

**BEFORE THE DIRECTOR OF THE CALIFORNIA
DEPARTMENT OF FISH AND WILDLIFE
AND THE PRESIDENT OF THE
CALIFORNIA FISH AND GAME COMMISSION**

**PETITION FOR ADMINISTRATIVE RULEMAKING
TO AMEND THE REGULATIONS REGARDING THE
BREEDING AND POSSESSION OF HYBRID CATS**

**ANIMAL LEGAL DEFENSE FUND
BIG CAT RESCUE
BORN FREE USA
THE WILDCAT SANCTUARY
WILDCAT HAVEN**

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I. NOTICE OF PETITION

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June 26, 2014

Pursuant to § 11340.6 of the California Government Code, the Animal Legal Defense Fund and Big Cat Rescue, Born Free USA, Wildcat Sanctuary and WildCat Haven (collectively “Petitioners”) as interested parties hereby petition the Director of the California Department of Fish and Wildlife (“CDFW”) and the President of the California Fish and Game Commission (“FGC”) to amend 14 C.C.R. §§ 671, 671.1, and 671.6 as provided herein.

The proposed amendments ensure that CDFW and FGC’s regulation of hybrid cats, found in 14 C.C.R. §§ 671 *et. seq.*, complies with the law’s requirements to restrict wild animals that are a “menace to native wildlife” or whose possession threatens the animals’ welfare. Cal. Fish & Game Code §§ 2118 & 2118(i). Hybrids of domestic and wild cats are arbitrarily unrestricted under 14 C.C.R. § 671(c)(6)(K)(1)(b). The proposed amendments would restrict early generations of wild-domestic hybrids, impose certain requirements on “grandfathered” cats, and forbid breeding of these hybrid animals.

The unregulated importation, breeding, transport, and possession of hybrid cats pose a threat to public health, native wildlife, and animal welfare in California. Public health concerns include increased aggressiveness in cats with recent wild ancestry, as well as lack of an approved rabies vaccine for hybrids. Native wildlife is threatened by the presence of hybrid cats, whose wild ancestry allows them greater hunting prowess and an ability to interbreed with existing feral cat populations, thereby introducing a risk of becoming an invasive species. Animal welfare is also violated, as hybrid cats are often at increased risk of serious congenital defects, early-generation death, and abandonment or release by owners unprepared for their wild behavior.

CDFW has jurisdiction over this petition under the Cal. Gov. Code § 11340.6, and the FGC has authority to amend the regulations regarding restricted animals under the Cal. Fish & Game Code §§ 2118(i) & 2118(k). This petition sets in motion a specific process, placing definite response requirements on CDFW. Specifically, CDFW must “notify the petitioner in writing of the receipt and shall within 30 days . . .” schedule the matter for a public hearing or indicate in writing why the petition was denied. Cal. Gov. Code § 11340.7(a).

II. INTRODUCTION

A. Hybrid Cats are Genetically and Behaviorally Distinct from Domestic Cats

A hybrid cat is the result of interbreeding a domestic cat (*Felis catus*) with any of several species of exotic wild cats. These two species are chromosomally compatible yet behaviorally and biologically distinct, and are the product of artificial crosses by cat breeders.¹ The two most common hybrid breeds are the Bengal, a cross between a domestic shorthaired cat and an Asian Leopard Cat, and the Savannah, a cross between a domestic cat and an African Serval.² Other prevalent breeds include the Chausie, a cross between a domestic cat and a jungle cat, and the Serengeti, a cross between a Bengal and an Oriental Shorthair.³

Hybrid cat breeders generally seek to create offspring with the appearance of a wild animal and the temperament of a domestic pet,⁴ and people are often willing to pay breeders up to tens of thousands of dollars for a pet that “looks as if it could prowl the wilderness.”⁵ While the aesthetic of hybrid cats may be ascertained at birth, the desirable temperament hybrid breeders and owners seek is less predictable or identifiable. The earlier the generation of hybrid cat, the closer the animal is to the bloodline of the exotic wild cat, and the more closely the hybrid’s behavior reflects that of the wild animal.⁶ Hybrid cats have been known to exhibit wild cat-like traits such as extreme nocturnal activity, an aversion to interaction with humans, frequent urine marking, and the inability to integrate into domestic settings.⁷

While research suggests the housecat species became domesticated as early as the Neolithic period (10,000 years ago), other wild cat species have historically been viewed as unsuitable pets. Even the European wildcat, an animal almost genetically indistinguishable from the domestic cat, has been described by naturalist H.C. Brooke as “probably the least amenable of all living creatures.”⁸ Given the millions of years separating domestic and wild cat lineages, it is no surprise that they maintain stark behavioral differences,⁹ nor is it surprising that domestic/wildcat crosses have never been observed in the wild. Now these species, long separated by time and genetics, are being recklessly forced together by cat breeders.

