

The Ratite Review

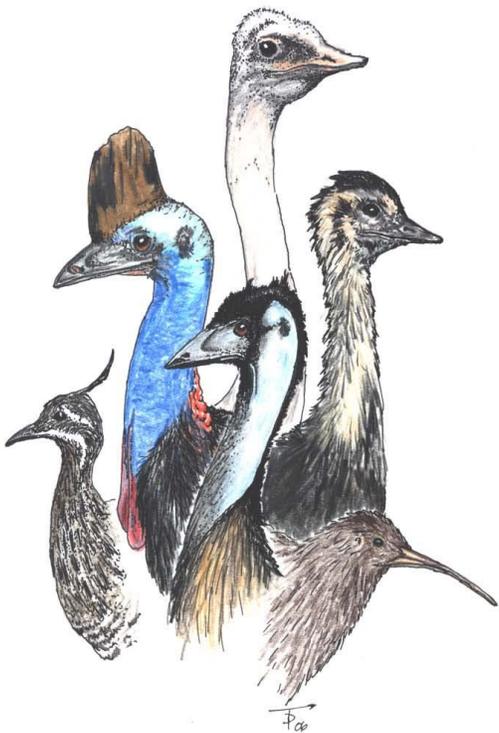
THE AZA STRUTHIONIFORMES TAG ANNUAL NEWSLETTER



The Ratite Review 2019

Welcome to *The Ratite Review*!

The vision of the Struthioniformes Taxon Advisory Group is to engender appreciation of ratites and tinamous by raising awareness of conservation threats and helping zoo visitors and the zoo community better understand actions they can take to help conserve these species in the wild.



**ASSOCIATION
OF ZOOS &
AQUARIUMS**



www.facebook.com/RatiteTAG

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Cover Photo: Cassowary 'Emil', Birmingham Zoo
by Scott Kayser

Newsletter Editor: Kirby Pitchford

Ratite TAG Personnel

AZA Struthioniformes TAG Officers

Chair: Sara Hallager, Smithsonian National Zoological Park

Vice Chair: Scott Tidmus, Disney's Animal Kingdom

Secretary: Nicole LaGreco, San Diego Zoo

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Bruce Bohmke, Woodland Park Zoo

Dominick Dorsa, San Francisco Zoo

Mike Mace, San Diego Zoo Safari Park

Craig Mikel, Louisville Zoological Garden

Kristi Newland, Lee Richardson Zoo

Cindy Pinger, Birmingham Zoo

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Mike Taylor, Jacksonville Zoo

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Bonnie Van Dam, Detroit Zoological Park

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Eddie Witte, Oklahoma City Zoo

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Carrie Brooks, Birmingham Zoo

Nutrition Advisors

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Mike Maslanka, Smithsonian's National Zoological Park

Cassowary, Emu and Rhea Veterinary Advisor

Marc T. Valitutto, Smithsonian National Zoological Park

Ostrich Veterinary Advisor

Peter Black, Busch Gardens Tampa

WCMC Liaison

Colleen Lynch, Riverbanks Zoo and Gardens

SPMAG

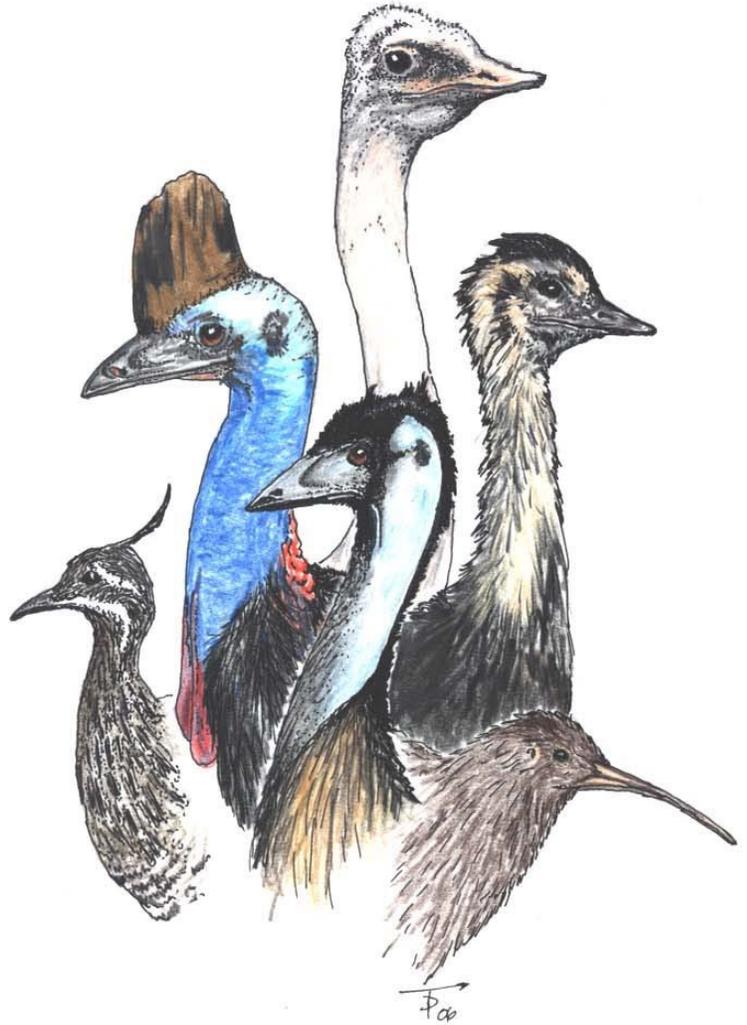
John Andrews, Lincoln Park Zoo

Enrichment Coordinator

Dana Urbanski, North Carolina Zoo

Zookeeper Representative

Kirby Pitchford, Birmingham Zoo



SSP Program Leaders

Brown Kiwi: Kathy Brader, Smithsonian National Zoological Park

Elegant Crested Tinamou: Kristen Clark, Smithsonian National Zoological Park

Greater Rhea: Heather Anderson, Smithsonian National Zoological Park

Southern Cassowary: Nicole LaGreco, San Diego Zoo

Species Champions

Emu: Monica Halpin, Zoo Atlanta

Ostrich: Scott Tidmus, Disney's Animal Kingdom

TAG Announcements

Like us on Facebook!

www.facebook.com/RatiteTAG

The Struthioniformes TAG has a Facebook 'like' page! We gained nearly 200 supporters within the first forty-eight hours of being activated, and each of our posts reaches an average of 280 people — our recent holiday giveaway reached over 4,500 people! We plan to continue our own weekly hashtag: **#RatiteWednesday**, when we feature a different ratite or tinamou species every week!

Be sure to like, share, and comment on our posts to help us get more followers!



Upcoming Events

AZA Midyear Conference

April 13-18, 2019

Phoenix, AZ

AAZK Conference

August 18-22, 2019

Indianapolis, IN

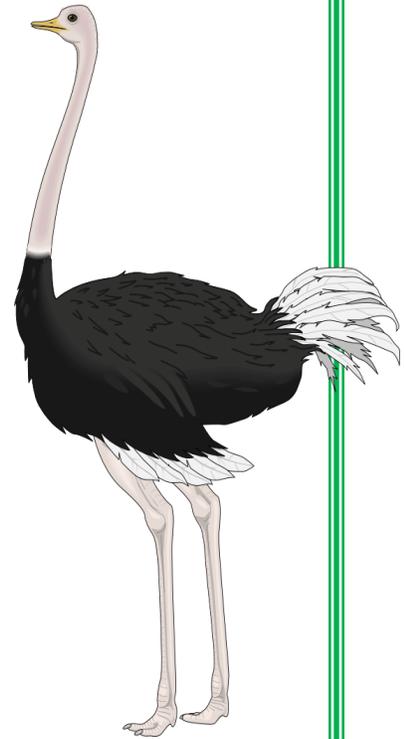
AZA Annual Conference

September 7-11, 2019

New Orleans, LA

World Cassowary Day

September 28, 2019



TAG mart Update

The TAG participated in the 2018 TAG mart at the AZA midyear conference in Jacksonville FL. Thanks to everyone who supported the TAG through the purchase of one of a kind ratite items! Be sure to stop by Phoenix for all your ratite shopping needs!



Thank you, Monica!

The TAG would like to thank Monica Halpin at Zoo Atlanta for her hard work editing the newsletter since it began nearly ten years ago. She recently decided to step down as editor and passed the torch on to Kirby Pitchford at Birmingham Zoo. We appreciate you and all the effort and time you've contributed to make *The Ratite Review* a success year after year!

Do you have an announcement for next year's newsletter?

Email kpitchford@birminghamzoo.com.

Population Updates



North Island Brown Kiwi, *Apteryx mantelli*

International Studbook

39.18.0 at 16 global institutions

Red SSP

SSP Coordinator: Kathy Brader, braderK@si.edu

Yellow SSP

Elegant-crested Tinamou, *Eudromia elegans*

Regional Studbook

29.19.0 at 10 U.S. institutions

SSP Coordinator: Kristen Clark, clarkK@si.edu



Greater Rhea, *Rhea americana*

Regional Studbook

26.53.14 at 29 U.S. institutions

SSP Coordinator: Heather Anderson, andersonH@si.edu

Yellow SSP

Yellow SSP

Southern Cassowary, *Casuarius casuarius*

International Studbook

32.29.4 at 30 U.S. institutions

133.123.15 at 129 global institutions

SSP Coordinator: Nicole LaGreco, NLaGreco@sandiegozoo.org



Photos credits: brown kiwi, Columbus Zoo; elegant-crested tinamou, Carolina Aruda; greater rhea and southern cassowary, Scott Kayser

2019 Ratite Keeper
of the Year!

Keeper Tracks!

Meet Larkin Johansen at Jacksonville Zoo and Gardens!



I am a New Orleans transplant in Jacksonville, Florida and couldn't be more fortunate to work with such a wonderful group of birds and bird enthusiasts at Jacksonville Zoo and Gardens!

I graduated with a Bachelor of Science in Marine Science from Jacksonville University and began my zoo career at JZG in March of 2013. Five years later I find myself a Senior keeper, Lead penguin keeper, and primary trainer to many of our animals, including "Brisbee" our quirky Southern Cassowary.

Brisbee was the first animal put in my charge to train and has certainly been both challenging and endlessly rewarding. We started together from ground zero, not really sure of each other or where to start. Now, we have a solid relationship with numerous mutually beneficial behaviors in our repertoire that allow for top quality husbandry and medical care. Brisbee is a guest and staff favorite and we honor him and his wild

counterparts every year by celebrating World Cassowary Day.

My passion for conservation and animal care continues to grow and expand immeasurably each year and I am honored to be able to work alongside JZG's conservation committee, our bird team, and contribute where possible to the Struthioniformes TAG.



Right: Brisbee receives an Injection.



Above and right: Larkin spreads awareness on World Cassowary Day by hosting a booth and talking to the media.



2018 Hatchings!

Emusing Emus at Brevard Zoo

Michelle Ferguson, Area Supervisor,
Lands of Change: Australia and Beyond

On March 14th and 15th, Brevard Zoo welcomed 1.1 Emu chicks. They were 2 out of 6 eggs that hatched successfully. Keepers hand raised the pair, and they have been a wonderful addition to the zoo. Once they were big enough, they were introduced to a mixed species habitat, where they currently live with macropods and muntjac. The entire yard is part of a walkthrough experience for guests. These two have tons of energy and are constantly putting smiles on people's faces as they learn about the walkabout's different inhabitants!



Photos courtesy of Brevard Zoo staff



2018 Hatchings!

Egg Sexing of Greater Rhea Eggs

Marisa Boyd, Senior Keeper, Birds

At the Arizona Center for Nature Conservation/Phoenix Zoo, we have successfully used in-ovo sexing on more than two dozen Greater Rhea (*Rhea americana*) eggs over the past three years. We have primarily selected to produce females to grow our own flock, allowing the sire to incubate and rear any offspring that we decide to produce. A few times each week, the nest is checked for new eggs. They are numbered over the air cell in the order in which they are laid, as this allows us to track egg development. About half-way through the incubation period (day 17), we pull the eggs into a heated brooder and transport them up to our Animal Care Center for in-ovo sexing by bird keeper staff.



Rhea eggs are so large that the veins developing on the corioallantois membrane are very easy to visualize and cannulate. We put each egg up to the candler, mark the location of a medium-sized vein along the equatorial midline of the egg, and prepare the site for drilling with disinfectant (chlorohexidine 2%). After the rotary tool abrades the outer shell to the membrane, we disinfect the surface again (povidone-iodine) and collect < 0.05ml of blood (just under one drop) with a 27G insulin needle. The sample is deposited onto a sample card and sent off to Animal Genetics for the sex to be determined. If the embryo is female, we will allow it to progress on through incubation. If the embryo is male,

we will pull the egg and end incubation. We have successfully hatched 2.3 Rhea after in-ovo sexing, and plan to produce more females next year. The two male chicks that were produced the first year this was done were placed at another institution.

Determining the sex of an embryo prior to its hatching (i.e., “egg sexing”) is a great management tool that allows animal care staff to selectively-produce a specific sex in a population of birds and some reptiles (e.g., Komodo dragons). Many of these species would otherwise probably not be bred due to resource limitations (e.g., space). This is especially true for species like Greater Rheas where males cannot be housed together indefinitely. The bird team at the Zoo will continue to utilize this technique to better manage our populations.

Meet the Editor

Meet Kirby Pitchford at Birmingham Zoo!



Since this is the first time the newsletter has changed hands, I wanted to introduce myself. I hatched in Dothan, Alabama in 1996. I fledged and started college in 2015, and at the end of this summer I will be completing my degree in biology and museum studies at Auburn University Montgomery. I edit *The Ratite Review*, the North American Songbird Working Group (NASWG) newsletter, as well as run the Ratite and CP&P TAG Facebook pages and the ASAG twitter account.

I started my career four years ago at Montgomery Zoo, first as a docent, later as an intern, and finally as a zookeeper where I worked with hoofstock, carnivores, primates, elephants, rhinos, birds, herptiles, and marine fishes. I gained a broad range of experience there, and one of the most exciting things I learned was how to arrange animal transports. I grew the bird collection in terms of taxa by over 35% - which included some of my favorites like pelicans, crested screamers, and kori bustards. Last spring I attended midyear in Jacksonville and worked with both bird teams at Dallas Zoo on a keeper exchange. In October of last year, I accepted a position in the bird department at Birmingham Zoo where I now work with about ninety species, a marvelous team, and two incredible mentors — Alan Yester and Cindy Pinger.

I've always felt drawn to birds. I've been fascinated with them since childhood, and I enjoy their behaviors, striking appearances, and the amount of taxonomic diversity. I would try to name a favorite, but that tends to change day to day. I have a special interest in ratites, native birds, neotropical passerines, and coastal and wetland birds – storks, cranes, ibises, pelicans, flamingos, and waterfowl. Growing up, everyone always knew I'd end up at the zoo and I am excited to be able to focus my career on bird conservation, management, and informal education.

In the short time I've been in the field, I have already gained the help and mentorship of so many wonderful people who have guided me and given me priceless knowledge, practical advice, and fantastic opportunities. I look forward to being a part of the ratite TAG and the ASAG community for many years to come! Outside of work I enjoy casual birding, playing the clarinet, and performing as drag entertainer Kori Balearica Screamer.





Out and About with Ostrich



Ostrich Training at Disney's Animal Kingdom Lodge Kayla Chambers, Animal Keeper III



Disney's Animal Kingdom Lodge currently houses four female ostrich. Two of the females live on a three acre savanna while the other two live on an 18 acre savanna both groups with African hoofstock and birds. Being at Disney's Animal Kingdom Lodge, the animals are on exhibit for 22 hours a day. All of the animals are cued into the barn in the early morning hours to get their grain diet. However, our ostrich are cued into the barn in the evening and spend the night inside. Keepers were observing that the ostrich feather condition was declining. It was narrowed down to the irrigation water soaking them throughout the night because once they bed down, they

would not move while irrigation was going off to get away from the water. The trainers began cuing the ostrich at night so they would be undercover and after a while the feather condition greatly improved. Now they have full feathers year round. Over the last couple of years there have been various cases where special training was needed for our ostrich. As ostrich have come up lame, we have



been able to train for voluntary radio-

graphs, sonograms, and an aspirate. We have also trained voluntary blood draws as one of our ostrich swallowed a foreign object. Because of this, we drew blood once a week to measure any changes in metal toxicity, but it aids in their physical exams as well. Knowing that it was going to be frequent, trainers worked with our birds so that all behaviors would be voluntary instead of manually restraining the ostrich, which can be dangerous for the birds and keepers. Working with ostrich is very similar to the other hoofstock collection, but more hands on, which has helped tremendously with training. They are used to tactile so when we need to focus a training that requires multiple people or tactile in different locations then it is not new to them. Overall we have learned that there is no limit to what can be trained with ostrich.



