PDXWildlife

2021 ANNUAL REPORT

Annual Report Staff

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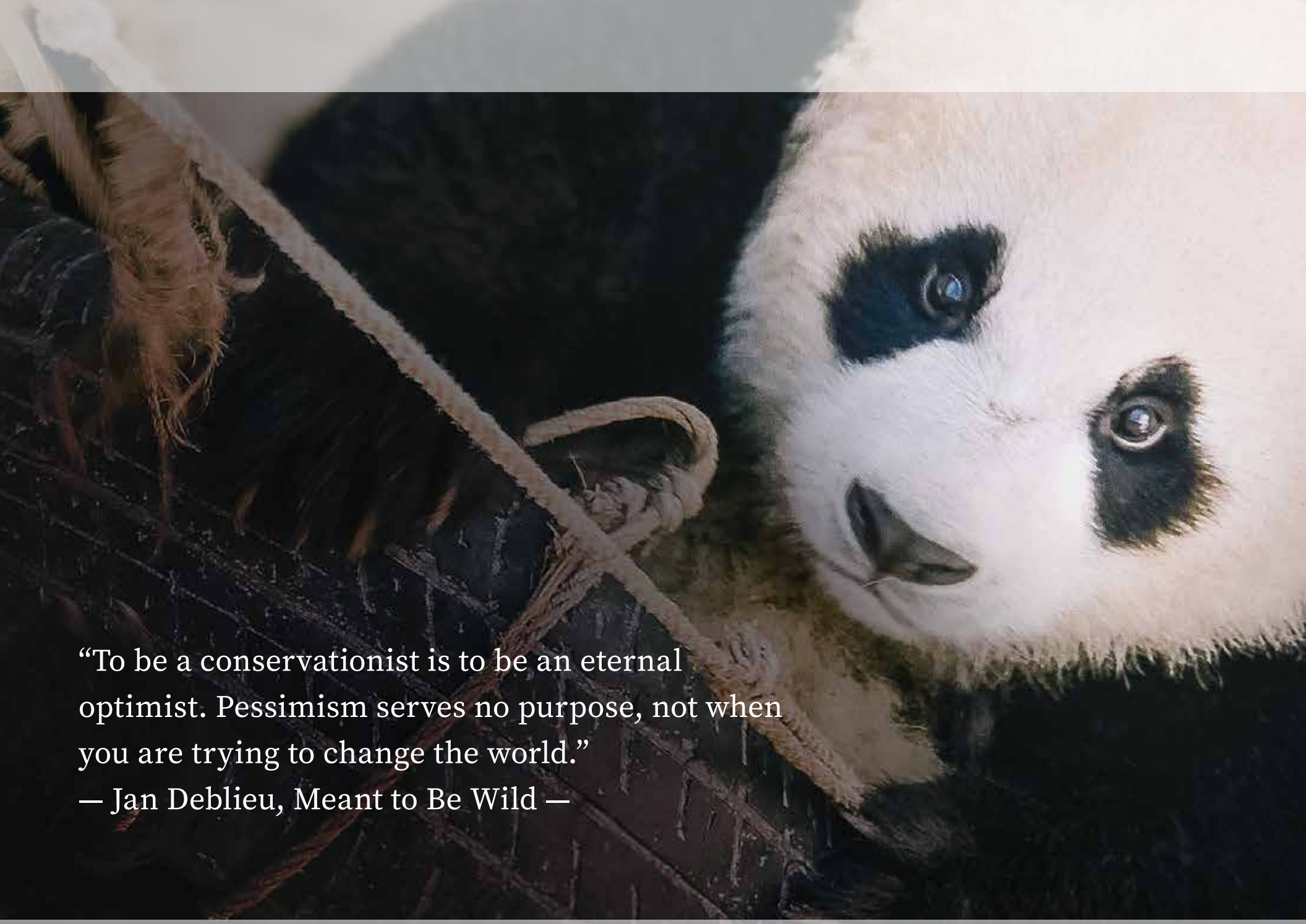


