brings *Homo habilis* just a hop, skip, and a jump southward to Uluru. Still grasping his dingo ulna, *Homo habilis* knows that replenishing his full Oldowan tool kit is high priority, and scans for appropriate rocks amidst the red sands and scrub-brush shaped by managed mosaic fire regimes. *Homo habilis* approaches a jumble of rocks. Golden Eagle streaks earthward, toward the movements of a fuzzy creature behind the rock jumble! *Homo habilis* is bent down, using the dingo ulna to leverage around the various jumbled rocks for any useful for his tool-making purposes. *Homo habilis* is getting hot in Australia under the sun, especially with the damaged ozone layer from modern human activities.

GOLDEN EAGLE CLOSES in TALONS OUT JUST AS...

*Homo habilis* straightens up his back, possibly wipes sweat from his brow (as it's a hot and heavy debate on whether *Homo habilis* could sweat)...

SEEING THE STREAKING EAGLE, *HOMO HABILIS* FLINCHES BACKWARDS!

SEEING THE FULL SIZE OF *HOMO HABILIS*, EAGLE ABORTS ATTACK!!

FLINCHING BACKWARDS, *HOMO HABILIS* STUMBLES ON HIS BIPEDAL FEET, ARMS WINDMILLING!!

Golden Eagle has landed on the jumble of rocks and looks at *Homo habilis* crumbled unconscious on the ground, a smear of blood on a large rock near his head.

Golden Eagle has landed on the jumble of rocks and looks at *Homo habilis* crumbled unconscious on the ground, a smear of blood on a large rock near his head. Golden Eagle flight-hops toward unmoving *Homo habilis*. *Homo habilis* remains still. Golden Eagle flight-hops landing with her impressive talons next to *Homo habilis*' head and those vulnerable orbits...

ALL THIS ACTION HAS ATTRACTED ATTENTION FROM THE LOCAL APEX PREDATOR... DINGOES! Unconscious, *Homo habilis* is unable to apply any dingo safety training. And even standing at his full height, his small stature all alone on the landscape... As the dingo pack takes full advantage of the incapacitated hominin, Golden Eagle catches an invasive rabbit, contributing to Uluru's rabbit eradication program, ongoing since 1989. GOLDEN EAGLE DEFEATS *HOMO HABILIS*!!!! Narrated by Profs. Marc Kissel and Katie Hinde.



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# 2023 MMM

April 3, 2023

If you're learning, you're winning!

Since 2013



## FINAL ROAR

THE PENULTIMATE NIGHT of March Mammals Madness 2023! For a decade now we have kaleidoscope celebrated our natural world, the scientists who research, the conservationists who protect, the educators who teach, the artists who illustrate, and the librarians who curate, in a non-stop extravaganza of performance science! Any glance at the news showcases how apathy, exclusion, greed, and corruption are not only the destruction of our natural world, but poison our communities and separate us from our neighbors. But in these weeks of #2023MMM, this celebration has demonstrated, unequivocally that we can manifest wonderful, hilarious, brilliant,

kind, and welcoming communities... even in the most vile of places <cough contemporary twitter>. We can choose how we grow, how we learn, how we spend our time, and how we forge precious opportunities for awe and appreciation. Please in your local communities, wherever you are in the world, know that you can be a seed that grows, a spark that lights, a breeze that blows us to the better future we all deserve.

## Okapi vs. Hyrax

**Mighty Stripes winner Okapi v. Itty Bitty Comeback City winner Rock Hyrax** –To make it to the Final Roar, the most Okapi (*Okapi johnstoni*) has done this tournament is stink-out a striped mouse, scare a striped mongoose based on size alone, regurgitate food, lick a dolphin, and educate a kudu about boundaries. After birth, infant Okapis hide for ~2 months. Mom Okapi visits infrequently, reducing predation, to nurse. Mom's milk is so nutritionally balanced that the infant doesn't defecate for two months, also reducing predation. Rock Hyrax (*Procapra capensis*) has battled with a diversity of opponents: Rodentia (Pygmy Jerboa & Mara), Artiodactyla (Dik-Dik), and Chiroptera (Bulldog Bat). In this decade of MMM, a hyrax has competed thrice times and never have they made it past the Sweet Sixteen. Rock Hyraxes have a large dorsal gland on their back that is visually obvious,

# FINAL ROAR: OKAPI vs. HYRAX

a bare patch of skin surrounded by long, distinct hairs, and emits strong odors, playing a role in social functions like mating, raising offspring, and communication within social groups. Our combatants belong to two different mammal superorders: Laurasiatheria (Okapi) & Afrotheria (Rock Hyrax). Despite diverging from each other over 80 million years ago, they have similarities like being prey to leopards.



David J. Stang / Wikimedia Commons / CC-BY-SA 4.0

The randomly selected battle location is ephemeral wetlands, aka vernal pools, prairie potholes, or playa lakes, filled with snow melt and spring rains, which often dry up in summer. Ephemeral wetlands are important "stepping stones," or moist corridors, in wetland connectivity. These short-term habitats are rest stops for migratory birds and



Yael & Amihay / Wikimedia Commons / CC BY-NC 2.0

are safe havens for amphibians to lay their eggs due to a lack of predators that require more permanent waterways. Many macroinvertebrates and plants also thrive in ephemeral wetlands. Being ephemeral makes these wetlands hard to define and the US legal system struggles with squishy concepts. The 2015 Clean Water Rule of the Clean Water Act clarified that ephemeral wetland habitats are protected, but the rule was rolled back in 2019. The Navigable Waters Protection Rule did away with federal protections for "isolated" waters, such as our ephemeral wetlands. Some states, such as Wisconsin and Ohio, have picked up the slack to try and save these valuable ecosystems.

Tonight's battle takes place at Cuyahoga Valley National Park, about 20 miles south of Cleveland, Ohio. In early April, the ephemeral wetlands of the Park are filling due to increased rainfall. The high



# 2023 M M M

temperature today was ~60°F (15°C) and the sun was shining; a great day for frogs and salamanders to lay their eggs in the fish-free waters. Okapi wanders onto the scene after some MMMagic, landing in Beaver Marsh. It's a little chilly and flooded spaces aren't her favorite and usually avoided. She peers around the wetland and tentatively sniffs the air. Okapi favors fast-growing sun-loving plants (heliophilic species), which are just starting to leaf-out at Beaver Marsh. Okapi splashes over to a nearby shrubby tree and out shoots her prehensile tongue to grab some sweet leaves. Ultrasonic screaming of plants fills the air. Being stressed by drought or being eaten by an herbivore, plants can emit distinct sounds, at a frequency that can be detected by many nearby organisms. MMMagic transports Rock Hyrax directly onto a shrubby, speckled alder tree! Rock Hyraxes often go into the trees, balancing on branches to snag a tasty leafy meal. Rock Hyrax has been enjoying the Austral summer sun and a higher ambient temperature than the current conditions at Beaver Marsh; he attempts to bask in the setting sun to deal with this thermal shift. As Rock Hyrax basks, there is massive activity of Hyrax's many ectoparasites - lice and ticks! Stress reduces resistance to parasites. Hyrax's louse and tick numbers have increased during the many challenges of novel combatant encounters and it's a feeding frenzy! All this ectoparasite movement and feeding is beyond irritating. Hyrax bites and scratches with his two anatomical adaptations for self-grooming: a curved claw on the inner toe of the hind foot and two pairs of flattened and chisel-like lower incisors.

SPLASH! Hyrax's ectoparasite-induced scratching and biting makes him lose his balance and fall out of the small weak tree, into the marshy water! Hyrax doggie paddles back to his tree trunk and struggles back to his disappearing sunspot amongst the thinnest branches of the little tree. His fur is inundated with water. Rock Hyrax shakes off the water and basks again. Sensitive to UV light, Okapi is keen to wrap up foraging and goes for the great, green new leaves of an alder tree! Okapi jostles the tree with her neck as she browses on the tastiest of leaves. Our Rock Hyrax "squeaks and yaps" at the disturbance. When he sees it's just a big artiodactyl thing shaking his tree, he lets out a sharp bark, as if to say "Hey! Leave me alone!" (Fourie 1977). It's getting cold in the setting sun, wet fur, and rain. And now this! Hyrax "now also emits growls sometimes accompanied by, or alternated with, teeth gnashing...[he] suddenly emits a snarl, at the same time thrusting the head forward" as if to bite and continues growling (Fourie 1977). Okapi moves forward to stretch tongue to a particularly enticing leaf, unphased by the vocalizations from what looks to be a tree rodent (Hyrax is not a rodent) and knocks Hyrax back into the water just as the sun sets. Parasite-infested, cold, wet, and artiodactyl-overwhelmed, Hyrax swims to the margins of the ephemeral wetland to find a rock crevice away from the field of battle. OKAPI DUNKS HYRAX!!!! Narrated by Drs. Jessica Light, Mauna Dasari, Margaret Janz, and Katie Hinde.

