



2018 ANNUAL REPORT



“It is time for great change through research designed to accomplish small, measurable impacts.”

— Meghan S. Martin-Wintle —



RESEARCH



NATURAL BREEDING

We stand huddled together in a group watching the pair of giant pandas below, one male and one female. The female is obviously interested, chirping (a call similar to a bird's for which it was named) and soliciting the male closer. The male . . . not so much. He's distracted and investigating the pen around him rather than concentrating on the task at hand.

The breeding manager, Zhang Guiquan, and I look at each other and shrug. We've seen this before countless times. Sometimes males just aren't interested in breeding with females though we've struggled to find out why. Our "male-male competition" research is winding down this season and we hope that the answer to this decades-long question will be answered soon.

Poorly motivated males are the "weak link" and often blamed for captive breeding failures. The wild mating system is in stark contrast to current captive breeding

methods. In the wild, rival males will compete to establish dominance for an estrous female, with the winner securing breeding rights. In captivity, males have no male-male competition and are actively managed to avoid any kind of male-male interaction. Understanding how giant pandas perceive and respond to male-male competition during

"The birth rate is currently higher than at any time since the breeding program began." -Zhang Guiquan

the breeding season may be critical to increasing reproductive success, particularly in animals that may be underrepresented in the gene pool.

This year our research showed that males given competition have greater intromission success than males not given competition. Their courtship behavior towards a female greatly increases after they “compete” with a male. Even more promising, it appears that some males need this competition more than others and we successfully mated two males that had previously never bred. With these results we hope to see breeding success rates for poor breeders skyrocket.

PDXWildlife’s team of scientist and interns have directly contributed to increasing the captive giant panda population which has helped it reach sustainable levels, thus making it resistant to extinction. Surplus cubs from the captive breeding program will now be used to supplement and bolster the wild population. In the future, PDXWildlife will build on this success and focusing on social suppression of female giant pandas. Maybe 2019 will bring an even greater increases in breeding success and spreading of our results to other endangered species!

Meghan S. Martin-Wintle, Director



References

1. **Martin-Wintle, Meghan S.**, et al. “Free mate choice enhances conservation breeding in the endangered giant panda.” *Nature communications*, 6 (2015): 10125.
2. **Martin-Wintle, Meghan S.**, et al. “Do opposites attract? Effects of personality matching in breeding pairs of captive giant pandas on reproductive success.” *Biological Conservation*, 207 (2017): 27-37.
3. Li, D., **Wintle, N. J.**, Zhang, G., Wang, C., Luo, B., **Martin-Wintle, M. S.**, ... & Swaisgood, R. R. (2017). Analyzing the past to understand the future: Natural mating yields better reproductive rates than artificial insemination in the giant panda. *Biological Conservation*, 216, 10-17.

Accomplishments

- Increased breeding success from 23% to 90% through implementing mate choice and personality studies.^{1,2}
- Produced 31 baby cubs in 2018.
- Published “Vocal behaviour predicts mating success in giant pandas.” in *Royal Society Open Science*.
- Published “Improving the sustainability of ex situ populations with mate choice” in *Zoo Biology*.
- In preparation “Male-male competition increases sexual motivation and intromission success in giant pandas”

“Applying for an internship with PDXWildlife was one of the best decisions I have made for my future career. I was fortunate to be able to go to China twice to help with data collection - the first time to observe stereotype behaviors and the second to observe breeding behaviors for the male-male competition study. I am incredibly interested in breeding behavior and am grateful to Meghan for allowing me to return to China and for inviting me to come to Portland to train on the data analysis side of the work PDXWildlife is doing. Meghan has been an amazing mentor. Her insights are invaluable and she is patient and thorough in her guidance. What I have learned working with her has provided me with a solid foundation to build a successful career working as a research biologist.”

– Shalyn Gordon –



ANTHROPOGENIC POLLUTION AND WILDLIFE

Humans are a source of various pollutants that can make their way into an animal's system and China is known for its coal plants which pollute the atmosphere. To make sure none of these pollutants are making their way into and harming the giant panda, PDXWildlife found that the panda's unique gut physiology allows it to pass polluted food without too much bioaccumulation. Levels of overall mercury and lead body burdens in giant pandas was very low compared to the high levels present on bamboo plants in the region. .