“To be a conservationist is to be an eternal optimist. Pessimism serves no purpose, not when you are trying to change the world.”
— Jan Deblieu, Meant to Be Wild —

LETTER FROM OUR FOUNDER

Dear Supporters,

2021 ushered in a little more freedom of movement within the pandemic, but still finds travel abroad greatly diminished. We're so thankful for all you have done for PDXWildlife and your continued support through these difficult times. While our panda work abroad has been paused, we are certainly thriving at home with new and exciting research opportunities. In 2021, ***YOU***:

- helped publish two panda papers, one 'Akikiki paper and one iguana paper.
- helped evaluate the effect of management style on African painted dog introductions.
- helped host a virtual workshop on mate choice to teach breeding managers from 12 organizations how to propogate endangered species with our mate choice methods.
- helped finish the "Pacing Panda" citizen science project.
- helped educate three graduate-level interns on analysis and publication methods.
- gave input on the *Black Footed Ferret Species Survival Plan.*
- participated in three educational PANDAppy Hours and our online auctions.

What a year for educating and spreading the word! We are forever grateful for your support! And, in 2022, we're ready to expand and start moving PDXWildlife into its next, 10-year phase - the desire to start our very own small-breeding facility. In the past, your donations have helped fund our research and salaries keeping our current programs, intern training and educational outreach alive! We hope in the future you will grow with us to reach our dreams of moving our research into our very own facility!

Happy New Year!

Meghan Martin

RESEARCH

2021 YEAR IN REVIEW

12
AZA Facilities trained on Conservation Breeding Methods

3
Endangered Species Plans Updated

12
Endangered Species Ethograms Developed

5
Scientific Papers Submitted

505
Breeding & Welfare Analysis Points Gathered

6
Researchers Trained

Citizen's Helping Science

Beginning in May 2020, we asked you to help us on our PACING PANDAS citizen science program. You responded and our first virtual citizen science program has been a huge success with over 400 individual observations. For comparison, a normal, five-year study performed by our researchers and interns usually produces around 300 observations and you did more than that in one year! Way to go!

This study really highlights the power of citizen scientists. In 2022 we'll evaluate the data and investigate when and how stereotypes develop during a giant panda's cubhood and evolve throughout their lifespan. With this knowledge, we can improve animal welfare across an individual bear's lifespan.

Accomplishments

- Completed first phase from May 2020 to Dec. 2021
- 46 citizen scientsts trained.
- 400+ research observations at 30 minutes/observation
- More than 400, 30-minute research observations recorded
- 19 identifiable pandas from 14 zoos, ranging from 1- 23 in age.

RESEARCH

Social Settings In Captivity

In 2021, we continued mentoring students on data analysis and publication methods. Soon-to-be Dr. Giulia Ciminelli, past PDXWildlife intern, successfully published her first paper in *Applied Animal Behaviour Science.* We're always so proud to mentor up-and-coming scientists and have kept close relationships with many of our past panda interns.

Giulia's study revolved around the effects social mediators play on reproductive success in giant pandas. Giulia found that mothers who gestated and raised cubs in close proximity to other giant pandas produce female-biased litters, and reject and neglect more cubs. Cubs also increased vocalizations in high-density housing, which could be caused by disturbances from neighboring conspecifics.

These results suggest that high-density housing areas stress gestating and postpartum mothers. In response, we are working with bases to improve housing conditions for the welfare of mothers and cubs. These results also suggest that sensitivity to environmental and social conditions may have negative effects on either sex, which might result in individuals failing to breed, produce cubs or properly care for their young.

Reproductive suppression has important implications for conservation programs. Understanding the role of social influences in reproductive success can be of great assistance to the success of conservation breeding programs.

Accomplishments

- Two interns trained in data analysis and scientific writing techniques.
- Published: Ciminelli, G., Martin, M. S., Swaisgood, R. R., Zhang, G., Guo, L., & Owen, M. A. (2021). Social distancing: High population density increases cub rejection and decreases maternal care in the giant panda. Applied Animal Behaviour Science, 243, 105457.
- Article in prepartion. "Familiarity breeds success in giant pandas (Ailuropoda melanoleuca): Social housing as a tool for breeding managers."