# FINAL ROAR: Golden Eagle vs. Wolverine



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## Animal Engineers winner Golden Eagle (1) v. Dad Bods winner Wolverine (3) –

"Large carnivorous mammals and large avian predators are top predators in natural ecosystems" (Rasmus et al. 2020). To make it to the Final Roar, Golden Eagle (*Aquila chrysaetos*) incidentally snarfed Spongilla Fly, compelled artist Pufferfish to forfeit, consumed Palaeocastor, and startled *Homo habilis* leading to his demise. In the United Kingdom, the Golden Eagle has outlasted the local extinction of brown bears, wolves, Eurasian lynx, and... wolverines! Wolverine (*Gulo gulo*) crushed Giant Waterbug, compelled a dad's sacrifice for

Bat-eared Fox, gorge-fed on Greater Rhea and curiously confronted Emperor Penguin into quitting the field of battle. "Skulls of wolverines are massive and heavy, indicative of a mammal possessing great jaw strength and capable of inflicting a tremendous bite" (Pasitschniak-Arts & Serge Lariviere 1995).

The randomly selected battle location is tropical rainforest. Specifically, MMMagic transports the combatants to the Koyna Wildlife Sanctuary in the North Western Ghats Montane Rainforest outside Mahabaleshwar, Maharashtra, India just after dawn. The Western Ghats UNESCO World Heritage Site is "recognized as one of the world's



# 2023 MAMMALS

eight 'hottest hotspots' of biological diversity" and "one of the best examples of the monsoon system on the planet" (UNESCO, 2012). Over 300 globally threatened species (IUCN Red Data List) occur in the Western Ghats, and >100 species of mammals including tigers, elephants, mouse deer, and lion-tailed macaques. Golden Eagle arrives, dismayed at the dense forest habitat; she prefers soaring at low energy above plains and grasslands searching for prey. She lands on a branch to survey the forest. Wolverine arrives and while the dense forest meets with his approval, the sun rising in a humid, already 60°F climate is at the upper limits of his preferred thermal zone for activity. Suddenly the barking of a dog

fills the forest in mountains older than the Himalayas. But this is no dog, it is a barking deer-muntjac- that barks a predator alert vocalization. Golden Eagle routinely hunts ungulates. "The most important prey for the Golden Eagle are mountain hare, grouse species, and during summer, also reindeer calves," but the same study found that "Wolverines prey on reindeer year-round" (Rasmus et al. 2020). Wolverine are not typically a stalk or ambush hunter, so he begins to chase the muntjac. Golden Eagle is also hunting, and turns out, well able to maneuver her flight through the tall trees of the canopy. Golden Eagle loses sight of her prey and rises out of the grove, seemingly abandoning the hunt.



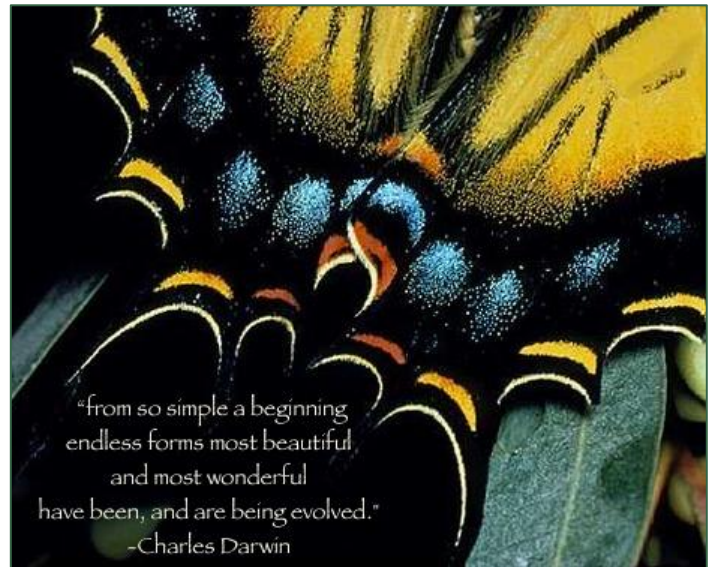
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# FINAL ROAR: Golden Eagle vs. Wolverine



But not so! From 15m above, Golden Eagle begins plummeting toward the forest floor, talons out! Wolverine leaps claws out at muntjac just as Golden Eagle's talons pierce Wolverine's skin of his back above his kidneys! Wolverine has the wind knocked out of him from the raptor impact! Golden Eagle attempts to rise, clutching Wolverine, "vigorously fans the air with her wings" but gets no lift (Grinnell 1929). Wolverine is his heaviest in late winter/early spring with greatest fat padding from ungulate hunting and winterkill scavenging. Golden Eagle's talons miss his vital organs, piercing skin and thick fur. At 17kg, Wolverine is much too heavy for 6kg Golden Eagle! And honed from years of surviving possibly lethal encounters with other carnivores, Wolverine is an experienced and canny fighter!

Twisting his long torso, one of Wolverine's clawed paws strikes Golden Eagle's head, Wolverine jaws following fast. Golden Eagle's beak slashes toward Wolverine's throat! Wolverine twists and rolls, pulling talon-attached Golden Eagle to the ground. She gets trapped under Wolverine! Fearing damage to her wings, Golden Eagle's talons release the Wolverine and the two well-matched combatants spring apart. Golden Eagle runs, spreading her wings to fly away, while Wolverine stands wounded, blood dripping from the talon punctures in his hide, as he watches the Golden Eagle depart the field of battle! **WOLVERINE DEFEATS GOLDEN EAGLE!!!** Narrated by Drs. Tara Chestnut, Chloe Josefson, and Katie Hinde.



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## Okapi vs. Rock Hyrax

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#2023MMM

FINAL ROAR EMOJI BATTLE!





# FINAL ROAR CITATIONS

## Golden Eagle vs. Wolverine

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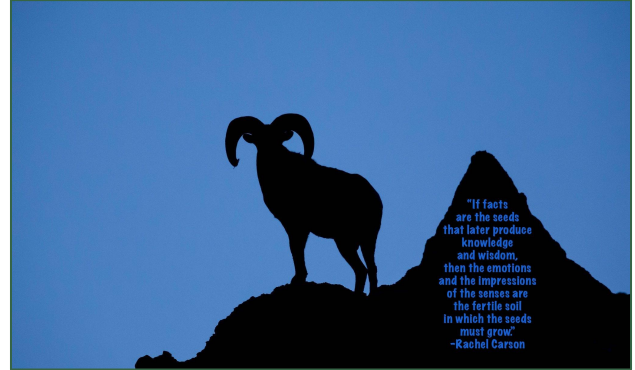
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& Thank you MMM Art Director

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**READ ALL ABOUT IT** by Katie Hinde, Margaret Janz, Melanie Beasley, Chloe Josefson, Anali Perry, Emily Rocha, & Abbie Thacher.





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# CHAMPIONSHIP BATTLE OKAPI vs. WOLVERINE

The distinctive posterior stripes of Okapi (*Okapi johnstoni*) are sometimes called "follow me stripes" to help baby Okapi follow their mothers through the forest after the nesting period (and not defecating for 2 months!). The Congo rainforest is dense and dark with thick vegetation. "Follow me stripes" and prominent white socks help Okapi visually find each other in the dark forest. But compared to closely-related giraffes, Okapi have poor eyesight and rely more on hearing and olfaction in a low-light environment. Often under

-recognized as a conservation issue, human conflict and warfare is a major source of stress and poaching on wild animals. For Okapi, the leading threat is the presence of armed groups in the areas of the "forest giraffe."

The Wolverine (*Gulo gulo*), a "blocky and bear-like mammal has been bestowed colorful names such as devil bear, devil beast, and skunk bear" (Beauvais & Johnson 2004). Skunk Bear 'may be the most fitting because of the broad yellow-brown lateral stripes that sweep from the

# FINAL BATTLE: OKAPI vs. WOLVERINE

neck to the rump and the anal musk glands that produce the pungent odor typical of mustelids' (Beauvais & Johnson 2004). The period of exploratory independence from mom's territory can be a particularly dangerous period for lethal attacks from other wolverines, wolves, and cougars for young wolverines. Wolverine Dad's tolerance of subadult offspring may be an important way for wolverine subadults to develop survival skills under Dad's protective umbrella.