Photos courtesy of Megan O'Brian

My Pal Rhea

Anna Kate Timothy,
Animal Care Professional I, Trails of Africa



Photo by Tessa Woods

Rhea is a spirited five year old common ostrich living at the Birmingham Zoo. She is a fun-loving and highly energetic bird who is always looking to make a new friend. Ostriches are social animals that can live in flocks consisting of as many as fifty individuals. Since Rhea is currently the only member of her flock, it has been extremely important for the Africa team to develop new ways to provide her with the socialization that she needs. One of the ways that we have been able to accomplish this has been with our mixed species habitats. As the honorary fourth member of our giraffe herd, Rhea enjoys spending her days on Savannah along with our three reticulated giraffe. On warm, sunny days guests will find Rhea playing chase with our giraffe as well as our grant's zebra herd. Integrating multiple species in one area provides a dynamic environment that challenges the norm for each individual.

Arguably the coolest thing that we have been able to do with Rhea is her new scale training program. It is important that we do routine weights to establish a healthy baseline for Rhea in the future. Through this behavior we will be able to better monitor and manage her health. It will allow us to observe any sudden drop or gain in weight, which could be attributed to a more pressing health issue. Not only has this been great from a health care standpoint, it has also served as a wonderful enrichment tool. By working with her one on one, we are able to engage her critical thinking skills and encourage her to become more adaptable when presented with new environments. Since our scale is located in the giraffe barn, a large portion of our training began with acclimat-

ing Rhea to a novel area with all new stimuli. It proved to be extremely important that she be comfortable not only with what we were asking of her, but that she be confident in her surroundings as well.

Ostriches are omnivores which means they have a very eclectic diet. They will consume anything from roots, leaves, and seeds to insects and small rodents. To mimic this, we give Rhea a variety of greens, egg, and fruit along with a specialized ratite diet. This gave us options when it came to choosing the perfect reinforcement for her training. We have used apples, zucchini, bananas, tomatoes, and lettuce, but ultimately we found that Rhea works best when she is being hand fed grapes. Hand feeding has been crucial for the training process because it allows her to retain focus on the trainer without getting distracted by searching for reinforcement on the ground. In just a couple months time, we were able to get a few separate weights on Rhea.

Though we still have a long way to go, we are encouraged by the progress we have made and the relationships we have strengthened throughout this whole process. Weighing in at 233.3 pounds, Rhea has become a more confident, well adjusted individual as a result of her scale training. It is our goal to continue to improve upon this training program in hopes that we can also use the techniques we develop on other ostriches that join Rhea's flock in the future.

Managing a 0.3 Ostrich Group in Mixed-Species Ungulate Savannas at Fresno Chaffee Zoo

Taylor Keddie, African Ungulate Keeper



Sahara enjoying a summer swim

The Fresno Chaffee Zoo currently houses a group of 0.3 ostriches in two mixed species savannas as part of the African Adventure exhibit which opened in 2015. Currently, our ostriches are exhibited with white rhino, giraffe, greater kudu, addax, wildebeest, common eland, Egyptian geese, pink-backed pelican, and yellow-billed stork. We have also housed the ostrich with impala, springbok, Speke's gazelle, and Abdim's stork at various times in this exhibit's history and these species worked well with the ostriches. They can be exhibited in both mixed-species ungulate savannas but are typically housed on the larger white rhino habitat. The giraffe herd is housed on the adjacent, smaller exhibit. Our savannas are equipped with a connecting "creep" (see table for dimensions) which excludes rhino and giraffe while allowing all other species to move between savannas.

Our climate lends itself well to the needs of our African ungulate collection. The ostriches are housed outdoors year-round except. Each ostrich is secured in an individual stall every morning to receive their daily diet of Mazuri Ratite grain and oyster shell supplement; additionally, a produce mixture is given on exhibit as a group diet before the other animals are shifted out. We are fortunate that our ostriches have never directed any aggression towards keepers and this allows for free contact management for medical exams, monthly scale training, and certain daily shifting. It is likely we can work free contact because we have non-breeding females; it is doubtful we could use the same setup if we had

male birds. They have never been able to navigate the connecting creep with any regularity despite our best efforts to train them to use this gate. It seems that the height of our creep discourages the ostrich from using it, since they seem unwilling to lower their heads to pass through. For this reason, the ostriches are moved between savannas via a nearby, larger rhino gate.

We have encountered few instances of intraspecific aggression with our ostrich, and while they are great exhibit animals, they can be challenging to manage. It has been difficult to offer diet to the ostrich while they are on the mixed species savannas. All of our ungulates are very food motivated, which has prompted us to discontinue perimeter feedings — offering some of their diet along a fence line or barrier wall. Our animals have exhibited food guarding behavior in these situations which has resulted in aggression. Ideally, we would like the option to offer multiple daily feeds to the ostriches while on savanna, but we have not found any practical way to feed them on exhibit that excludes the other animal species. The ostriches have caused some problems during our rhino behind-the-scenes tours which utilizes food reinforcement for the rhinos. The birds will attempt to eat the rhino grain which causes displacement from the rhinos. We address this by keeping the ostrich in a separate savanna during scheduled tour days. In these instances, the ostriches are secured on the giraffe savanna but occasionally disrupt our giraffe feeding station by displacing the giraffes.



When the ostriches are secured in holding overnight or for long periods due to management or medical needs, they tend to peck and forage extensively in the granite substrate. To prevent the potential over ingestion, keepers bed ostrich stalls with hay any time other than the typical morning lock in. We are currently looking into AstroTurf carpeting when they need to be secured long term to prevent potential substrate ingestion.

All our ostriches will step onto a scale platform for voluntary weights and receive training to maintain this at least once monthly. Keepers originally attempted to target train the ostrich so that they could be guided onto the wooden scale top but the ostrich (surprisingly) proved unwilling to peck at the target. To address this, we amended our scale behavior to include using grapes offered by hand to encourage the birds onto the scale from designated start and end positions. Trainers have each bird step onto the scale three times and an average

of these weights is taken to correct for any variance. Our scale tops are wooden platforms that sit atop two scale bars attached to a reader. Since hooved animals and ostrich have the potential to slip on slick, wooden surfaces, our scale tops have abrasive sandpaper tape mounted on them to provide traction. The ostrich each displayed some level of aversion to the scale top at first and were desensitized to it. The birds initially had some trouble stepping up onto the scale top, which is likely due to this being a non- natural movement for the species; this was easily remedied by stacking two stall mats to create “stairs” onto the platform.

The Fresno Chaffee Zoo aims to use naturalistic, goal-based enrichment on exhibit for the benefit of our animal collection and guest experience. The ostriches are given some form of enrichment on exhibit at least twice weekly, although we may offer any approved enrichment to the birds in holding as desired. We have found that enrichment targeted at extending foraging behavior is most successful.

The ostriches have daily access to two large filtered pools, with each containing a gradual slope to their maximum depths. They regularly use these pools, especially in the summer when temperatures exceed 100°F most days. Our ostrich will wade, lay down, and actively swim in the exhibit pools and this has proven to be very enriching to them and our guests. Overall, the ostrich flock has been easy to manage on the African Adventure savannas and are a proven favorite with our guests. We are confident that they will remain an iconic addition to our collection for years to come.

Photos courtesy of Sara Bazley



Training with “Pepper” Ostrich at the Dallas Zoo



Laura Burleson,
Lead Zoologist, Middle Wilds of Africa



“Pepper” was an 8-year old Ostrich (*Struthio camelus*) housed at the Dallas Zoo from the time she was roughly one year in age. She arrived to the zoo with a developmental defect resulting in severe rotation of the third digit of her left foot. This defect caused difficulties with mobility, and worsened over time. She was managed at the Dallas Zoo for about 7 years, until her mobility declined severely and her quality of life was impacted. Although given a diagnosis with not much hope early on, staff were able to implement operant conditioning training with her, which combined with her easy-going demeanor, allowed for great success in maintaining her condition and quality of life for as long as possible. Pepper was trained for a variety of behaviors, including tactile habituation, voluntary injection, voluntary blood draw, and voluntary radiograph collection. All of these behaviors allowed keeper



and veterinary staff to more closely monitor her condition, as well as provide more psychological stimulation for Pepper.

Pepper’s medical condition initially presented as a slight limp that became part of her typical gait, as well as swelling at her DDF tendon sheath. This swelling typically coincided with increased lameness. As her condition worsened, the toe turned out to a 90 degree angle, and she walked broken back on the



elevated toe joint with a more severe limp. She was managed with non-steroidal anti-inflammatory drugs (NSAIDs) for several years, the dosage of which was altered as needed based on her mobility. Since she was on long-term NSAIDs, veterinary staff required bi-annual blood collection to monitor her hepatic and renal function. To accomplish this, while making it a more positive experience for Pepper, operant conditioning-based training was initiated.



Pepper had a generally even temperament, was often managed under free contact practices and enjoyed tactile from keepers. Keepers used this to their benefit to begin voluntary blood draw training with Pepper. Pepper was housed with I.I conspecifics for the majority of her time at Dallas, and had to be separated from them for training purposes. Keepers were able to station her in the narrow gateway in the ostrich exhibit shift area, to more safely access her. Since the other ostrich could stand on the other side of the gate, she often seemed more comfortable and focused in training sessions with them present. Pepper's rewards were typically romaine lettuce, spinach, or a variety of browse types. Sessions began with one trainer outside the holding yard offering Pepper's rewards, and a second trainer in the yard with Pepper. This trainer

started with tactile work on Pepper's right side, then worked lifting the wing. After that keepers used alcohol and a cannula to mimic the blood draw. An extra keeper was included in the yard at that time to mimic the veterinary technician, who would be doing the actual blood draw. Pepper was very comfortable with all of this, and voluntary blood draws were collected in full contact, as needed. This training was crucial for weekly blood collection to monitor her when she had elevated white blood cell counts.

In line with this training success, keepers began voluntary injection training for Pepper's annual vaccinations in her right thigh area. The same process was used, starting with tactile desensitization, then the use of alcohol wipes and a cannula, followed by successful voluntary injections. Both these behaviors allowed for Pepper to receive medical treatment and tests that were needed, without having to restrain her, which could be very stressful, especially with her mobility issues.

As Pepper's condition worsened, keepers were able to use tactile training with Pepper to allow application of topical medications to her deformed foot, as well as monitor more closely any other physical injuries she may have received to her legs and feet. Tactiles were also used to monitor her body condition and ensure she did not become too over-conditioned, thereby making her mobility even more difficult.

To more closely monitor the condition of Pepper's foot, veterinary staff requested voluntary radiograph collection. Staff made alterations to Pepper's station area in the exhibit shift gateway to allow an access window for the radiograph machine, as well as a radiograph plate box that Pepper would be able to station on for radiographs. The radiograph plate could be slid into this box for collection of images from below Pepper's foot. Pepper picked up on this quickly and grew comfortable with the access window being opened while she was stationed on the radiograph plate box. When actual radiographs were attempted, keepers found she was fearful of the radiograph computer nearby, as well as the





lead aprons and extra staff present. Pepper's trainers went back a few steps to reintroduce each of these items slowly and she grew comfortable with them. She stationed well for actual radiograph collection, but unfortunately did end up having to be restrained in that location so that keepers could manipulate her foot and achieve the necessary angles for the radiographs; however her training helped prepare her for that scenario making it much less stressful than it would have been otherwise. These radiographs allowed veterinary staff to better assess the bony changes to her deformed toe and monitor the progression more closely.



Although Pepper's prognosis was not promising, and her mobility did slowly decline over time, the training done allowed for a greatly improved quality of life. It saved her from countless stressful restraints for medical procedures, and allowed keeper and veterinary staff to be able to more frequently monitor and assess her condition. By being so diligent in monitoring her mobility, staff were able to quickly make changes to assist her by increasing/decreasing medication dosage or decreasing her activity. With all this, she was able to maintain a regular routine going on exhibit with her conspecifics and other hoofstock for several years, as well as receiving additional psychological stimulation from her training sessions.



Human Hunting Is Driving the World's Biggest Animals Toward Extinction

A new analysis found that 70 percent of Earth's largest creatures are decreasing in number, while 59 percent are at risk of extinction

Read more: <https://www.smithsonianmag.com/smart-news/human-hunting-worlds-biggest-animals-megafauna-extinction-180971437/#7trLOdmPEIHMfqxV.99>

Mission: repopulating the Tunisian aridlands with the endemic North African ostrich

Dr. Marie Petretto, Dr. Philip Riordan



Over the last decade, Tunisia has been making considerable effort to repopulate their aridlands with the once endemic North African ostrich *Struthio camelus camelus*. This giant flightless bird disappeared by the end of the 19th Century due to overexploitation with the species last recorded in 1887. Reintroductions are now underway through a partnership between Tunisia's Forestry Directorate (DGF, Ministry of Agriculture) and Marwell Wildlife (www.marwell.org.uk/conservation).



These territorial ratites were once abundant in much of the Saharan region but despite its previously extensive range, it is now thought to be restricted to just a few fragmented populations in Cameroon, Chad and Central African Republic. Since 2016, Tunisia is committed to catalyze a regional effort to deliver toward its return in their natural habitat as part of the International Sahelo-Saharan Conservation initiatives.

Outcomes & outputs of the Tunisian reintroduction program

With nearly 40 years of commitment, Tunisia is one of the lead countries in Sahelo-Saharan Conservation. Its two-fold strategy is to restore functioning ecosystems where wildlife can recover and to protect sustainable populations of species that are today threatened at global scale. Thus, dedicated protected areas were established and efforts are now under way to facilitate coexistence between people and wildlife, with habitat restoration actions to ensure that the reintroduced animals will be “re-wilded” as part of large-scale ecosystem recovery. The expertise developed in Tunisia is also being shared to benefit other range countries that have the shared goal to see the return of emblematic species in their former ranges in the unique biocultural region that is North Africa.

A combination of tools and approaches are necessary for such an ambitious plan. Detailed studies of individuals are needed to assess their abilities to express the natural behaviors required to survive and breed. Long-term population monitoring protocols are being established and advanced genetics analyses are being used to better document the species' requirements and assist wildlife managers. In 2018, Marwell Wildlife developed an unprecedented behavioral study on the parental behavior of North African ostrich under different forms of management. The results are still being analyzed as part of a MRes project with Southampton University (UK) but we anticipate it will greatly help to identify some of the drivers of quick and successful population settlement where various threats to survival exist.

With the still relatively small group sizes in each protected area, the current population continues to face significant challenges. Monitoring and management are becoming more standardized across different teams and the demographic and behavioral trends (find out more details in our last technical report https://www.marwell.org.uk/media/other/ostrich_tunisia_report_may2018.pdf) show that the population is increasing: by January 2019, there were 64 adult ostriches, 22 juveniles (6 months old) and the new nesting season is to come. After the natural challenges faced in 2017 (predation, drought and thankfully few bacterial infections), we are happy to report a significant number of semi-wild birds were able to reach maturity and we are expecting a better rate in the next generations. We hope that the hatching success of this year will mitigate previous losses.

We are optimistic: the reintroduced animals are demonstrating ability to adapt and respond to the inherent variability that characterizes these harsh arid lands. Exposure to risks beyond our control (predation, diseases, resource shortages, or anthropogenic threats) remains a concern, but the DGF and its partners are continuously refining their actions to deliver toward the conservation of this critically endangered bird.

Repopulating & re-wilding



The reintroduction success can be evaluated by the creation of a sustainable meta-population which is resilient to changes in their environment: therefore, one of the crucial steps is the selection of founders with as much genetic diversity as possible in order to reduce the risk of inbreeding deleterious effects. Consequently, the Tunisian population has been comprised of birds imported from Morocco and Saudi Arabia with a goal of maximizing the genetic diversity of the national population. Preliminary genetic work (sent to the Smithsonian Conservation Biology Institute, Front Royal, Virginia, U.S.A.) has indeed confirmed that the birds in the two breeding centers originated from two distinct source

populations: from Chad and Sudan respectively. Tunisia thus retains one of the most diverse populations known today.

With still limited numbers of breeders and the natural low chick survival rate, achieving the goal of repopulation will be a relatively slow process, but experience tells us that cutting corners is not the most efficient strategy at the end. As with many birds, the North African ostrich is not an easy species to re-wild and captive-bred individuals show a lower ability to adapt to the constraints of natural habitat than those born and raised with free-ranging parents, particularly regarding anti-predator, foraging and nesting behaviors. They are also large and powerful territorial animals and, with reduced fear of humans, can become dangerous for the local communities, potentially leading to counter-productive human-wildlife conflict.

The ongoing reintroductions in Dghoumes and SidiToui National Parks (NP) are so far successful pilot-projects, increasing our knowledge for the species' reintroduction in many ways. Further translocation operations are expected in early 2019, specifically to Bou Hedma NP and Oued Dekouk National Reserve (NR), doubling the number of areas where the desert birds cohabit with the emblematic scimitar-horned oryx (*O. damah*). With an increasing number of adult birds, more releases are planned, with the ultimate goal of releasing them in the Great Erg during the next decade.