Accomplishments & future plans

- Published journal article “Blood lead levels in captive giant pandas” in *Bulletin of environmental contamination and toxicology*.
- Article in preparation “Mercury levels in captive giant pandas”.



“It is great news that giant pandas near large polluted city centers do not show lead levels which would cause health concerns.” – Nathan J.P. Wintle –



“Meghan has been an incredibly astute and supportive mentor in the past two years that I have known her. She has given me the invaluable opportunity to work under her as a research assistant at PDXWildlife and has single handedly coached me through the process of data organization and data analyses through the program R. Alongside of data handling, she has also encouraged me to form my own hypothesis around my interests and has taught me the critical thinking skills needed to conduct proper scientific research. She continues to be responsive and attentive to all my questions and has strengthened my confidence as a burgeoning scientist. ”

– Celina Tu –



IMPROVING WELFARE

Celina Tu, one of our new Masters-level research assistants has joined us for the last year to learn how to run teams in China and summarize data into scientific articles. Under Dr. Meghan Martin-Wintle she is evaluating how enclosure characteristics impact the welfare for giant pandas. Specifically, she's studying the incidences of stereotypical behavior and if they're alleviated or worsened by certain enclosure characteristics such as size, public viewing exposure, and climbing structures. This research is being conducted in conjunction with Meghan's evaluation of whether stereotypical animals are more reproductively successful than non-stereotypical animals. Together we hope our findings will inform managers on the best enclosure designs and the biological functions of stereotypical behaviors.

Accomplishments

- One research assistant trained in intern management, data analysis, and scientific writing.
- Article in preparation "Stereotypic behaviors predict reproductive success and litter sex ratio in giant pandas (*Ailuropoda melanoleuca*)"
- Article in preparation "Sex differences in stereotypic behavior based on enclosure characteristics"

SOCIAL HOUSING & REPRODUCTIVE SUCCESS

As part of our new internship program that provides Masters level students with data wrangling, data analysis, and scientific report writing experience. We've asked two students to investigate social mediators for reproductive success in giant pandas. Reproductive suppression has important implications for conservation programs. As a result of sensitivity to environmental conditions, individuals of either sex may fail to breed, produce cubs, or properly care for their young. Understanding the role of social influences in reproductive success can therefore be of great assistance to the success of conservation breeding programs. One project focused on social suppression of gestation, cub production, and maternal care in mother giant pandas. The other project investigated familiarity and social housing of a pair around mating introductions and the effects on that pairs reproductive success.

Accomplishments & Future Plans

- Two upper level interns trained in data analysis and scientific write-up.
- Article in preparation "Proximity to other females increases gestation length and decreases maternal care behaviors in the asocial giant pandas"
- Article in preparation "Familiarity increases intromission success and cub production in giant panda mating pairs"



EDUCATION





PDXWildlife offers truly unique research experiences to students from all around the world. Our interns go through an intensive 3-week training program at the beginning of their internships that prepares them for their three month research-abroad experience. More than that, it trains them as future conservation biologists. Internships in China provide practical research experiences that range from the glamorous, behavioral recording on giant panda mate choice, to the not so glamorous, fecal collection for hormone analysis. But each task prepares our interns for future work in the field and gives them a real-world experience of international research collaboration.

Even though PDXWildlife originally set out to primarily conduct research, we quickly realized that offering hands-on training that gives rise to future scientists may be our most important job. It is our pleasure to encourage the hopes and aspirations of future leaders in conservation biology.

With the finalization of our male-male competition project we opened up a new internship opportunity to Masters levels students that would

enable them to get hands-on experience with the final stages of a large-scale research effort. Four interns joined us at our PDXWildlife office in Portland, OR to learn data wrangling, analysis, and scientific writing skills. This program provides a vital stepping stone between undergraduate and Masters programs to doctoral programs and scientific jobs.