Tonight's randomized battle habitat is the ephemeral wetland. Specifically in the foothills of the Sierra Mountains in the Sequoia National Forest, currently under emergency closure restrictions from late March until late April due to winter damage and in anticipation of the perilous BIG MELT. The 2022-23 winter snowpack eases, but does not solve, the ongoing California drought and is an indicator of global warming "climate whiplash." Due to short-sighted water management decisions in the 1900s, the Big Melt is expected to cause widespread devastation this spring. Now early April, in the Southern Sierra foothills, with warming temps and above freezing in the nighttime, the melt has begun. Just yesterday, the California Department of Water Resources, California Department of Forestry and Fire Protection, and California State Parks released a Public Service Announcement: "As the temperature rises, snowmelt-fed waterways can

quickly induce incapacitating cold-water shock to even the strongest swimmers. We encourage everyone to follow the advice of public safety officials and avoid entering waterways if asked... Be aware of fluctuating water levels" and "Rising water levels in rivers and streams will be very cold, very fast and can easily overwhelm those that aren't prepared." In the Sierra foothills, an ephemeral wetland has formed, a combination of rain and beginning snowmelt. Jumbled logs, "coarse woody debris" uprooted by past mudslides, make a log jam that slows water flow & deepens the vernal pool (Harmon et al 1987).



Wolverine once roamed the Sierras, but became locally extinct in the mid-1900s from trapping, poisoning, and extirpation of other large carnivores whose kills were essential for scavenging.



# 2023 M M M

One Wolverine dispersed into Northern California in ~2008, making the California Sierras their lonely home for a decade and efforts are ongoing to bring back the Wolverine throughout its historical range. MMMagic delivers Okapi to the squishy margins of the ephemeral wetland in a meadow surrounded by ponderosa pine-mixed conifer forest. The meadow is colder than Okapi's preference and she quickly shelters in a stand of pine trees to block the breeze. Through the tree trunks, Okapi gazes in wonderment at a small, fuzzy mammal with black, brown, and streaks of golden fur... unlike anything she has ever seen in the dense Ituri forest of equatorial Africa, her home habitat. With little of the foliage she prefers to browse in the understory, Okapi vigilantly watches the lumbering... seems to be a carnivore? Unbeknownst to Okapi, this carnivore is currently the very top of the local food chain. The carnivore stumbles... and leans against a tree trunk... with eyes partially closed.



LassenNPS / Wikimedia Commons / CC-BY 2.0



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Wolverine is also watching the \*young black bear cub\* lean against the tree trunk, as tonight MMMagic fictitiously contributes to Sierra Wolverine reintroduction efforts, delivering Wolverine to cling part-way up a coniferous tree trunk. The black bear cub-of-the-year, recently emerged from the winter natal den and is just 8lbs having grown exclusively on mother's milk. Baby mammals are one trophic level above their mothers because moms are, in part, liquifying their own bodies to synthesize milk and nourish young. Soon the bear cub perks up and playfully does a summersault roll beyond the line of sight of Wolverine! Okapi shifts slightly and the waning sunlight illuminates a large scar on her haunch... evidence of a close encounter, but successful escape, from a leopard, Okapi's primary source of natural mortality. Indeed many Okapi in the wild carry such leopard scars.

Wolverine climbs a few feet up his tree trunk to a snagged deadfall tree, to better view the ursid

# FINAL BATTLE: OKAPI vs. WOLVERINE

version of veal. Wolverine winces slightly as his climbing rips the slowly healing wounds from golden eagle talons even of the Final Roar. Moving into the broken tree snag, Wolverine startles the tree's resident, a great gray owl (North America's largest owl!) with a unique population in the Sierra Nevada. Great gray owl, disinclined to build their own nests, instead make use of other animal's nests, and this one has co-opted the nest of a Western gray squirrel, to lay eggs. The unexpected Wolverine momentarily drives the owl from the tree. Wolverine is ravenous having eaten little during the 2023 MMM tournament, and has an injury that takes energy to heal. Wolverine quickly snarfs the owl eggs as Great Gray Owls are most aggressive in defense of nearly fledged nestlings (as per Solheim et al. 2023, the first ever documentation of wolverine predation on great gray owl nests).



Dfaulder / Wikimedia Commons / CC-BY-SA 2.0

Below the action in the trees, Okapi extends her tongue 25cm, 3/4ths a stoat, beyond her snoot to wipe some fallen pine needles from her eye. Wolverine, while ravenous, is not ENTIRELY reckless, and quickly shimmies away from the owl nest, down the tree trunk only a few feet from Okapi... But without a snowpack for Wolverine to use for the high ground advantage to ungulates sunk into the snow, Wolverine ignores Okapi, he has other, easier prey in his sights.

Wolverine, skirting the vernal pool, lumbers toward the black bear cub bewitched by a rapidly-trilling cedar waxwing getting ready for spring-time migration north to nesting grounds. Wolverine, body quivering from muscle tension to unleash predatory attack... when MAMA BLACK BEAR anti-predator charges from the forest in defense of her cub! Bolting in panic from the charging mama bear, Okapi and Wolverine are now in the deep vernal pool! The water depth is chest-deep for Okapi, so she can breathe freely but Wolverine is several stoats deep. Wolverine surfaces and swims toward some coarse woody debris avoiding the shore where mama bear is standing on back legs threat grumble-huffing, before bear stiff-legged walks away with her cub.

Okapi's bolt into the vernal pool has landed her trapped amongst the log debris. She can't wade through the tangled trunks and all attempts to



# 2023 MMM

climb onto the unstable logs fail. Okapi's 275kg weight can not be supported as the wedged logs become dislodged and she keeps collapsing back into the water. Indeed, Okapi actively avoids the "large swampy areas of the forest" in her home habitat (Bodmer & Rabb, 1992). Maybe Wolverine doesn't need a snowpack to have the high ground for some fresh Artiodactyl meat after all! Wolverine scampers along the log jam and onto the wedged logs that can easily support his 17kg body weight. Coming up on Okapi's flank, Wolverine's claws slash across Okapi's leopard scar and Okapi gives her "bellow of acute distress" (Bodmer & Rabb 1992). Rearing back Okapi uses the anti-predator defense of her girrafid kind but Wolverine dodges the striking hooves. Wolverine skitters across the wet logs to dash in and sink his jaws into Okapi's haunch with an estimated maximum bite force of 844 Newtons. Okapi flails and rolls the pine log, plunging Wolverine into the vernal pool! Underwater Wolverine is trapped by broken bough stumps pushing him deeper as the pine trunk rolls. Okapi heaves with all her might against the tangled trunks. Underwater, a broken bough nubbin grinds and gouges in Wolverine's leg, pinning him to the silty bottom of the vernal pool as air bubbles come from the thrashing Wolverine. Okapi, adrenaline coursing into her body tissues, turns and power pushes into the surrounding logs. Okapi breaks through the tangled trunks!

In the roiling vernal pool, the pine log slowly rolls... BWUGH! GASPING WOLVERINE IS CLINGING TO THE PINE LOG! Wolverine claws his way onto the resettling coarse woody debris and watches the wounded Okapi dash from the vernal pool into the forest... OFF THE FIELD OF BATTLE! WOLVERINE OUTFLANKS AND OUTLASTS OKAPI! WOLVERINE IS THE 2023 MMM CHAMPION! Narrated by Drs. Jessica Light, Jessica Popescu, Chloe Josefson, and Katie Hinde.



