



RECENT PUBLICATIONS

Hope for Tropical Forest Birds

by Dr. Nathan Brouwer, Research Associate

In a recently published study, Dr. Steven Latta and I, along with collaborators from Connecticut Audubon and the San Vito Bird Club in Costa Rica, show that young tropical forest fragments are more valuable for bird conservation than previously thought. Protecting pristine, uncut forests has always been the cornerstone of rainforest biodiversity conservation, with little conservation value assigned to the younger successional forests that regrow after coffee plantations and other farms are abandoned. Data from Dr. Latta's long-term study in Costa Rica, however, show that from 2005 to 2015 the abundance of forest birds consistently increased in secondary forests that were less than 50 years old.

"When we began our research in 2005, we expected to witness declines in forest species," said Latta. "Younger forests have been found to buffer bird populations and perhaps stall their decline; we found that although these forests lack some of the complex vegetative structure of more mature forests, they nevertheless accumulated more birds and more species over the course of our study, including primary forest specialists."

To carry out this long-term study, Latta and his principal collaborator, Judy Richardson, from Connecticut Audubon, returned to southwestern Costa Rica each fall and winter. With the help of the San Vito Bird Club, they systematically counted and banded birds in three small secondary forest patches. Over ten years they observed or captured almost 5,000 birds of 152 different species.

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EDUCATION

Fostering Dominican Ornithologists

by Steven Latta



In many countries, ornithologists become ornithologists through practical training, field experience, and short course offerings, often by non-governmental organizations. Financing these endeavors is always a challenge, but their successful outcomes are critical to the success of conservation ornithology.

In August 2017, the National Museum of Natural History in Santo Domingo, Dominican Republic teamed up with the National Aviary and other non-profits to offer a workshop entitled, "An introduction to the study and conservation of birds." The workshop was completely funded by proceeds donated by my co-authors and me from the sale of a Spanish translation of the only complete field guide to the birds of the country, *Birds of the Dominican Republic and Haiti*.

The workshop included material on avian biology and ecology, and tips on how to identify birds, with an emphasis on common Hispaniolan (especially endemic)

birds. The need for conservation of birds and their habitats was covered, as well as the critical role of ecotourism in conservation. Finally, the workshop included field experience in mist netting and banding birds.

Dr. Carlos Suriel of the Museum of Natural History expressed his complete satisfaction with the success of the course by stating, "The course fulfilled all of our expectations, from beginning to end. The participants now have the tools and the enthusiasm to continue learning about and working for the conservation of birds."

The 18 participants in the workshop included undergraduate students from the Biology program at the Autonomous University of Santo Domingo, the Ecology and Environmental Management program at the Catholic University of Santo Domingo, and the Education Department at the Technological Institute of Santo Domingo, as well as technicians from the Ministry of the Environment, a community organizer from near Los Haitises National Park, and the

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NATIONAL AVIARY

The National Aviary inspires respect for nature through an appreciation of birds.

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FROM THE EDITOR

Creativity in Conservation

In a world increasingly faced with a burgeoning human population, global warming, and the pressing social, political, and environmental issues that these spawn, effective conservation requires creative approaches and strategies.

Creativity in designing successful, low-cost research, management, and education programs that use limited funds to best advantage is always a challenge. Creativity also requires finding new and imaginative ways to solve old conservation problems, reach new audiences, and create those “Ah-ha!” moments that will help spur real change.

At the National Aviary, we try to face conservation issues with creativity on a daily basis, and we highlight this in the current issue of *Flightpaths*. For example, in biostatistics — a field which might not at first glance seem ripe for creativity — National Aviary Research Associates, Nathan Brouwer and Emily Scott, have drawn on plant demographics to find new ways to make use of naturally scarce data from rarely seen birds. Newly minted Ph.D. Brian Trevelline has drawn on molecular biology studies of bats and small mammals to develop a novel way to explore avian diets, and he has used the technique to undertake a novel study of how bird species partition, or share, available food resources.

In the vet hospital, our top-notch staff is continually inventing or adapting new tools and techniques to tend to the unique needs of avian patients from pittas to penguins.