We've continued our capacity building with the Chinese scientists at the CCRCGP. Providing workshops for CCRCGP employees on behavioral data collection using iPad technology, training on camera trap set up, and statistical analysis in R. In 2019 we have been invited to the Chengdu Panda Base to provide a workshop on mate choice and breeding techniques to improve the reproductive success with their pandas.

While continuing our collaborations with Edinburgh University, Edinburgh Zoo and the University of London's Royal Veterinary College we have also been invited by the American Zoo Association's (AZA) Reproductive Management Center to begin a project to perform a broad survey of the uses of mate choice across all endangered Species Survival Plans' captive breeding programs. These collaborations continue to involve sponsoring and co-



advising graduate students from their respective universities. We know this capacity building work will only make our research better and more efficient.

Not to mention, we're very excited to see what the future holds!

NATE WINTLE

– Nathan J.P. Wintle, Deputy Director

Accomplishments

- 10 interns trained in 2018.
- Started collaborative project with the AZA's Reproductive Management Center on mate choice survey across all SSPs
- Hosted a table on mate choice and population sustainability at the annual AZA Conference in Seattle, WA.
- Started collaboration with Maria Diez-Leon from the University of London on a Mate Choice in Captivity book.
- Attended and presented “Using Mate Choice to Improve the Sustainability of Captive Populations” & “The Effects of Anthropogenic Pollution on Giant Pandas” at the Giant Panda Technical Conference in Chengdu, China.





“After my seven months in Wolong I moved to Portland where, thanks to the constant help and assistance of Meghan, I had access to a large database, and analyzed my own questions about the pandas through excel and R.

This was the most useful internship, it improved my statistical knowledge and R skills and my capacity to research and understand scientific papers and summarize my ideas as a researcher.

Through this internship I’ve been given the opportunity, not only, to publish a scientific paper but also to apply with success to PhDs fulfilling my dream of becoming a conservation biologist!”

– Giulia Ciminelli –



“2018 saw a move from our main base of operations at Bifengxia to the brand new panda base, Shenshuping, at Gengda. We also conduct reintroduction research nearby at Hetaoping and Tiantaishan. Gengda is nestled in the beautiful

Wolong Nature Reserve and is surrounded by mountains. This mountain range is one of the few places left in China where pandas naturally occur.”

– Nathan J.P. Wintle –

“During my internship in China with PDXWildlife I learned how to work in an international team with different backgrounds, this experience gave me the opportunity to have contacts with Americans, Europeans and Chinese researchers and students. I carried out several kind of research, each one taught me a lot; now I have an extensive knowledge on this species, I know how to develop a scientific protocol, how to use diverse ethograms and making direct and camera observation in more than one facilities.”

– Giulia Ciminelli –



A close-up photograph of a bird's nest. The nest is constructed from a dense, circular arrangement of light-brown, fibrous material, possibly dried grass or twigs, creating a cup-like shape. Inside the nest, two light-colored, speckled eggs are visible. The nest is situated within a larger structure of darker, thicker twigs and branches. A semi-transparent green banner is overlaid on the upper right portion of the image, featuring the word "EXPANDING" in bold, white, uppercase letters.

EXPANDING



'AKIKIKI

While we love pandas we are also keenly aware that our research on social factors surrounding successful intromission can help increase the populations of other endangered species. So when we were asked by the San Diego Zoo to extend our work to the 'Akikiki captive breeding program at the Hawai'i and Kaua'i Endangered Bird Conservation Center we jumped at the chance.

The 'akikiki is a small forest dwelling Hawaiian honey creeper. Its population has shown steep declines over the past 10 to 15 years, and now numbers fewer than 500 birds in the wild. The breeding population comprises individuals hatched from eggs that are collected from the wild. 'Akikiki nest on tiny branches at the top of the canopy, about 30 to 40 feet high, and camouflage their nests as clumps of moss. They have been severely affected by introduced diseases such as avian malaria, loss of native forest habitat, hurricanes, and the introduction of non-native predator species in the wild. Very little is known about them and they have not been raised in a zoological setting before.