**Jessica Popescu**  
@JessPopescu

## #2023MMM CHAMPIONSHIP E



6:18 PM · Apr 5, 2023 · 763 Views

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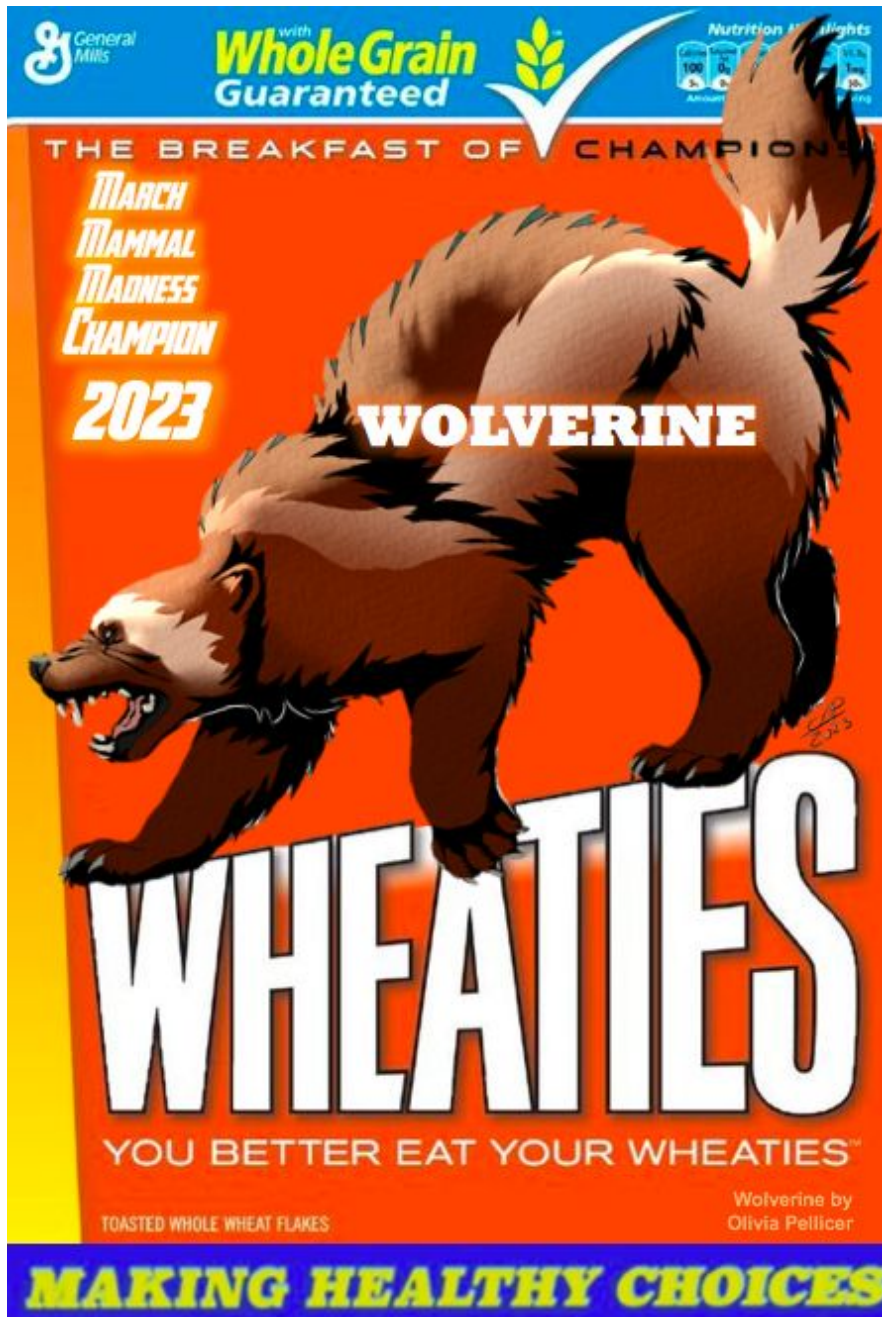
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# 2023 CHAMPION WOLVERINE!



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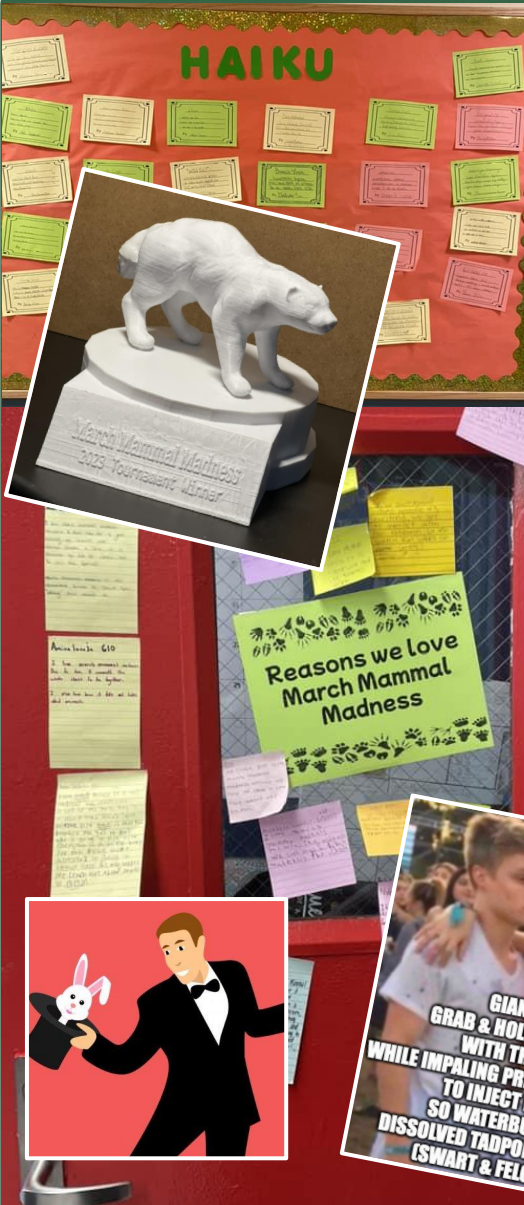
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# 2023 MMMemories



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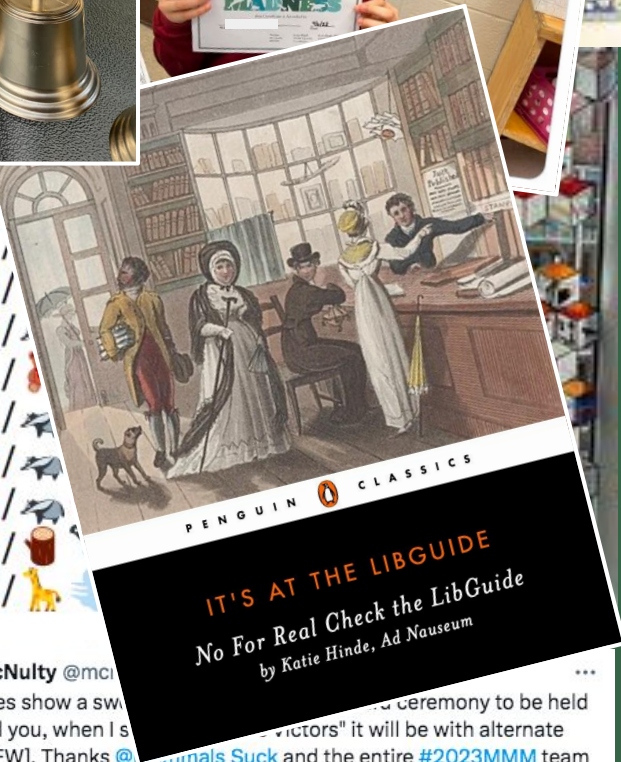


Soeder and Lee @sciencewo - 1m  
Our trophies this year were "stoat"ally Awesome Stoat Stat Sunglasses  
@MMMletsGo @Mammals\_Suck



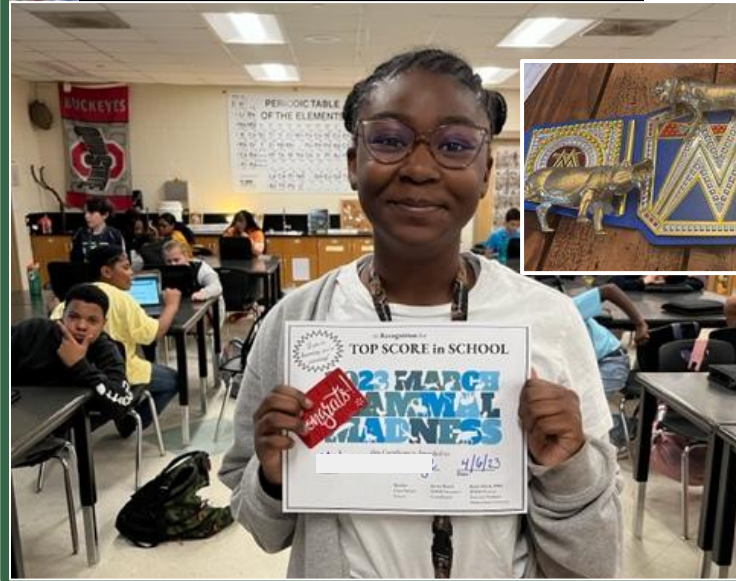
Reasons we love March Mammal Madness

GIANT WATERBUGS GRAB & HOLD PREY UNDERWATER WITH THEIR FRONT LEGS TO INJECT LIQUIFYING SPIT SO WATERBUG CAN SLURP UP DISSOLVED TADPOLES LIKE A MILKSHAKE. (SWART & FELGENHAUER 2003)



2023 MMLTHS TOURNAMENT CHAMPION!

Kieran McNulty @m...  
Final scores show a sw... ceremony to be held later. Mind you, when I s... victors" it will be with alternate lyrics (NSFW). Thanks @Mammals\_Suck and the entire #2023MMM team or an amazing rookie season. Looking forward to next year!



