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In this issue

News and Events

News and Events **3**

Awards and Recognition

Clouded Leopard Consortium Partners
Win AZA Bean Award **4**

Collaborative Grant to Cincinnati and
Omaha to Help Big Cat SSPs **7**

Feature Articles

Successful Fracture Repair and
Reintroduction of 1.2 African Lions **8**

Training a Sumatran Tiger
(*Panthera tigris sumatrae*) for Routine
Subcutaneous Allergy Injections **11**

Breeding Cats in a Construction Zone **15**

Community Support Through the
Pandemic **17**

Pride Dynamics: Managing a Pride of
1.2 African Lions **19**

Roaming Cats Hinder Zoological
Conservation **21**

The Safe Spot

What Keepers Can Do to Avoid
Complacency **26**

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Roaming Cats Hinder Zoological Conservation

By Grant Sizemore, M.S., CWB®, Director of Invasive Species Programs, American Bird Conservancy

Since diverging from the Near Eastern wildcat (*Felis sylvestris lybica*) approximately 10,000 years ago, the domestic cat (*Felis catus*) has been introduced by people to new environments across the globe (Driscoll et al. 2007; Driscoll et al. 2009). These introductions have resulted in an explosion of domestic cats roaming the landscape and tremendous ecological consequences for native wildlife.

Domestic Cat Predators

While indoor domestic cats make wonderful companion animals, they are non-native and instinctive predators that contribute to staggering wildlife mortalities when roaming outdoors (Table 1). In the United States and Canada, for example, domestic cats are the single greatest direct source of anthropogenic mortality to birds, a group of species that has experienced a net loss of 2.9 billion birds in the last 50 years (Loss et al. 2015; Rosenberg et al. 2019). In total, domestic cat predation has contributed to the extinction of at least 63 species of birds, mammals, and reptiles in the wild and continues to threaten large numbers of at-risk species (Medina et al. 2011; Doherty et al. 2016).

Table 1. Annual mortality of wildlife by taxon and location due to domestic cat (*Felis catus*) predation

Taxon	Location	Annual Mortality	Study
Birds	Australia	377 million	Woinarski et al. 2017
Birds	Canada	204 million	Blancher 2013
Birds	United States	2.4 billion	Loss et al. 2013
Mammals	United States	12.3 billion	Loss et al. 2013
Reptiles	Australia	649 million	Woinarski et al. 2018

Disease Transmission

In addition to predation, domestic cats may also indirectly harm wildlife through the spread of parasites and diseases. Some of these pathogens are specific to felines (e.g., feline leukemia virus), whereas others may impact wide varieties of species (e.g., plague).

Among the least selective and most concerning of domestic cat-spread pathogens is *Toxoplasma gondii*, which causes toxoplasmosis. Felines are the definitive host of *T. gondii*, which can only sexually reproduce in a feline gut. Felines then excrete the parasite's oocysts into the environment, where, if ingested by an intermediate host (virtually all birds and mammals), it replicates in the host's tissues. If an infected intermediate host is then consumed by a feline, the parasite completes its life cycle, and the process begins anew.

Toxoplasmosis is particularly concerning because of the variety of negative impacts it may cause in intermediate hosts, including miscarriage, blindness, behavioral modification, and death (Tenter et al. 2000; Aguirre et al. 2019). *T. gondii* infection, specifically caused by domestic cat oocyst excretion, has emerged as a source of mortality and conservation concern for endangered species such as Hawaiian crow (*Corvus hawaiiensis*), Hawaiian monk seals (*Monachus schauinslandi*), and southern sea otters (*Enhydra lutris nereis*) and also affects many other species (Work et al. 2000; Conrad et al. 2005; Honnold et al. 2005; Dubey and Jones 2008).

Feline Conservation and Domestic Cats

Wild felids are also at risk from roaming domestic cats due to competition, hybridization, and disease transmission. Although smaller felines are more susceptible to both competition and hybridization, even big cats may be at risk from parasites and diseases spread by domestic cats. Table 2 (below) considers these conservation concerns and relevant science.

