CONSERVATION UPDATE

SAN DIEGO ZOO INSTITUTE FOR CONSERVATION RESEARCH

LEADING THE FIGHT AGAINST EXTINCTION

SUMMER 2015

WHEN IT'S NOT REALLY THE END: WILDLIFE DISEASE LABORATORIES ARCHIVE

By Bruce Rideout, D.V.M., Ph.D.,
Director, Wildlife Disease Laboratories

Eventually, every animal in our care will reach the end of its life, and when that happens, we have a very important job to do. Every one of these animals provides a window into the health of its population, so we want to learn as much as we possibly can. We have a strong commitment at San Diego Zoo Global to ensure that all animals in our care have an opportunity to thrive. We want them to have the best possible lives and contribute as much as possible to our conservation mission. The Wildlife Disease Laboratories help ensure this by playing a vital role in optimizing the health and well-being of our animals through diagnostic services and research. A very important, but often underappreciated, aspect of this is our postmortem disease surveillance work: discovering why an animal died.

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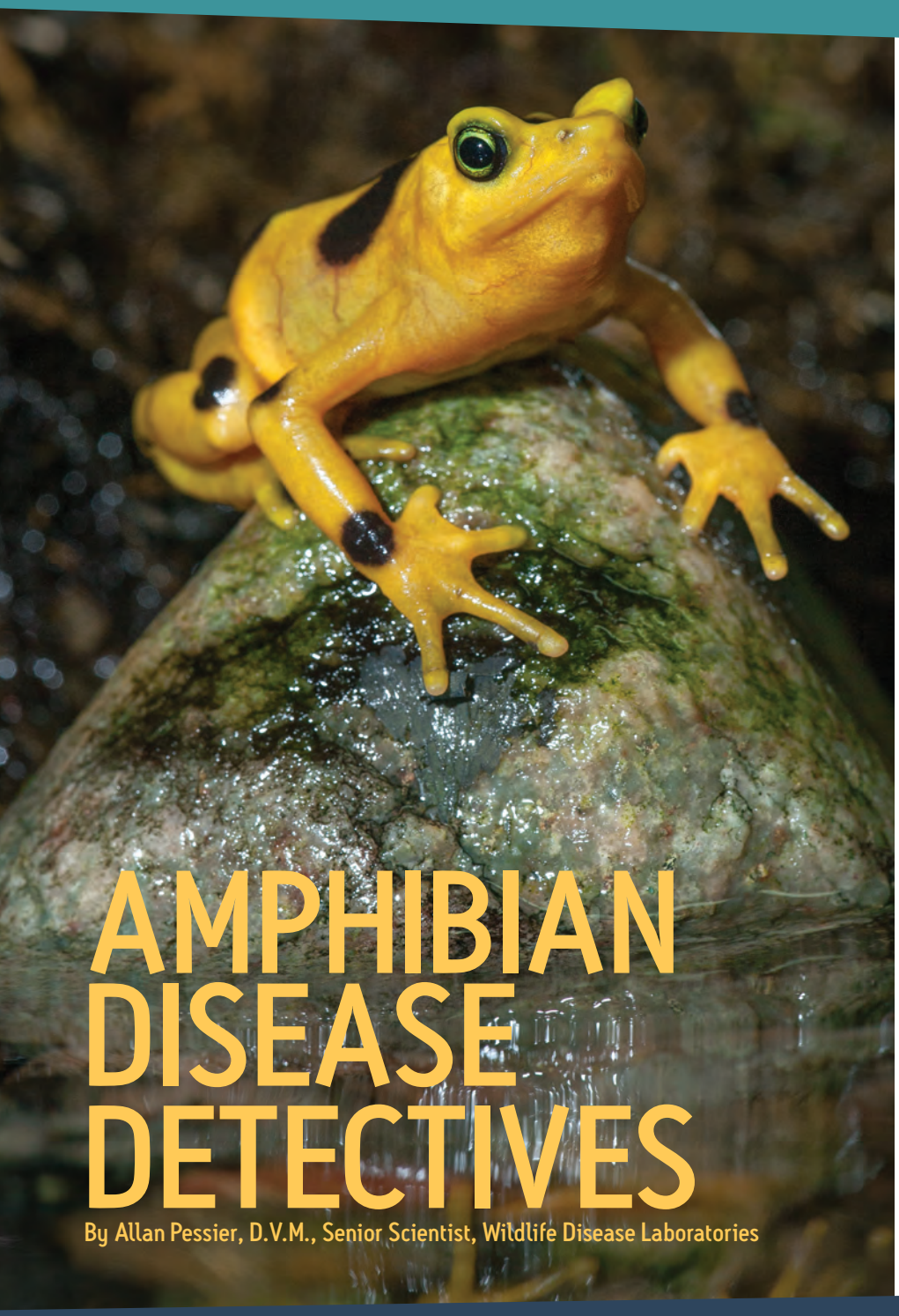
A first step is collecting a wide variety of samples from each animal, which generates a large amount of information and results in a unique archive of biological samples and research data. The information generated is shared with a broad audience, both in-house and around the world, to help improve and maintain wildlife health. Our archives are of great historical and scientific value to San Diego Zoo Global as well as to conservationists and researchers everywhere.