Collaborations

PDXWildlife and Oklahoma City Zoo lead a multi-institutional survey to better understand how social factors promote reproductive success and successful pack formation in African painted dogs. In November of 2021, our data collection phase successfully ended with 105 individual data points for analysis on pack formation events from 33 North American zoos. Results are coming in early 2022 with plans to launch pilot studies at OKC Zoo and Oregon Zoo.

2022 Plans

- January - February 2022: Analysis of surveys.
- March - May 2022: Apply for American Zoo Grants and Fundraise.

"PDXWildlife is always working to protect species and better understand how they respond to their environments — and climate change. Our research has shown that there is a need to better promote animal welfare and wellbeing in the wild and captivity."

— Meghan S. Martin, director & founder of PDXWildlife —

RMC Research

AZA's Reproductive Management Center (RMC) has invited PDXWildlife to evaluate the current breeding methods used in all the North American Species Survival Plans (SSPs). When zoo conservationists believe animals are in danger of extinction in the wild, SSPs and captive breeding programs may be a species 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.

"There is no better high
than discovery."
– E. O. Wilson.–

Animal Welfare

In 2020, we evaluated the reproductive success of giaint pandas that exhibit stereotypes versus indviduals that didn't. Published in the prestigious *Scientific Reports* journal, we found male giant pandas that stereotype had higher reproductive success, while female giant pandas had fewer copulatioins and offspring survivorship. Our findings raise concern on differential reproductive success among high and low stereotyping pandas, and possible genetic adaptation to captivity.

In 2021 we welcomed back and mentored Brian Kinan, past PDXWildlife intern, to evaluate whether stereotypical male giant pandas were "winners" in our male-male competition. We found that males who won male-male competitions had more locomotor and non-locomotor stereotypies, indicating that male stereotypical behavior may be a positive indicator of male competitive ability and reproductive success. These findings highlight that behaviors labelled as "unnatural" or "bad" may actually be outlets for wild behaviors and sexual motivation.

Accomplishments

- One intern trained in data analysis and scientific writing techniques.
- In prepartion: Brian Kinane, Meghan S. Martin, Hemin Zhang, Guiquan Zhang, Ronald R. Swaisgood. 2022. The effects of dominance on reproduction and stereotypy performance in male giant pandas (Ailuropoda melanoleuca).

RESEARCH

EveryBody Loves A Winner

Meghan S. Martin has been focusing the last 5 years of her scientific research on fixing the "weak link" in giant panda breeding centers - i.e. the males. While giant pandas now breed with relative ease due to changes in social settings prior to and around breeding events, the program still struggles with getting males to breed consistently. In fact, most captive giant pandas are descendants from just two very well breeding males - Pan Pan in the 1990s to early 2000s and Lu Lu directly following him. While other males breed, they do so much less frequently and reliably. In response, we started our male-male competition study to investigate reasons for this failure.

While there are many differences between wild and captive breeding programs, one of the most glaring is the fact that male-male competition is completely removed from managed-care breeding. In fact, where we see groups of males congregate and fight for females in natural settings, males in captivity are actively managed to avoid all contact. Our study investigated how introducing just a little male-male competition back into the breeding programs may improve outcomes. From 2016 to 2020, we studied whether increasing male-male interaction would provide more breeding success against males who bred using traditional conservation breeding methods that avoid male-male interactions. Our data shows that male-male competition can greatly increase breeding success and even "rescue" non-breeders.

This research can now be applied yearly, or on an individual basis, to improve breeding and diversity outcomes of underrepresented males.

Accomplishments

- One intern trained in data analysis and scientific write-up.
- In prepartion: Meghan S. Martin, Hemin Zhang, Guiquan Zhang, Meghan Owen, Ronald R. Swaisgood. 2022. Male-male competition increases reproductive success in giant pandas (*Ailuropoda melanoleuca*).
- In prepartion: Meghan S. Martin, Hemin Zhang, Guiquan Zhang, Meghan Owen, Ronald R. Swaisgood. 2022. Everybody Loves a Winner: The effect of dominance increases reproductive success of male giant pandas (*Ailuropoda melanoleuca*).