# REACH & IMPACT



# MMMETRICS

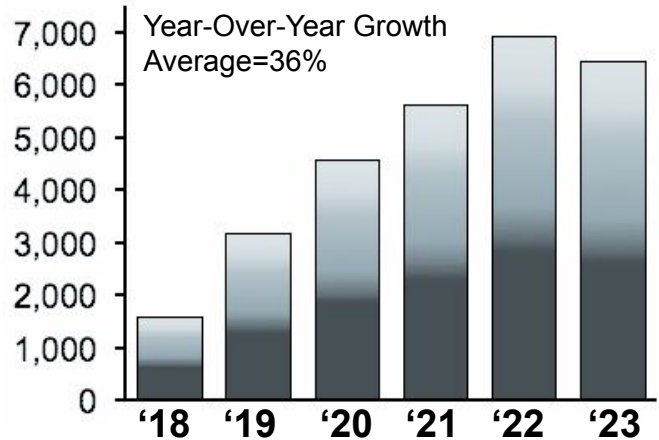
Since the launch of the LibGuide in 2017 and the annual Educator Survey in 2018, we have been able to quantify multiple aspects of user engagement with MMM to reveal an overall pattern of year-over-year growth (graphs this page).

~50% of educators who try MMM return to use the resources the following year.

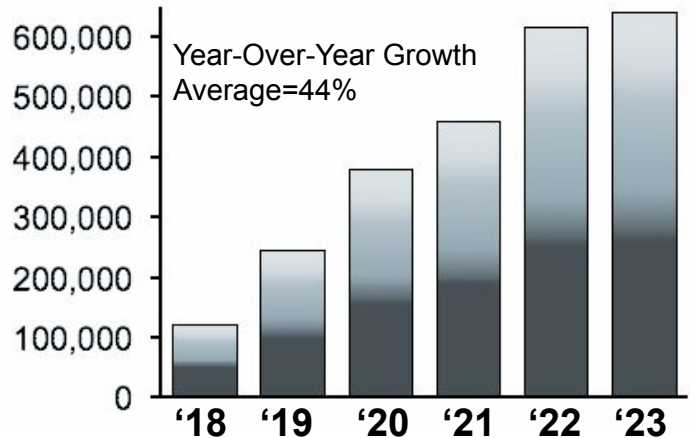
As of the end of 2022, ASU March Mammal Madness LibGuide was #33 in traffic out of 750,000 LibGuides in the United States.



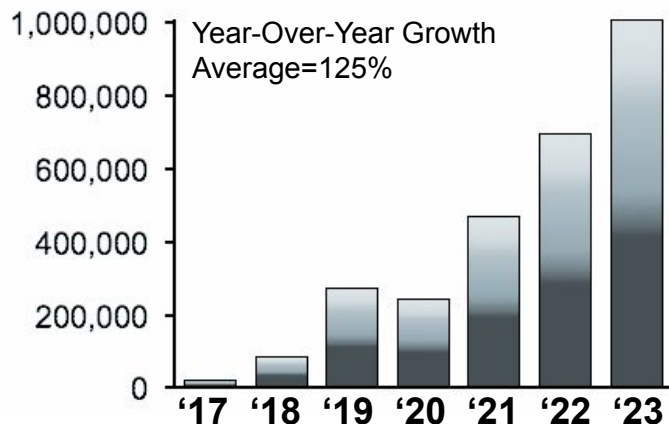
## Educators requesting MMMaterials



## MMM Bracket Distribution to Learners by Educators



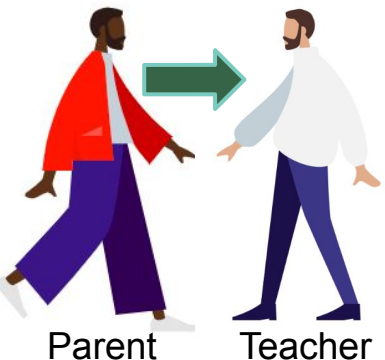
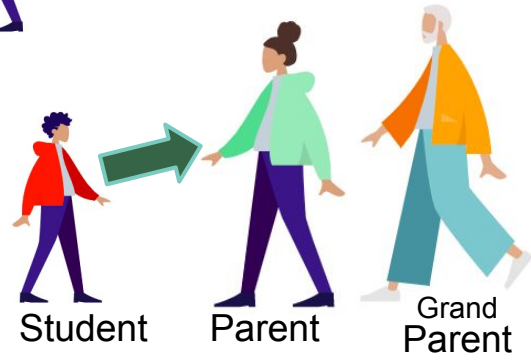
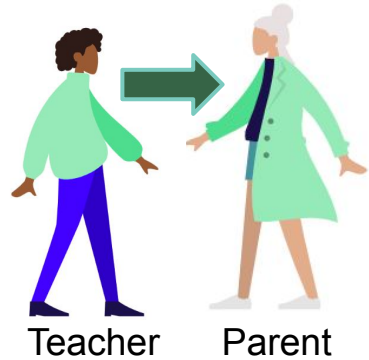
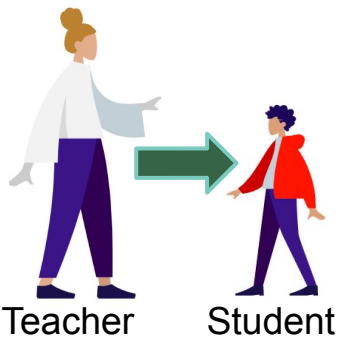
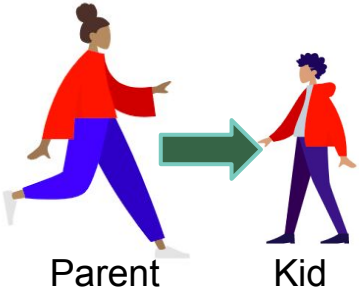
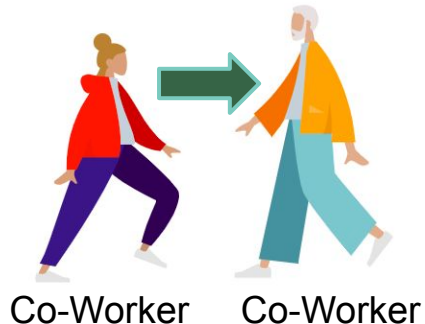
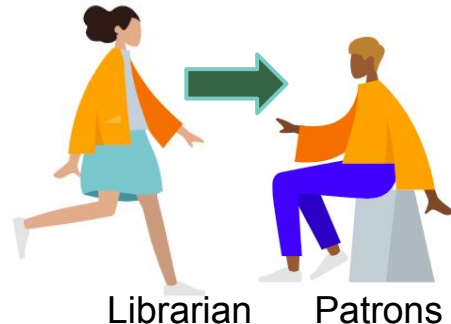
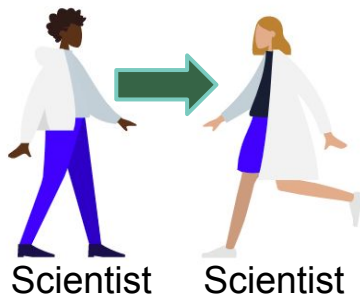
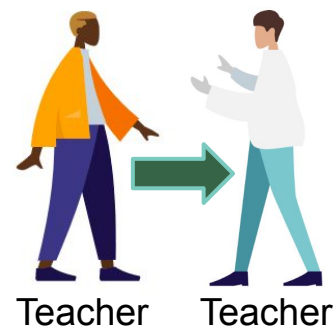
## Pageviews to the ASU LibGuide During MMM (including Pre-Season)



# SOCIAL TRANSMISSION

Players have reported many, many different social network connections for learning about and playing MMM.