The core of our archive is a collection of more than 400,000 microscope slides of tissue sections from more than 1,000 species of animals dating back to the late 1930s. It is also the only one of its kind accredited by the American Alliance of Museums.

Supplementing this core archive is a growing collection of blood smears, cytology slides, frozen tissue samples, and digital photographs representing more than 6,000 diagnostic procedures we conduct each year. This archive is used daily by our scientific staff, as well as students, postdoctoral fellows, and visiting scientists, resulting in well over 100 scientific journal publications and several hundred scientific presentations over the last 10 years. We also distribute more than 300 valuable anatomic specimens to museums and educational institutions each year. It is definitely an archive that keeps on giving.

So when an animal reaches the end of its life here, it's not really the end. Each one leaves a legacy that will help us advance our conservation mission for many, many years to come.



AMPHIBIAN DISEASE DETECTIVES

By Allan Pessier, D.V.M., Senior Scientist, Wildlife Disease Laboratories

In the Amphibian Disease Laboratory, we're never sure what new challenge might appear in each morning's mail delivery. Most samples that arrive are skin swabs to test frogs for the deadly amphibian chytrid fungus, *Batrachochytrium dendrobatidis,* but others are tissues to detect viruses or even whole deceased animals so we can determine cause of death. We accept samples from outside zoos, wildlife agencies, and conservation organizations working with endangered species ranging from the mountain yellow-legged frog in Southern California to the golden mantella in Madagascar.

So why does the Institute for Conservation Research operate a special disease laboratory for amphibians? They are among the most rapidly disappearing groups of animals, and outbreaks of disease like the chytrid fungus are major contributors to population declines. For other animal groups like birds and mammals we have good basic background information on disease, and many validated tests and diagnostic laboratories are available worldwide. But despite the importance of detecting and preventing disease to advance amphibian conservation, very little is known about the spectrum of diseases that occur in these unique animals. Also, until recently, specialized diagnostic testing was limited to a few overworked research laboratories. Our Amphibian Disease Laboratory was created to fill this void and works toward removing disease as a roadblock to conservation efforts worldwide.

One of the most exciting things about work in the Amphibian Disease Laboratory is that every lab result or discovery has an impact in promoting amphibian health and conservation. In 2015, we are leading efforts to test animals in U.S. zoos for the presence of a new chytrid fungus, *Batrachochytrium salamandrivorans,* which threatens salamander populations worldwide; researching outbreaks of the fungal disease fusariosis in Panamanian golden frogs (left); and collaborating with Brazilian colleagues to investigate malformations and disease in toads from the environmentally sensitive island of Fernando de Noronha.

It's time to open the mail....

HIDE AND SEEK WITH THE INVISIBLE

By Josephine Braun, D.V.M., Dr.Vet.Med., Scientist, Wildlife Disease Laboratories

There are zillions of microorganisms in us and all around us, some of which are vital for our survival—and among all the beneficial microorganisms there are several, called pathogens, that can cause serious illness and even death. It is fascinating to study pathogens, their characteristics, effects within individual animals, and their impact on populations. The more we know about them, the better equipped we are to minimize transmission and prevent disease outbreaks.

