



PDXWildlife

2020 ANNUAL REPORT



**“Great works are performed not by strength
but by perseverance.”**

— Samuel Johnson —

Dear Supporters,

Most of you won't be sad to see 2020 go and welcome a fresh new year in 2021. We wanted to take a moment to celebrate your perseverance and all you have done for PDXWildlife:

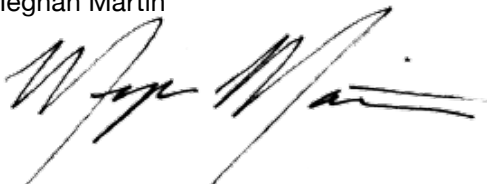
- YOU helped publish 4 panda papers and 1 'Akikiki paper this year (in review)
- YOU helped 7 female 'Akikiki find their perfect mates
- YOU started a citizen science project on stereotypic behavior in giant pandas
- YOU started a research project on mate choice in African Painted Dogs
- YOU educated 5 graduate-level interns on analysis and journal write-up methods
- YOU have helped spread the word through our Mate Choice Virtual Workshop

For a pandemic year we think you were wholly successful! And we are forever grateful to have such a great donor base supporting us and helping our work thrive! But like you, we're also excited to say goodbye to 2020 and welcome in 2021. This year marks PDXWildlife's 10-year anniversary and we couldn't have come so far without YOU. Your donations helped fund our research and salaries keeping our current programs, intern training, and educational outreach alive! Not to mention all the species we've helped save - 6 in total! We may be ambitious but we're aiming to add another 4 this year so we can say we've helped 10 species in 10 years!

That's why we need YOU to help us reach our goals, save more endangered species, and end extinction in 2021. Thanks for hanging in there with us!

Happy Holidays!

