



2019 ANNUAL REPORT



“Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it’s the only thing that ever does.”

— Margaret Mead —

A giant panda is perched on a thick, brown tree branch. The panda's body is primarily white with distinctive black patches on its ears, around its eyes, and on its limbs. It is looking towards the camera with a calm expression. The background is a soft-focus forest with green leaves and some yellowish-orange foliage. A dark green rectangular box is overlaid on the right side of the image, containing the word "RESEARCH" in white, bold, uppercase letters.

RESEARCH

A giant panda is shown climbing a tree trunk. The panda is positioned on the left side of the frame, with its body angled upwards. It has its black and white fur clearly visible. The tree trunk is a thick, brown, textured surface. The background is a soft-focus green forest.

WILD REINTRODUCTION

I breathe in the cool mountain air and peer through the bamboo stands straining to see a moving black and white form, a shadowy outline moving through the dense vegetation. I strain my neck, scanning back and forth and... there it is! I get a good glimpse of the giant panda...in the wild? No, this one is in a very large enclosure and is being prepared for a new life in the wild soon.

I am here at the Tian Tai Shan reintroduction center just outside of the Wolong Nature Reserve where the China Center for Research and Conservation of the Giant Panda (CCTCGP) is training pandas born at their breeding centers for life in the wild. The idea is to bring a mother with a very young cub to these large, naturalistic enclosures that are not too disparate from what pandas would experience in their wild habitat. The cub will be released, not the mother, and it will have no experience with the artificial environments back at the breeding centers. And, we at PDXWildlife are working closely with the Center to develop this training program, an exciting prospect.

“It is time now for us to roll up our sleeves and get on with the continued work necessary to keep giant pandas on the path to recovery.” -Ron Swaisgood

We will be doing a series of studies designed to learn what pandas need to know for life in the wild, and how we can promote some of those essential behaviors. We'll research behaviors that pandas need to survive and thrive in the wild such as bamboo feeding [1], predator avoidance, and social responses to other pandas. I'm training the new interns in the methods on this very trip.

As I watch a mother and cub move in and out of view. The mother, reared more traditionally in a breeding center, is more used to humans, and even comes down to have her GPS collar battery exchanged (for which she is given a treat). She will not be released, though her cub will in another year. As planned, the cub keeps its distance and is nowhere to be seen. Watching the mother makes me think how lucky I am to be here and to have this opportunity.

Over the past 10 years we have helped get the pandas breeding and producing cubs [2] for this very reintroduction project. Since I've been there for the conception of each and every cub and have watched them grow [3], I care deeply what happens to them next on this leg of their life journey. I want to make sure they make meaningful contributions to the species' conservation (they will by supplementing small, isolated wild populations that are at risk of inbreeding depression), and that they do not needlessly suffer too rough a transition to the wild. Although pandas have reached a major milestone recently and were downlisted from Endangered to Vulnerable, it is time now for us to roll up our sleeves and get on with the continued work necessary to keep them on the path to recovery.

Meghan S. Martin, Director



References

1. Swaisgood, R. R., **Martin-Wintle**, M. S., Owen, M. A., Zhou, X., & Zhang, H. (2018). Developmental stability of foraging behavior: evaluating suitability of captive giant pandas for translocation. *Animal Conservation*, 21(6), 474-482.
2. **Martin-Wintle, Meghan S.**, et al. "Free mate choice enhances conservation breeding in the endangered giant panda." *Nature communications*, 6 (2015): 10125.
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

- Trained and researched 8 cubs
- Trained 6 interns on methods
- Published "Developmental stability of foraging behavior: evaluating suitability of captive giant pandas for translocation." in *Animal Conservation*.
- Published BD Charlton, MA Owen, JL Keating, **MS Martin-Wintle**, H Zhang, RR Swaisgood. Sound transmission in a bamboo forest and its implications for information transfer in giant panda (*Ailuropoda melanoleuca*) bleats. 2018. *Scientific reports* 8 (1).