Every year, a few of the hoofstock in the large, multispecies enclosures at the San Diego Zoo Safari Park fall ill with enteritis and need to be treated by our clinical veterinarians. The pathogens commonly found to cause disease outbreaks include specific viruses, bacteria, and protozoa that target the intestinal tract, which leads to inflammation, poor absorption of nutrients, and poor digestion. Feces from an infected animal can become a source of infection for an enclosure mate, so animal care staff does an extremely thorough job of "poop scooping" in these large enclosures to minimize potential disease spread.

One critical question we investigate is whether the water features within the Safari Park's enclosures act as a reservoir for these microorganisms after feces are deposited and runoff from fecal material flows in after heavy rains. We do know these pools and mud wallows are also a natural enrichment feature enjoyed by many species. Rhinos take their morning baths there during hot summer months, while antelope, Cape buffalo, gaur, warthogs, and elephants all enjoy a good mud bath. Tell-tale signs come from plenty of hoof prints near a water hole and the occasional muddy "boots" on an animal's feet, which indicate activity at the water. Although animals here do have fresh water sources, keepers notice they find these muddy water sources quite tasty for drinking!

That said, we always keep an eye out for animals that show signs of disease, collect blood and fecal samples, and call in our veterinarians to treat the patient. By testing and analyzing our pond water, we will know which pathogens we are dealing with. At San Diego Zoo Global, we are all committed to one goal—breaking the chain of disease transmission.

We completed a full-year cycle of water sample collection in January 2015: 700 liters (185 gallons) of water. Here, Jennifer Burchell, senior research coordinator, holds up a water sample from the Safari Park next to two curious bongo antelope. Later this year we expect to finalize sample testing of specific pathogen agents and identify the best intervention to eliminate or mitigate them.

MEET A CONSERVATION RESEARCHER

MEGAN JONES

D.V.M., Ph.D., Wildlife Disease Laboratories

By Karyl Carmignani, Staff Writer, Publications Department

For wildlife pathologist Megan Jones, a vital skill is to "specialize in being a generalist," since what awaits under the microscope, on her desk, or in her mailbox is wildly unpredictable. She has a keen interest in diseases in free-ranging wildlife, infectious disease pathology, and diagnostics, making her well suited to function as liaison between San Diego Zoo Global's Wildlife Disease Laboratories (WDL) and our conservation field projects. Postmortem surveillance is critical to a population's recovery. Even when a group of animals is generally healthy, necropsies of unexpected deaths help us understand population health, detect unforeseen diseases, and collect valuable samples for research.

For instance, last year Megan received the body of a California condor. Necropsy revealed that it had died from accidental trauma, but from a conservation standpoint it was also important to confirm that the bird was healthy before the accident as well as monitor for potential hazards or disease that could affect other condors. "Disease can impact a population," Megan explained. "My job as a pathologist is to identify and understand it, so that we can work as a team to stop or lessen its impact." Solving health and disease puzzles, collecting baseline data, and sharing findings with others—such as veterinarians, biologists, animal care staff, project managers—are just part of the job. Our pathologists, veterinarians, scientists, and research associates at WDL have a long history of supporting conservation, but Megan's post of "wildlife pathologist" is a new position. "I'm very excited about what I'm doing, to be a zoo-based pathologist whose primary job focuses on free-ranging wildlife and conservation. WDL is a unique place to be." She added, "It's great that we have dedicated resources to increase and expand our support for field projects."

> *"I'm very excited about what I'm doing, to be a zoo-based pathologist whose primary job focuses on free-ranging wildlife and conservation."*

Last fall, Megan organized a veterinary pathology workshop in China, to support Chinese giant panda conservation efforts. "It was so rewarding to train such enthusiastic and interested veterinarians about wildlife pathology, sharing the importance of doing this work." Whether it's peering into a microscope, collecting biological samples from any species, writing up a pathology report, or sharing crucial information, the intrigue of her job never wanes: "That's what makes it fun—you never know what you're going to see next!"