public domain mix-&-match illustrations by Pablo Stanley at Humaaans.com

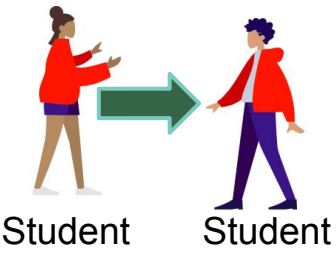


Became a Teacher

Played MMM as a Student

Uses MMM with Students today

*I'm not crying, you're crying!*



# FORMAL LEARNING SETTINGS

## Conventional

4-Year College  
Community College  
High School  
Middle School  
Elementary School

## Special Populations

Alternative Schools  
Clinically-Intensive Residential  
Elementary Institute  
Home School Co-Op  
International Schools  
Charter Schools  
Private Religious Schools  
Juvenile Correctional Facility  
Adult Special Education  
Services  
Adult Correctional Facility

March Mammal Madness is adopted widely for informal learning among coworkers, friends, family, and other social groups of all ages to generate extensive *COMMUNITAS*. Players have self-described the following contexts for playing MMM via IRB-approved survey or public social media:

# INFORMAL LEARNING SETTINGS

## Adult-Oriented

BioTech Company  
Renewable Energy Company  
Career Tech Center  
College Dorm  
Conservation Non-Profit  
International Wildlife Rehabilitation Council  
National Primate Research Center  
California Department of Fish & Wildlife Staff  
Aquarium Staff  
Zoo Staff  
State Science Council  
Science Teachers Club at Teaching College  
ASU Mary Lou Fulton Teachers College Staff

## Youth-Oriented

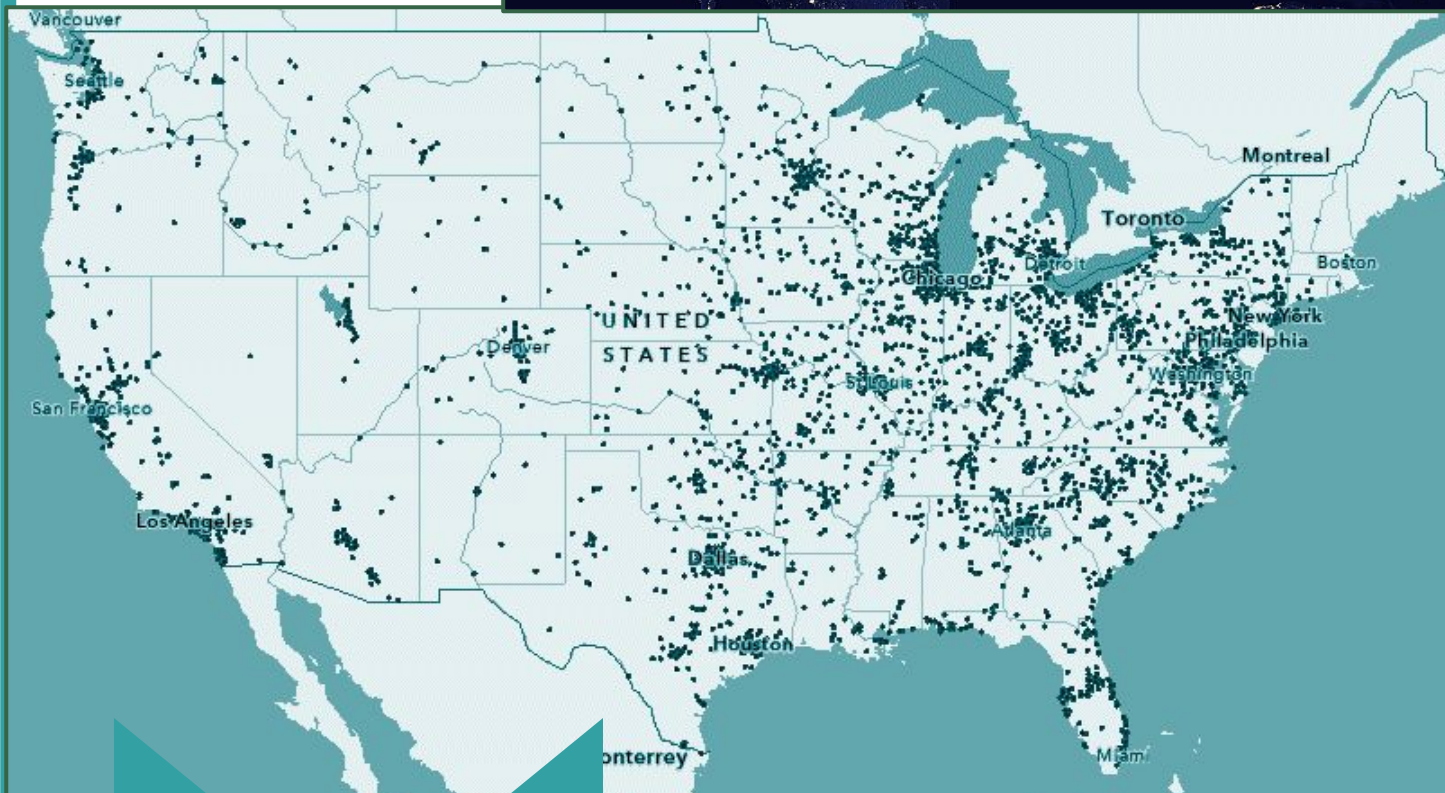
4-H Youth Development Programs  
Afterschool Program  
Boys and Girls Club  
Children's Library  
Girl Scouts  
Science Club

## General Public

Community Center  
Museum  
Nature Center  
Public Library  
State Park  
Library Stem Lab  
Zoo



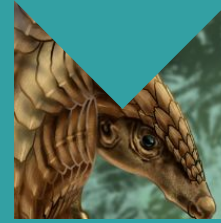
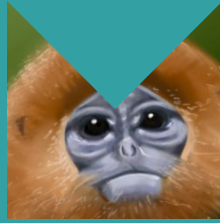
To gain better understanding of the geographic distribution of MMM use in the United States, in 2023 we asked educators for the zip code of their classrooms or facilities where they use MMM with their learners. N>5000 educators in the USA provided a usable 5-digit zip code that allowed us to create a more refined visualization of MMM use. *Special thanks to Matt Toro, Director of the Map and Geospatial Hub at ASU Library for map creation.*



Visual comparison with NASA Earth Observatory / NOAA images of US electricity use at night (above) showcase how MMM classroom distribution co-varies with US population distribution but also reveal regions of limited MMM propagation.

In coming years we will work to specifically reach out to educators in regions with low participation in MMM, particularly in New England, Eastern Montana, and Nevada.





## EMERGENT THEMES FROM QUALITATIVE ANALYSIS OF TEACHER RESPONSES

**EXCITED:** Rewarding to see students so engaged, hearing students talk MMM in the hallways outside class, seeing students animatedly debate traits of different species.

**RETENTION:** Applying info from MMM to new lessons, even months later.

**RESILIENCE:** March is a really tough time during the academic year, MMM is the thing that gets students AND educators through.

**CONNECTIONS:** Students returning to visit past classrooms to discuss MMM with new students, even after graduating from the school.

**SPARK:** MMM reaching students typically unengaged in science.

**LOVE of LEARNING:** Asking about MMM early in the school year to make sure the class will play again.

*"I enjoyed watching my more competitive students dive into deep discussions about their mammal choice and why it would win. They weigh the pros/cons of the strengths and weaknesses and were quite engaged!"*

*"During covid it helped one of my class connect with me and with other students in the "virtual world" since they would get excited to see the outcome of the "fight" and get to "smack talk" with their fellow classmates"*

*"I had a very nice but disengaged student who didn't do much in Biology until MMM. The year we had the tardigrade--and the tardigrade completely captured his interest and attention, and we even went outside to collect moss and lichens to find them!"*

*"Approaching the end of the school year, one senior with a bad case of "senioritis" said, "MMM is the only reason I come to school."*

*"A student who typically underperformed in class won the classroom bracket, was awarded his trophy and a noticeable change in his efforts for the rest of the year could be seen."*

*"Each year I have several students grow especially attached to their champion. Last year, a 9th grader became obsessed with Stellar's Sea Eagle and she came in each day with new factoids and research. The group of sophomores that I had the year of the tardigrade all advance STILL argue, shout, and carry out about it to this day -- and they are graduated! I have several former students who ask for the bracket each year."*



# How Humans Learn

An exciting tournament of animals, presented in narrative form by expert scientists, combined with illustration, experienced socially, is **bangarang** for learning!

- **HUMANS ARE SOCIAL LEARNERS**

We most readily learn from people who are perceived as knowledgeable, successful, have shared identities, and to whom we have access.