Ostrich reintroduction in Dghoumes NP (Tunisia) is part of the long-term strategy of aridland ecosystem restoration; emblematic sahelo-saharan species are progressively returned to their natural habitat.

Sourcing animals & promoting local expertise

To achieve the national strategy, Orbata National Reserve is a key-site within the species national management plan. Located in the close surrounding of the university town of Gafsa, this former royal zoological park was converted into an ostrich and gazelles (*G. dorcas*) breeding center in the early 1970s. Though they receive daily food supplementation and are protected from predators, the flock is managed in an extended farming system where they can graze and determine their own social structures. The reserve has thus the remit of producing and securing a source population, not only to repopulate Tunisia, but other countries with an interest in the species' recovery.

Marwell Wildlife's 2019 fundraising campaign will target specific key-deliverables regarding the infrastructure of this reserve that are inevitably becoming obsolete and unsuitable for the best standards of wildlife reintroduction. Training and more expertise need to be brought in the local teams. Specifically, we are seeking \$20,000 to re-design and/or undertake basic repairs to animal enclosures and provide isolation areas for animal management. Facilities for veterinary procedures are urgently needed, which we estimate to cost \$15,000 to reach a minimum standard. Continuing recruitment and training of personnel, especially from local communities, requires constant investment, for which we will be seeking \$7,000 in 2019. Your generous financial or in-kind support for this work will be greatly appreciated.

Raising awareness & engaging

While the species (*Struthio camelus*) is categorized globally as of 'Least Concern' in the IUCN Red Data List, this fails to recognize that *the North African ostrich S. c. camelus* is on the verge of extinction in the wild. Furthermore, CITES lists ostriches from North Africa in Appendix I. As such, conservation organizations working in the region, including Sahara Conservation Fund (SCF), have identified the urgent conservation priorities for North African ostrich as:

- 1) Identification and stringent protection of existing wild populations;
- 2) Captive-breeding of *S. c. camelus*;
- 3) Reintroduction into secure protected areas.

Echoing our commitment to the Scimitar-horned Oryx reintroduction in Tunisia and acknowledging the urgency of regional recommendations, Marwell Wildlife hosted the first SCF meeting for the North African Ostrich Conservation in November 2016. It was attended by several international partners, including Smithsonian's National Zoo, Saint Louis Zoo, San Diego Zoo Global and Zoo Hannover. Attendees agreed to collaborate on a Regional Recovery Action Plan, for which the projects in Niger and Tunisia will be instrumental. This initiated a useful platform for knowledge and experience sharing. As a direct outcome of this wider effort, Marwell Wildlife brought the experience and empirical knowledge from Tunisia to Niger in 2017, where SCF has been supporting a captive breeding program for many years. A second meeting was held in Bussy-St-George (France) in May 2018, with a gathering of representatives from most of the range countries, including Morocco, Sudan, Senegal, Niger and Tunisia. Following on that event, teams from Jordan and Israel have also expressed their interest in the cause. The intensive work in Tunisia continues, with the goal of having sustainable populations in each of the targeted protected areas, and possibly even beyond, by Marwell Wildlife's 50th Anniversary in 2022.

Hatches, Matches, And Dispatches: North African Ostrich Recovery



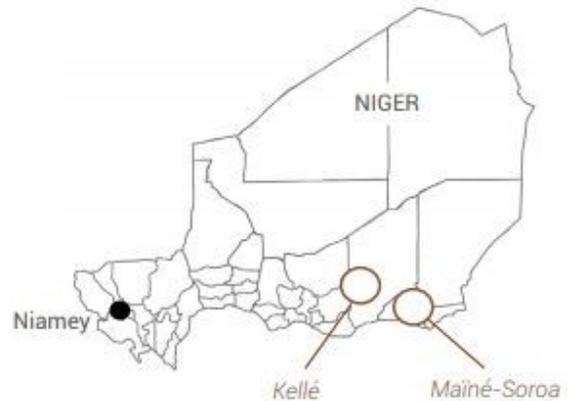
Thomas Rabeil, Conservation Biologist, SCF Senior Program Officer



Over the past decade, SCF and its partners have significantly improved the infrastructure, the food, the captive-breeding, the handling and the husbandry of Niger’s remaining North African ostriches, paving the way for the program’s long-term goal of reintroducing this magnificent bird back into the wild.

Major progress has been achieved lately towards our objective of returning North African ostriches back into the wild in Niger. Our captive population of ostrich in Kellé is growing, with the birth of three baby ostriches this past fall. For now, the chicks are still in the enclosure with their parents, under the close watch of the keepers and Maimounatou, our Nigerien site manager. In November, births were also recorded at the neighboring site of Mainé, where six eggs hatched from a clutch of nine.

To keep building and diversifying the ostrich population held at Kellé, two chicks were moved from Mainé when they were about one week old. Translocating them at this early stage allows the reduction of the transportation risks and enables close monitoring by staff in Kellé. With no protection from their parents, the chicks are housed in a closed facility before being integrated with the main group. As the resident adult ostriches are already taking care of their own chicks, they are expected to accept the new arrivals without fuss.



Translocating them at this early stage allows the reduction of the transportation risks and enables close monitoring by staff in Kellé. With no protection from their parents, the chicks are housed in a closed facility before being integrated with the main group. As the resident adult ostriches are already taking care of their own chicks, they are expected to accept the new arrivals without fuss. Juvenile birds transferred from a third site at Diffa earlier in the year are also in good shape and seem to adapted well to their new environment. One of the young birds has already been identified as a male. Unfortunately, one of the chicks died in late September of as yet unknown causes.

Left: SCF Ostrich Site Manager Maimounatou Ibrahim holds a chick

To improve the security and protection of the Kellé site, a perimeter firebreak is under construction, as well as the setting of a system to keep the jackals away from the pens. This wily and common predator is one of the main threats to young ostriches. After a long sea journey from California, we are really pleased to announce the arrival on site in Kellé of the five custom-built containers destined to serve as a solar-powered ostrich egg incubation and hatchery unit. In February, three experts from the States will come to set up the solar array and associated circuitry and hardware. They will also train project staff in facility use and maintenance. Along with the containers, incubator and hatchery we will also install a pump to bring water from a nearby well and a parabolic antenna for communications and Internet reception.



These five custom-built and equipped containers were made possible in large part by support from the Wildlife Conservation Network and Stephen Gold, a San Francisco-based solar energy fan who wants to help with conservation. He found that many conservationists were using either diesel generators or antiquated solar systems that were inadequate for their needs.

These two chicks have been brought to SCF's captive-breeding center from Mainé - a neighbouring breeding center - to improve the genetic diversity of the ostrich population on site. A very important success criteria for future reintroduced birds.



Over the years, SCF has gained unique knowledge and experience of the Sahel and Sahara, allowing it to engage in successful partnerships and network with the stakeholders critical to the success of species conservation and especially reintroductions. In Chad, SCF is promoting a pragmatic, integrated approach with all land-users to ensure the long-term success of the oryx reintroduction project. The development of effective natural resource-sharing models is crucial to satisfy the interests of both wildlife and humans.

Learn more at www.saharacconservation.org



Catching up with Cassowary



World Cassowary Day!

By Larkin Johansen, Senior Bird Keeper

World Cassowary Day, an annual event originating in Australia to celebrate cassowaries and Aboriginal culture, has really begun to take root and gain international interest. This year, AZA facilities were encouraged to join in on the festivities to champion ALL ratites on September 26th, 2018 and the results were spectacular!

Jacksonville Zoo and Gardens, along with Brevard Zoo and many others, spent the day setting up educational booths with fun activities to spread awareness to our guests as to why cassowaries are globally important. We shared with visitors how our individual and collective conservation efforts protect cassowaries, their wild habitats, and helped guests learn how they can personally get involved to save this wonderful keystone species.



Photo by Janel Jankowski

The Southern Cassowary, *Casuarus casuaris*, is found on the Island of New Guinea and in Australia in dense, tropical rainforests that provide a supply of fruit all year round. In Australia, these large flightless birds live in the oldest continuously surviving rainforests of the World Heritage listed Wet Tropics rainforests and surrounding areas. Not only are they needed to spread the seeds of unique rainforest trees, but by protecting their home we are also protecting the homes of many other unique and endangered animals, including tree kangaroos and spectacled flying foxes. This past year marked the 30-year anniversary of the World Heritage listing of the Wet Tropics, which has been fundamental in halting the decline of cassowaries. However, like many other flora and fauna in this biodiversity hotspot, the cassowary remains endangered in Australia with an estimated 4000 birds living in the Wet Tropics bioregion. Habitat loss, car strikes, and dog attacks continue to threaten the survival of these ecologically important birds.



With the world going digital, AZA helped make the cassowary famous with hash tags like **#LoveCassowaries**, **#WorldCassowaryDay**, and **#SavetheCassowary**. Many people updated their social media profile pictures with cassowary-themed frames, joined online groups to share or read stories about cassowaries, and learned about events taking place locally that they could attend.



Wren McLean of Rainforest Trust Australia presented her research at Jacksonville Zoo and Gardens.

“World Cassowary Day is going digital this year,”
 “Cassowaries are well-known to people who live in the Wet Tropics and Cape York, or visitors to the region, but they remain unknown to those who aren’t familiar with this part of the world. To better protect cassowaries and their world-heritage home, we need the whole world to know about them.”

- Bess Murphy,
 Cairns and Far North
 Environment Centre



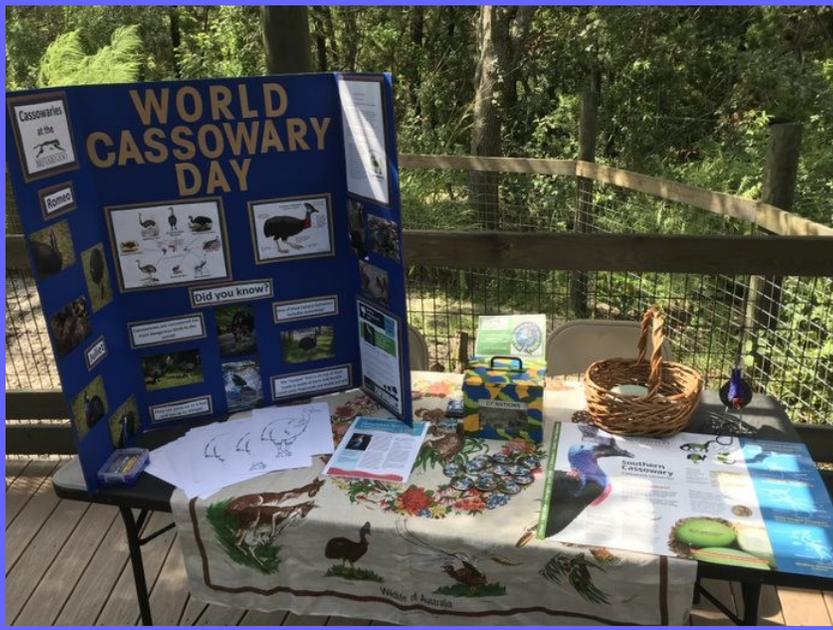
This has been a big year for the cassowary, especially at Jacksonville Zoo and Gardens with the upcoming renewal of our three-year commitment to “Expanding the Daintree Rainforest,” a conservation project through Rainforest Trust Australia to purchase back parcels of rainforest intended for development to re-connect fragmented rainforest. We also had the privilege of hosting Wren McLean, Australasia Conservation Officer for Rainforest Trust Australia, who spoke to us about her research on cassowaries in northern Queensland, Australia and her subsequent paper: *Visual lures increase camera-trap detection of the southern cassowary (Casuarius casuarius johnsonii)*.

Wren has identified that using colored visual lures to mimic large red and blue fruits is an effective method in detecting cassowaries at a site. She was able to detect over twice as many birds on camera traps using lures than those without lures, had shorter detection latency, experienced longer capture duration, increased likelihood that a cassowary would stop in front of the camera, and achieved a 95% probability of detecting cassowaries in 12 trap days compared to the 28 days for camera traps without lures. Her findings suggest, “lures represent a new and effective survey technique for the cassowary. Such an extensive collection of quality images is efficacious for identifying individuals, understanding behavioral interactions, age demographics and site usage as well as providing valuable data for abundance estimates of this cryptic species.” Additionally, her research supports the idea that this new approach is cost and time effective, gives flexibility in that data collection can be done remotely without the need to re-bait traps, and can be an important compliment to fecal DNA surveys for cassowaries.



A wild cassowary investigating fruit lures from Wren McLean's study

Wren’s research, Rainforest Trust Australia, and AZA’s collective conservation efforts between data collection studies, raising funds for *in-situ* conservation projects, and generating local public awareness, have greatly increased our knowledge of this secretive species and made huge impacts on protecting the habitat of wild cassowary populations. We now know there are more cassowaries in the wild than previously believed and everyone who has come together and worked hard to Save the Cassowary is a contributor to this.



Above: Brevard Zoo's World Cassowary Day Booth



“We had SO many kids come up to the booth and learn about cassowaries. They loved our unique cassowary stamps! We also featured training and enrichment demos with our pair, Romeo and Juliet.”

- Michelle Ferguson, Area Supervisor, Brevard Zoo



Above: Staff at the Brevard Zoo gearing up for their World Cassowary Day celebration

Left: Guests visiting the booth



Use of Technology in Detection and Monitoring of Southern Cassowaries

Carrie Brooks, TAG Education Advisor

Working at the Birmingham Zoo, I have been fortunate to receive a 2019 Passion into Conservation Action (PiCA) grant to travel to Australia in March to aid in cassowary conservation research with Dr. Ashley Tews, a Senior Research Scientist at the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Tony O'Malley at Terrain. As you know, vehicle strikes are the leading cause of mortality. New technology involving thermal monitors and color vision cameras may be able to help determine where cassowaries are most commonly found on roadways, aiding in better warning drivers and potentially reducing interactions. This exciting new technology will be applied in known cassowary hotspots in the Cassowary Coast region determined through the Zoo & Aquarium Association's Significant Cassowary Incident Mapping (SCIM). In addition to cassowaries this system may also become applicable to the monitoring and conservation of other species in the future. Check out the Ratite TAG Facebook page in March for more details.

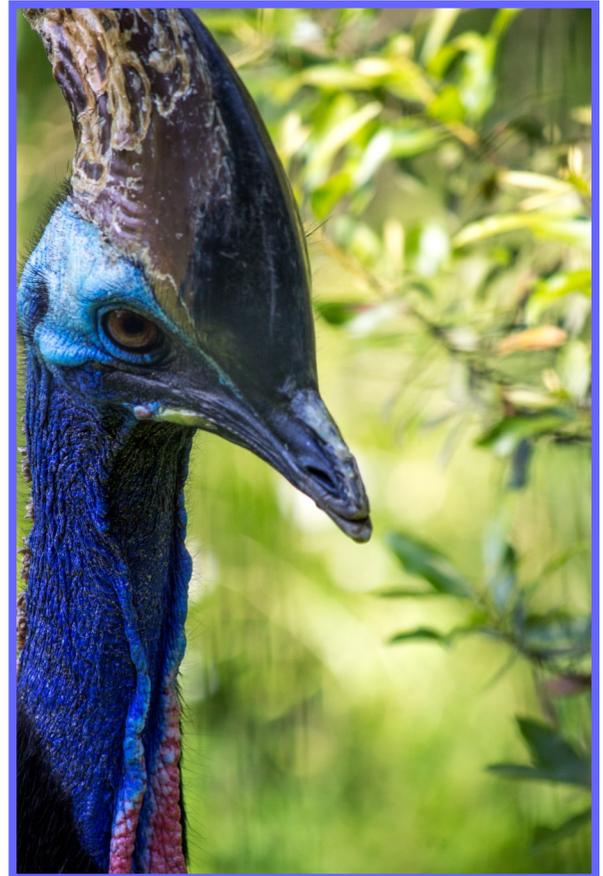


Photo courtesy of Scott Kayser

More about PiCA...