We also undertake creative approaches to promoting education and building capacity in communities of people who lack access to many of the conservation tools and resources that we take for granted. In this issue, we describe how we used proceeds from the sale of our popular field guide to fund a multi-partner workshop in the Dominican Republic to introduce students and community leaders to birds, ecotourism opportunities, and avian conservation.

At the National Aviary, we view science and conservation as creative endeavors, and we believe that solving the many difficult conservation challenges we face today will require our collective creative efforts, now more than ever.

Steven Latta, Ph.D.

Director, Conservation and Field Research



VETERINARY PROGRAMS

Creative Treatments for Avian Patients

by Dr. Pilar Fish, Director of Veterinary Medicine

Providing quality health care is important in order for birds to recover from medical conditions or injuries; however, treatments can be challenging when veterinary instruments and medications are mismatched to the anatomy and physiology of birds.

At the National Aviary, we have used a variety of approaches to adjust, re-use, adapt, and invent new approaches to bird care.

For example, prescribing medications can be difficult because doses specific to our unique bird species often don't exist. When dog, cat, or human tablet concentrations are not suitable, we make a suspension by crushing the tablets. The medication can then be injected into a preferred food item such as a grape for a toucan, or a fish for a penguin.

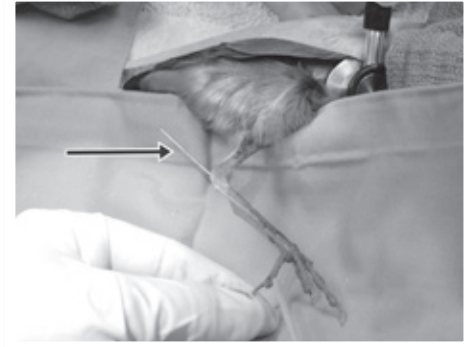
When a bird becomes ill, collecting blood for tests is important for a diagnosis, but birds' veins can be minuscule. Fortunately, human insulin needles come in a variety of extra small sizes that match bird veins.

Surgery in birds also requires a delicate approach. We use human ophthalmic surgical instruments because they are appropriately sized for fragile tissue. Using these fine-tipped instruments can make the difference in ensuring a successful outcome.

Even anesthetizing birds for surgery is different. In large birds, a safe gas anesthesia is normally given through a breathing tube; however, the smallest standard tube available won't fit birds under 80 grams. For these tiny patients we have modified a catheter intended for horses' veins to fit their tracheas. This provides a safe and effective way to ventilate birds under anesthesia.

Besides taking great care to handle small birds, we also need to take precautions when handling large, powerful birds such as Andean Condors. While doing physical examinations and collecting blood, staff could be badly injured by their strong beaks. To prevent injury, we cut a large diameter PVC pipe to fit over the condor's head and act in a similar fashion to an E-collar on a dog or blinders on a horse. The condor remains calm, and we can safely work near its face.

At the National Aviary we are often faced with challenges when working with bird patients because each bird has its own species-specific requirements. We enjoy the challenge of continually devising customized techniques and tools to meet the needs of our unique avian patients! ■



We discovered that a spinal needle for small dogs was an exact fit to repair a leg fracture for this Hooded Pitta. Standard bone pins were too large for this bird that is smaller than an American Robin.



Hope for Tropical Forest Birds

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On average, forest bird numbers in the young forest fragments increased by about five percent each year. Over a decade this resulted in a 50 percent increase in the abundance of many species. For example, capture rates of species that prefer primary forest, such as the Green Hermit, White-ruffed Manakin, Sulphur-rumped Flycatcher, and White-breasted Wood-Wren, doubled over the course of the study. Surprisingly, this occurred without substantial changes to the structure or composition of the forest habitats themselves. Our study attributes these increases to growing populations of birds recolonizing the secondary forest

fragments from a few remaining undisturbed forest plots in the region.