“When I heard I was accepted to join the PDXWildlife research team for the breeding season, I couldn’t believe it! The chance to work in conservation! The chance to work with reproduction! The chance to work with Pandas! I couldn’t think of a more fitting opportunity encompassing everything I’ve been striving towards for as long as I can remember. If I get the chance, I would be more than happy to just keep doing work with the Giant Pandas! As symbols of peace, harmony, and friendship...they are absolutely gorgeous creatures who not only need, but also fully deserve the concern and support of all those passionate about them. I am truly honored to be among the ones that can.”

– Meagan Gombart–



SOCIAL HOUSING & REPRODUCTIVE SUCCESS

Over 2019 we hosted four Master-level students with data wrangling, data analysis, and scientific report writing experience. Two students investigated social mediators for reproductive success in giant pandas. Reproductive suppression has important implications for conservation programs. As a result of sensitivity to environmental and social 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 interns trained in data analysis and scientific write-up.
- Article in preparation “Effects of social housing during pregnancy, birth, and postpartum periods in giant pandas (*Ailuropoda melanoleuca*)”
- Article in preparation. “Familiarity breeds success in giant pandas (*Ailuropoda melanoleuca*): Social housing as a tool for breeding managers”





“My current interests are focused on improving welfare and ethical treatment of both wild and domestic captive animals. Ultimately, I’d like to understand the cause and role of behavioral stereotypes in captivity and how they affect individual welfare. This panda internship seems custom made for me! We are also collecting data on stereotypical behavior that will be analyzed retrospectively for any factors that may cause or alter these behaviors. I’m going to get behavioral research experience in my area of interest AND work with Giant Pandas in China– how many people can say that!?”

– Celina Tu –



IMPROVING WELFARE

Stereotypes are behavioral anomalies that arise in captive environments and may impair conservation breeding. Celina Tu analyzed data and found that social conditions such as the number, sex, and age of conspecific neighbors and the housing area density affects both male and female giant panda's presence and intensity of stereotypy performance. Meghan also evaluated whether stereotypical animals are more reproductively successful than non-stereotypical animals and found that male and female stereotypes are likely the outcome of different frustrated motivation. Male stereotypes are associated with improved breeding success whereas stereotyping females displayed lower reproductive success. These findings have implications regarding the effects of captivity on behavior and in the future we can suggest management intervention to address conservation breeding goals.

Accomplishments

- One research assistant trained in intern management, data analysis, and scientific writing.
- Published: **MS Martin**, M Owen, NJP. Wintle, G Zhang, H Zhang, RR Swaisgood. 2019. "Stereotypic behaviour predicts reproductive performance and litter sex ratio in giant pandas". *Scientific Reports*.
- Article in preparation "Differential effect of social environment on male and female giant panda's activity level and stereotypy performance."
- Article in preparation "Sex differences in stereotypic behavior based on enclosure characteristics"

BOOK CHAPTER

The dramatic growth of the captive giant panda (*Ailuropoda melanoleuca*) population exemplifies how the application of scientific findings to animal care and reproductive management can improve conservation breeding outcomes. This chapter documents the development of successful giant panda managed breeding programs by focusing on three key areas, (1) the development of science-driven reproductive techniques to improve fecundity in a species where the mating system was poorly understood, (2) how targeted research and adaptive management of social settings surrounding estrus and breeding improved reproductive success, and (3) insights and solutions to challenges faced across the program's history with future directions for research.

Accomplishments & future plans

- Published Martin-Wintle, M. S., Kersey, D. C., Wintle, N. J., Aitken-Palmer, C., Owen, M. A., & Swaisgood, R. R. (2019). "Comprehensive Breeding Techniques for the Giant Panda". In *Reproductive Sciences in Animal Conservation* (pp. 275-308). Springer, Cham.