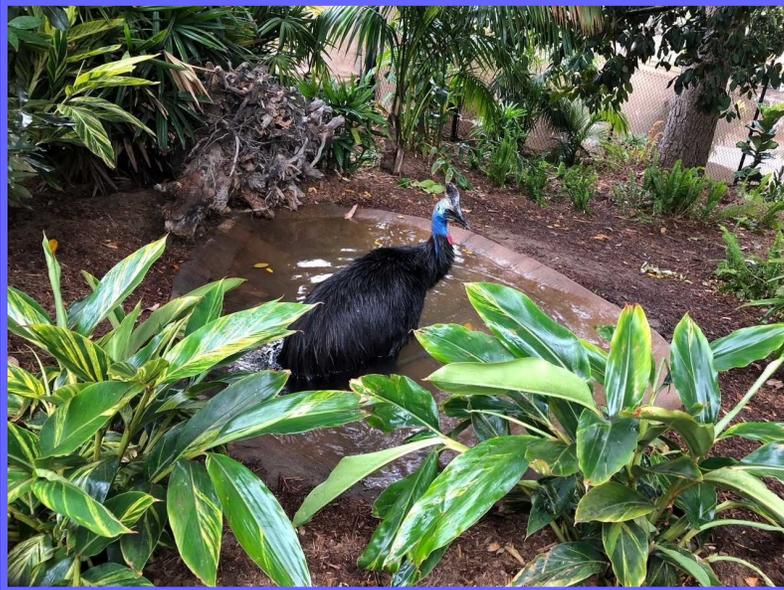
The Birmingham Zoo's Passion into Conservation Action program, also known as PiCA, allows employees to submit conservation research projects that the zoo funds. These projects support the zoo's conservation initiatives and give animal care professionals the opportunity to work in the field and gain valuable hands-on experience. Applications are taken annually and individuals who are awarded grants receive funding to carry out their projects.

See past recipients here: <https://www.birminghamzoo.com/conservation/passion-into-conservation-action-pica-program/>

WALKABOUT AUSTRALIA

AT THE SAN DIEGO ZOO SAFARI PARK

Andrew Stehly, Associate Curator of Birds
Kristina Heston, Animal Care Supervisor, Bird Dept



On Memorial Day weekend 2018, San Diego Zoo Safari Park opened our newest exhibit, Walkabout Australia. This amazing experience showcases many of Australia's unique species such as Grey kangaroos, Red-necked wallabies, Matschie's tree-kangaroos, Magpie geese, Radjah's shelducks, Freckled ducks, Australian Wood ducks, and Spotted whistling ducks. However, in our opinion, the highlights of the experience are the Southern cassowaries and their exhibit.

This is the first time in the Park's history that Southern Cassowary have been exhibited. Guests can view the cassowary from a large deck overlooking the enclosures.

Large glass panels give guests an up close and personal view of the cassowary who are often hanging out in that part of the yard. On most days, volunteers are present to talk to guests and answer questions about cassowary.

The exhibit is divided into two separate yards. Multiple slider doors along the shared wall provide us the option of giving birds access to both yards or keeping them separate, depending on our needs. Both yards are heavily planted with many plant species they would find in their native habitat and we were able to incorporate several large established trees in each enclosure. To keep the cassowaries cool and comfortable, both yards have naturalistic pools and misters in the trees.





The cassowary barn consists of three 10 x 10' bedrooms and a push alley with two specially designed push panels. With three bedrooms, connecting alleyways and push panels, keepers have the ability to safely move birds between rooms and yards. Currently 2 crates are set up in the push alleyways for training purposes. All of the doors inside the barn are operated by pulley systems located inside the keeper service area. The keeper service area also houses a state of the art camera system giving staff the ability to view the entire exhibit.

We currently have 2 young adult sibling males on exhibit, Maka and Ponto. They are housed in separate yards but are rotated yard to yard for enrichment and training. Both have adjusted very well to their new homes. Keepers are working with them and are in the process of training them for behind the scenes tours, shifting, weights, vaccinations, and other medical procedures. So far, Maka and Ponto have proven to be excellent students and we are pleased with their progress. In the future, we plan on pairing up both males with young females we currently have off exhibit.



**SAN DIEGO ZOO
SAFARI
PARK**

Hand-rearing Cassowary Chicks at Pinola Conservancy

Jessica Cockrell, RVT



Pinola Conservancy has had the great opportunity to rear three different cassowary chicks; 1 in 2016 and 2 in 2017. Cassowary chicks are extremely personable and are very rewarding to hand-rear, though their care is intensive and leaves little room for error.

Be prepared for hours of dedication as they would naturally get from their spectacular sires in the wild. The following discusses the success at the Pinola Conservancy and lessons learned from raising cassowary chicks.

We pulled the first of our clutches immediately at day one due to severe thunderstorms with significant rainfall. The second chick was allowed to stay with the sire throughout the day as he adequately brooded and kept it warm. When pulled, they were set up in a brooder with heat, UV, and hourly encouragements at standing and eating. Not much interaction occurs past those gentle stimulations. The chick is not expected to eat or do much more than stand and have a few steps by the end of the day. At day two, the cassowaries begin to have hourly time for sunshine outside, encouragement to walk, and teaching them how to feed themselves. Day three and onward they are taken on long walks at least every two hours to encourage plenty of exercise. Each walk ends in a ten-minute encouragement to feed their growing bodies.

EXERCISE AND SUBSTRATE:

Leg splaying is a certainty for those who do not get enough exercise, so intervention should be looked into if by the end of the second day the cassowary is not out and about walking well. They will progressively walk and run further each time, but a chick that is not walking is a chick that is not well.

Pinola Conservancy is happy to share complete protocols and past histories via email.

An example of highlights raising our early June 2017 hatch, which include daily weights as they are easily scale trained:

- Hatch date: June 9, 2017 at 480g. Showing some interest as food dropped/progressively walking better throughout the day.
- June 10th, 2017. 458.5g. Weight drop expected and within normal range. Picks food up in bill; can't swallow/eat it yet; walks very well now.
- June 11th, 2017. 433.9g. Ate blueberries yesterday evening.
- June 12th, 2017. 410.4g. Begin weighing the food.
- June 13th, 2017. 410g. Ate a bit of overnight food; ate ratite starter on own yesterday.
- June 15th, 2017. 440g. And from here, the weight increase steadily, with slow gains of 10g to large leaps of 50g every day, so that by the 26th, the cassowary had hit 900g.



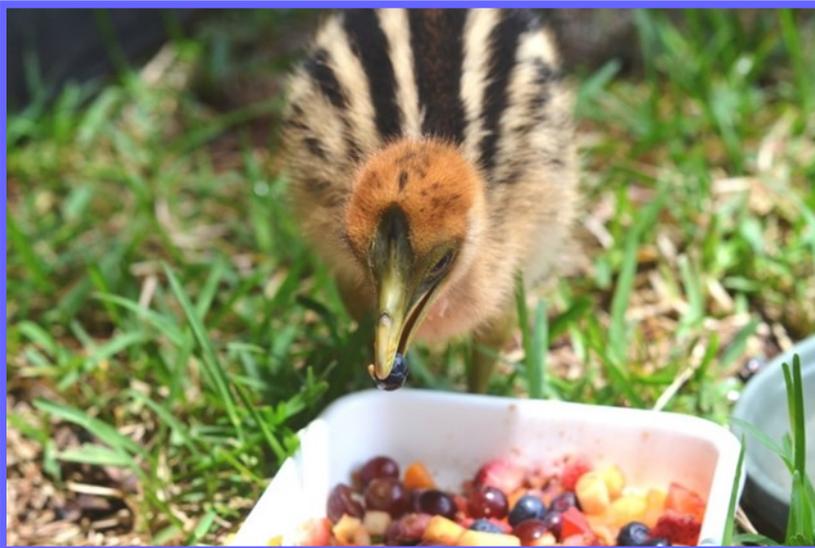
For the first week of life, we keep the chicks in indoor brooders with a 175-watt Halogen Reflector Bulb held about 12 inches the first night above the brooder, and then about 15 inches the remaining nights, along with UV lighting. NOMAD matting is placed to prevent toe curling, and leg splaying. Rolled towels act as bumpers along the edges of the brooders to avoid their bills getting caught or scraped anywhere, and a comfort plush. However, after that, they are kept outdoors in corrals outdoors on the lawn with grass with plenty of room to roam about with interaction every hour. We take them on 10-15 minute walk around the property roughly 100 yards on average. As they grow older, we increase the lengths of the walks and then place them back in the corral to await the next walk. Walks take place on dirt roads and grassy lawns.

With the second chick, we provided young domestic chickens for socialization in the times we weren't there. However, the chickens were frightened of the cassowary, and the cassowary wanted nothing to do with them, so they were removed. Once the cassowaries were feeding themselves reliably and too large to fit within corrals any longer, they were moved into a larger shared enclosure. This enclosure had a gentle slope into the pond to prevent any damage to the feet allow them to have access to a large swimming area. They shared the pond with junglefowl, pygmy geese, and various passerines and doves with no aggression between any of them. Our enclosure is roughly 45'L x 30'w x 18'H.

NUTRITION/ DIET:

Our veterinarian, who is the current SSP veterinary advisor for cassowaries and who has prepared the AZA veterinary section for the species manual (currently under review), prepared a full nutrition plan for our growing cassowary chicks. The diet plan was created to account for nutritional growth requirements with changes made based on weight and consumption response each week.

Their diets (view chart below) remain the same from day one and is weighed out daily and include apples, strawberries, papaya, grapes, blueberries and a blend of two proteins chosen from the following: Mazuri insectivore mix, egg, pinky mice, or high-protein dog food. We always had the most success mixing insectivore and egg as it would be inadvertently swallowed with other fruits. All diets were sprinkled with calcium and vionate, with ad lib crickets, and fresh adult feces mixed into the feed during the first week of life. Ratite Starter is always available ad lib in a separate dish, as it tends to get soggy almost immediately when touching the fruits and then the cassowary was less likely to consume anything.



While not included in their main diet, the cassowaries thrived on raspberries as a means to encourage eating the first couple of weeks of life before they stopped enjoying them. The diet is premade in the morning with half fed in the morning and half fed in the evening as they tend to stomp around in it, mushing it up pretty well.

WEIGHT GAIN:

Each of our chicks weighed about 465 grams at hatch and lost 10-20 percent of weight by the fourth day. This is a common feature of ratites and other precocial birds that resorb their yolk sac within the first week of life.

CASSOWARY DIET BASED ON GROWTH

BODY WEIGHT (g)	KCAL/DAY	FRUIT (g)					PROTEIN (g) - CHOOSE TWO ITEMS				RATITE ST AD LIB
		APPLE	STRAWB.	PAPAYA	GRAPE	BLUEBERRY	INSECTIVORI	EGG	PINKY	DOG KIBB	
300	119	36	59	44	27	33	4	8	7	3	48
350	133	41	67	50	31	37	4	9	8	3	54
400	147	45	74	55	34	41	5	9	9	4	60
450	161	49	80	60	37	45	5	10	10	4	65
500	174	54	87	65	40	49	6	11	11	4	71
550	187	57	93	70	43	52	6	12	11	5	76
600	199	61	100	74	46	56	6	13	12	5	81
650	212	65	106	79	49	59	7	14	13	5	86
700	224	69	112	83	52	63	7	14	14	5	91
750	236	73	118	88	55	66	8	15	14	6	96
800	247	76	124	92	57	69	8	16	15	6	101
850	259	80	129	96	60	73	8	17	16	6	105
900	270	83	135	101	63	76	9	17	17	7	110
950	281	87	141	105	65	79	9	18	17	7	115
1000	293	90	146	109	68	82	9	19	18	7	119
1100	314	97	157	117	73	88	10	20	19	8	128
1200	335	103	168	125	78	94	11	22	21	8	137
1300	356	110	178	133	83	100	11	23	22	9	145
1400	376	116	188	140	87	106	12	24	23	9	153
1500	396	122	198	148	92	111	13	26	24	10	161
1600	416	128	208	155	96	117	13	27	26	10	169
1700	435	134	218	162	101	122	14	28	27	11	177
1800	455	140	227	169	105	128	15	29	28	11	185
1900	473	146	237	176	110	133	15	31	29	11	193
2000	492	151	246	183	114	138	16	32	30	12	200

- ~ SPRINKLE CALCIUM & VIONATE ON ALL
- ~ FEED 1/2 TWICE A DAY
- ~ FEED INSECTS AD LIB
- ~ ADD FRESH ADULT FECES TO ENCLOSURE

NOTE: This is a minimum recommended volume. Should consume at least 2/3 of diet daily.

Date	Weight (g)	Notes
6/9/2017	480	Hatch
6/10/2017	458.5	
6/11/2017	433.9	
6/12/2017	410.4	
6/13/2017	400	
6/14/2017	410	
6/15/2017	440	
6/16/2017	450	
6/17/2017	500	
6/18/2017	540	

Date	Weight (g)	Notes
10/30/2017	450g	Hatch
10/31/2017	438	
11/1/2017	420	
11/2/2017	417	
11/3/2017	398	
11/4/2017	442	
11/5/2017	447	
11/6/2017	452	
11/7/2017	472	



VETERINARY CARE:

Shreveport, Louisiana is prone to high levels of mosquitos especially during the months of May-November. Infectious diseases carried by mosquitos are not uncommon in the area; thus, Pinola institutes a comprehensive preventative medical program with a focus on infectious diseases endemic to the region. Because cassowaries are known to succumb to encephalitis viruses, we have implemented vaccination guidelines that were shared previously to the RATITE TAG by the SSP veterinary advisor. This includes: administering 5 (0.25mL) boosters of Merck's Encevac T + WNV with Havlogen subcutaneously (SQ) every two weeks before adding to adult vaccination schedule (which is 1.0mL of Encevac T + WNV every February and September). The Enevac T vaccine includes West Nile Virus Vaccines, Eastern & Western, killed virus, killed flavivirus chimera, & tetanus toxoid.

Starting at around two to three months of age, the cassowaries begin to get anxious within their corrals whenever their keeper puts them back after their walk. We have had a couple of superficial self-trauma incidents due to pacing and cutting their bills or casques while trying to break out of the corral and get back with their keeper. When this behavior began to occur, they were placed in a larger mixed species aviary to occupy their time along with continued hourly keeper interaction within the aviary.

Each chick reliably gained some minor respiratory infection at approximately 30 days of age. Signalment included clicking sounds and observation of open-mouthed breathing. Each chick was placed on Clavamox orally twice a day for five days, and there was no recurrence for either chick. Resolution occurred between 3 -4 days of treatment, and each time occurred after rainy days. The cassowaries proved to love puddles and likely picked something up from their splashing.

BEHAVIOR AND OPERANT CONDITIONING

A formal operant conditioning plan was not initiated and instead the cassowary chicks were offered care through passive acclimation to humans to allow for frequent handling assessments, translocations and exercise. The cassowaries adore water and spend hours playing in their gradually increasing sized tubs we provide for them. When puddles are available, walks become an even longer experience as they preferred to spend as much time wallowing and splashing as they can.

The cassowaries faithfully imprint to their lead handler and tend to stop eating when their primary caregiver is not there or if they are not given steady attention, along with enclosure moves. A brief period of adjustment and weight drop off should be expected in both of these scenarios. With enclosure moves, the lead keeper should dedicate some extra time each day to encourage feeding and offer additional social interactions for them to adjust.



Daily handling and conditioning should occur while the cassowaries are still young to acclimate them to future restraints and injections. Gentle prodding on legs where injections and blood draws would be part of this routine.

From early weeks, towels are used as a form of enrichment and ‘play,’ tossing them over the cassowaries gently and getting them used to the feeling. During handling times, towels are draped or wrapped around them as well, so they are more comfortable for restraint during medications and vaccinations.

Each bird is a little different with their preferences, and personalities. Our first cassowary loved crickets and would go crazy for them running around, while our next two wanted nothing to do with them. All of them favored blueberries for scale and crate training and would devour those first in the feed dish.

Scale training occurs as soon as they are reliably walking. They are prompted with blueberries to step onto the scale. They train very quickly as we have a large a large ridged scale they can walk onto without fear of slipping.



FINAL NOTES:

It is essential to not misunderstand the danger that these birds present, even as young as three months of age. During this stage, where their talons are now large enough to warrant caution, the cassowaries would often kick at unfamiliar keeper staff presenting their diets. Keepers should always be cautious working with these creatures. They will eventually practice bluffs and threats towards their handlers and grow skittish or aggressive very quickly if not given daily interaction.

Lastly, we had a plan in place to hand rear these birds should such a situation arise. Our first clutch had two chicks hatch during a storm where the sire had kicked one away during the storm. Though the sire was brooding the other chick, we worried about leaving our very first clutch. We pulled them both, though the one the sire neglected did not survive. The poor doer survived 10 days and failed to absorb the yolk sac. Another reason we hand rear is due to their aviary being open topped and in a wooded area which leaves vulnerable chicks open to aerial predation. In our opinion, these risks do not outweigh the reward for this valuable species. In the future, once we fulfill all the requests of the Species Survival Program, we may elect for the sire to rear the chicks himself. Our pair of cassowaries are unique in the fact that they share an enclosure year round with no aggression. We would also need

to be wary of how shared enclosure space with both the sire and dam would affect sire rearing.

Raising the cassowaries has been by far my favorite part of this engaging job. Having their large eyes watch me for another blueberry while standing at attention on a scale every morning puts a smile on my face. Rushing down the dirt path with them in stride beside me all day long allows for ample time to fall in love with and appreciate them as a species. They demand constant attention, but with their adorable features and quirky personalities, it's not hard to give them hours of care a day.