CONSERVATION BREEDING

CONSERVATION BREEDING

Natural Mating

In 2021, we welcomed back Ming Fei Li, a past giant panda intern, to evaluate our maternal care data for the effects of fertillization method on maternal care (artificial insemination versus natural mating). She found that naturally mated females were more likely to rear infants, and were more attentive to infant cubs compared to artificially inseminated females. These results suggest that female giant pandas may need the behavioral cue of natural-mating events to prepare for rearing altricial young.

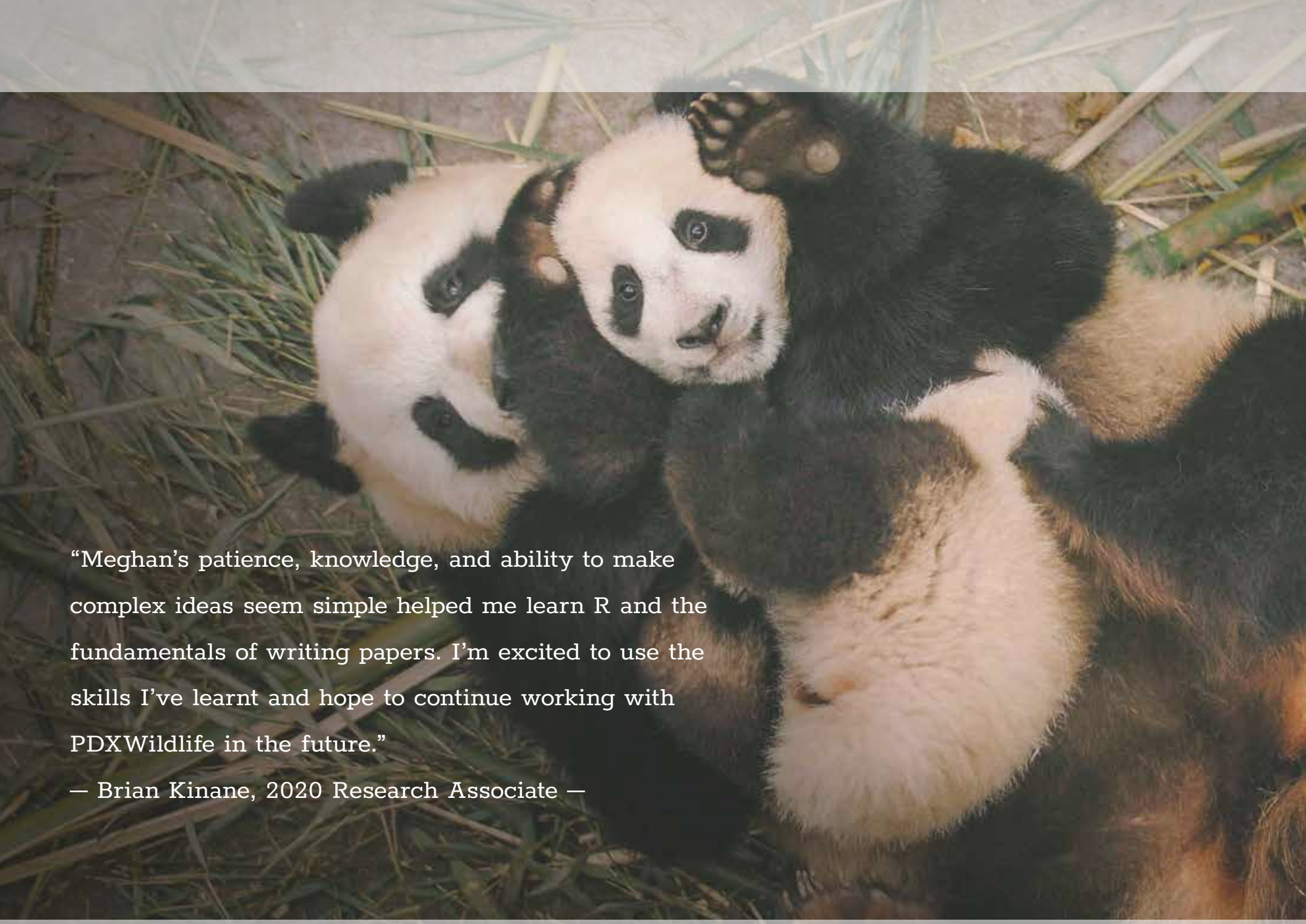
PDXWildlife focuses on optimizing natural mating methods in conservation breeding programs and advocates for employing mating behaviors seen in the wild within captive breeding management. We strongly believe that incorporating natural mating behaviors will improve both welfare and outcomes of breeding programs. Ming Fei Li's study helps further this mission by showing for the first time that artificial insemination techniques may be hindering not only breeding success (Martin-Wintle et al. 2017), but also extends to maternal care behaviors. This finding sheds light on the reliance of artificial insemination in some breeding programs, and suggests we should further investigate the effects of mating style throughout the breeding and offspring production phases of an animal's life.