“The resultant holistic understanding of giant panda reproduction has improved reproductive success in the captive population to such an extent that it is now self-sustaining and provides surplus animals for reintroduction..” – Meghan Martin –

AKIKIKI

The 'akikiki is a small forest dwelling Hawaiian honey creeper with fewer than 500 birds in the wild. In 2018 PDXWildlife stepped in to help improve breeding success since the first two years of the conservation breeding program produced zero chicks. After two years it is clear that our research on mate choice increases both the number of clutches and eggs produced by a breeding pair.



“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 2020 breeding season to increase sample sizes.

ISLAND IGUANAS

Island iguanas are the largest endemic land-dwelling animals on most Caribbean islands and are also the most threatened. San Diego Zoo Global breeds three species; Grand Cayman blue, Anegada Island, and Jamaican iguanas. However, reproductive success rates have gone down in recent years. PDXWildlife continues to work with the Kenneth and Anne Griffin Reptile Conservation Center to research the effects of mate choice and socialization opportunities on reproductive success. We find that iguanas given socializations prior to breeding had a significantly higher chance of breeding success. We'll have our final findings ready in 2020!



“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 2020 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 –

SOCIAL BUTTERFLIES

PDXWildlife continues to work closely with the Oregon Zoo on investigating factors increasing reproductive success in Taylor's checkerspot butterfly. The Oregon Zoo has bred the butterfly for over a decade in captivity and has copious records on each pairing. With the butterflies we're able to investigate whether more matign partners results in higher success. Turns out, more isn't always better, and butterflies in captivity have a "sweet" spot when it comes to the number of mates introduced. 4-5 males introduced to a female results in the highest breeding success.

Future Plans

- 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.
- In prepartion "Social Butterflies: More mates are better than one"



"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 was able to place my little world in a whole new world to eventually aid everyone's world." – Meagan Gombart –

EDUCATION





“Our interns are now based in the idealic valley of Gengda nestled within the Wolong National Nature Reserve in Sichuan, China. The Shenshuping base is surrounded by snow capped mountains and a bamboo forests and right in the middle of wild panda territory!”

– Meghan S. Martin –



TRAINING THE FUTURE

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!

Meghan S. Martin



Accomplishments

- 4 interns trained in 2019.
- 4 papers in the process of publishing
- Continued collaborative project with the AZA's Reproductive Management Center on mate choice survey across all SSPs
- Planning workshop at AZA's Mid-Year conference on using Mate Choice to Improve Population Sustainability.
- Continued collaboration with Maria Diez-Leon from the University of London on a Mate Choice in Captivity book.





“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 –

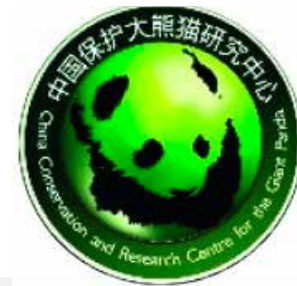
THE FUTURE





COLLABORATIONS FOR CHANGE

PDXWildlife's Board just voted to expand our research at the CCRCGP through facilitating a multi-institutional collaboration between PDXWildlife, The Red Panda Network, and the CCRCGP. Plans and friendships are just getting started but we hope to perform research that aligns with our captive breeding goals as well as the Guardians of the Forest Program that has been successfully implemented by the Red Panda Network in Nepal to help the endangered red panda!



2020 Plans

- Establish MOUs and develop research methods.

“Collaborations doubles, or even triples, our efficiency. We can increase our teaching and learning opportunities, reduce individual pressure, and heighten flexibility & creativity!”

– Meghan S. Martin –

“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 —





SPREADING THE WORD

AZA's Reproductive Management Center (RMC) has invited PDXWildlife's 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.

In conjunction with the RMC, PDXWildlife is developing a workshop to teach SSP and conservation breeding program managers about our techniques. Our experience on various species 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 optimize other conservation breeding programs.

2020 Plans

- Summarize and publish SSP data to determine to what extent programs are utilizing mate choice in their breeding programs and how it is impacting reproductive success.
- Teach Workshop at AZA's Mid-Year Conference in Palm Springs.



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