Running with Rheas



Bird Box

Carolyn Atherton, Curator of Birds



We have 3 female greater rheas that have lived together for many years. Recently, one of the girls started poking her cage mates in the eyes, causing irritation and occasional injuries. At first, we would separate the aggressor rhea of in a holding pen for several days while the injured rhea would be treated for her injuries. After the injuries had healed, we would let the rheas be out on exhibit together again. Everything might be fine for a few weeks, when suddenly, the one rhea would start attacking eyes again. This cycle continued for many months, and as I was unable to find rhea-sized aviator goggles to protect their eyes, it was decided that something must be done with the offender.

After a little searching, we were pleased to discover that a zoo about an hour and a half away wanted another rhea. Perfect! Nothing easier than transporting an animal to the nearest zoo, right?! We got an appropriately sized shipping crate out and got it prepped to hold a rhea. I carefully padded the ceiling of the box, and the sides. I didn't want the rhea to be injured during transport. As the shipping day approached, we made plans with the vet team. We decided to mildly sedate the bird to make loading and the shipping time a little more pleasant.

The big moving day arrived. I had the crate prepped and the vehicle ready to go. We medicated the rhea and waited for her to get loopy. After a good long while, she still didn't appear loopy, but she was not running around crazy. We decided to load her up.

I'm going to stop here for a moment to tell you how much I hate handling rheas. Give me an ostrich or an emu any day, and I will happily jump on and wrestle them down. I've even tackled a cassowary once or twice in my life. All of those are fine with me, but rheas are... difficult. Rheas are just small enough that I'm afraid to sit on them to get control. They are too big to carry comfortably. And somewhere, in between there, whenever I try to restrain a rhea, I usually end up with them drumming a rapid tattoo on my shins with their kicking legs.



I do not like restraining rheas.

Now back to our story. We had the crate ready to go and we began trying to gently shift the rhea into the box. She didn't seem terribly afraid of the box, but she most certainly did not want to go in. After several passes at the box, I finally got up my nerve and grabbed her up and forced her into the crate. Of course, she beat my legs mercilessly as I got her in. But nonetheless, I got her in the crate, and we got the door closed. Success!! We quickly got the crate loaded in the vehicle and got ready to go.

Before we even got into the vehicle, I could hear her kicking and kicking inside the box. I waited a few minutes, hoping she would settle down before we got going. But she continued kicking and kicking—and then the box started to fall apart. In the space of about 2 minutes of kicking she fractured the 3/4" plywood door of the crate, and the whole frame began to give way. We quickly took the crate back to the holding yard and let her back out before the whole thing disintegrated. At this point, we gave up for the day.

We decided to try again a few weeks later. We had the carpenters rebuild the crate, and they made it sturdier than ever. We had discussions with the vets and determined that maybe we had been a little lenient with the relaxing medications and decided to go heavier for the next go. Once again, we dosed the rhea under vet supervision. Once again, she seemed to be a little bit mellow, so we decided to go for it. This time, as soon as we put the crate in the holding pen she freaked out. She knew exactly what it was, and what she was in for. I gave up on even trying to coax her into the crate, and just man-handled her straight away. Once again, she beat my shins black and blue going into the crate. We closed the door and waited to see if she would calm down.

She did not. The crate was sturdy enough to handle her kicking, but I couldn't stand the thought of her kicking away at those walls the entire trip. After a few minutes it was obvious she wasn't going to settle down. Reluctantly, we let her back out into the holding yard. I went ahead and cancelled the transfer. I couldn't figure out how we could get her shipped safely. It looked like she was going to have to spend the rest of her days in the holding pen because she couldn't resist poking her friends in the eyes.



A few weeks following our attempts to ship her, we had a hurricane warning for our area. Our normal protocol is to give birds access to their larger exhibits if possible, so they can search out cover as they want. I was nervous to leave her in the small holding pen because there were several trees with potential limb falls over it. I decided to let her into the exhibit and risk her poking another eye for the greater safety of all. I had a long talk with her before I released her and asked her to please play nicely with everyone.

We lucked out and the hurricane missed us. The rhea also appeared to be playing nicely with her friends again. I decided to leave her with the others until she misbehaved again. Either she took my words to heart about being nice to her friends, or she decided it was worth behaving to not have to live by herself in the holding pen and being periodically shoved into shipping crates. She's been perfectly behaved ever since, and my shins are forever grateful.

News from the Darwin's Rhea (*Rhea pennata*) Recovery and Conservation Program in Patagonia National Park, Chile

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The Darwin's rhea recovery and conservation program in Patagonia National Park in southern Chile began in 2015 with the primary goal to avoid the local extinction of the species, whose local population reached less than approximately 15 birds in the wild in 2013.

The specific objectives of this program are:

- To increase the rhea population to at least one hundred mature birds, and reassess their presence as an iconic species of the Patagonian steppe (biological and cultural);
- To monitor and maintain records of the wild population of rhea (individuals, nests, trends);
- To identify and control the threats limiting the survival of the species in the area;
- To develop alliances and trusting relationships with neighbours (border police of Chile and Argentina, gauchos of the two countries, and ranchers in the area).

In previous newsletters of the Ratite TAG (2016, 2017 and 2018), we have shared learnings about the care, breeding, and reproduction of rheas in the breeding center, as well as field observations associated with the wild population.

The success and survival in the management of the rheas has been quite good, considering that we started the program without having any experience with the species and the information available about their management was mostly associated with their commercial breeding in captivity, which as a business, has not been successful.

The results of the breeding season from 2016 to this date allowed us to observe and record the most important stages: courtship, copulation, egg postures, natural incubation, and breeding periods (Figure 2). From these events, it has been possible to establish that the reproductive period (in these latitudes – 46°S) begins annually between April and May, the incubation periods are between 38 and 42 days and the "independence" phase begins when chicks reach 4 or 5 months of age (Figure 3. Breeding behaviour).

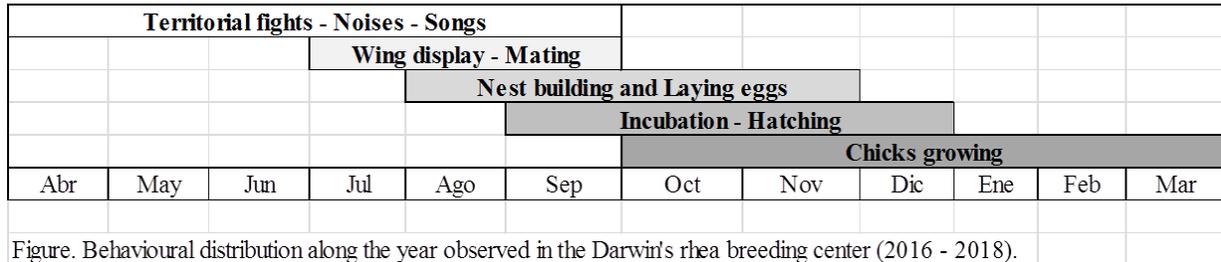


Figure 2

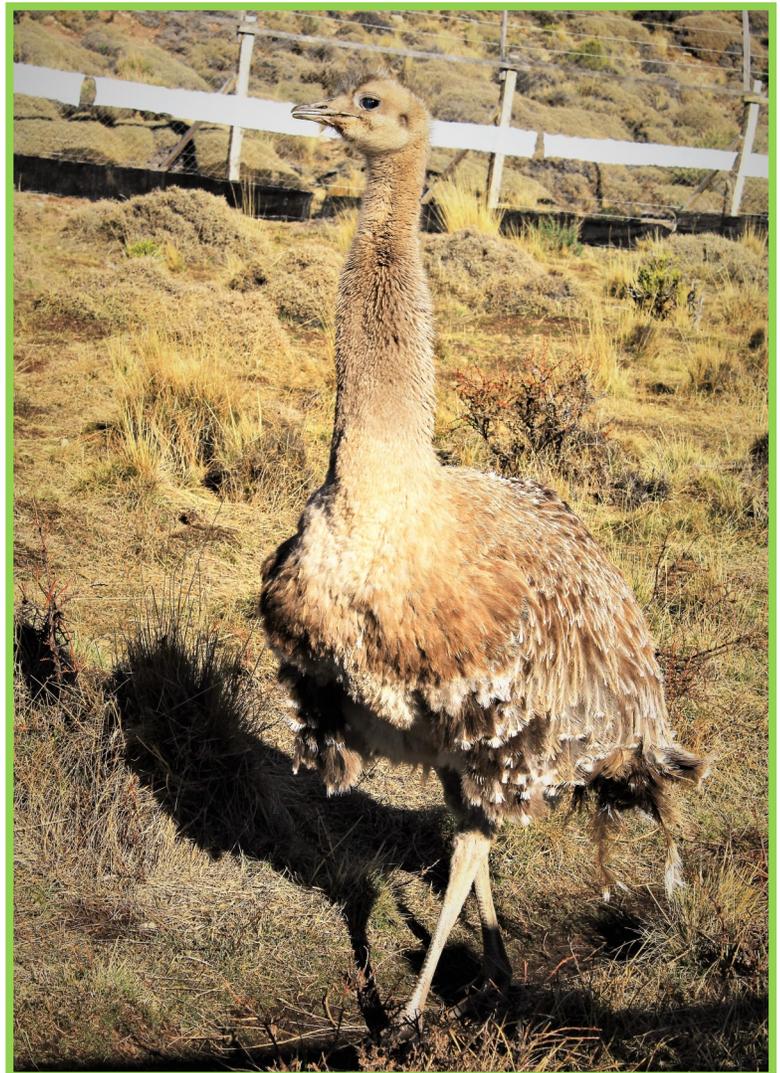


Figure 3



We have also faced difficulties such as the death of some individuals associated with traumatic events, as when individuals collide with the walls of the facilities (mainly during the night), death by stress during a management to control the overgrowth of the peak, and the gastric impaction in chicks. But the event (in August 2018) that has had the greatest impact was the puma (*Puma concolor*) attack on 22 chicks in acclimation pens, which made us reconsider

the improvement of the facilities and general management.

We have decided to increase the height of the perimeter fences of the pens (from 2.50 m to 3.10 m) and installed an additional perimeter electric fence. We also decided to decrease the time of acclimation of the young inside the smaller pens (defining 1 month as maximum) to pass from the acclimation corrals to the pre-release area (72 ha) to allow birds to be in large area during autumn and winter, allowing them to develop better to evade predation and to live in wild conditions.

These difficulties had an important effect on the production of individuals for the population augmentation and management. Despite this, we are optimistic because our current estimation of the wild population is about 40 – 45 individuals, and we have recorded wild rheas occupying areas where they were not observed before. This is due to the systematic removal of fences and livestock fences made in 2014 - 2015. The rhea population has increased by more than 30% of their original distribution area, reaching more than 4,000 ha today and advancing for at least ten km to the west along the Chacabuco Valley (Figure 4). For this reason, we have resumed the removal of the last fences that are remaining in the area. This management will facilitate the dispersal and occupation by wild rhea individuals, increasing the options for interaction between them and the individuals that are being released in the near future.



We had the privilege of having the support of experts and members of the EAZA Ratite TAG Advisory Group (Peter Smallbones) AZA Struthioniformes TAG (Sara Hallager), Daniel Sarasqueta (expert from Argentina), Fauna Andina (Fernando Vidal) and Jürgen Rottmann from the Union of Chilean Ornithologists (UNORCH- Aves Chile).



Adult Darwin's rheas in pre-release pens

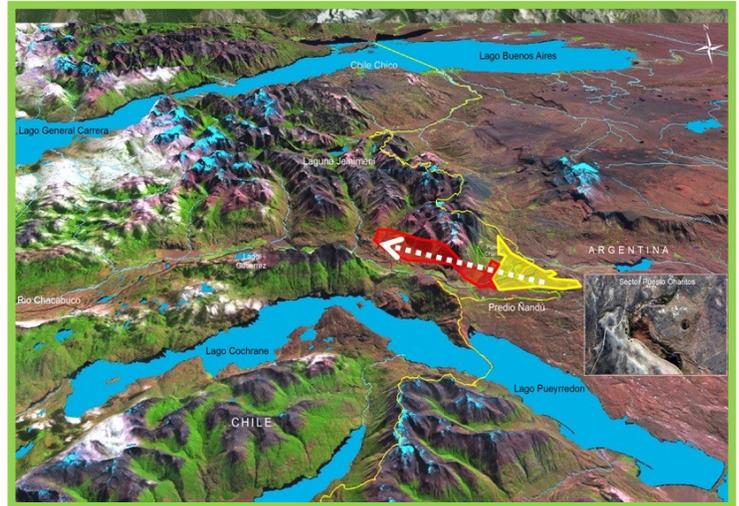


Figure 4



Photo by Pamela Stithem

Rheas are often exhibited with a variety of other species. Successful combinations include South American camelids, cavies, capybaras, large tortoises, tapirs (Baird's and Brazilian) and other birds. This greater rhea's name is Ray-Ray and she lives with a couple of llamas at the David Traylor Zoo in Emporia, KS.



Photo by Scott Kayser



Emu Encounters



Rehabilitation Therapy in a senior emu (*Dromaius novaehollandiae*) named Windana

By Wendy Gardner, Zookeeper; Harmony Frazier, LVT; Kimberly Dawson, LVT



As animals in zoos age, keepers may find that some animals experience age-related issues like joint stiffness, trouble getting up and down and overall mobility problems. Starting in 2009, Windana, a 17-year-old male emu at Woodland Park Zoo was periodically having trouble lying down, turning, stepping up over ledges, appearing stiff when first getting up, and occasionally limping. In following years, symptoms progressed and Windana began to show a “catch” in his legs when he went to lie down. Additionally, at times he would make several attempts to lay down, and often just give up and stand or walk away. In April of 2009, a veterinary exam was performed that included blood collection, physical exam, and limb palpation. Mild-to-moderate lameness was noted and an injection of Meloxicam (NSAID) was given. The procedure was done under hand restraint and was well tolerated. In May 2009, standing radiographs were taken of both his feet and legs with minimal hand restraint. No abnormalities were apparent on radiographs.

Through desensitization this emu has become accustomed to being touched and rubbed on his back and neck and has become accustomed to having his wings manipulated for blood collection. Starting in 2016, touching and rubbing his legs and feet were incorporated into the ongoing training in hopes of including laser and rehabilitation protocols into his therapy. Training was voluntary, and only done if he chose to participate. Our female emu was allowed to be in the area if she chose to be as he usually did better when she was visible to him. They both receive apple in their daily diet and this was used initially as primary reinforcement for coming over to us and letting us touch his neck and back. Training sessions lasted 5–20 minutes a couple times a week.

The session would start with both emus getting their daily apples. Then the keeper would focus on Windana and work on acceptance of tactile stimulation by rubbing his neck and moving down to his back and sides while offering his apples. If this was tolerated, as it often was, then the focus would move to desensitization of touch to his legs. When his legs were touched, it usually resulted in him moving forward, but did not end the session. It appeared to be a simple response to the stimulation. If touch to the leg was stopped and moved to his hip or back, he would stay in place. Touch was more readily accepted when it began by rubbing his hip and worked downward rather than starting on his legs and working upward. We continue to work on desensitizing his legs to touch and are making steps forward.

Rehabilitation Plan



The Rehabilitation plan was created by our senior licensed veterinary technician who has a Certification in Animal Physical Rehabilitation and a License in Animal Massage. The plan was reviewed and approved by the staff veterinarian.

Therapy sessions were approximately 30 minutes. Sessions were initially twice per week and when symptoms reduced, sessions went to once a week. Symptoms appeared to be diminished during warm weather, so treatment sessions could be suspended during spring and summer, but were re-initiated if symptoms were observed. Sessions included therapeutic massage and therapeutic laser, also known as Photobiomodulation. A bit of background on Photobiomodulation or Low Level Laser Therapy (LLLT)

L = light

A = amplification (by)

S = stimulated

E = emission

(of)

R = radiation

Therapy lasers offer a non-invasive treatment option. The treatment of each condition will vary based on the laser itself or on the tissue or disease and symptoms being treated.

Laser therapy can be employed to treat some of the following maladies:

Wound healing, pain relief, reduce edema, spasm & inflammation, increase circulation and healing.

Woodland Park Zoo currently uses a Class IIIB Therapeutic LASER (either a Thor or a SpectraVet). For this emu, massage and laser therapy is targeted at his pelvis, hips, stifles and tarsometatarsal joints. The goal of the rehabilitation plan was to address overall symptoms with the below regimen:

Analgesia (pain control): targeting nerves from caudal synsacrum, up spine as far as he would tolerate, ending at the base of the neck (cervical vertebrae). Area just cranial to the ilium at the caudal thoracic spine and back to the caudal tip of the synsacrum was the first priority. ~ 5 minutes

Reduce inflammation/healing: Targeting ligaments and joint capsules to reduce inflammation that could be restricting movement.