Accomplishments

- One intern trained in data analysis and scientific writing techniques.
- Published: Ming Fei Li, Megan A. Owen, Ronald R. Swaisgood, Hemin Zhang, Guiquan Zhang, Meghan S. Martin. 2022. Consequences of nescient mating: Artificial insemination reduces maternal care and offspring rearing in the giant panda (Ailuropoda melanoleuca). Applied Animal Behaviour Science.

2022 Plans

- Pilot study for aritificial insemination experimental manipulation study in China 2023.



"Meghan's patience, knowledge, and ability to make complex ideas seem simple helped me learn R and the fundamentals of writing papers. I'm excited to use the skills I've learnt and hope to continue working with PDXWildlife in the future."

— Brian Kinane, 2020 Research Associate —

Breeding Species

PDXWildilfe's overarching mission statement is "Conserving species and habitats through research" - a grandious and slightly vauge mission. How we actually accomplish this mission is broken up into much smaller minute goals every year such as; 1) bringing our mate choice research to at least one new facility and/or species, 2) hosting outreach and engagement opportunities for the public to spread the word, and 3) conducting scientific research to investigate mangement issues and opportunities in conservation breeding programs. Thus, over our 11 years, PDXWildlife has started to specialize in optimizing and improving conservation breeding programs so that endangered species have insurance populations and will sustain themselves into the future. While scientific research is essential to any conservation nonprofit, we've also been anxious to start our very own breeding facility where we can help species directly. Every dream must start small so we have set our fourth goal as - starting a PDXWildlife Conservation Breeding Center! Every goal starts in first steps we hope to raise funds to purchase a small tract of land in Oregon where we can begin conservation breeding programs for butterfly and amphibian populations. We hope that as we expand and grow you'll help support us and spread the word that we're not only good at saving pandas but also other animals!

Zoos use captive breeding as a tool to prevent extinction of a species that cannot survive in the wild, often due to the deterioration of a species' habitat.

– World Association of Zoos and Aquariums –

Meghan S. Martin, Director

"When I started investigating how to improve African painted dog behavioral compatibility and reproductive success, I immediately thought of Meghan and wanted her help. Her expertise in carnivore behavior and mate choice is exactly what is needed to improve reproductive management and welfare for this socially complex species."

– Rebecca Snyder, OKCZ –

Accomplishments

- Trained one postdoctoral student in mate choice research methods.
- First survey on APD sent to 33 AZA institutions with 95% response rate.
- 105 data points on pack formation ready for analysis.

2022 Plans

- Appl y for an AZA grant to investigate personality, dominance, and social factors affecting successful African painted dog introductions.
- Publish results from data analysis and preliminary findings.

African Painted Dog

The African Painted Dog (APD) is listed as endangered on the IUCN Red List and is the largest wild canine native to sub-Saharan Africa. It is estimated that about 6,600 adults live in 39 subpopulations that are all threatened by anthropomorphic factors. The APD is a highly social animal, living in packs with separate dominance hierarchies for males and females. Packs are notoriously close-knit and difficult to form under managed care settings. PDXWildlife and OKC Zoo hope to improve welfare and breeding success by researching factors that cause pack failure.

