David Edwin Wildt (1950-)

David Edwin Wildt developed and applied assisted reproductive technologies to conserve rare and endangered wildlife species in the US during the twentieth and twenty-first centuries. He advocated genome resource banks to help preserve biodiversity, and he advocated for practical ethics to guide wildlife reproductive biologists when they use technology and environmental planning. Wildt often focused on the cheetah (Acinonyx jubatus), but he researched greater than fifty vertebrate species. In the early decades of the twenty-first century, he directed the Smithsonian's Conservation Biology Institute Center for Species Survival in Front Royal, Virginia. He researched reproductive biology and population genetics, used assisted reproduction technologies (ART) for wildlife species, and showed researchers how to utilize noninvasive techniques to monitor the hormones in organisms and their reproductive behaviors.

Wildt was born on 12 March 1950 to Louise and Robert Wildt in Jacksonville, Illinois. The Wildts had a livestock and grain farm with many pets, and David Wildt participated in 4-H and Future Farmers of America (FFA), which he claimed imbued him with a sense of compassion and curiosity for animals. Wildt married Brenda Baldwin in 1970, with whom he was married until 1985. Wildt received his BS in animal science from Illinois State University in Normal, Illinois, in 1972. Wildt stated that he had few job prospects after receiving his degree, so he applied to graduate school and went to Michigan State University in East Lansing, Michigan, where he completed his master's degree in animal husbandry in 1973.

Wildt continued as a PhD student at Michigan State, studying physiology and animal husbandry under the supervision of Richard Dukelow. Wildt studied the reproductive physiology of commercially valuable livestock such as cows (Bos Taurus) and pigs (Sus scrofa domesticus), but Dukelow urged Wildt to broaden his scientific horizons.

After Wildt completed his PhD in 1975, he took a one-year postdoctoral fellowship in comparative reproduction and endocrinology at the Baylor College of Medicine in Houston, Texas. Wildt's daughter Chelsea Elizabeth Wildt was born in 1976, after which he worked at the Institute of Comparative Medicine, a joint venture between Baylor and Texas A & M University. He was a research associate from 1977 to 1978, and an assistant professor from 1979 to 1982. Wildt studied the reproductive physiologies of laboratory cats (Felis Catus) and dogs (Canis lupus familiaris), which researchers increasingly used as model species to study human diseases. In Wildt's autobiography ”Lions, Tigers, and Pandas, Oh My,” he notes that he began to meet people interested in the then new specialization of zoo veterinary science (theriogenology), some of whom worked at the Houston Zoo located across the street from Baylor.

Wildt traveled to the Smithsonian National Zoo in 1978 when the zoo received a Siberian tiger. Wildt asked the zoo workers about the species' estrous cycle and sperm numbers, but the workers did not know the answers. Wildt later said that this experience was the moment when he realized that he had stumbled upon a gap in scientific knowledge. He noted that scientists studied the reproductive biology of some species, such as humans and farm animals, but scientists typically did not study the reproductive biology of wildlife species.

Wildt took a position at the US National Institutes of Health (NIH) in the Veterinary Resources Branch headquartered in Bethesda, Maryland, from 1979 to 1982, and another job at the National Cancer Institute (NCI) in the Lab of Viral Carcinogenesis, in Frederick, Maryland, from 1982 to 1983. In those years, Wildt continued to study the reproductive biology of laboratory dogs, cats, and mice while he wrote and published on the reproductive biology of endangered wildlife species, such as the cheetah, gorilla (Gorilla gorilla) and the giant panda (Ailuropoda melanoleuca).

The location of NIH and NCI enabled Wildt to collaborate with JoGayle Howard, an intern who became a breeding specialists at the nearby Smithsonian National Zoo. Wildt later recalled Howard as an early scientist who recognized the lack of basic information and skill needed to breed captive wildlife, and who saw potential in using assisted reproduction technologies (ART), which scientists had developed to address issues of infertility in humans, as a resource to use in captive breeding programs for endangered species. Wildt collaborated with Howard for decades, and Howard studied with Wildt for her 1989 PhD. Howard was also one of Wildt's post-doctoral fellows until 1993. Many considered the recovery of the black-footed ferret (Mustela nigripes) as one of the major successes of Wildt's collaborative career with Howard. The black-footed ferret went from presumed to be extinct in the 1970s to greater than 6,500 bred in captivity, and scientists released some of the ferrets into the wild by 2011.