Bilateral femoral heads/acetabulum

Bilateral, lateral and medial stifles

Bilateral, ventral distal Tarsometatarsal (ankle).

~ 6 minutes

Massage and weight-shifting exercise:

The physiological benefits of massage include:

Increased circulation

Decreased inflammation

Decreased pain

Stimulated the release of endorphin

Increased cellular activity and metabolism

Stimulated lymphatic system, resulting in improved immune function

Promoted sense of comfort and relaxation

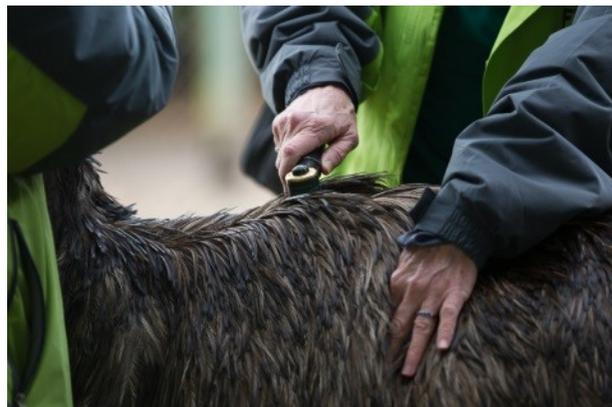
A typical session with Windana would include light passive touch and effleurage over thorax and spine were applied, working caudal to synsacrum, back to femoral heads, using slow pulsing compression. Therapy continued down each leg to distal end of tibiotarsus at the lateral tibial condyle. Then treatment slowly began to work back up the legs (one at a time) working both medial and lateral with focus on myofascial release to the flexor and extensor muscles and tendons. Slow movement was used to warm and give light stretch to the tissue, noting any restrictions or trigger points. Staff used the same technique from tip of synsacrum as far up spine as he allowed. If tolerated, staff lightly stretched his pectoral muscles by placing hands against his pectorals under his wings and stretching tissue up as hands moved toward spine. Follow with weight shifting from side to side to further activate the joints and muscles~ 15–20 minutes.

“Collateral ligaments connect bone to bone in joints, providing stability.

Tendons and ligaments flex and extend joints during motion. There is a very close relationship between the health of all joints and of the soft tissues that surround, support and move them. Often, joints show signs of pain, heat and swelling more readily than the surrounding soft tissues. If a collateral ligament has fiber damage for example, the joint also sustains trauma leading to inflammation. The inflammation may resolve quickly with anti-inflammatory treatment and a short rest, but if the ligament damage is sufficient so that joint stability is affected, excessive motion will cause recurrent inflammation and may lead to arthritis.”

From: *Equine Ultrasound And Sports Medicine* equineultrasound@earthlink.net

Good book for anatomy References-*Avian Surgical Anatomy, Thoracic and Pelvic Limbs*, Orosz, Ensley, Haynes, W.B. Saunders Company 1992.



Timeline of symptoms and treatment



In October 2010, our male emu began presenting with a limp on his left leg for a few steps when he first started to walk, then would walk normal. By November, it appeared that the lameness/limping had resolved and he was moving normally. In July 2012 he was seen having trouble laying down. He would put his right leg back and start to bend it then come back up and try again. It looked like the leg would “catch” (it looks similar to when a person goes to straighten their arm but the elbow won’t release allowing the arm to extend out all the way) when he tried to lay down. He was able to lay down when he used the left leg first as he started to lie down. In July 2012, he was stiff when getting up and down. Due to the stiffness issues observed, he was started on co-sequin (capsules 900 mg) once a day administered in a piece of apple. Compliance in consumption of the supplement was best when a whole capsule was placed in the apple; if he tasted the powder it would not be consumed.

In May 2014, he began to present with the same catching in the left leg as had been occurring in the right. Each time he would try to lay down the leg would catch and he would pop back up. By the end of May 2014, he started having more trouble laying down, but ambulation was still normal. In September 2014, it was noted on a few days that he had trouble laying down with catching in both legs. This was noted again in June, July, and August 2015.

In October 2015 radiographs were taken of his hips and stifles under behavioral and manual restraint. Limited films of the right stifle and hip joints were unremarkable but not all structures were visible. No evidence of degenerative skeletal issues or tendon ossification was seen on these films.

On 28 October 2015, he had his first laser therapy session. All sessions are done on a voluntary basis; minimal manual restraint is used. At the first session, there were three people present so he was a little nervous and did some pacing and vocalizing. He tolerated the keeper rubbing his neck and back but he remained unsettled. The veterinary technician was able to begin the first portion of the laser therapy by applying the cluster probe over three areas just cranial and two areas caudal of the synsacrum. The session was stopped when the bird walked away. He had his second session on 31 October 2015 with just one vet tech and keeper present. This time apples were fed prior to starting the session. When he was done eating the keeper began to rub his neck and back and the vet tech approached from behind and started to use the laser. He did really well until the laser probe neared the end of his synsacrum then he moved away, ending the session.

On 7 November, 2015 his treatment was 75% successful; he allowed the laser treatment to be completed over his synsacrum, femoral heads and stifles along with some very light weight shifting. He did lie down during this session and there was no catch observed. Additionally, staff observed an increase in his stride length when walking.

On 18 November, 2015 he had laser and massage. This was the best session so far with 95% of the laser therapy regimen completed. During the treatment he was really compliant and even rested his head on his back during the procedure. The emu accepted light massage on his back but did not want his legs touched.

On 28 November, 2015 therapy was done with a different vet tech, which did not seem to affect the session. The bird tolerated the full laser therapy treatment, but did not allow massage.



On 5 December, 2015 he was only compliant with half of treatment. He accepted the full analgesia protocol. Therapy started cranial to the ilium at the caudal thoracic spine and worked back to the caudal tip of the synsacrum. Treatment of the femoral heads/acetabulum or stifles was not possible as he was more interested in going in the yard with Kowia (female emu).

On 8 December 2015, staff were able to administer his laser and massage both legs. He laid down when his back was being treated, which he did smoothly and got up with no problems.

On 12 December, 2015 staff were able to conduct the entire laser treatment protocol and conduct massage along his back and legs to just past his tibiotarsus joint on each leg. He presented with sensitivity at the location on his left side and picked up the foot slightly during massage. At this point therapy seemed to be making a positive impact on the bird's condition; he appeared less stiff when he first got up and his gait was improved. He had not been observed trying to lay down so staff was not sure if he still presents with the catch in movement.

On 19 December, 2015 he was fully compliant with his laser treatment. Treatment consisted of massage (compression, passive touch, effleurage) along thorax and spine, working caudal to synsacrum, continuing to stifles and down each leg. He was very calm and almost sleeping during massage but when working on the left leg he shifted his weight slightly and seemed more sensitive on this side. His muscles slightly tensed/twitched while doing gentle compression. At end of session he stood still for a while and seemed to hesitate while turning on the left leg.

On 23 December, 2015 he was observed lying down. He started to go down with his right leg, hesitated once, and then went right down.

On 26 December, 2015 he was only partially compliant, accepting analgesia treatment but no massage. Staff noticed that if he stood in one place too long he would high step with the left leg. We discussed reducing treatment time or alternating massage one day and laser the other day.

On 1 January 2016, he was limping quite a bit in the morning and was observed having trouble getting up the grass slope of this exhibit due to the limp on his right leg. The limp lessened throughout the day but he did have trouble laying down.

On 2 January 2016, staff was able to conduct all laser protocol along with some massage on his left leg with a small reusable heating pod.

On 23 January, 2016, some hesitation was observed when he had to step up over a ledge. He stopped and at the ledge, stepped up but it looked like there was some discomfort when putting full weight on the right leg. He was favoring the right leg and he reacted to massage around the stifle, directly above the joint. During this timeframe he was compliant for almost all of his treatments and his mobility by the 23rd was the best it had been since the start of the therapy sessions.

On 6 February, 2016 we went to once-a-week treatments.

February 7-20, 2016 we were able to conduct entire laser protocol and massage at most sessions during this time. It was limited a little on his left stifle which has been a sensitive spot on him.





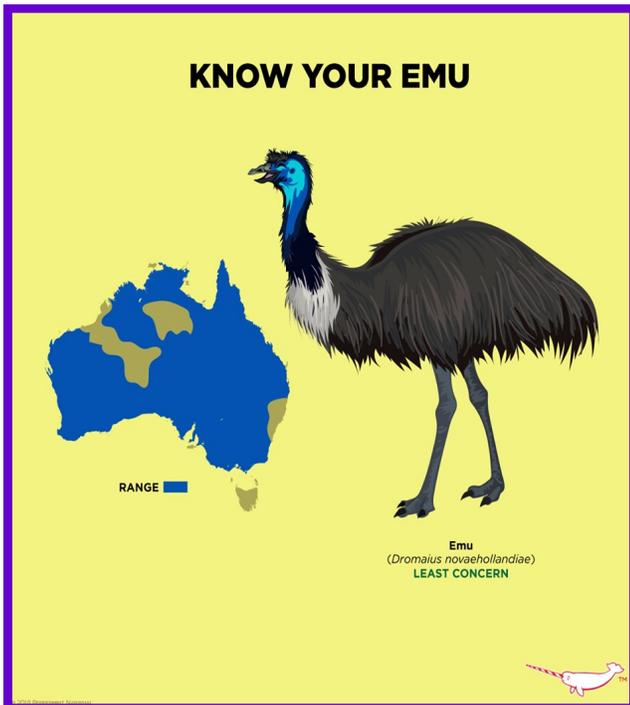
At his 12 March, 2016 session staff were able to conduct a full laser session but did not complete massage. At this point, he was doing well and had been ambulating normally. Since he was doing better, it was decided to wean him off sessions and go to once every two weeks for two sessions then re-evaluate. It was decided to re-assess on a seasonal basis as colder weather may affect him more.

In April he was seen having trouble laying down. He tried three times to lie down but his left leg would not release to allow him to do so. After the third try he walked around and tried again, this time he went down but he may have used his right leg.

On 27 Aug, 2016 rehab/laser treatments were started again and have ranged from every week to every other week through 2017 depending on how his symptoms present.

Currently, while he continues to still have difficulty laying down, he has improved and has little to no trouble stepping up over ledges anymore. Overall, it seems like the laser and rehab therapy have helped him with his stiffness and mobility concerns. He was compliant for most sessions and only walked away to not participate a couple of times. Non-compliance usually was associated with something going on that was making him alert. Being able to do radiographs, laser and massage with little to no restraint has been very helpful in his care, especially as he ages.

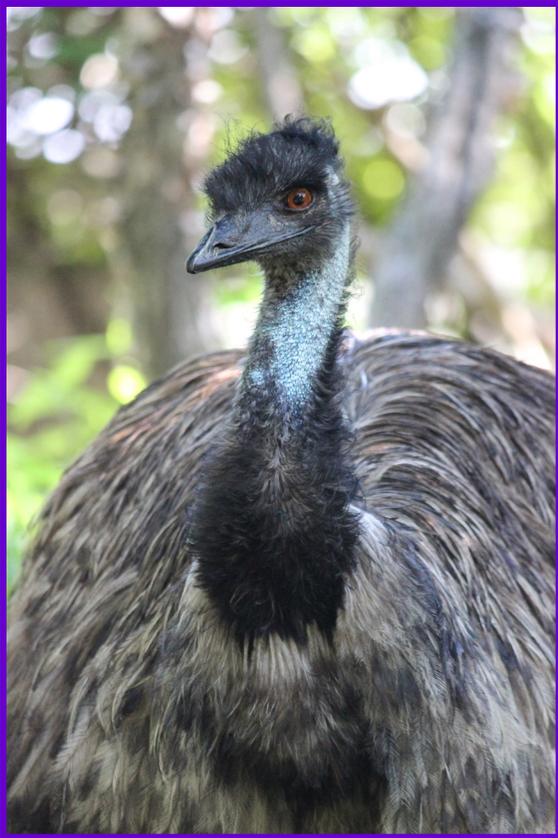
Photos courtesy of Jeremy Dwyer-Lindgren, Beth Carlyle Askew and Wendy Gardner



Graphics by Peppermint Narwhal

Six Enrichment Ideas for Emu

Brookfield Zoo Staff



Brookfield Zoo's Wild Encounters is home to 2.0 emus, Charlie and Blue. A simple but effective enrichment item that keepers use for both emus is a feeder log. Feeder logs are made from a hollow piece of PVC pipe with large holes cut out of the surface of the pipe. Feeder logs can be made in a variety of shapes, sizes, and colors, and they can be placed anywhere in a habitat. The feeder logs at Brookfield Zoo are textured and painted brown and green to appear naturalistic, and many of the feeder logs are equipped with hooks that can be attached to the mesh fencing of the emu enclosure. Feeder logs encourage natural foraging behaviors in the emus, and substrates can be mixed in with the diet to add variety. Both Charlie and Blue have been observed interacting with feeder logs multiple times throughout the day. They'll often pick out their favorite foods first, then return to the feeder log later in the day to snack on the rest.

-Jen Ferchau, *Seasonal Keeper, Brookfield Zoo*

One type of enrichment that our keepers use for our emus are floating pans. This enrichment consists of a baking pan or any small flat-bottomed container filled with water, in which you can then place food or treats in for the emu to eat. At our zoo, we most commonly use Marion Leaf-eater chow or peanuts since these are their favorite treats. The treats will float from side to side in the water, promoting activity and encouraging foraging behaviors for the emu. Our emus really enjoy this type of enrichment and it keeps them engaged for long periods of time. You could also try to put other items in the water beside treats to see if the emus are still interested. We have found this as a successful type of enrichment for our emus.

-Morgan Thums, *Seasonal Keeper, Brookfield Zoo*

In observing the emu Charlie at Brookfield Zoo, the staff has noticed some of his most liked and most successful enrichment toys. The staff members will stick a variety of objects such as lettuce, hay, straw, shredded paper or newspapers in the fencing of the exhibit. Utilizing fencing, signage, and other pre-existing structures as opportunities for enrichment offers options for institutions that may be low on space or finances. By the staff adding the chosen items to the fencing of the habitat, the emu Charlie is able to tap into his natural foraging behaviors. Charlie the emu has been observed by staff spending several minutes picking and pulling the chosen items out of the fencing. This natural foraging behavior is an indication that Charlie is interested and engaged with the enrichment device set out by the keeper staff.

-Gabriella Fabiano, *Seasonal Keeper, Brookfield Zoo*

Using plants and other browse promotes natural behaviors such as foraging. When supplied with extra bamboo stalks, animal care staff will place bamboo along the fence-line of the emu enclosure, loop several branches together into a garland, and hang it from trees on exhibit. Bamboo has increased our emus' activity levels within the exhibit yard and inside the holding enclosure. They are often observed pecking and taking apart the garland. At times, the emu were able to pull the bamboo through the fence or off the trees and subsequently continued interacting with the browse on the ground. To encourage interaction with this enrichment, staff can combine this with other elements such as diet items or treats. The emus' diet or added food enrichment can be woven into or skewered onto the bamboo. This enrichment helps to positively stimulate the mental and physical health of our emus.

-Patricia Torres, Keeper Aide, Brookfield Zoo



During the hot summer months, keepers place a sprinkler in the emu exhibit that is connected to a timer that is programmed to turn the sprinkler on throughout the day. Our emus have been observed walking through the spray, as well as standing/sitting in the sprinkler. The water helps the ratites keep cool on hot days. In addition, a large water trough is put out for the emus to drink from. The emus drink by using their beak to scoop up the water, shaking their head while gulping and pausing in between. In addition, they like to splash water on their body and have been seen dipping themselves in the water troughs. The sprinkler and the water troughs provide enrichment that elicits emus' natural behaviors. In the wild, emus often bathe and cool off in puddles of water. They have been seen swimming in ponds as well. Water enrichment is great for the emus because it allows the birds to present behaviors such as bathing and swimming, but also gives them a chance to lower their body temperature. In the future, staff could put multiple sprinklers and troughs or pools on exhibit to encourage the emus to move between multiple locations since they are considered a nomadic species. This will also allow guests to observe natural emu behaviors up close.