We coined the process of birds recolonizing these younger forests as a "species credit" cashed in over the course of the study. Latta explains, "Environmental conditions in our study sites didn't change, it's just that, over time, as forests like ours regenerated across the landscape, more and more birds found high-quality habitat in these younger fragments and began using them."

He continues, "These results are so encouraging for conservation because they

suggest that if forests are allowed to recover, growing populations of birds will respond and may return to them much sooner than we expected, as long as remnant populations remain as a source for these new recruits."

Funding for this long-term study was provided by the National Aviary's Avian Conservation Endowment, Point Reyes Bird Observatory, and the Grace Jones Richardson Trust. The paper, entitled "Long-term monitoring reveals an avian species credit in secondary forest patches of Costa Rica", is available through the open-access journal *PeerJ* at peerj.com/articles/3539. ■

Assessing Threats to Neotropical Parrots

by Steven Latta

Parrots, parakeets, and related species in the avian order Psittaciformes are among the planet's most endangered birds. More than 30% of Neotropical parrot species are considered to be under some sort of threat, but a complete assessment of the status of these species has not been made in more than 25 years.

In a broad collaborative study, I participated with lead author, Igor Berkunsky, and dozens of other experts, including biologists and wildlife managers from government agencies and non-governmental conservation organizations, to fully assess the conservation situation of Neotropical parrots. For the first time ever, we assessed distinct populations within species, as well.

Published recently in *Biological Conservation*, our article, "Current threats faced by Neotropical parrot populations," stresses the critical need for updated data to strategize conservation actions, especially because so many of the threats are caused by expanding human populations. We presented information on specific threats affecting 192 populations of 96 Neotropical parrot species in 21 countries, as well as estimates of population trends of these species. Many parrot populations are affected by multiple threats, but the most frequently cited threats are agricultural development, capture for the pet trade, and logging.

In contrast to previous studies, our study showed that capture for the pet bird trade is the threat most closely associated with decreasing trends in local populations of parrots. Other threats associated with decreasing populations include habitat loss associated with small-holder farming, agro-industrial grazing, and nest destruction by poachers.

Finally, of great concern was our finding that conservation actions have been implemented for fewer than 20% of parrot populations. Although there are many threats to wild parrot populations, we emphasize how critical it is to curb the illegal capture of wild parrots for the pet trade (see related article on opposite page). ■

Dr. Latta and personnel from the National Zoological Park in Santo Domingo release back into the wild Hispaniolan Parakeets that were confiscated from the pet bird trade.



Fostering Dominican Ornithologists

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president of a neighborhood association in the city.

All the student participants signed on for monthly activities to continue to grow their knowledge, beginning with a presentation by National Aviary Research Associate Andrea Thomén on the role of

cacao plantations in bird conservation and a count of waterbirds at an internationally important migratory stopover site. The students are already moving forward with the creation of their own birdwatching club.

The National Aviary congratulates the Museum of Natural History for organizing

such a successful workshop, and we look forward to working with our other collaborators — Vermont Center for Ecostudies, Tody Tours, Grupo Jaragua, Fundación Propagas, and the Grupo Acción Ecológica — to create new workshops and follow-up programming. ■

Keeping Wild Birds Wild

by Robert Mulvihill

Around the world, the aesthetic and status-enhancing aspects of many kinds of birds (and, therefore, their monetary value) are contributing to their rapid elimination from the wild, in the same way that human obsession with ivory and aphrodisiacs imperils wild elephant and rhinoceros populations. The birds may not be directly killed for products, but their capture is tantamount to mortality as far as the wild population is concerned.

In fact, trapping of birds for the illegal pet trade has been identified by Birdlife International as one of the top five factors driving declines in globally threatened bird species (see also article on opposite page), affecting some 450 species, or 34% of the total number of species threatened with extinction. Parrots (Psittaciformes) are reportedly among the most threatened bird orders with 28% (111 of 398) of the world's existing species classified as threatened under International Union for the Conservation of Nature (IUCN) criteria, with the vast majority of these being trapped for the illegal bird trade.