Meghan Martin





RESEARCH

2020 YEAR IN REVIEW

30

Citizen Scientists
PACING PANDAS

5

Scientific Papers
Submitted

7

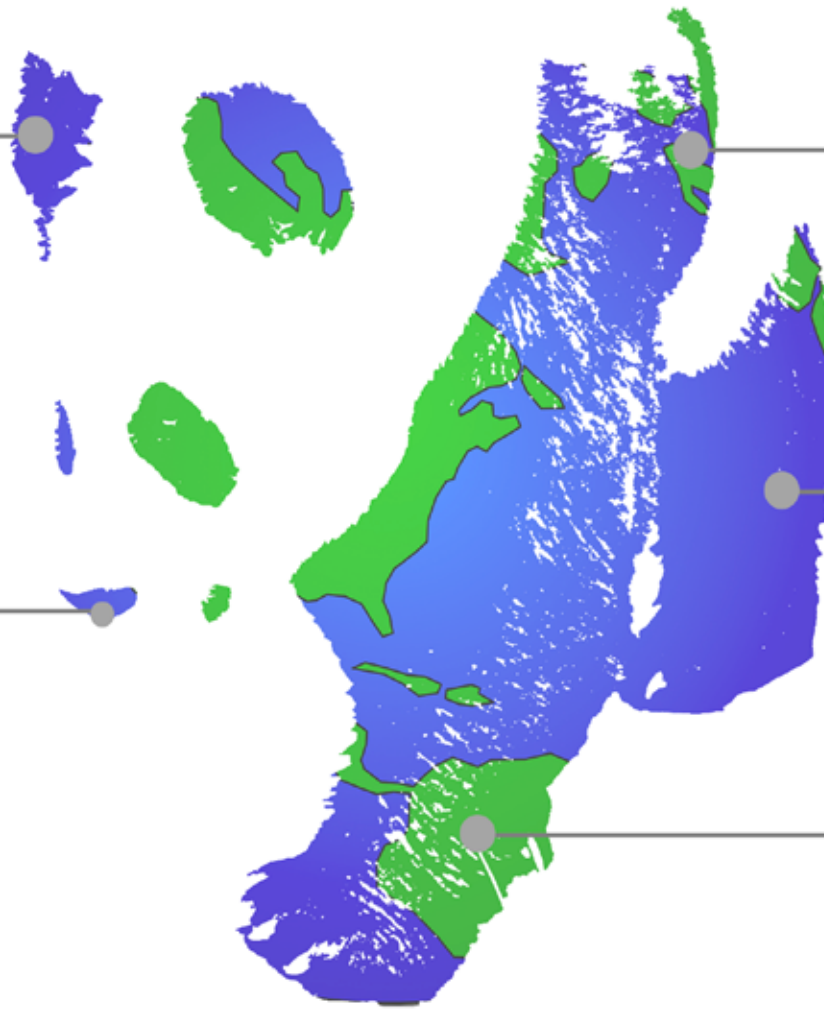
Female 'Akikiki
choosing mates

88

Zoos researching
African Painted Dog
Breeding & Welfare

5

Interns trained





CITIZEN SCIENCE

For years we've been playing with the idea of starting a citizen science project on pandas utilizing the panda cams placed in exhibits around the world. With stay-at-home orders solidly in place, we thought there couldn't be a better time to launch a citizen science web cam project. In May 2020, we were able to take advantage of panda fans' desires to stare at fuzzy, cute bears during the pandemic and launched our citizen science program PACING PANDAS!

Stereotypes are behavioral anomalies that arise in captive environments and may impair conservation breeding but little is known about their development and demographics in the zoo world. We asked you all to help start a new research project PACING PANDAS that is entirely virtual. Through the power of our citizen scientists, we hope to answer when and how stereotypes develop during giant pandas cubhood and how they evolve throughout their lifespan. With this knowledge, we can suggest management intervention to address conservation breeding goals and improve animal welfare across an individual bear's lifespan.

Accomplishments

- Developed and launched program in May-June 2020
- 30 citizen scientists trained
- 300 research observations at 30 minutes/observation
- 150 observation hours
- 15 identifiable pandas, 8 zoos, 1- 23 age range

SOCIAL HOUSING & REPRODUCTIVE SUCCESS

In 2020, we continued mentoring students on data wrangling, data analysis, and the scientific report writing experience. Our focus this year was getting publications written and submitted. Publishing is the “hidden costs” section of scientific research. A single article can cost anywhere from \$3,000-\$6,000 dollars to make publically available with more prestigious journals charging higher. Depending on the complexity of the article and analysis, an article can take 1-2 years to go through the drafting, publishing and review process. Thus, each paper from data collection through final publication represents multiple years of a researcher’s life!

Our studies revolved around the core question of what effects social mediators play on reproductive success in giant pandas. Reproductive suppression has important implications for conservation programs as most facilities house many individual animals at one location - often at higher population densities than those found in the wild. 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.



Accomplishments

- Two interns trained in data analysis and scientific write-up.
- Submitted: G. Ciminelli, M.S. Martin, R.R. Swaisgood, G.Zhang, M. A. Owen. 2021. Social Distancing: High population density increases cub rejection and decreases maternal care in the giant panda.
- Article in preparation. “Familiarity breeds success in giant pandas (*Ailuropoda melanoleuca*): Social housing as a tool for breeding managers”.



STEREOTYPES AND WELFARE

Last year, we evaluated the reproductive success of giant pandas that exhibit stereotypes versus individuals that didn't show these behaviors. Published in the prestigious *Scientific Reports* journal, we found that male giant pandas that stereotype had higher reproductive success while female giant pandas had fewer copulations and offspring survivorship. Our findings raise concern about differential reproductive success among high and low stereotyping pandas, and possible genetic adaptation to captivity. These findings also raised more questions such as: In what social conditions do stereotypes arise? Are giant pandas more likely to develop stereotypes when housed next to females or males, young or old pandas, more or less neighbors?