-Olivia Damaszk, Seasonal Keeper, Brookfield Zoo

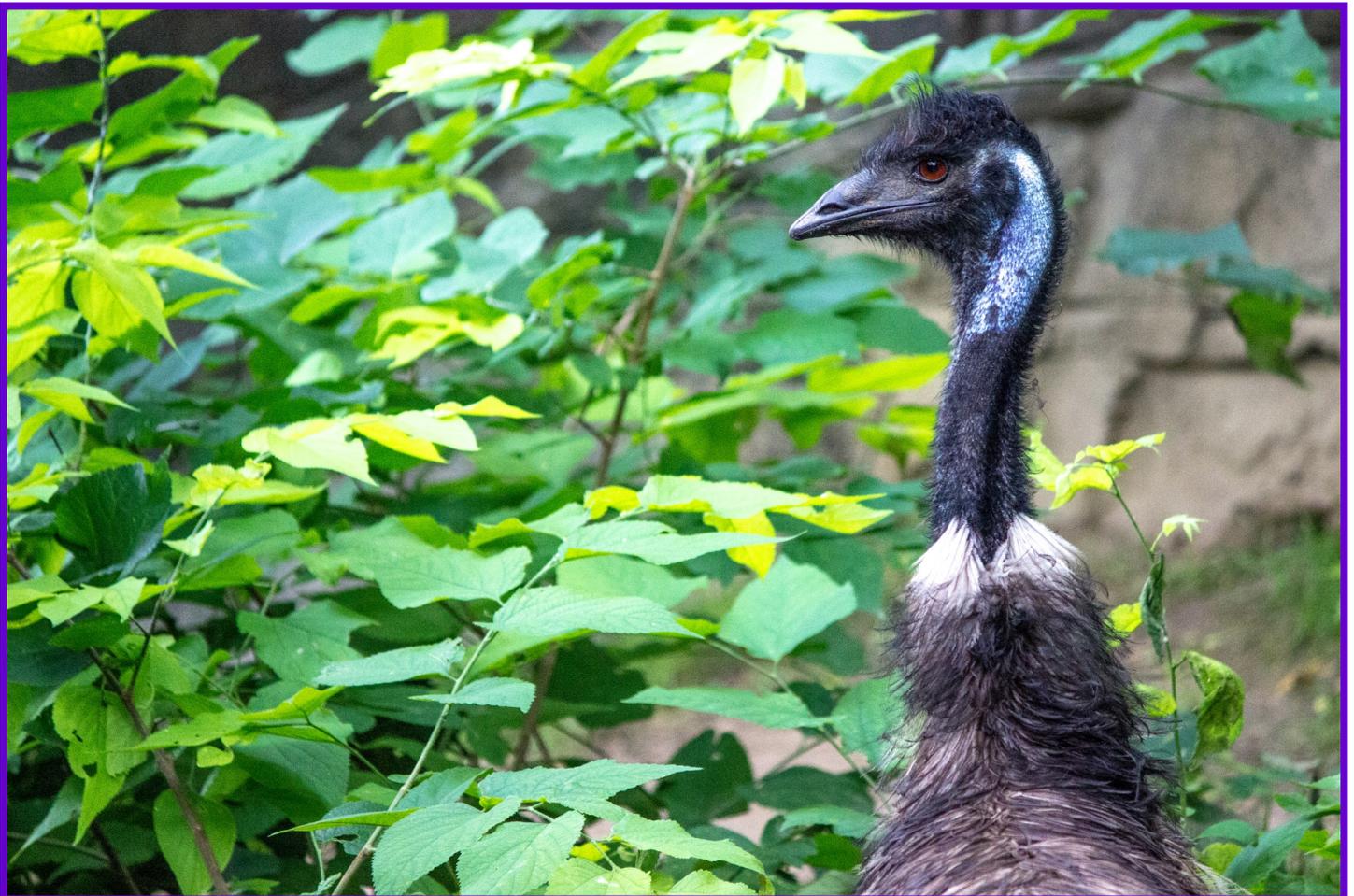
A category of enrichment that we use for many of our animals on a semi-regular basis is paper product. A fast, easy, and fun way to use paper as a form of enrichment is to wrap parts of an animal's enclosure in toilet paper. Only naturalistic enrichment can be used in view of the guests, so in the case of our emu we can only use toilet paper in their off-exhibit stalls. The example I will be discussing involves I.O emu reacting to being shifted into his stall for the night after most of the stall had been wrapped in toilet paper. The back of the shift door has a metal rod that was specifically installed for hanging enrichment, so quite a long piece of paper had been wrapped around that rod. As this instance took place in the summer months, fans were running to keep the emu stall from becoming too hot, thus causing the paper to sway in the wind. When the stall door was opened, the initial reaction of the emu was to be quite frightened of the moving piece of paper.

He ran a couple of feet away from the door and refused to enter his stall until that piece was taken down and placed on the ground. He then willingly shifted into his stall for his diet as he does each night, but he remained wary of the toilet paper that was hanging from other parts of the stall as it was also moving in the breeze from the fans. He was interested enough in his food to eat it despite there being pieces of moving paper close to it, but he continued to keep an eye on them as he ate. The next morning, several pieces of paper were on the ground including one that was placed there, but overall the emu had not ripped many down during the night. He was also calmly sitting when keepers first entered the stall, showing that he had become more comfortable with the enrichment sometime overnight.

-Emma Ziolkowski, *Seasonal Keeper, Brookfield Zoo*

Photos courtesy of Scott Kayser

Emus at Kansas City Zoo; Vancouver Zoo, and Cincinnati Zoo



Emu Enrichment—Timed Feeders

Ashley Paquette Keeper Aide, Brookfield Zoo



Chicago Zoological Society

Inspiring Conservation Leadership



Because of their natural foraging behavior, food is an excellent source of enrichment for the emu. Emus are nomadic, and known for traveling long distances, “sometimes at a rate of 15-25 km per day.” (*Behavior of Emu bird (Dromaius novaehollandiae)*, 2018). In order to stimulate natural foraging, and locomotive behaviors, we installed a system of timed feeders throughout the exhibit and in holding areas.

We are using the Pentair - **FIAP Belt Feeder** which can dispense dry food for up to a 24 hour period. Dry food can be placed in various positions on the belt and as the belt retracts over 24 hours, the food will drop through the open bottom. To reset it, you can simply pull out the belt again, as pictured. The feeder is manufactured for aquarium use, so it lays flat and hangs over an edge with an opening on the bottom. For

our exhibit purposes, several platforms for the timed feeders were custom built, and affixed along the exhibit fence.

In order to increase locomotion between different parts of the exhibit, food can either be placed on the belt at irregular intervals, or be evenly dispersed for constant dispensing. As the birds learn where the feeders are located, they will also learn to travel across the exhibit to check each feeder throughout the day. To keep them interested, not all platforms are used at once, and the ones we utilize varies by day. This also encourages the Emu to explore, and reduces pacing behavior by creating interest in other areas of the exhibit.

Because the food falls on the ground, this also is a good source of enrichment to stimulate natural foraging behavior. “In the arid land of nutrient-poor soil that is Australia, the emu can cover great distances in order to forage enough food for survival” (*An ecological and cultural review of the emu*, 2011). For added enrichment, substrates can be used below the timed feeder to further encourage the Emu’s natural foraging behavior. Pictured here is a timed feeder in use in the emu holding area.



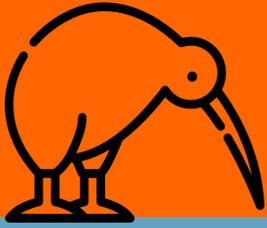
substrates can be used below the timed feeder to further encourage the Emu’s natural foraging behavior. Pictured here is a timed feeder in use in the emu holding area.

REFERENCES

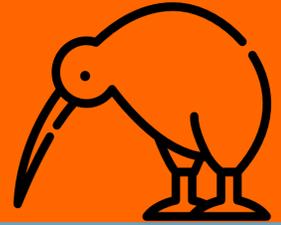
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Keeping up with Kiwi



Brown Kiwi Program Update

Kathy Brader, SSP Coordinator and International Studbook Keeper



In some ways it has been a quiet year and in different ways a bit crazy! I volunteered to put the Kiwi Studbook into ZIMS, which has been a bit of learning curve. All in all, I am glad to have done it but it still has some “bugs” to work out, which in one way I can blame all of my mistakes on ZIMS!

It looked like we were not going to have any new hatches for 2018 and then surprise! Alphen Zoo (Netherlands) had two hatches (both males). This is the first for this zoo and after many years well deserved. The New Zealand Ambassador for the region, Mr. Lyndal Walker, came in for the naming ceremony. Congrats, to the Alphen Zoo team!

For the Studbook and the SSP, it has been hectic. I hope by the time this comes out the updated studbook will be published and then Stefan Stadler and I will start to prepare for the Breeding and Transfer Plan in April 2019. To this end, I am so grateful to all the EAZA zoos for filling in the AZA forms for the Sustainability Partnership. No one needs more paperwork, but AZA now requires all non-AZA institutions to be approved to participate in the SSP. Thank you!

The overall kiwi population stands at 57 birds (39.18.0) at 16 institutions. The big news this year is bringing in 1.2 kiwi from Frankfurt Zoo to pair up kiwi in North America. WCS and San Diego Zoo Safari Park all received females for some lonely boys. We also welcomed Pinola Conservancy into the kiwi SSP with a young male name “Rongo” from Frankfurt. Smithsonian Conservation Biology Institute in Front Royal, Virginia now has the largest collection of kiwi held outside of New Zealand and it keeps them very busy.

In New Zealand, Ms. Suzy Barlow is no longer the kiwi species coordinator. The new contact is Mr. Todd Jenkinson who is always available for questions and comments (todd@zooaquarium.org.au). Todd also mentioned that he is committed to reviewing and updating the kiwi Husbandry Manual in 2020.

Department of Conservation in New Zealand has issued an updated Kiwi Recovery Plan and a Kiwi Recovery Plan summary that you might find helpful:

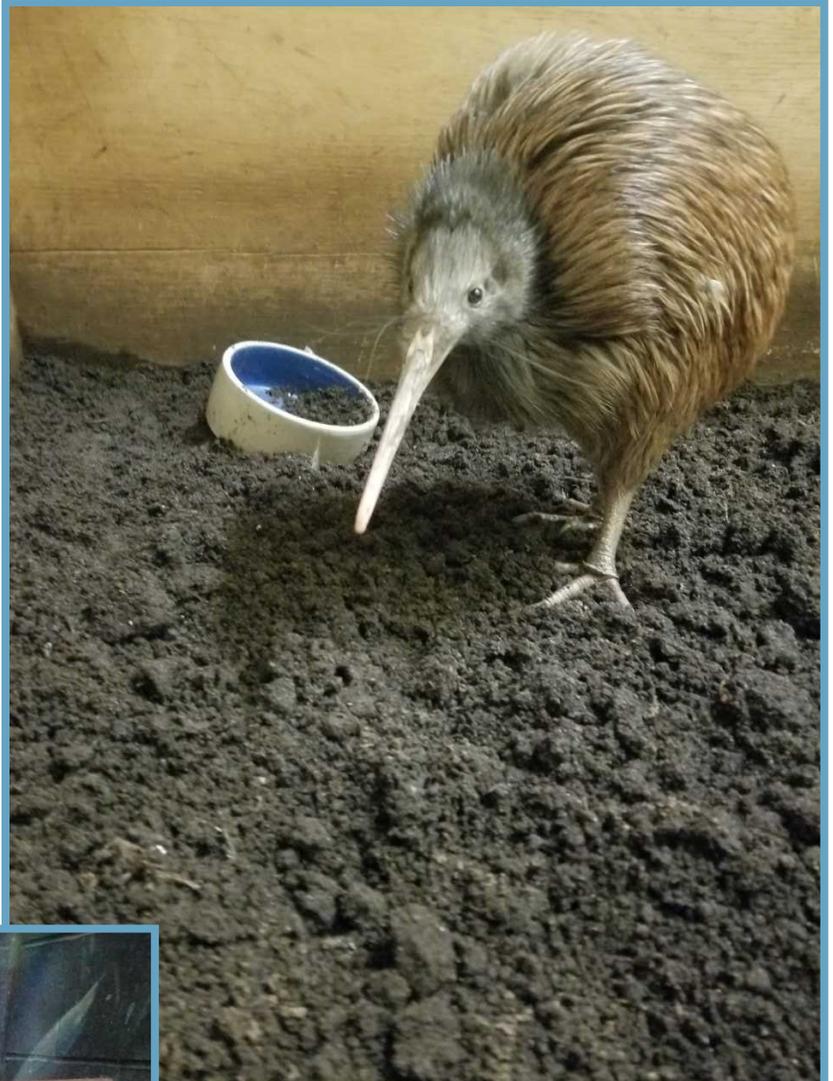
<https://www.doc.govt.nz/globalassets/documents/conservation/native-animals/birds/kiwi-recovery-plan-summary.pdf> and <https://www.doc.govt.nz/globalassets/documents/science-and-technical/tsrp64entire.pdf>

I will be delivering our 8th donation of feathers to the New Zealand Embassy in Washington DC. soon.

Kiwi in Columbus!

Taylor Hann,
Head Keeper, Australia and the
Islands

This year has been one of growth for our kiwi. Our youngest kiwi, Haka, celebrated his first birthday in June and our older kiwi, Hari, turned 2 in May. We are currently working on introducing these 2 brothers in our viewable kiwi habitat. So far, they have both done well with the introduction process and we look forward to the two living together in 2019.





Kiwi Update from Frankfurt

Christine Geiger, Zoo Frankfurt



New pair Puawei and Hari

In 2018, the German summer was extraordinarily long and hot, and by the end of October none of our three females had yet started calling for her male. Nevertheless, Felicitas had been moved into her "husband" Kelsey's enclosure in November where she laid her first egg of the season on 17th December. Kelsey is incubating the egg as reliably as every year. Felicitas is currently gaining weight again, so we are awaiting her second egg before she will be moved back into the "kiwi girls room" where she will stay until the next breeding season.

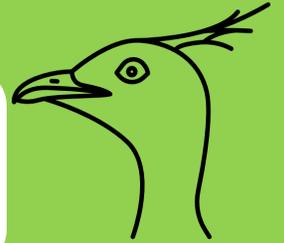
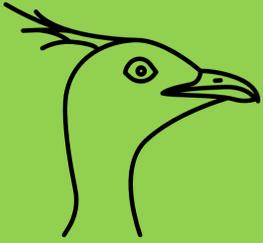
A few days later our new breeding pair - female Mahuru and male Kaytee were reunited. They seemed to recognize each other from the last breeding season and shared nesting boxes on 12th November. Mahuru laid her first egg this season on 22nd December. Kaytee had immediately

started incubating intensively but has later on been showing increased activity levels, especially in the mornings when leaving the egg. During this activity, the egg has always been covered with a thick layer of leaf litter. Mahuru is also gaining weight again, and we expect Kaytee to start incubating eggs more intensively after she has laid a second egg. On 11th January we found the eggs from both Mahuru and Felicitas to be fertile!

Also during October 2018, we decided to choose Hari as the new partner for our future breeding female Puawei. After some nights of close observation where he proved to have a brave heart and a nice character, we decided to leave these two together from 19th October. Every now and then they were observed sharing the nesting box in the morning, so we hope to find Puawei's very first egg soon. We are very excited about Hari's response as he does not have any "egg-experience" so far. Male Kaimi will stay in Frankfurt as a "backup", too, because Hari seems to be a bird with potential health issues from time to time, and we are not sure about his general fitness for the far future. For this reason we currently feel it is not a good idea to give this sensitive bird away. Kaimi has shown very good brooding performance when he was allowed to foster an abandoned and infertile third egg from Kaytee and Mahuru last season.

The other exciting event in 2018 was the journey of three young kiwis to the USA: Females Roa and Anahera and male Rongo left Frankfurt for the Bronx, San Diego and Pinola Conservancy, respectively. We are very grateful for the help and cooperation with our kiwi colleagues abroad who made this shipment possible!





TIME FOR TINAMOU



There were no tinamou article submissions for this year. If you work with tinamou, we'd love to hear from you in time for next year's publication!

Photos by
Carolina Arruda, Dallas
World Aquarium

Great Tinamou, *Tinamus major*

Little Tinamou, *Crypturellus soui*

According to **IUCN**, of the **48** tinamou species,

2 are increasing,

6 are stable,

40 are **declining**.



Photo by Joel Sartore

Enrichment

Category is...

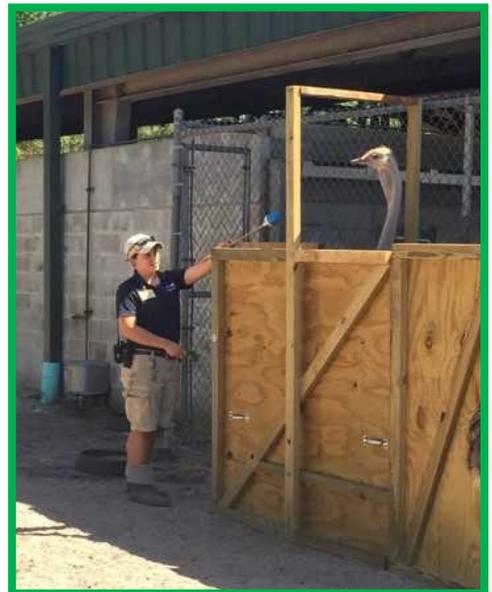
'Best Of' for each species!

Brevard Zoo and Staten Island Zoo tie for the win! Do you make any fun enrichment or offer any novel items to your ratites? We want to hear from you—especially any kiwi or tinamou keepers!