- **NATURE IS GRIPPING TO HUMAN MINDS**

We have cognitive biases to learn about animals and nature, especially children and particularly about dangerous animals and toxic plants.

- **HUMANS ARE STORYTELLERS & ‘STORYLISTENERS’**

Our bodies and minds are adapted for language, culture, cooperation, & our control of fire allowed human social groups extended hours of fireside socializing and storytelling. *“Stories, proverbs, and anecdotes are cultural tools used in Indigenous communities to teach children about their environment.”* -Harriet Mutonyi

- **STORIES IMPROVE LEARNING**

Through narratives, learners are transported across time and space, experience emotions, and make inferences. Information in story-form is easier and faster to understand, remembered better, and inconsistencies are more easily detected. Narrative-centered learning promotes learner interest, perception of control, and self-efficacy.

- **STORIES ARE OFTEN ABOUT ANIMALS**

Animals feature prominently in many oral traditions, stories, fables, and folklore. Traditional stories often include information for avoiding predators, successful hunting, safe navigation, and social behaviors for cooperation. Analysis of hundreds of fairy tales identified four fairy tales in the last common ancestor of Proto-Indo-European languages, 5000 years ago. All four were about animals or creatures.

- **ART, GAMES, & EXCITEMENT IMPROVE LEARNING**

Long-term retention of science is enhanced by arts-integrated instruction. Learning embedded in games or other approaches that generate excitement also improve learning outcomes.

- **UNIVERSITIES & LIBRARIES INSTRUMENTAL AGAINST MISINFORMATION**

Researchers, Professors, and Librarians are at the forefront, teaching information literacy skills, curating information portals for more reliable search results, and navigating the knowledge landscape.

Learning Bias  
Content Bias  
Delivery Bias  
Source Bias  
Community  
Emotional Valence



Social  
Animals, Nature, Art  
Narrative, Illustration  
Trusted Experts  
Collective Experience  
Excitement

(Reviewed in Hinde et al. 2021 eLife)

**teaMMM**



# COMBATANT ILLUSTRATIONS



**Charon Henning, BIS**  
Scientific Illustrator  
MMM Art Director



**Mary Casillas, BS**  
Science Teacher  
& Illustrator



**Olivia Pellicer, BFA**  
Character Animator



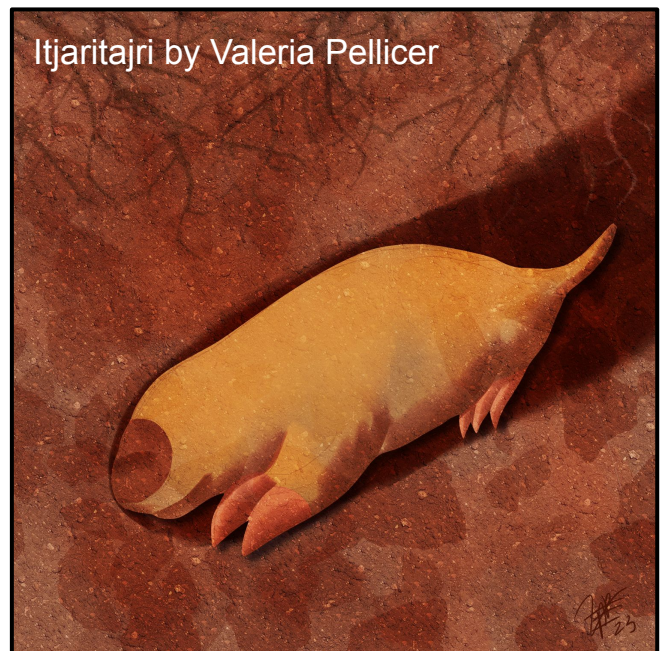
**Valeria Pellicer, BFA**  
Science Illustrator

From the Desk of the Art Director: The MMM Illustration Team experienced new opportunities and challenges in 2023. Each year, each of us consider new techniques as we approach creating the combatant artwork. We highlight traits, behaviors, and environments that speak to the scientific content of the tournament. At the same time we seek to portray the combatants to resonate with the tournament audience. Through lighting, palette, and scenery we further extend the mood of the combatants and tournament dynamics.

All of the illustrators have a background in visual science communication, with Mary and Charon working mostly in traditional media and Olivia and Valeria working digitally. While our collective work on MMM has gone almost exclusively digital, stylistic choices of each artist make their individual contributions easily identifiable. Additionally the combatant species and sequential tournament rounds afford extensive opportunity to experiment artistically.

Valeria excels in the use of limited color palettes and simple shapes, producing works full of personality. She is particularly adept at including pop culture references in a way that remains accurate to the natural history of the combatant. This is an valuable

aspect of science art specifically created for education in a K-12 setting, and can be difficult to create.



Itjaritajri by Valeria Pellicer

Mary is a middle school science educator with a clear understanding of how art can assist with comprehension of scientific concepts. Her digital work reflects her skills with traditional media and has grown into exceptional depth and detail. She has a knack for making microscopic and seemingly simple organisms accessible and incredibly fascinating through her art.



Giant Waterbug by Mary Casillas

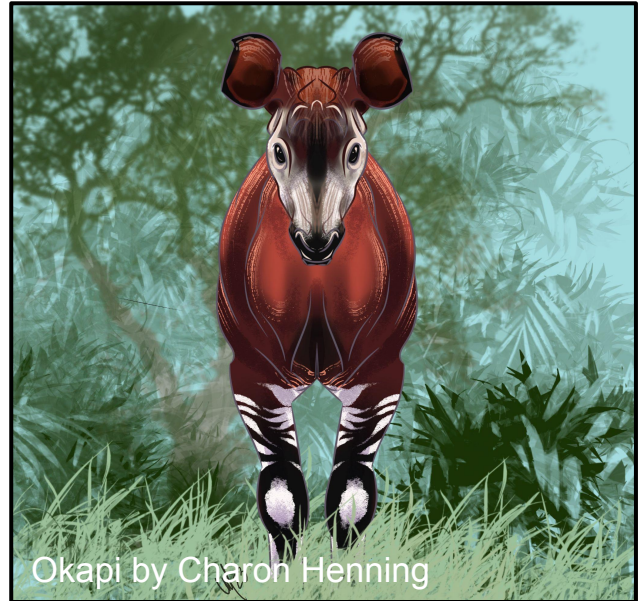
Olivia, a skilled animator with an eye for detail, uses MMM to explore the potential of single frames and different uses of layers and lines. She had moved from creating works mostly based in realism to more abstract and minimal renderings.



Mara by Olivia Pellicer

Charon, a community educator and scientific illustrator, uses MMM as an opportunity to study lesser known species and showcase their amazing features and adaptations. While she spends most of her year nature journaling

in traditional media, she makes the most of the opportunities the tournament provides for furthering her knowledge and skills in digital rendering.



Okapi by Charon Henning

Many of the seemingly less fascinating combatants become quite interesting as we research them. Charon and Mary in particular will take on species that require a strong and positive presentation in order to create a true connection with players. While we don't always succeed in making the dobsonfly squeeze everyone's hearts, our illustrations showcase the unique natural beauty across the Tree of Life. In 2023, while working on the lungfish, Charon recalls finding all kinds of patterns in its skin. "I had this moment where I recalled some of the closeups of Karloff in the mummy). I found those same patterns again months later on sturgeon skin."



Lungfish by Charon Henning

The very real possibility of an imminent heat death of the Twitterverse and the possibility that the tournament delivery would need to pivot to new platforms sparked a great deal of discussion among the Illustration Team. Habitats? Battle specifics? COMBATANT ENCOUNTERS? Although ultimately the 2023 tournament stayed on Twitter, many new ideas for art were brainstormed for possible inclusion in future tournaments on another platform.