In 2020 Celina Tu, our past intern, evaluated these questions and submitted an article for review. Our findings indicated that social conditions changed presence and intensity of stereotypes performed by male and female giant pandas, suggesting that careful planning of social conditions must be taken into consideration in animal housing and management.

Accomplishments

- One intern trained in data analysis and scientific write-up.
- Submitted: Celina Tu, Meghan S. Martin, Hemin Zhang, Guiquan Zhang, Ronald R. Swaisgood. 2021. Effect of social environment on anticipatory behavior and stereotypy performance in male and fe-male giant pandas (*Ailuropoda melanoleuca*).

“A career in wildlife conservation is neither the most lucrative nor the easiest; and, as such, it’s a path that demands passion, persistence, and purpose. It mandates a sort of tenacity that can only be fueled by enthusiasm.

There is a small community of conservationists who understand and realize that, only through collaboration and mutual support, can we actually make a change. PDXWildilfe, and its founder, Dr. Meghan Martin, are definitely part of this community, as they have been invaluable in supporting, guiding, and actualizing my aspirations to work with wildlife.”

– Meagan Gombart–



NATURAL MATING

In 2017, we published a retroactive analysis of the relative success of natural mating versus artificial insemination for the giant panda conservation breeding program. We found that natural mating methods were much more likely to result in cub production. These findings, as with most research lead us to question whether artificial insemination also impacts maternal rejection, care, and offspring survivorship.

We welcomed back Ming Fei Li, a past giant panda intern, to evaluate our maternal care data for the effects of fertilization method on maternal care. She found that naturally mated females were more likely to rear infants, and were more attentive and less neglectful to infant cubs compared to artificially inseminated females. Fertilization method did not have an effect on infant survival and infant developmental behaviors. These results suggest that female giant pandas may need the behavioral cue of natural mating events to prepare for rearing altricial young. While artificial insemination is important for genetic management of the population, particularly when a genetically valuable individual is not mating, our results indicate that managers should focus on behavioral and biological management to encourage natural mating and normal maternal rearing and care behaviors.

Accomplishments

- One intern trained in data analysis and scientific write-up.
- Submitted: Ming Fei Li, Megan A. Owen, Ronald R. Swaisgood, Hemin Zhang, Guiquan Zhang, Meghan S. Martin. 2021. Consequences of nescient mating: Artificial insemination reduces maternal care and offspring rearing in the giant panda (*Ailuropoda melanoleuca*)



CONSERVATION BREEDING



HELPING SPECIES



“Breeding programmes serve many purposes [such as to] support demographic and genetic backup to wild populations, provide animals for public education, support important research, and provide awareness opportunities as ambassador animals”