This year's enrichment feature was compiled by Dana Urbanski, TAG Enrichment Coordinator. Email submissions for future enrichment features to Dana at dana.urbanski@nczoo.org



Cuteness
Award!



Top: Colorful clips with produce. Photo by Ellen Dreyer, Enrichment by Michelle Quinn, Brevard Zoo

Above left: Emu chick bath time. Michelle Ferguson, Brevard Zoo

Above middle: Snack in a sprinkler head. Elle Hulette, Staten Island Zoo

Above right: Ostrich chute training. Ashley Gill, Brevard Zoo

Left: Ice cube tray with jello. Deanna Romanello, Staten Island Zoo

Education

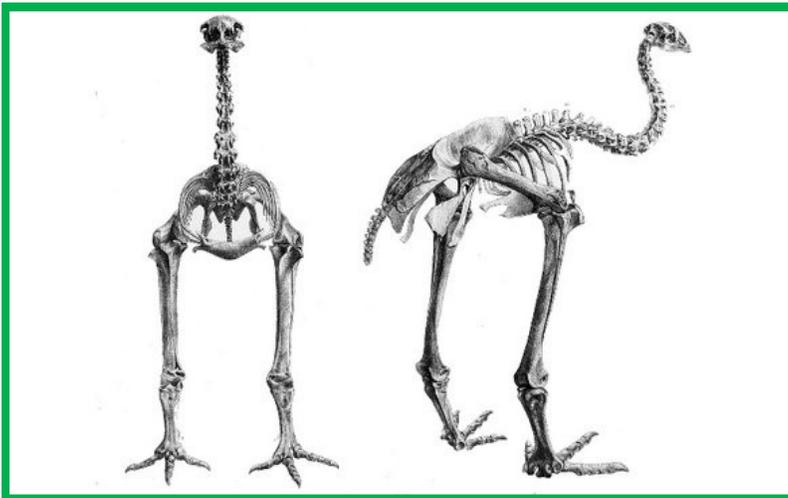
The little bush moa inhabited parts of New Zealand and went extinct in the late 13th century as a result of overhunting

Source: www.ibtimes.co.in

Scientists are a step closer to bringing back a species of flightless bird that has been extinct for almost 700 years. The little bush moa that inhabited parts of New Zealand went abruptly extinct as a result of overhunting in the late 13th century. A team of researchers from Harvard University has assembled a nearly-complete genome of the extinct moa by extracting ancient DNA from the toe bone of a moa specimen held at the Royal Ontario Museum in Toronto, Canada. The scientists now believe that they are closer to the goal of "de-extinction" — the vanished species can be brought back to life by slipping the genome into

the egg of a living species, Statnews reported. "High throughput sequencing has revolutionized the field of ancient DNA (aDNA) by facilitating recovery of nuclear DNA for greater inference of evolutionary processes of extinct species than is possible from mitochondrial DNA alone," according to the study.

The little bush moa was a part of the palaeognathae clade of birds and birds, and those like the kiwi, ostrich, and emu were considered its cousins. There were nine species of the moa but all of them are extinct now. They roamed in the forests of the North and South Islands of New Zealand before they became extinct, the NZ Herald said. They were on an average four feet tall and



Credit: J. Erxleben, Transactions of the Zoological Society

weighed about 66 pounds. Experts believe that the Harvard researchers' work could make it easier to bring back the long-lost species from extinction.

"The fact that they could get a genome from a little bush moa toe is a big deal since now we might be able to use their data to do other extinct bird species," Ben Novak, lead scientist at non profit conservation group Revive and Restore, told Statnews.

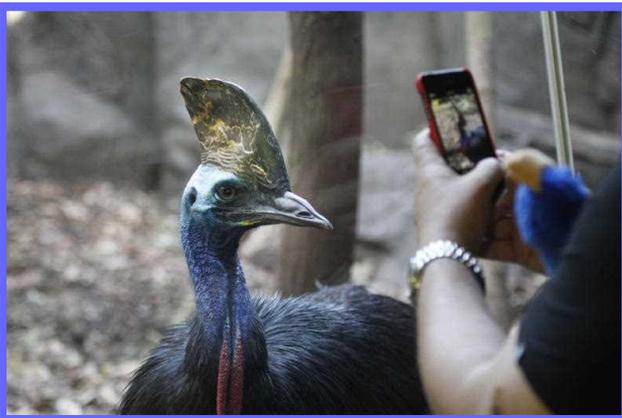
"De-extinction could be useful for inspiring new science and could be beneficial for conservation if we ensure it doesn't reduce existing conservation resources," University of Queensland scientist Hugh Possingham said in a statement. "However, in general, it is best if we focus on the many species that need our help now," he added.

Education

Researchers have answered a 200-year-old mystery surrounding Australia's iconic cassowary

Source: SBS News

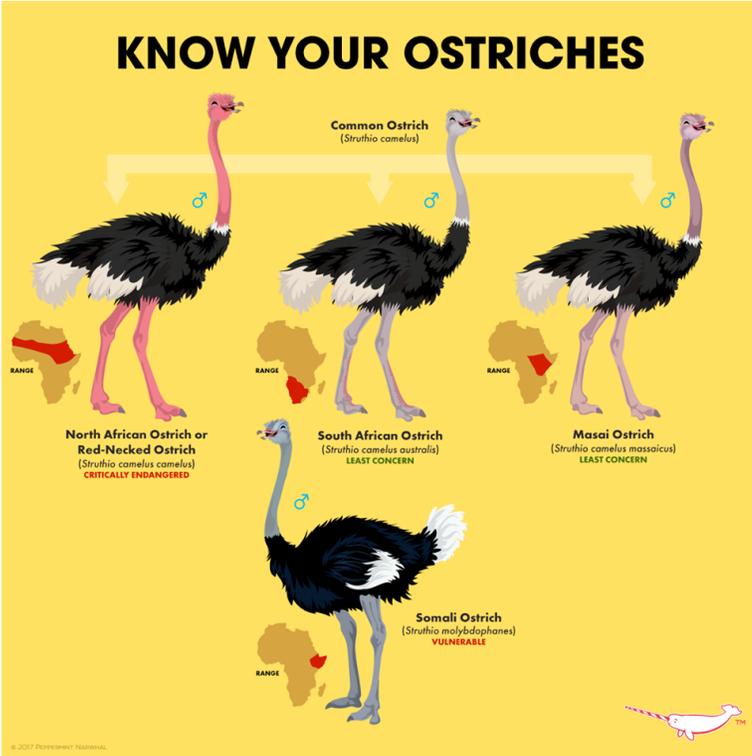
After years of speculation, researchers from La Trobe University believe they know what the hard growth on the cassowary's head is used for. It is a question that has baffled scientists for two centuries, and now Victorian researchers believe they have found the answer to the meaning of the southern cassowary's distinctive helmet. In a report published on Wednesday, La Trobe University researchers have revealed that the horn-like growth, known as a casque, is likely used to help the birds keep cool during Australia's hot summers. Danielle Eastick, from the Department of Ecology, Environment and Evolution, measured 20 captive cassowaries across Australia and found that the birds released less heat from the casque in cold weather, and the greatest levels when temperatures hit 36 degrees. "Our results are quite compelling and it's highly probable this is what the casque is actually used for," Ms Eastick said. "It's really exciting to think we may have solved a mystery that has baffled scientists for so long.



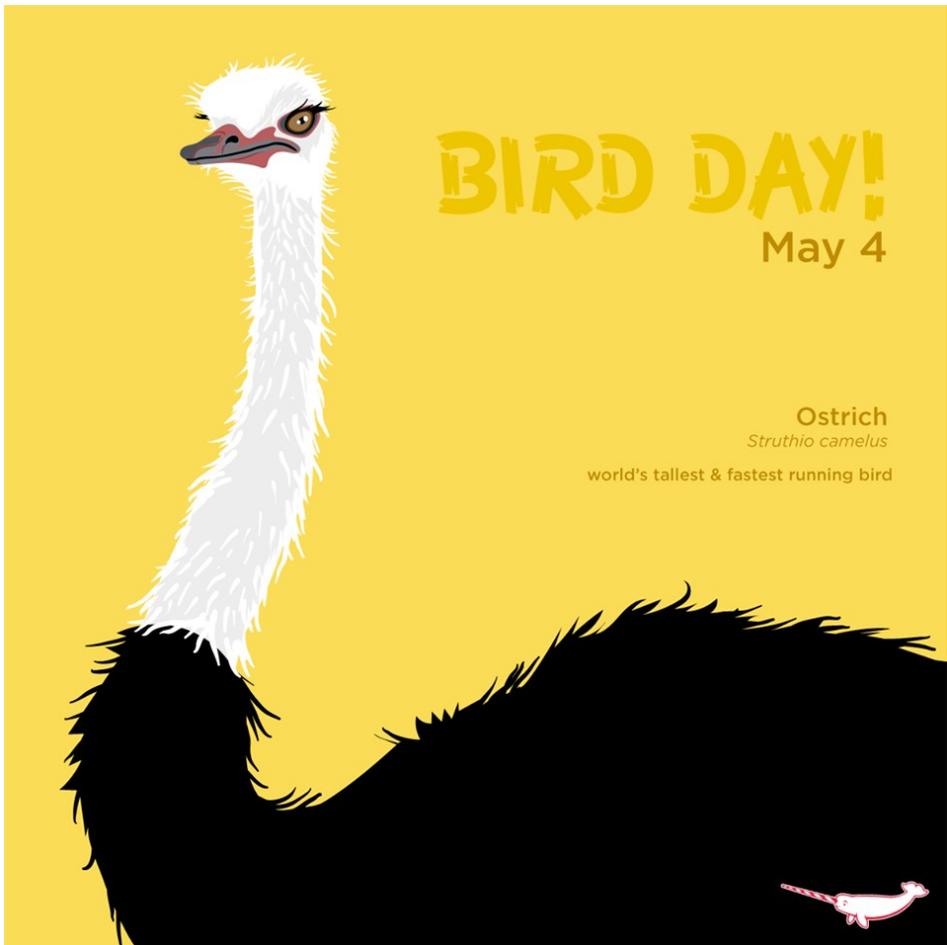
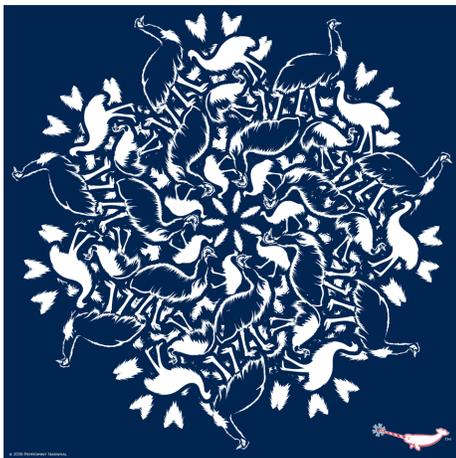
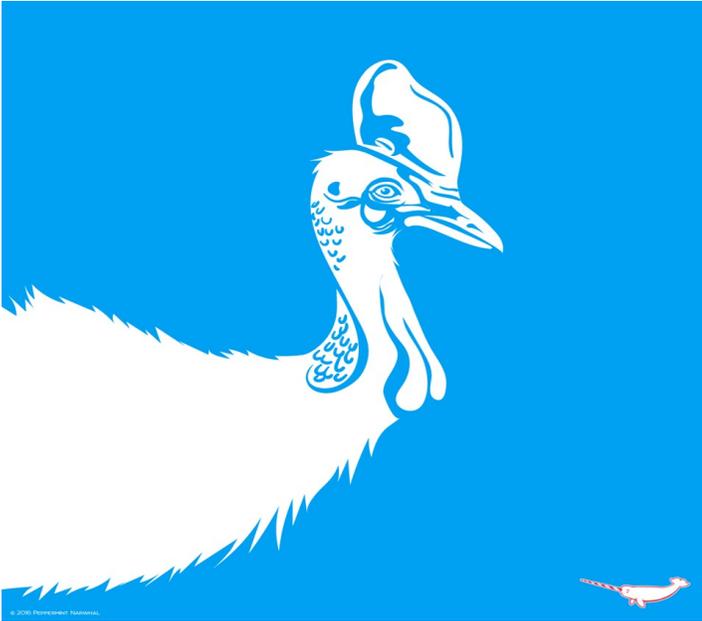
"The report said cassowaries, as large-bodied, dark feathered birds that live in tropical climates, have a strong need to offload heat. Many animals have evolved morphological structures, or adapted existing body regions, known as 'thermal windows', for heat exchange," the report reads. "The cassowary casque meets the characteristics of thermal windows: uninsulated and vascularised." Previous speculation suggested the casque may have been used as a protective structure for moving through dense vegetation, as a weapon against other animals or as a means for attracting a mate.

"The casque has caused considerable curiosity and speculation for nearly two centuries and animal experts have proposed various theories," Ms Eastick said. "Just as humans sweat and dogs pant in hot weather or following exercise, cassowaries offload heat from their casque in order to survive. The hotter the ambient temperature, the more heat they release." Cassowaries are one of the heaviest native land animals in Australia and can live up to 40 years in the wild, and 60 years in captivity. But the new findings don't only shed light on the famous, flightless birds. Ms Eastick pointed out that many dinosaurs had casques and it is possible they also used them to regulate their temperatures.

Educational Graphics



Educational Graphics



Social Media Superstars

A collection of pictures posted to our Facebook page



Photo by Ashley Brooks

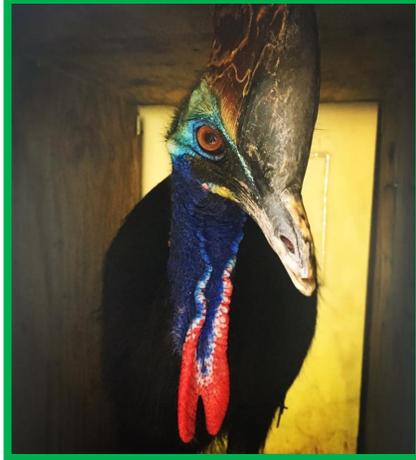


Photo by Kirby Pitchford

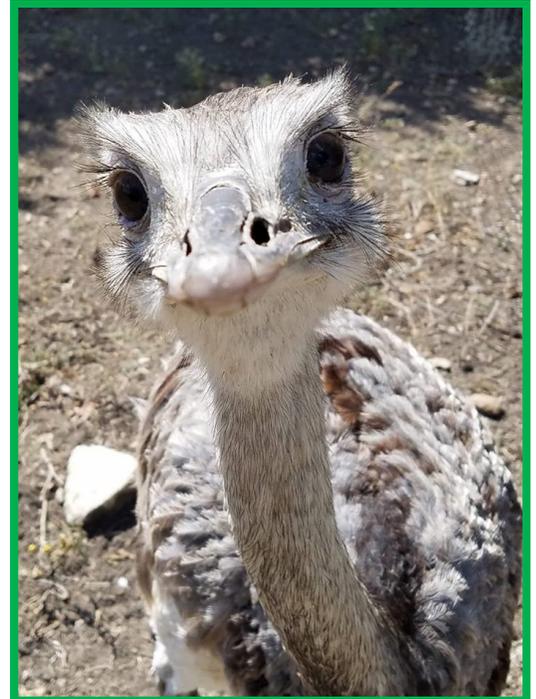


Photo by Melissa Wagner Ruth

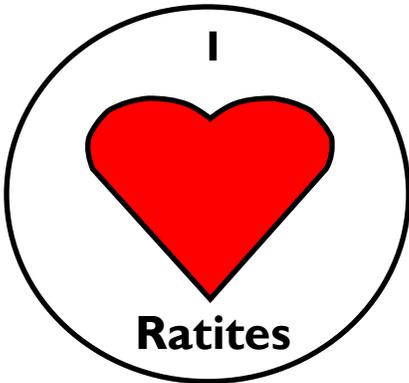


Photo by Ben Keller



Photo by Serena Vachon



Photo by Taylor Hann

Odds and Ends

with our feathered friends



Photo by Scott Kayser,
Birmingham Zoo

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www.aviansag.org

TAGmart items needed

Do you have any unique ratite-themed gifts laying around? Consider donating them for the TAG to sell at midyear in Phoenix. Footprints are always a huge hit! Contact Sara if you can contribute.

After all that reading I think it's time for a nap...

Call for Pictures!

Our ratites and tinamous are photogenic and charismatic, we want to feature them here! Please reach out to your marketing departments and keepers and encourage them to send in their photos.

Your birds could be featured in a future newsletter!



Call for Articles!

Please include your name, job title, and facility as well as any pictures you want to share. It's never too early to submit your article!

Please email all pictures and article submissions to kpitchford@birminghamzoo.com

Want to get involved with the TAG?

Do you love ratites? Are you looking for a way to get involved? Email TAG Chair Sara Hallager at hallagers@si.edu to find out what you can do.

We would love to have your help!