¹ *Wild Cat Hybrid Fad in California Concerning to Experts*, CBS LOCAL (Nov. 5, 2013) [hereinafter *Hybrid Fad*]; *The Case Against Hybrids*, PETFINDER, <http://www.petfinder.com/pet-adoption/exotic-pets/case-against-hybrids/> (last visited Apr. 24, 2013).

² *The Case Against Hybrids*, *supra* note 1.

³ Ariel Levy, *Living Room Leopards*, THE NEW YORKER, May 6, 2013, 28–32 (2013).

⁴ *Id.*; *The Case Against Hybrids*, *supra* note 1.

⁵ Levy, *supra* note 3.

⁶ *Hybrid Fad*, *supra* note 1.

⁷ *The Case Against Hybrids*, *supra* note 1; *Hybrid Facts: What About Hybrid Cats?*, BIG CAT RESCUE, (last visited Dec. 26, 2013) <http://bigcatrescue.org/hybrid-facts/>.

⁸ Levy, *supra* note 3.

⁹ The caracal lineage, which includes the African Serval, diverged from the lineage giving rise to domestic cats approximately 8.5 million years ago. The leopard cat lineage, including the Asian Leopard Cat, diverged from domestic cats approximately 6.2 million years ago. Anna Markula, et al., *Pest Animal Risk Assessment: Serval Hybrids — Hybrids of *Leptailurus Serval* (Serval) and *Felis Catus* (Domestic Cat), Including the ‘Savannah Cat,’* QUEENSLAND GOV’T: DEP’T OF PRIMARY INDUS. AND FISHERIES, 16 (Jan. 2009), at 4.

Perhaps because of these long-standing behavioral barriers, the breeding of hybrid cats for use as pets is only a relatively recent phenomenon.¹⁰ The first attempt was not until 1963, when Jean S. Mill crossed a domestic cat with an Asian Leopard Cat.¹¹ The modern Bengal breed traces back to such cats bred by Mill in the early 1980s. Likewise, the first known Savannah dates back to just April 7, 1986, when a female domestic cat gave birth to a kitten sired by an African Serval.¹² It was these recent efforts that established the market for hybrid cats and allowed them to become readily available pets.

B. California Has an Active Hybrid Cat Market

There is now an active market for hybrid cats. Exotic cats often are regarded as status symbols, and reports suggest hybrid cats have been sold for as much as \$35,000.¹³ Compared with lower-priced domestic breeds, dealing in hybrid cats is an attractive pursuit for breeders. However, as described below, many states impose restrictive regulations on hybrid cats, which effectively prohibit hybrid cat breeders from operating within state lines.¹⁴ The controversial nature of part-wild hybrids has led some breeders to be secretive in public, emphasizing the domestic qualities and minimizing the wild characteristics of the cats they sell.¹⁵

California lacks any regulation on the importation, breeding, transport, or possession of hybrid cats. Not surprisingly, it is also home to an extensive network of hybrid cat breeders. The number of hybrid breeders operating in California is elusive, but cat breeder websites offer a glimpse into the size of the market. SavannahCat.com, a website dedicated to supporting the Savannah breed, lists thirty-two Californian Savannah breeders on its directory, for example.¹⁶ Similarly, The International Bengal Cat Society lists ten Bengal breeders located in California.¹⁷ Numerous other California catteries deal in lesser-known hybrid breeds.¹⁸ While the lack of registration requirements prevents determinations of the exact number of hybrid cats in California, the evidence suggests they are pervasive throughout the state.

III. INTERESTS OF PETITIONERS

Animal Legal Defense Fund (ALDF) is a non-profit corporation founded in 1979 to

¹⁰ Levy, *supra* note 3.

¹¹ *Bengal: History*, THE INTERNATIONAL CAT ASSOCIATION, <http://www.tica.org/public/breeds/bg/intro.php> (last visited Apr. 24, 2014).

¹² Susanna Kim, *Breeders of 'Misunderstood' Hybrid Cats Dispel 'Myths' of Wild Animals*, ABC NEWS (June 4, 2013) <http://abcnews.go.com/Business/breeders-misunderstood-hybrid-cats-dispel-myths-wild-animals/story?id=19271782>.

¹³ Levy, *supra* note 3.

¹⁴ See *infra* Section III(B).

¹⁵ Levy, *supra* note 3.

¹⁶ These include San Diego-based Designer Spots Savannah Cats, Shingletown-based Africadabra, and Modesto-based Belafamilia Cattery. *Breeder Directory: California*, SAVANNAHCAT.COM, <http://www.savannahcat.com/public/index.php?page=breeder&id=11&type=country> (last visited 4/25/14).