While working at NIH and NCI, Wildt met Mitchel Bush, a veterinary scientist at the Smithsonian National Zoo, and he met NIH colleague and geneticist Stephen O'Brien. Together, they gathered data on cheetah genetics and sperm in 1981 noted that male cheetahs had, compared to other cat species, abnormally high levels of defective sperm. The researchers published their results in 1983 in two separate papers, ”The Unique Seminal Quality in the South African Cheetah and a Comparative Evaluation of the Domestic Cat,” and ”The Cheetah is Depauperate in Genetic Variation.” In 1983, the Smithsonian National Zoo hired Wildt as a researcher in the Department of Animal Health. Wildt worked with Howard and Bush and continued to study model and farm species to help expand research into rare and endangered wildlife species.

In 1986, the Zoo formed the Reproductive Sciences Program and made Wildt the director. Wildt's lab and some collaborators at NIH and NCI, including O'Brien, announced their methodological plan and motivation in ”Developing Animal Model Systems for Embryo Technologies in Rare and Endangered Wildlife.” They planned to target rare and endangered wildlife species that do not reproduce well in the wild or in captivity, and they planned to test the hypothesis that ART can positively affect those species' population numbers. Wildt and his team identified the main issues inhibiting the plan as the lack of basic research, animal model systems, financial support, and of personnel trained with theriogenological skills. To overcome the first two problems, Wildt adopted a two-stage strategy. When basic research in the target species was insufficient, the lab selected suitable domestic counterpart species on which to model the reproductive system and develop appropriate ART. Once the collaborating labs established the efficacy and safety of the techniques in the domestic counterparts, they would adapt and apply the techniques to the target wildlife species.

Wildt joined the International Union for Conservation of Nature (IUCN) headquartered in Gland, Switzerland, in 1986 as a member of the Captive Breeding Specialist Group (CBSG). He also joined as a science advisor for various CBSG related activities, such as the species survival plans for the Florida panther (Puma concolor coryi), the black-footed ferret, Puerto Rican parrot (Amazona vittata), and others. He leveraged his position in the National Zoo to help integrate the IUCN's rare and endangered species recovery plans into the Zoo's operations.

Wildt, O'Brien, and Bush's earlier works on the cheetah led to the creation of the New Opportunities in Animal Health Sciences (NOAHS Center) in Washington, D.C., in 1988. The organization fostered collaboration among the National Zoo, NIH, and NCI with the mission to promote the health, genetic diversity, and reproduction of endangered species in zoo and wild populations. Their research continued to expand the range of wildlife species that Wildt studied by including endangered species such as African wild dog (Lycaon pictus), giraffe (Giraffa camelopardalis), and the humpback whale (Megaptera novaeangliae).

After an increase in funding for animal ART studies, researchers questioned how best to allocate resources and techniques. Different techniques included artificial insemination (AI), in vitro fertilization (IVF), embryo transfer (ET), cryopreservation of gametes, and endocrine monitoring techniques. Researchers were unsure of which to focus on or develop for endangered species. Wildt's lab had experimented with many of those techniques and tools, and it was in a position to offer professional assistance and commentary on the use of those tools.

In 1989, Wildt and Ulysses Seal of IUCN's CBSG organized the workshop ”Research Priorities for Single Species Conservation Biology.” Wildt published an editorial, ”Reproductive Research in Conservation Biology: Priorities and Avenues for Support" to review and project developments for wildlife theriogenology. According to Wildt, artificial insemination (AI) gained significant recognition in the field because it could ensure reproduction despite pairs of animals being behaviorally incompatible or geographically separate. However, for AI to be successful, scientists had to identify and manipulate the female's estrus or ovulation cycles to properly deposit sperm in the optimal time frame for conception. Wildt did not think AI was an optimal method because when AI failed to result in pregnancy, researchers struggled to determine what went wrong, whether it be the sperm, the egg, or something else.