RMC Workshop

In collaboration with AZA's Reprodutive Management Center, PDXWildlife hosted the first-ever, five-week long workshop on "Increasing Mate Compatibility for Improving Population Sustainability." The goal of the workshop was to increase our understanding of factors influencing mate compatibility within conservation breeding programs, a key component of successful reproduction. Participants identified priority species and issues for discussion, and developed an ethogram and protocol for promoting compatibility within their focus species.

Accomplishments

- Trained breeding managers from 12 AZA facilities on mate choice conservation breeding methods.
- 10 different species ethograms developed and research projects planned for mate choice in 2022 breeding seasons.

2022 Plans

- Summarize and publish SSP data to determine to what extent programs are utilizing mate choice in their breeding programs and how it impacts reproductive success.
- Make contact with virtual-workshop attendees to assist with conservation breeding program optimization.

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.

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.
- Submitted: Jeff Lemm & Meghan S. Martin. 2022. "Intimate Iguanas: Giving social opportunities improves breeding success in a Caribbean iguana breeding program."

" Dr. Martin's prior work with giant pandas and her expertise in mate choice has been instrumental in the success of this research."
– Jeff Lemm,
San Diego Zoo Global –

"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 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 throughout the globe."

— Meagan Gombart —

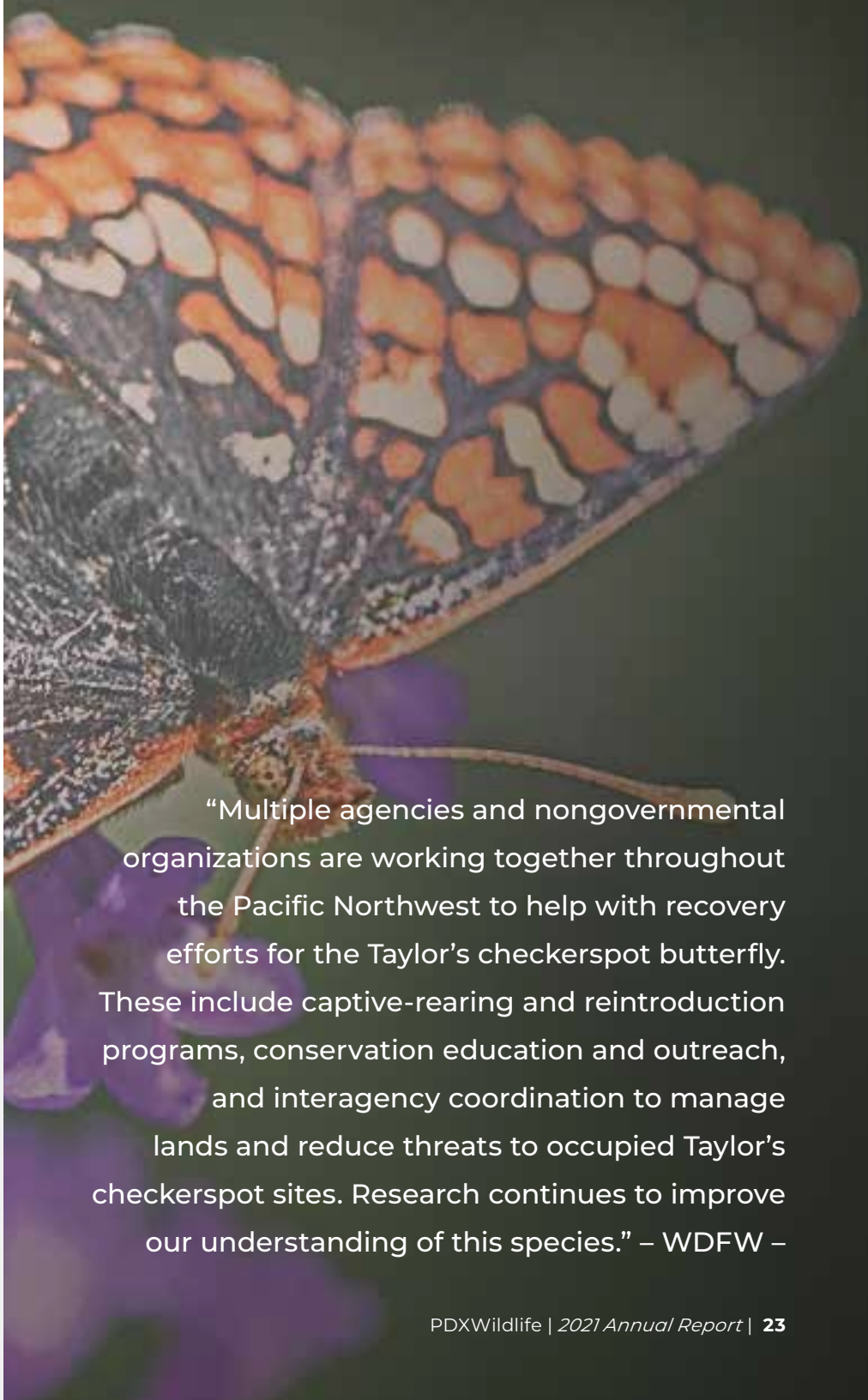
Social Butterflies

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. Four to five males introduced to a female results in the highest breeding success.

Future Plans