¹⁷ For example, Rosemead-based Urban Exotic Bengals and Santa Clarita-based Purreciouspot. *Breeder Directory*, THE INTERNATIONAL BENGAL CAT SOCIETY, <http://www.bengalcat.com/breederlist.aspx?region=2> (last visited 4/25/14).

¹⁸ For example, Styled in the Wild, a Benicia, California based cattery, works with a relatively new breed called a toyger—a Bengal-domestic cross. STYLED IN THE WILD, <http://styledinthewild.com/> (last visited Apr. 24, 2014).

protect the lives and interests of animals through the enforcement of laws enacted to protect animals, and through the provision of information to others desiring to protect the lives and interest of animals. Based in Petaluma California, ALDF has approximately 100,000 members nationwide, including lawyers, law professors, law students, and other individuals interested in protecting the lives and interests of both wildlife and companion animals.

Big Cat Rescue is one of the largest sanctuaries for exotic cats and is accredited by the Global Federation of Animal Sanctuaries. As a nonprofit organization, Big Cat Rescue provides lifetime care to over 100 exotic felids, including tigers, lions, cougars and hybrid cats, who were abandoned or seized from substandard facilities and private owners. Big Cat Rescue strives to educate the public about these animals and the issues that captive, wild and hybrid cat populations face.

Born Free USA's mission is to end the suffering of wild animals in captivity, rescue individual animals in need, protect wildlife—including endangered species—in their natural habitats, and encourage compassionate conservation globally. Born Free operates sanctuaries that provide safe haven from abusive situations in both roadside zoos and private possession.

WildCat Haven is a non-profit “last hope” sanctuary located in Oregon and is accredited by ASA (American Sanctuary Association) and verified by GFAS (Global Federation of Animal Sanctuaries). WildCat Haven is committed to providing a safe, natural, permanent home for abused and neglected captive born wildcats and hybrids.

The Wildcat Sanctuary is a non-profit big cat rescue facility located in Minnesota, providing a natural sanctuary to wild cats in need and intending to inspire change to end the captive wildlife crisis. The Wildcat Sanctuary accommodates hybrid cats if there is room, but has been overwhelmed by the number of calls from people asking to surrender their wild-domestic hybrids to the facility.

IV. STATUS OF THE LAW

A. Hybrid Cats are Unregulated in California

Currently, the importation, breeding, transport, and possession of hybrid cats in California are unregulated. California law requires the restriction of wild animals that are a “menace to native wildlife,” or whose possession threatens the animals’ welfare.¹⁹ Section 2118(b) of the California Fish and Game Code (“CFGF”) sets forth a list of animals which “it is unlawful to import, transport, possess, or release alive” into the state.²⁰ The list of restricted animals includes all cats except for “*felis catus*,” or domestic cats.²¹

Regulations promulgated by the California Department of Fish and Wildlife (“CDFW”) further clarify the law. CDFW’s regulations impose restrictions on certain “live animals” based

¹⁹ CAL. FISH & GAME CODE § 2118(i) (West 2014).

²⁰ CAL. FISH & GAME CODE § 2118 (West 2014).

²¹ *Id.*

on concerns regarding either animal welfare or detriment to the environment and wildlife,²² and all non-domestic felids are barred.²³ Section 671(c)(6)(K)(1)(b), however, arbitrarily excludes hybrid cats from restriction: “Domestic cats and hybrids of domestic cats are not restricted.” As a result of this exclusion, there exist no regulations on hybrid cats.

FGC has authority to amend the regulations regarding restricted animals under the Cal. Fish & Game Code §§ 2118(i) & 2118(k) as it sees fit.²⁴

B. Hybrid Cats are Prohibited or Regulated by Many States

California’s total lack of restrictions on hybrid cats stands in stark contrast to the progress other states have made in regulating these animals. Five states have enacted complete bans on hybrid cats.

- Hybrid cats are illegal outright in Nebraska, Hawaii, and Georgia.²⁵
- Rhode Island has banned hybrid cats explicitly due to the lack of empirical information on the effectiveness of rabies vaccines for hybrids.²⁶
- Likewise, Alabama has constructively banned hybrid cats by outlawing pets for which there is no USDA-approved rabies vaccine, including such felids.²⁷

Many other states have imposed significant restrictions on hybrid cats, effectively limiting the ability of people to purchase or import the animals as pets:

- Hybrids are illegal in Alaska unless grandfathered prior to January 23, 2002 and neutered, licensed, registered, and at least four generations removed from a wild ancestor.²⁸
- Connecticut, Massachusetts, New Hampshire, and Vermont have similar prohibitions, with exceptions for hybrid cats that are at least four generations removed from a wild ancestor.²⁹
- Connecticut and Massachusetts laws contain grandfather clauses, excluding from restriction any hybrid cat legally present in those states prior to specified dates.³⁰

²² CAL. CODE REGS. tit. 14, § 671(b).