Zoological Institutions and Domestic Cat Management

Within the zoological park setting, effective management of domestic cats can prevent conflicts with species collections. Just as domestic cats may kill, breed with, or transmit parasites and diseases to animals in wild settings, the same can occur in zoological parks. Examples of such conflicts include *T. gondii* transmission and subsequent mortalities in Bennett's wallabies (*Macropus rufogriseus*) at the Virginia Zoo and red kangaroos (*Macropus rufus*) and common squirrel monkeys (*Saimiri sciureus*) at Zoo Miami (Eberly 2015; Hanks 2016). *T. gondii* may be particularly prevalent in zoos. According to Sedláč and Bártoová (2006), "Although clinical disease in animals is not always apparent and is misdiagnosed, there are many reports of clinical toxoplasmosis in zoological parks." The authors urged effective management, stating that "contamination of zoo environments by oocysts must be prevented, but it is common practice that free-ranging felids have access to some zoos, resulting in high prevalence in some zoo animals."

To prevent conflicts in zoological park settings, the best management strategy is proactive removal of at-large domestic cats. To further reduce pressures on zoological collections, cooperation with and education of local communities may also be warranted, and education campaigns for zoo visitors may result in behavioral change (MacDonald 2015). Local behaviors, supported by ordinances, that prohibit at-large domestic cats and encourage responsible pet ownership (e.g., pet sterilization, microchips) may help reduce domestic cat incursions and support local ecosystems and public health. Strategies that maintain domestic cats on the landscape do not meet animal welfare, conservation, or public health goals and have been shown to be ineffective at domestic cat population reduction (Longcore et al. 2009).

Table 2. Select review of studies relevant to wild feline conservation and domestic cats

Study	Feline(s)	Topic	Location	Relevant Findings
Akucewich et al. 2002	Domestic cat	Parasites and Diseases	Florida, USA	“Cat fleas and ear mites were the most common ectoparasites of feral cats in north central Florida in summer.”
Anderson et al. 2003	Bobcat Domestic cat Florida panther	Parasites and Diseases	Florida, USA	“Our findings...may indicate that feral cats act as a reservoir for hookworm infection for wild canids and felids in Florida.”
Bevins et al. 2012	Bobcat Domestic cat Puma	Parasites and Diseases	California, USA Colorado, USA	Domesticated animals may serve as bioaccumulators that could impact prevalence among susceptible wildlife.
Brown et al. 2008	Domestic cat Florida panther	Parasites and Diseases	Florida, USA	A single domestic cat infected with feline leukemia virus caused the death of five Florida panthers.
Cunningham et al. 2008	Domestic cat Florida panther	Parasites and Diseases	Florida, USA	The authors speculated that domestic cats may have been the source of FeLV in Florida panthers.
Gerhold and Jessup 2013	Domestic cat	Parasites and Diseases		“Free-roaming cats are an important source of zoonotic diseases including rabies, <i>Toxoplasma gondii</i> , cutaneous larval migrans, tularemia, and plague.”
Hertwig et al. 2009	Domestic cat European wildcat	Hybridization	Germany	Over 18% of wildcats were genetically hybridized with domestic cats.
Pierpaoli et al. 2003	Domestic cat European wildcat Sardinian wildcat	Hybridization	Europe	Cryptic hybrids were identified in several countries and “extensive hybridization” with domestic cats was identified in Hungary.
Roelke et al. 1993	Domestic cat Florida panther	Parasites and Diseases	Florida, USA	Authors suggested that feral domestic cats could serve as a reservoir for parvovirus and an infection pathway for FIV.
Széles et al. 2018	Domestic cat European wildcat spp.	Competition	Europe	Feral cat diets were most similar to wildcat diets. The prey brought home by house cats indicated prey composition is similar to feral and wildcats.

In addition to protecting valuable zoological collections, effective domestic cat control at zoological institutions reduces potential conflicts with staff and guests. Domestic cats may transmit parasites and diseases to people just as they may to other animals. For example, domestic cats are the top source of rabies among domestic animals in the United States and disproportionately expose people to the disease as compared to wild animals (Roebeling et al. 2013). Roaming domestic cats are also a major risk factor in the transmission of *T. gondii*, excreted oocysts of which may directly or indirectly infect people (Aguirre et al. 2019).

Conclusion

Domestic cats make wonderful pets, but their introduction to new environments around the world has had severe consequences for native wildlife and threatens ongoing conservation efforts. To protect zoological collections, staff, and guests, zoological institutions should seek to eliminate incursions of domestic cats onto facility grounds and to educate staff and guests about why effective domestic cat control is worthwhile, both within zoological parks and at home.

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