PDXWildlife stepped in to help improve breeding success since the first two years of breeding produced zero chicks. Dr. Meghan Martin-Wintle was invited to Hawai'i in the fall of 2017 to prepare for the 2018 breeding season. She worked closely with both centers to devise a mate choice program and trained staff to measure female mate preference. Unlike the pandas, Meghan helped develop an R script that allowed scientists to make decisions in real-time about which male a female preferred so that those two birds could be introduced for mating.

Similar to the pandas, the hope is to eventually grow the captive population as an "insurance" population against extinction. Once the captive population is breeding surplus animals we can support the 'akikiki's future recovery by releasing captive-reared offspring into the wild. In 2018 PDXWildlife helped the 'akikiki get one step closer to this goal. The preferred pairings worked and the HBCC & KBCC were able to hatch and fledge the first 'akikikis in captivity. We hope that one day these young birds and their kin will be released on the Alaka'i Plateau, to help turn their numbers around.

Who knows . . . maybe one day we'll be downlisting this species too!



Meghan S. Martin-Wintle

“A panel of experts in Hawaiian forest bird conservation identified the initiation of a conservation breeding program as an essential step to prevent extinction of ‘akikiki. Being able to reproduce in captivity is another step forward for the species.”

– Michelle Clark, U.S. Fish and Wildlife Service –



Accomplishments

- First ever successful breeding and fledgling of ‘akikikis in captivity.
- Increased breeding success of the captive population from 0% to 83.3%, pairs producing a clutch from 0% to 80%, and egg fertility from 0% to 83.3%
- Trained eight staff at the Hawai‘i and Kaua‘i Endangered Bird Conservation Center in our mate choice research methods.
- Research will continue into the 2019 breeding season to increase sample sizes.



ISLAND IGUANAS

Island iguanas are the largest endemic land-dwelling animals on most Caribbean islands and are crucial to healthy ecosystems—but they’re also the most threatened. Caribbean rock iguanas *Cyclura* species are the most endangered lizards in the world. San Diego Zoo Global is the only organization to have successfully bred the endangered “Big Three”: Grand Cayman blue, Anegada Island, and Jamaican iguanas but reproductive success rates have gone down in recent years prompting them to invite

PDXWildlife to investigate ways to improve reproductive success.

Dr. Meghan Martin-Wintle visited the Kenneth and Anne Griffin Reptile Conservation Center in the spring of 2018 to develop and train the iguana team on mate choice work. She worked closely with both centers to devise a mate choice program and trained staff to measure female and male mate preference. The main goal of these experiments

is to determine if giving socializing opportunities to males and females prior to mating increases reproductive success of the pair. With this goal in mind researchers allowed some female/male pairs to have social contact through plexi-glass windows prior to mating introductions while others did not. We found that iguanas given socializations prior to breeding had a significantly higher chance of breeding success.



Meghan S. Martin-Wintle

“Over the period of the study the cameras picked up more copulations than I have ever seen and it appears that the howdy socialization doors are having a very positive affect on our pairings and breedings.”

– Jeff Lemm, San Diego Zoo Global –



Accomplishments

- Developed first behavioral ethogram for iguana mating and courtship behavior.
- Animals with socialization prior to breeding had 25% success of breeding versus 6.6% for animals without socialization.
- Trained two staff at the Kenneth and Anne Griffin Reptile Conservation Center in our mate choice research methods.
- Research will continue into the 2019 breeding season to increase sample sizes.
- Published “Improving the sustainability of captive populations with free mate choice” to *Zoo Biology*.