In comparison, Wildt said that IVF had the same benefits of AI and fewer drawbacks if researchers matured and fertilized animal oocytes outside of the bodies (in vitro) of female animals. IVF enabled researchers to inspect sperm and oocytes before mixing them to create embryos, which are then also inspected before inserting them into the gestational female. Wildt noted that IVF does, however, require more research into oocyte collection and maturation, the effect of hormones on oocyte quality, and embryo transfer (ET). ET, a third ART, added an additional benefit for rare and endangered species, in that researchers could transfer the embryo into a surrogate female of a more common species. Wildt argued that ET could increase the number of usable wombs to the point of exceeding the number of viable females in the target population, thus allowing for more offspring to be born than there are females in an endangered species.

Although Wildt discussed the uses of ART, he argued that the preservation of genetic diversity in larger genome banks was essential to preserve biodiversity. He further argued that researchers should noninvasively monitor animals' hormone levels by examining the animals' waste, and he argued against using reproductive technology as quick fixes for wildlife conservation.

The National Zoo's Department of Reproductive Sciences continued to expand with Wildt as director. It created the Conservation and Research Center in Front Royal, Virginia, as a space to monitor the behavior of organisms from rare and endangered species. Wildt continued to use ART on rare and endangered species and he published guideline articles, species-specific plans, and book chapters. He also presented at conferences about the value of genome resource banks and noninvasive endocrine monitoring, while urging scientists to use those methods. In 1995, he married Susie Ellis, gained two stepsons, Zachary and Maxwell, and moved near the Conservation and Research Center into Shenandoah Valley, Virginia.

Wildt said that researchers treated reproduction technologies only as quick fixes for conservation for captive bred animals, and that researchers should work to conserve wild populations. He began to develop arguments and methods for how to impact both wild populations (in situ) and captive populations (ex situ). In 1999, Wildt published "Sex and Wildlife: The Role of Reproductive Science in Conservation," in which he attenuates the role for ART techniques and reflects on his developing sense of ethics for the field and for his career. The large-scale production of animal offspring through the use of AI, IVF and ET had, according to Wildt, misconstrued the role that reproductive sciences play in conservation biology. He argued that one of the greatest applications of reproductive science is to better understand those features that make a species unique.

Wildt claimed that reproductive biologists should resist the reductionism that he said had dominated the sciences, return to studying reproduction at the level of the organism, and recognize that researchers need to look at the systemic causes of biodiversity loss. Wildt identified what he called the ironic failure of the mission and the practice of wildlife reproductive biology, which is that reproductive biology has been silent on the rate of human population growth, and that researchers had been systematically blind to the resultant loss of biodiversity. Wildt continued to develop these arguments, with the exception of human population in relation to biodiversity loss, in his 2001 book chapter, "Linkage of Reproductive Sciences: from 'Quick Fix' to 'Integrated' Conservation." Wildt published the book with his wife and intellectual collaborator, Susan Ellis, as well as with his National Zoo colleague JoGayle Howard.

In 2005, the IUCN created the Conservation Centers for Species Survival as a collaborative consortium of six large sized animal breeding centers USA, of which the Smithsonian's Conservation Research Center is one. During the following year, Wildt became the Senior Scientist and Head of the Center for Species Survival, which is a center within the Smithsonian's Conservation Research Center. In 2010, the Conservation Research Center was renamed the Conservation Biology Institute, maintaining its membership in the Center for Species Survival consortium and Wildt remained in his positions as the Senior Scientist and Head of the Center. Into the second decade of the twenty-first century, Wildt researched, published, and advocated for biodiversity as an advisor for the International Union for Conservation of Nature, where he helped organize environmental planning workshops for species conservation.

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