- Oregon Zoo plans to present females with more mating partners to improve reproductive success.
- Article in prepartion, "Social Butterflies: More mates are better than one in Oregon Taylor's Checkerspot Butterfly."

Photograph by Gary Grossman Photography



"Multiple agencies and nongovernmental organizations are working together throughout the Pacific Northwest to help with recovery efforts for the Taylor's checkerspot butterfly. These include captive-rearing and reintroduction programs, conservation education and outreach, and interagency coordination to manage lands and reduce threats to occupied Taylor's checkerspot sites. Research continues to improve our understanding of this species." – WDFW –

"Gradually increasing average temperatures due to global warming currently pose one of the greatest threats to survival in all animal species. Increased average temperatures also have the ability to change the metabolic rate and behavior of organisms, including breeding behavior. "

– Meghan S. Martin –

Death Feigning Beetles

The blue death feigning beetle, also known as the desert ironclad beetle (Asbolus verrucosus), can be found naturally in deserts of the Southwestern United States, such as the Sonoran and Mojave deserts. Native to desert climates, death feigning beetles are highly adapted to extreme environments and able to withstand prolonged periods of dryness, and hot and cold temperatures. Like other desert species, this unusual beetle faces climate-related threats, such as habitat loss, making it well suited for studying mating and courtship behavioral changes in extreme temperatures.

Accomplishments

- Developed first behavioral ethogram for blue death feigning beetles.
- Investigated personality profiles, sex differences and behavior changes in response to extreme low and high temperatures.

2022 Plans

- Investigate breeding behavior and shifts with temperature changes in blue death feigning beetles.