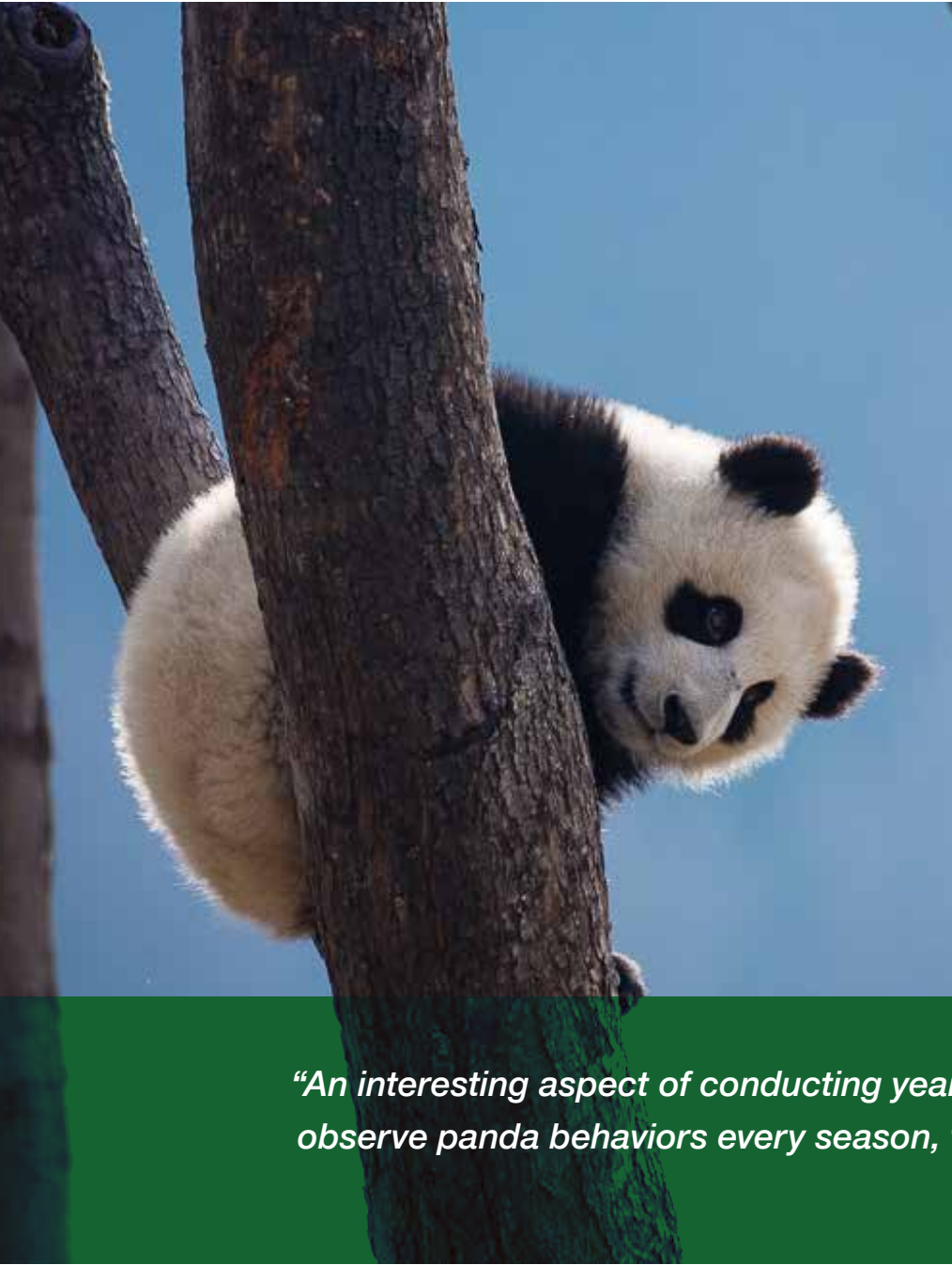


“I’m so excited to be spreading my knowledge of optimizing breeding programs into other endangered species programs! There’s such a need right now for improving captive breeding reproductive success so that these programs can provide animals for reintroduction into the wild to bolster declining populations.”

– Meghan Martin-Wintle –



THE FUTURE



MEASURING THE IMPACTS OF CLIMATE CHANGE

It's no secret humans are causing drastic shifts to our climate.

PDXWildlife started noticing a shift in the breeding season in 2014 and saw a drastic shift last year in 2017-2018. The winter was warmer, we had to wear less clothes to stay warm during our research and breeding lasted from December to June (normally from February to mid-May)! Good thing we collected environmental data during our research seasons since 2012! Now we're able to take a retrospective look at our data and see why pandas may be breeding so much earlier!