For example, in a recent 20-year span, more than 1.3 million wild-caught African Grey Parrots entered international trade. Factoring in pre-trade mortality of greater than 50%, the total number of birds removed from the wild in that time likely exceeded two million. According to one recent study by a team of researchers from Ghana and the United Kingdom, Ghana has lost 90-99% of its population of African Grey Parrots in just the last two decades.

The Blue-throated Macaw was nearly trapped to extinction before 1984, when its live export from Bolivia was banned. That threat has been reduced, but remaining Blue-throated Macaws, estimated to be in the low hundreds, face another hurdle to recovery: their known breeding range mostly falls within private cattle ranches, where tree-felling and burning has decimated macaw nesting sites.

Other examples include the Yellow-crested Cockatoo of East Timor and Indonesia, and the Spix's Macaw of Brazil.

Countries with the highest responsibility and priority for parrot conservation action are: Indonesia, Brazil, Australia, Colombia, Bolivia, Ecuador, Peru, Papua New Guinea, Venezuela, and Mexico. Critically needed actions include:

1. site protection and management
2. improved legislation
3. ex-situ conservation (i.e., propagation of insurance populations in accredited zoos and aviaries)
4. greater local awareness and education.

Some progress toward abating negative parrot population trends has been made. At the Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), there was a motion to increase the level of protection



The West African nation of Ghana lost 90-99% of its African Grey Population within two decades.

for African Grey Parrot to the highest level available, banning the international trade of wild-caught birds.

Notwithstanding existing legal protections, there needs to be a two-pronged approach to the problem of illegal poaching and trade in wild birds: transformational education and cultural evolution are needed if global demand for wild-caught birds is ever to disappear.

This will require sustained effective communication and public relations, and strictly enforced and substantial negative consequences, not only for convicted poachers and trappers, but also for resellers and consumers of wild-caught birds.

1.3 Million African Greys were captured for illegal trade within 20 years.

With rare exceptions (e.g., to preserve species feared extinct in the wild), birds living in accredited zoos like the National

Aviary are several generations removed from their wild relatives; rehabilitated birds with residual injuries too debilitating for them to be returned to the wild; or illegally caught birds confiscated by wildlife authorities but unable to be returned to the wild.

Through its education programs and partnerships, the National Aviary takes very seriously its responsibility to be a voice for protecting wild birds from illegal poaching and trapping, and to raise awareness in current and prospective parrot owners of the challenges inherent in caring for these extraordinarily intelligent, highly social, and long-lived birds. ■

National Aviary “Graduates” a Ph.D.

by Steven Latta



Dr. Brian Trevelline celebrates a successful defense of his dissertation at Duquesne University.

One of many responsibilities of research scientists is that of mentoring students and the next generation of conservationists. In September 2017, National Aviary Research Associate, Brian Trevelline, successfully defended his Ph.D. dissertation at Duquesne University. His dissertation, “DNA meta-barcoding reveals provisioning of pollution-sensitive aquatic insects, resource partitioning, and dietary shifts among breeding Neotropical migratory songbirds in a riparian habitat,” brought exciting new components to the Louisiana Waterthrush research program that I coordinate, and it has spawned cutting edge developments in migratory bird studies.

Brian earned his B.S. in Biological Sciences from the University of Pittsburgh in 2008, where he also developed laudable laboratory skills. By 2011 Brian had become interested in applying molecular techniques to answer questions related to the conservation of migratory birds, and he approached the National Aviary. For his M.S. thesis in Environmental Science and Management at Duquesne, Brian developed a molecular approach to study the diets of nestling Louisiana Waterthrush — the first study of its kind for any songbird – and this provided the framework for his subsequent dissertation research.

Brian continued his work in collaboration with our Louisiana Waterthrush program, providing through his Ph.D. research the first application of DNA meta-barcoding to investigate diet in a community of Neotropical migrants. His results emphasize the importance of aquatic insects in supporting terrestrial breeding songbirds. They also improve our understanding of how anthropogenic disturbances to riparian habitats can negatively impact bird populations.