YEAR-END RELFECTIONS

Return to CHINA

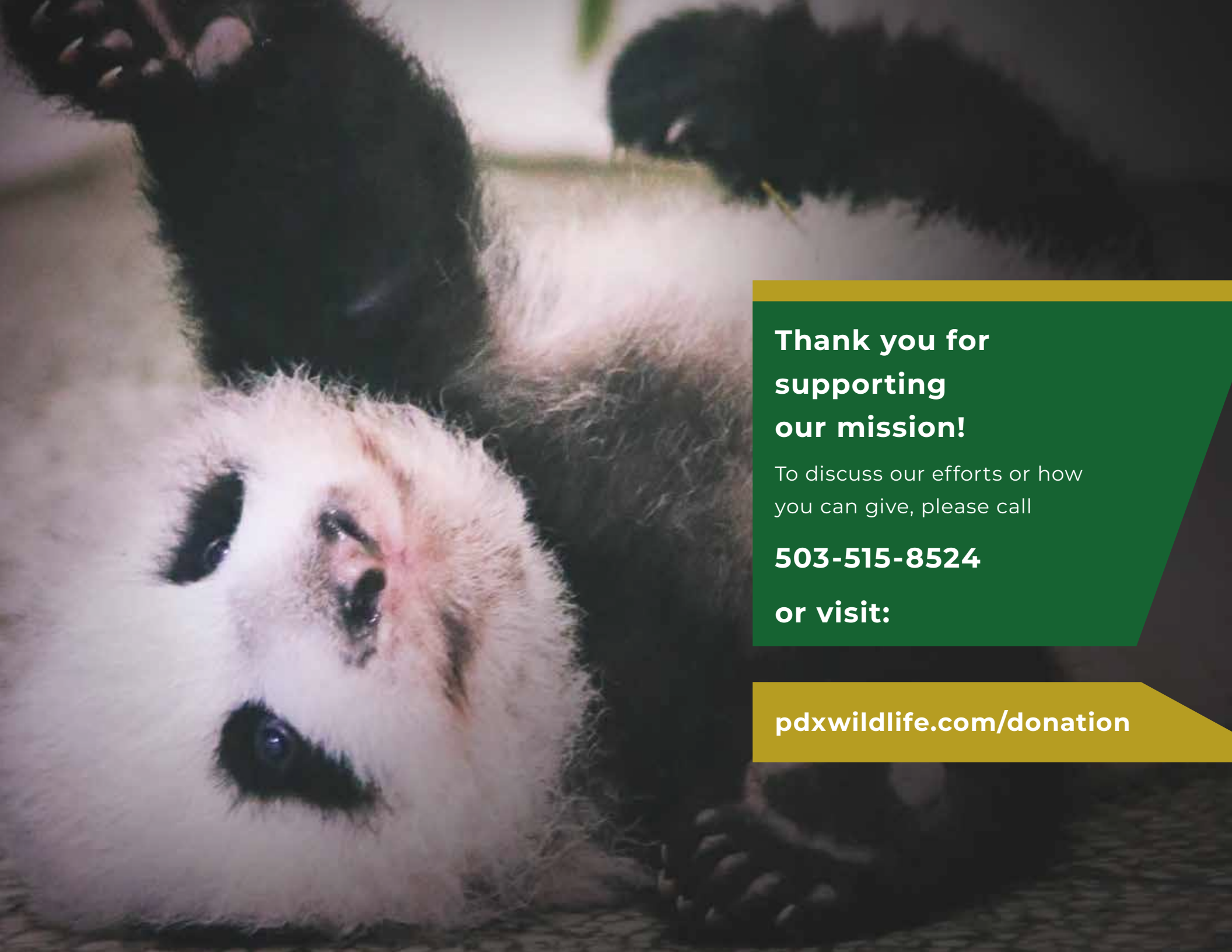
Our hopes are that PDXWildlife will return to China in the fall of 2022! As the world gets back to normal and relaxing travel restirctions, we hope to re-enter talks with collaborators in China by scheduling a research planning visit. In the meantime, we have plenty of species to help state-side through our collaborations with zoos, universities and breeding centers.

Over the next year, we will expand our work on African painted dogs, taking the knowledge from our multi-institutional survey and applying it to research studies targeting problem areas identified by management. We will host another virtual workshop on *Population Sustainability in Conservation Breeding* in July to get our message out to more endangered species breeding centers. As always, we'll keep moving forward with our data analysis and work with the species we're currently collaborating on: 'akikiki, iguanas, Taylor's checkerspot butterflies and pandas.

However, our main goal over the next ten years will be to obtain our very own small, captive-breeding facility. First steps include: business planning, partnering with organizations that need help in conservation breeding of Pacific Northwest species, and fundraising for acquiring land and facilities. It's a big list, but we're excited to start tackling the next phase of PDXWildlife's growth. Your generosity and support is a vital part in reaching these goals!

Thank you for supporting PDXWildlife across our 11 years!

Love,
The PDXWildlife Board



Thank you for supporting our mission!

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503-515-8524

or visit:

pdxwildlife.com/donation