KEEPING A CHECKLIST FOR HEALTHY WILDLIFE

THINK ABOUT ALL THE SIMPLE THINGS YOU DO IN A YEAR TO MAKE SURE YOU STAY HEALTHY: exercising, brushing your teeth, eating well, scheduling regular checkups, filling prescriptions, getting vaccines, and taking time off to reduce stress. At the San Diego Zoo Institute for Conservation Research, we are committed to making sure that species in our care, as well as their wild counterparts, stay healthy. We complement our world-class veterinary and keeper care with a host of novel techniques that help fill in the trickier aspects of animal health, including environmental testing of Safari Park and Zoo habitats, assessing diet to encourage reproductive fitness, and exploring patterns of disease inheritance through DNA testing. Below are some ways our research team uses cutting-edge science to advance wildlife health and help remove disease as a roadblock to conservation.

SINCE 2009, the Wildlife Disease Laboratories have offered a valuable diagnostic testing service to detect the deadly chytrid fungus responsible for drastic amphibian population declines worldwide. Over 100 zoos, aquariums, and wildlife agencies use our Amphibian Disease Laboratory, including international conservation programs from Ecuador, Madagascar and beyond.

THE ROLE PLAYED BY GENETICS, DIET, AND LIFESTYLE in heart health is well documented for people but not for great apes. Using samples from the Frozen Zoo®, our geneticists are exploring how genes associated with metabolic processes in gorillas vary between individuals who have a history of cardiovascular complications and those who don't. This study will help us uncover those hereditary and metabolic factors in gorillas that indicate individuals at high risk, so we can help keep them heart-healthy in our care.

AVIAN MYCOBACTERIOSIS is one of the most troubling diseases facing bird collections and conservation programs around the world. Historically, it was thought this highly contagious disease is passed from bird to bird, so management protocols often required euthanizing potentially infected flockmates. Our studies indicate that this disease is most likely transmitted through the environment, rather than bird to bird, a tremendous breakthrough when managing the disease.

RESEARCHERS IN THE ENDOCRINE LAB are studying the long-term effects of DDT and other environmental toxins by using cloned hormone receptors from a reintroduced population of California condors. This is a noninvasive way to test the environment for chemicals that may affect condor reproduction. The study results will also help wild polar bears, endangered primates, and white rhinos.

PLEASE CONSIDER GIVING TO CONSERVATION RESEARCH TODAY. TOGETHER, WE CAN MAKE A DIFFERENCE!

Allison Alberts

Allison Alberts, Ph.D.
Chief Conservation & Research Officer, San Diego Zoo Global

CONSERVATION RESEARCH **GIFTS & GRANTS**

The Institute for Conservation Research is grateful to the following for their investments in endangered species conservation:

A gift from **Frank and Lisa Chapman** will fund the 2015 BE WiSE program (Better Education for Women in Science and Engineering). The **Daphne Seybolt Culpeper Memorial Foundation, Inc.** gave a grant to the Wildlife Disease Labs Division for a freezer, ultracold freezer, and mastercycler repair. A global conservation map of our field projects will be displayed at the Zoo, thanks to the **Hattie Ettinger Conservation Fund** at the San Diego Foundation. The **Foundation for Sustainability and Innovation** gave a grant for an FSI Spring Fellowship in Applied Plant Ecology. **Bob and Dawn Fournier** supported okapi behavioral ecology. The **Virginia Friedhofer Charitable Trust** gave a grant for habitat restoration through the Applied Plant Ecology Division. The **Giraffe Conservation Fund** gave a grant for community-based education outreach in Africa. A gift from **Pat and Ken Glazier** will provide camera traps for lemur ecology in Madagascar. **Judith C. Harris and Robert Singer, M.D.,** provided scholarships for the International Frozen Zoo® Cell Culture Seminar. A gift from **Scott Hedrick** will support the California Condor Recovery Program. The **Heller Foundation of San Diego** gave a grant for a Bud Heller Conservation Fellow in environmental toxicology research. The **International Community Foundation** gave a grant to mangrove finch conservation in the Galápagos Islands. The **JRS Biodiversity Foundation** gave a grant to create a digital herbarium in Peru. **Charles and Susan Lang** supported giant panda field ecology studies. **Sharon Lansing** provided Summer Teacher Workshops in Conservation Science scholarships for Los Angeles County teachers, and these scholarships were provided for East Coast teachers by **Brian and Robin Leach**. Grants from the **Meadowview Foundation** will assist with environmental toxicology studies to benefit the California condor as well as grow the Institute's endowment. The **Money/Arenz Foundation** gave a grant toward field research in Peru to help conserve the Andean bear in its native habitat. The **Moore Family Foundation** continued its commitment to the recovery of the 'alala through the Hawaii Endangered Bird Conservation Program. **Cathy Moore and Bob Farley** contributed to jaguar conservation in Peru. A grant from the **NOJ Foundation** will support avian stem cell research in the Reproductive Physiology Division. The **Conrad Schlum Charitable Trust** made possible a 2015 Schlum Fellowship in Applied Plant Ecology. The **James Scott and Sally Foss Hill Foundation** gave a grant in support of the Little Green Guards conservation education program in China. A grant from the **Seaver Institute** will enable the Genetics Division to launch a genetic rescue of the northern white rhinoceros. **Carolyn Werner Sheldon** made gifts to support aviary improvements at the Safari Park's "condorminium" and the Maui Bird Conservation Center as well as provided student scholarships through the **Dr. James J. Sheldon Memorial Fund**. The **Takahashi Family Fund** at the San Diego Foundation gave a grant for Title1 schools in San Diego County to visit the Conservation Education Lab.