The National Aviary salutes Brian on a job well done! We also look forward to continued collaborations with Brian as he joins the laboratory of Dr. Kevin Kohl at the University of Pittsburgh as a postdoctoral research associate studying the influence of gut microbiota on the conservation physiology of Louisiana Waterthrush and other wild birds. ■

A Natural Inspiration for Biostatistics

by Emily Scott, National Aviary Intern

I grew up in rural New Hampshire, flanked by the White Mountains and a system of glacial lakes. My childhood summers were filled with camps at the environmental education center, which fostered in me a sense of wonder and appreciation for the natural world. The outdoors continued to serve as a source of inspiration, and by the time I was in high school, the curiosity of my youth gave meaning to my academic coursework, helping me to answer existing questions and to ask new ones. My study of the natural world became progressively more rigorous, and not just in an academic sense. My hobby of raising silk moths grew into a relationship with NH Fish and Game department, for whom I spent summers rearing endangered Karner blue butterflies. I also started working as a field technician for a bat biologist and spent summers surveying for bats in New England.

Studying biology at the University of Pittsburgh was a natural step for me, though it meant moving to a city for the first time. I grew fond of the Oakland campus, but jumped at the opportunity to take classes at the Pymatuning Laboratory of Ecology in northwest

Pennsylvania. Leaving Pymatuning after three weeks of ecology, my boots still mud-caked and wet in the trunk, I knew I would return. I went on to take conservation biology, entomology, and ornithology there before graduating from Pitt in December 2016 with a degree in biology and mathematics.

Dr. Steven Latta was my instructor for conservation biology and subsequently for a field course in Wyoming. He put me in contact with Dr. Nathan Brouwer, a Research Associate at the National Aviary, with whom I began working to develop statistical techniques and population models in order to better understand how populations of migratory birds change over time (see TREE Conference, page 7).

I am excited that the organic development of my fascination with the natural world led me to Drs. Latta and Brouwer at the National Aviary. I am now pursuing a Master’s degree in biostatistics at Johns Hopkins University, and I hope to apply what I learn there to ongoing projects at the National Aviary. ■

As a student, Emily Scott was inspired by the Wyoming Field Studies Program.



RECENT PUBLICATIONS

Birds Wear What They Eat

by Robert Mulvihill

It turns out that the old adage, “you are what you eat,” applies to birds, too! In a review article to be published in the next issue of *North American Bird Bander*, a colleague from the Royal Alberta Museum, Dr. Jocelyn Hudon, and I explored the effects of introduced honeysuckles (*Lonicera spp.*) on the coloration of 15 species of birds representing seven avian families. Specifically, we amassed published and unpublished instances of plumage reddening (i.e., erythrism) due to ingestion of berries containing a carotenoid pigment called rhodoxanthin.

We discovered that the reddening of portions of a bird's plumage ordinarily colored yellow can provide clues regarding 1) seasonal dietary shifts in species previously unknown to consume fruits; 2) plumage regions not previously recognized as containing carotenoid pigments; 3) timing of post-breeding molt; and 4) the pattern and extent of pre-breeding molt.

The study builds on work both of us have published previously focusing specifically on erythrism in Cedar Waxwings (birds with orange rather than yellow tail bands), Yellow-breasted Chats (with orange breasts),

and Northern Flickers with mixed yellow and red flight feather shafts previously identified as hybrids between the eastern Yellow-shafted and western Red-shafted forms of the Northern Flicker.

We raise the possibility that the geographically widespread plumage-reddening effect of consuming exotic honeysuckle fruits during feather molt has the potential to confuse social signalling in some species, e.g. species recognition, age, and individual quality. Bright red carotenoid-based coloration in birds like the Scarlet Tanager and Northern Cardinal has long been hypothesized to signal high levels of fitness to prospective mates (i.e., low infection and parasitism rates; high levels of immunocompetence), so increased reddening due simply to consumption of a novel food item has the potential to render plumage a less reliable indicator of male quality, and this, in turn, could affect natural and sexual selection trajectories for some populations. ■



Orange-tipped tails on Cedar Waxwings, like this one, were the first sign of diet affecting plumage color.