– World Association of Zoos and Aquariums –

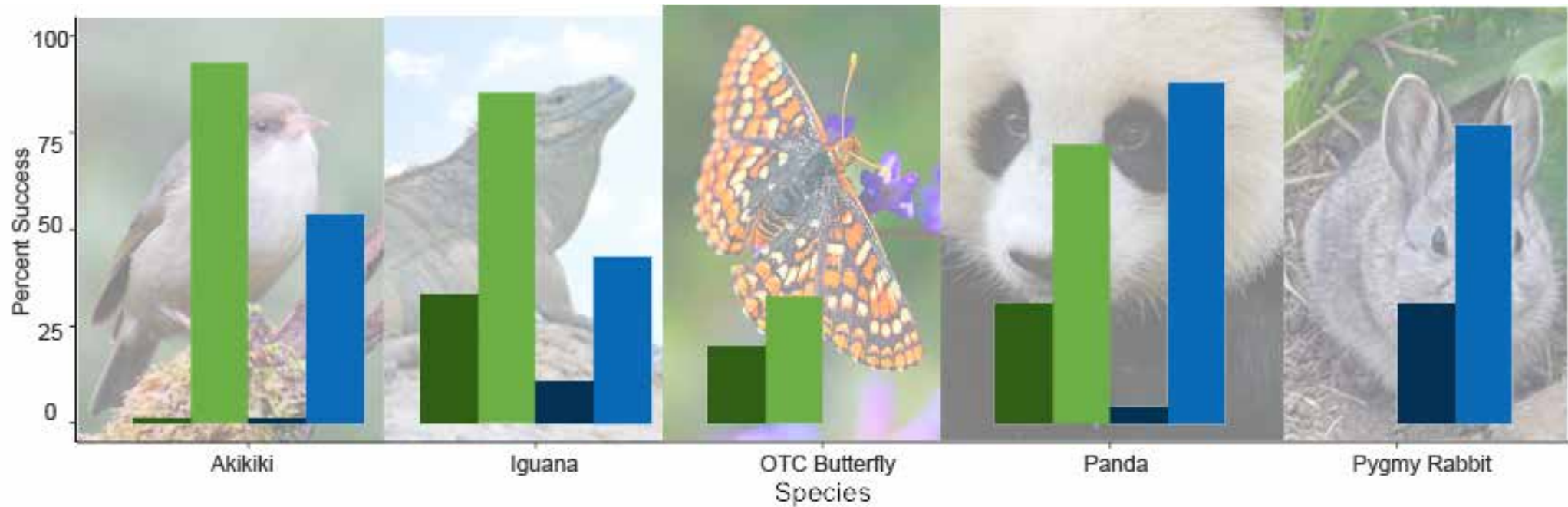
Nothing quite matches the thrill of seeing a successful mating between a male and female that were genetically recommended for breeding. So few animals breed in captivity compared to the population as a whole that each successful pairing is treasured. Even more so when the genetics are rare or the individuals involved haven't successfully bred before. The moments when I see a baby animal being born and know that it exists solely because PDXWildlife's research helped the parents breed are unparalleled. This, after all, is what my life's work has focused on - improving conservation breeding programs so that endangered species have insurance populations and will sustain themselves into the future. These populations can help bolster the declining wild populations through reintroductions and hopefully save the species for future generations.

This overarching goal of PDXWildlife - optimizing conservation breeding programs - is hard to motivate donors to fund. While scientific research is essential to any

conservation non-profit doing meaningful work, it's often the hardest to fund. This work, however, is vital to ending extinction and central to our core mission. Thus, I've decided to show the numbers, as only a scientist knows how - graphically! On the following pages, you'll see visual representations of how our work physically produced more breedings and, hence, more babies for each species we're working on!

A handwritten signature in black ink, appearing to read 'W. J. Martin', written in a cursive style.

10 YEARS OF MATE CHOICE



Over 10 years PDXWildlife has helped 5 species return from the brink of extinction. Our research on mate choice has been essential for the reproductive success of these conservation breeding programs. The figure above shows the difference in breeding success between females with choice (light green bars) and no choice (dark green bars) as well as the offspring production of females offered choice (light blue bars) and no choice (dark blue bars). While the relative magnitude differs between species, it is clear that choice was a large factor driving increased reproductive success in all of these species.



“Being part of PDXWildlife means being part of something that’s greater than us. It means being part of a growing solution; understanding what’s important in life. And it means making an impact for species at risk”

– Katie Zajac –

'AKIKIKI

The 'akikiki is a small forest dwelling Hawaii 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. Data analysis showed that females mated to their preferred partner were significantly more likely to produce a clutch of eggs and had a higher number of eggs per clutch. With our research methods applied in 2021 we're hoping this species starts making its come back from endangered status!



“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

- Trained eight staff at the Hawai'i and Kaua'i Endangered Bird Conservation Center in our mate choice research methods.
- First ever successful breeding and fledgling of 'akikikis in captivity.
- Increased breeding success of the captive population from 0% to 93.3%, pairs producing a clutch from 0% to 54%, and average number of eggs per clutch from 0 to 4.3 eggs.
- Results were applied to 7 females that tested for their mate choice in the fall 2020 and are now happily paired with their chosen partner!
- In preparation: “Designing a mate choice setup: tactics trialed and lessons learned with the critically endangered honeycreeper, 'Akikiki (Oreomystis bairdi)”

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 found that iguanas given socializations prior to breeding had a significantly higher chance of breeding success.