What can a dedication to wildlife, a passion for conservation, and a five-year commitment to help achieve? No less than hatching 20 critically endangered California condor chicks (pictured) and 37 'alala (Hawaiian crows). In 2010, **Dr. James J. Sheldon and Carolyn Werner Sheldon** pledged their help to support endangered bird species through the California Condor Recovery Program and the Hawaii Endangered Bird Conservation Program, which have made remarkable strides in breeding and reintroducing birds to the wild. This past fall, we were sorry to say good-bye to the late Dr. Sheldon, whose remarkable legacy will continue, with Carolyn's help, through student scholarships, new aviaries, and, of course, dozens of young birds taking flight.

In 1926, Miss Ellen Browning Scripps gave an extraordinary gift to the San Diego Zoo to build a research center to advance animal health. Today, the **Ellen Browning Scripps Foundation** carries forward the philanthropic legacy of Miss Scripps, making possible great strides in understanding and combating diseases that threaten rare and endangered species.

Thanks to generous grants from the **McBeth Foundation**, through its shared commitment to wildlife health and conservation, our Wildlife Disease Labs have invested in technology and robotic equipment for rapid diagnosis of disease and efficiency in disease analysis.

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WILDLIFE WISH LIST: HOW YOU CAN HELP!

Our field research team all over the world relies on the generosity of donors to help achieve San Diego Zoo Global's vision to lead the fight against extinction. Below are Wish List items that can help us right now. If you are interested in funding any of these, or learning about other ways to help, please call Maggie Aleksic at 760-747-8702, option 2, ext. 5762, or email maleksic@sandiegozoo.org.

Genetic disease testing for condors: California condors were once on the brink of extinction, with only 22 birds left in the wild. Thanks to careful and dedicated management of the population by San Diego Zoo Global and its partners, today we have more than 420 condors. The condor recovery team continues to monitor the birds' health, ensuring that their breeding and reintroduction programs remain strong. **Cost: $5,000 for reagents needed for genetic disease screening in California condors.**

Antibiotic-treatment tests: Desert tortoises can get an inflamed and congested nasal cavity, resembling a person's congestion when they have a cold. When they can't find food and water by smell, tortoises may die. Help us care for wild tortoises by supplying antibiotic-treatment, trial-sample testing assays. **Cost: $1,700 for one year of antibiotic-treatment trials.**

Testing hormones in big cats: When are solitary big cats looking for company? Our Behavioral Ecology team is asking this question about cheetahs and tigers. Using a high-tech, liquid-handling robot, they measure hormones present in saliva to confirm when big cats are ready for introductions that may lead to breeding. **Cost: $1,250 per quarter for hormone testing.**

Storage units for tissue samples: When solving disease puzzles, the Wildlife Disease Labs team may find answers in cells or in tissues. Histopathology techniques include examining tissue samples for disease. For a high level of diagnostic accuracy, exact preparation of tissues is needed. **Cost: $4,905 for purchase of storage units to archive histopathology glass slides.**

CONSERVATION UPDATE

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PHOTOGRAPHS/ ILLUSTRATIONS
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