TREE Conference Takes Root in Pittsburgh

by Steven Latta

Organized primarily by graduate students and postdoctoral associates from the University of Pittsburgh, the first Three Rivers Evolution Event (TREE) encouraged participation by individuals from all backgrounds, including early-career researchers, and promoted observational and experimental studies under natural and controlled conditions.

On a sunny weekend in September, nearly 175 attendees from 38 institutions viewed 50 talks and 60 posters. The diverse research spanned viruses, microbes, plants, invertebrates and vertebrates, and included both theoretical and applied studies in anthropology, epidemiology, developmental biology, ecology, paleontology, and many other specialized research areas.

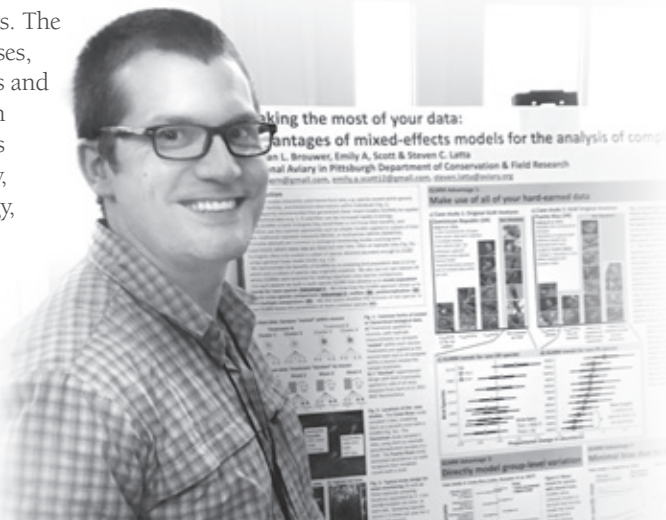
Scientific meetings are integral for communicating research results and their applications. But annual meetings of professional

societies are often large and expensive, and don't always encourage participation by students and early-career researchers. This new regional conference was greeted with enthusiasm by the academic and non-profit science communities, and it gave the National Aviary an opportunity to present important new concepts in use of large data sets to researchers from western Pennsylvania and surrounding areas who have an interest in evolution and related fields.

The National Aviary was represented at the conference by Dr. Nathan Brouwer, who presented his work done with help from National Aviary intern Emily Scott, and me. His poster, “Making the most of your data: mixed effects models facilitate insights into complex datasets,” presented important new concepts in the application of statistics in situations where large sample sizes are impossible to obtain. His examples included my own long-term monitoring data from Costa Rica and the Dominican Republic where many rare bird species are not well-represented in the data, but whose patterns of occurrences are nonetheless critical to understanding population trends and making conservation recommendations.

The National Aviary congratulates the TREE organizers, and looks forward to helping to grow future conferences where researchers and conservation professionals can share ideas, insights, and applications. ■

National Aviary research associate Nathan Brouwer presented analysis of long-term population trends of tropical birds.





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RECENT PUBLICATIONS

National Aviary Sponsors New Raptor Guide

by *Steven Latta*

Raptors are some of the world's most striking and popular groups of birds, but also some of the most difficult to identify. Now, thanks to a beautiful book sponsored by the National Aviary, the raptors of Middle America can be better known, appreciated, and conserved.

In *Raptors of Mexico and Central America* (Princeton University Press), author William S. Clark and artist N. John Schmitt present information about 69 species of eagles, hawks, kites, falcons, and vultures that occur in the region, including all migrants and vagrants. Through the creative use of 32 traditional painted plates and the liberal use of 213 photographs, each species is illustrated in a wide variety of plumages, postures and poses so that key field marks are visible.

But this guide is much more than plates and photos. The species accounts are as extensive and thorough as would be expected from perhaps the foremost

raptor expert in the world. These accounts provide in-depth tips for identification in all plumages, including timing and patterns of molt, behavioral cues and similar species.

The National Aviary, under then-Director Dayton Baker, sponsored this guide by funding Clark's extensive field research for the book in Mexico and Central America. ■