“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.
- Females mated to their preferred mates had 85.7% breeding success compared to 33.3% for nonpreferred pairings.
- In Preparation: “Intimate Iguanas: Giving social opportunities improve breeding success in a Caribbean iguana breeding program”



“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 mating 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

- One intern trained
- Females presented with more mating partners will have increased reproductive success
- In preparation "Social Butterflies: More mates are better than one in Oregon Taylor's Checkerspot Butterfly"



"In conservation, sometimes you just need that one person who believes in you, sees your potential, and gets your foot in the door. I attribute so much of my growth, both professionally and personally, to Meghan, for the opportunities she's provided me at PDXWildlife. We share in a common vision to help protect the wildlife species that need it most. I, now, have the opportunity to help fulfill that vision, inspire the public community, and make a difference for wildlife species throughout the globe." – Meagan Gombart –

MATE CHOICE BOOK

In collaboration with María Díez-León from University of London's Royal Veterinary College, Dr. Meghan Martin has submitted a book proposal to Cambridge Press on **Mate choice and conservation breeding: insights from behavioural ecology and applications**. This book expands on Dr. Martin's research over the past 11 years and will serve as a resource for conservation breeding managers and university students in zoo programs. It aims to provide the most up-to-date knowledge on both the fundamentals of mate choice, as well as practical considerations when applying mate choice paradigms to conservation breeding settings. In doing so, this book offers a new perspective which is sorely needed to improve the success and long-term sustainability of conservation breeding programmes. This subject area is emerging, especially in light of the acknowledged increasing need for conservation breeding programmes.

“Given the dramatic improvement in the handful of conservation programmes where mate choice has been implemented - still a tiny fraction of the total number of on-going breeding programmes-, it is surprising that this breeding approach has not been more widely adopted in the decade since our pygmy rabbit work was first disseminated.” – Meghan Martin –



THE FUTURE





COLLABORATIONS FOR CHANGE

PDXWildlife was approached by Oklahoma City Zoo to help lead a multi-institutional collaboration between 88 zoos researching social factors that promote reproductive success and successful pack formation in African Painted Dogs. Research is just getting started but we hope to send an evaluation survey to all zoo that house African Painted Dogs in January of 2021.



2021 Plans

- January 2021: Administer survey on pack formation success.
- March 2021 - August: Analysis of surveys

“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 virtual 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.

2021 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.
- Launch Virtual Workshop for 50 participants in April 2021



Perseverance in a Pandemic

This year has been unprecedented in its many “firsts” and the hurdles it has thrown at the animal conservation and non-profit communities. That is why we would like to thank all of YOU for your continuous support and encouragement through this global pandemic. Your dedication and commitment to PDXWildlife is inspiring, and our work would not be possible without all of you! Gifts from our supporters have enabled us to expand our program to help so many endangered species that desperately need conservation. 2021 marks PDXWildlife’s 10 year anniversary and we couldn’t have come so far without YOU. Your donations helped fund our research and salaries keeping our current programs, intern training, and educational outreach alive!

The end is in sight for 2020, but we continue to need your support now more than ever. In the fall of 2021, vaccine willing, not only do we hope to continue our research on giant pandas with the CCRCGP, collaborating on old projects such as our behavioral competency tests for reintroduction candidates but also hope to start new projects that will begin their pilot phases such as the Red Panda research we have planned. Additionally, we are excited to expand our work to help African Painted Dogs, an endangered species that has a difficult time breeding in managed care, and to develop a virtual workshop on Population Sustainability in Conservation Breeding with the American Zoo Association’s Reproductive Management Center. Your donations will directly contribute to these goals.

Thank you for supporting PDXWildlife as we persevere and thrive through these challenging times!

Love,

The PDXWildlife Board



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