Future Plans

- Publish "Shifting Temperatures = Shifting Breeding Seasons: How climate change has changed the giant panda".

"An interesting aspect of conducting year-round research at Bifengxia is that we get to observe panda behaviors every season, which allows us to detect seasonal changes."

“Our research has the potential to directly bolster endangered captive breeding populations through increasing the genetic diversity and number of individuals produced in captivity that are available for reintroduction programs.”

— Meghan S. Martin-Wintle —





ONE SPECIES AT A TIME

AZA's Reproductive Management Center (RMC) has invited PDXWildlife's Meghan Martin-Wintle, as an expert in captive breeding, to evaluate the current breeding methods used in all the North American Species Survival Plans (SSPs). SSP programs focus on animals that are in danger of extinction in the wild, when zoo conservationists believe captive breeding programs may be their only chance to survive. These programs also help maintain healthy and genetically diverse animal populations within the zoo community. Sadly, most programs have seen very low success rates with as few as 20% of recommended pairs in Species Survival Plans successfully produce young before their next breeding and transfer plan.

PDXWildlife has the chance to make a large, impactful difference with their research in these endangered species breeding programs. Our experience on giant pandas has prepared us to evaluate and improve other endangered species programs — quickly and efficiently. The intensive work we've devoted to protocol design, troubleshooting facility limitations, and writing protocols uniquely prepares us to consult on other conservation breeding programs.

As humans continue to endanger wildlife populations (we've now entered what scientists are coining the *6th Mass Extinction* or the *Anthropocene Extinction*) it is important to have some individuals of a species still existing somewhere rather than go extinct completely. Conservation breeding techniques exist as another tool in our toolbox and can help to keep endangered species viable instead of risk complete extinction.

Our hope is that PDXWildlife can help conservation programs become more efficient and successful in less time than it would take starting from scratch, thus, saving more species from extinction. Your support allows us to continue to achieve conservation results around the globe and to help save some of the world's most threatened wildlife. We are so grateful for the opportunity to make even a small difference in the fight against extinction but know that without your support our work would be impossible. Enough small incremental steps can add up to a BIG change!

Future Plans

- Survey all 450 SSPs to determine to what extent they are utilizing mate choice in their breeding programs and how mate choice may be impacting reproductive success.
- Develop pilot research projects across large taxonomic groups and within mating strategies to evaluate the effects of mate choice on reproductive success



SOCIAL BUTTERFLIES

Continuing to expand our research to other studies is important to PDXWildlife’s mission and what better place to start than in our own backyard? Taylor’s checkerspot butterfly was once abundant in the inland prairies of the Pacific Northwest but is now limited to 12 isolated sites in Washington, two in Oregon and one in Canada. It is listed under the U.S. Endangered Species Act. The Oregon Zoo has bred the butterfly for over a decade in captivity and has copious records on each pairing. One of our new Masters-level student interns is currently investigating the effect of offering multiple mating partners on the reproductive success of mate pairings.

Future Plans

- We are currently investigating whether females presented with more mating partners will have increased reproductive success
- The checkerspot butterfly would be the first ex situ insect breeding program to investigate this potentially important factor on program reproductive success.



“Now home, I have implemented my learnings in a project with the Oregon Zoo. Currently, I am aiding in understanding what enables reproductive success in captive breeding of the Taylor’s Checkerspot Butterfly. Looking back, I wouldn’t have traded my experience with PDXWildlife for anything, I am forever grateful. Dr. Martin-Wintle was able to place my little world in a whole new world to eventually aid everyone’s world.” – Meagan Gombart –



“I was once told when lamenting about my height as a teenager that, ‘Good Things come in small packages.’ This statement has become my life motto - I truly believe that small non-profits which focus on a distinct niche can make small impacts that, overtime, add up to BIG changes! PDXWildlife is a small non-profit intent on delivering good results to the conservation world. ”

— Meghan S. Martin-Wintle —



PDXWildlife
9233 SW Brier Pl.
Portland, OR 97219
www.pdxwildlife.com