Hyrax by Mary Casillas

## ART TEAM CONTINUED



**Jeanne Dietrick**  
 Director/Writer/Puppeteer  
 BE Creative LLC  
 MC Marmot



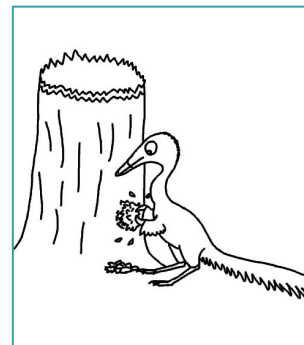
**Brain Easterling**  
 Producer/Editor/Puppeteer  
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 MC Marmot



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 Department of Design  
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 Bracket Design



**Katie Hinde**  
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 Combatant Phylogeny




**Cyn Rudzis**  
 Combatant Art

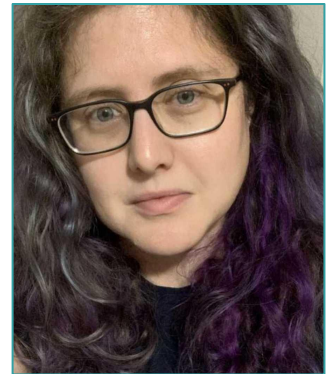
# LIBRARY & CURRICULA TEAM



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Combatant Info Slides & 



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# LIBRARY & CURRICULA TEAM



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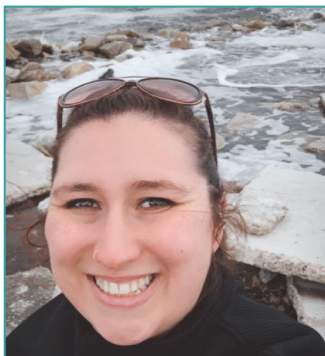
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Park Ecologist  
Mt. Rainier National Park  
Curricular Design



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NC Museum of  
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Sports Summaries



**Margaret Janz, MA**  
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Sports Summaries



**Kate Lesciotto, PhD**  
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**Melanie Beasley, PhD**  
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**Mr. Ian Hecht, M.Ed**  
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MMM Trading Cards



**Mr. Jeff Brunstrum**  
Jacobs High School  
Online MMM Bracket



**Ms. Jennifer Gabrys**  
Detroit Country DS  
MMM Trailer



**Ms. Kaitlyn Faust**  
Kankakee Valley HS  
MMM Presentation



**Ms. Robin Coffman**  
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MMM Presentation



**Ms. Madeline Sinnott**  
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MMM Presentation

# GENETICS TEAM

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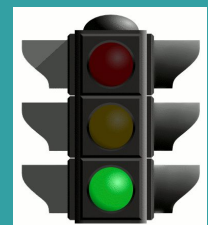


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## BEHIND THE SCENES



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# Narration TEAM



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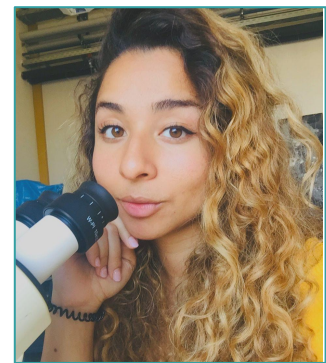
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# Narration TEAM



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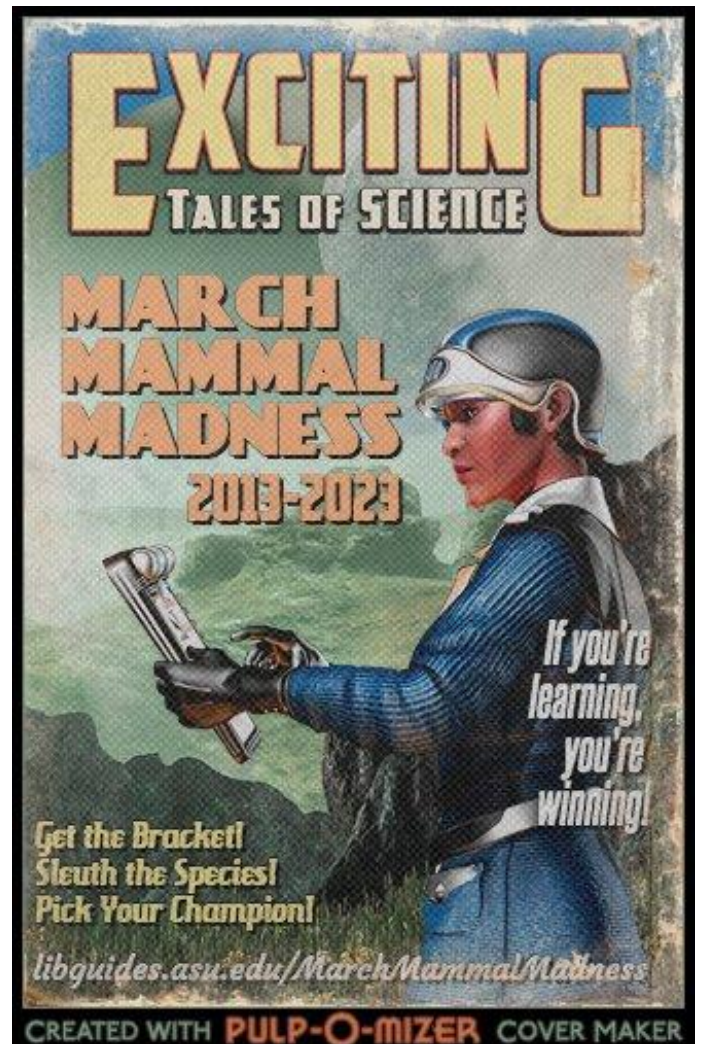
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**Kwasi Wrensford**  
Mammalogist  
Integrative Biology  
UC Berkeley



Excuse me, I was told there would be

# CARNAGE

## MARCH MAMMAL MADNESS

### SPOTLIGHT: teaMMM ACCOMPLISHMENTS



In 2023, **Elinor Karlsson**, director of the vertebrate genomics group at the Broad Institute of MIT and Harvard, AND MMM GENETICS TEAM MEMBER, released the first wave of findings from her brainchild the **Zoonomia Project**. These papers presented the results of meticulous alignment and comparisons of genomes from 240+ mammalian species, involving 100+ scientists, and generating 11 papers in the journal Science. The Zoonomia Project has “demonstrated how comparative genomics can not only shed light on how certain species achieve extraordinary feats, but also help scientists better understand the parts of our genome that are functional and how they might influence health and disease” ([DiCorator 2023](#))

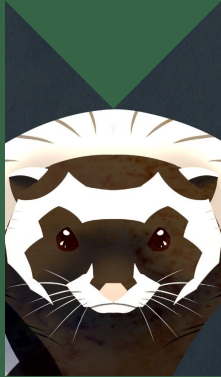
### VIVAT COMMUNITAS!

Each year, an active, interconnected community emerges among the MMM citizenry. Students, fans, scientists, academics, and institutions hilariously interacted during the weeks of this tournament. In this way, March Mammal Madness reaches many “publics” and explicitly dismantles boundaries among scientists, students, and the broader members of society. Thank you for being a part of this incredible community.

Although the March Mammal Madness tournament is finite in duration each year, may all of your curiosity and enthusiasm for knowledge and nature last a lifetime. **Because if you're learning, you're winning!**



**Katie Hinde** PhD  
Human Evolution & Social Change  
Arizona State University  
MMM Founding Director

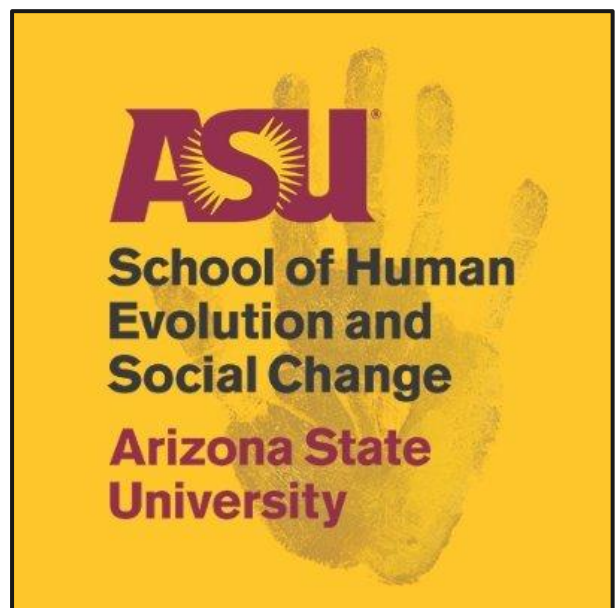


# SPECIAL THANKS



IMAGE LIBRARY  
American Society of  
Mammalogists

Oxford University Press, in collaboration with March Mammal Madness, has curated a special collection of articles of combatants freely available to the general public. The [Journal of Mammalogy](#) and [Mammalian Species](#) have been predominantly featured in these collections, but 2023 included articles from other journals including *The Auk*, *The Condor*, *Systematic Biology*, and *Biological Journal of the Linnean Society*.



Perennial appreciation to PhyloPic 2.0, Animal Diversity Web, and Wikipedia and their communities for the incredible resources made available to the learning public.