²³ CAL. CODE REGS. tit. 14, § 671(c)(6)(K)(1); all prohibited felids are barred on welfare grounds, except for cheetahs, which are considered detrimental animals

²⁴ CAL. FISH & GAME CODE §§ 2118(i)-(j).

²⁵ NEB. REV. STAT. § 37-477 (2013); HAW. CODE R. § 4-71-2 (2013); GA. CODE ANN. § 27-5-5 (West 2013).

²⁶ R.I. DEPT. ENVTL. MGMT., FISH & WILDLIFE, RULES AND REGS. GOVERNING IMPORTATION AND POSSESSION OF NATIVE WILDLIFE (2006).

²⁷ ALA. CODE § 3-8-1 (2013).

²⁸ ALASKA ADMIN. CODE tit. 5, § 92.029 (2013).

²⁹ CONN. GEN. STAT. ANN. § 26-40d (West 2013); MASS. GEN. LAWS ANN. ch. 131 § 77A (West 2013); N.H. CODE ADMIN. R. FIS. 802.03 (2013); 10 V.S.A. APP. § 18 (2013).

³⁰ CONN. GEN. STAT. ANN. § 26-40d (West 2013); MASS. GEN. LAWS ANN. ch. 131 § 77A (West 2013).

- Iowa law specifically excludes Bengals and Savannahs four generations removed from a wild ancestor from regulation.³¹
- New York requires that any hybrid cat within the state be at least six generations removed from a wild ancestor and registered with the state.³²
- Maryland prohibits hybrid cats over thirty pounds.³³
- Delaware requires any hybrid cat within the state to have a permit.³⁴
- Texas specifically outlaws Servals and any hybrids thereof.³⁵

Still other states have imposed regulations on hybrid cats to at least some extent, though these fall short of actual bans:

- Pennsylvania outlaws hybrid cats other than the Savannah, Bengal, Chausie, and Safari, which it considers domestic breeds.³⁶
- Indiana prohibits any hybrids with a wild parent.³⁷
- Florida regulates hybrids based on “size, characteristics and behavior” similarity to the wild parent.³⁸
- The District of Columbia regulates ocelot and margay hybrids.³⁹

A final group of states defines acceptable cat breeds based on the standards of independent cat registry organizations. For example:

- Illinois and Utah ban those hybrid breeds not recognized by The International Cat Association (“TICA”).⁴⁰ TICA recognizes the major breeds, including the Savannah and the Bengal, but excludes many others.
- Similarly, Minnesota prohibits hybrid breeds but makes an exception for any breed recognized by a registry association, such as TICA or the Cat Fanciers’ Association (“CFA”).⁴¹ Unlike TICA, the CFA does not recognize hybrid cats as legitimate

³¹ IOWA CODE ANN. § 717F.1 (separately amended) (West 2013).

³² N.Y. ENVTL. CONSERV. LAW §§ 11-0103 (Gould 2013).

³³ MD. CODE ANN., CRIM. LAW § 10-621 (West 2013).

³⁴ 3 DEL. CODE §§ 7201–03 (2013).

³⁵ TEXAS HEALTH & SAFETY CODE ANN. § 822.101 (West 2013).

³⁶ *Pennsylvania*, HYBRIDLAW, http://www.hybridlaw.com/index_test.php?state=RI (last visited Apr. 24, 2014).

³⁷ 312 IND. ADMIN. CODE. 9-3-18.5 (West 2013).

³⁸ FLA. ADMIN. CODE ANN. r. § 68A-6.002 (2013).

³⁹ D.C. CODE § 8-1808 (2013).

⁴⁰ 8 ILL. ADMIN. CODE § 25.110 (LexisNexis 2013); UTAH ADMIN. CODE R657-3-2 (2013).

⁴¹ MINN. STAT. ANN. § 346.155 (West 2013).

breeds. When questioned about his feelings regarding breeding hybrid cats, the CFA's president Jim Mendenhall stated, "It's plain wrong."⁴²

In total, twenty-one states and the District of Columbia regulate the importation, breeding, transport, or possession of hybrid cats.

C. Several Foreign Countries Regulate Hybrid Cats

There is also significant foreign precedent for regulating hybrid cats:

- Both Australia and New Zealand have successfully enacted complete bans on hybrid cat importation, with the exception of hybrids at least five generations removed from a wild ancestor.⁴³ A discussion of their reasoning is included later in this petition.
- The United Kingdom requires permits for any hybrid cat with a wild parent.⁴⁴
- Norway and Sweden prohibit any hybrid cat less than five generations removed from a wild ancestor.⁴⁵ In both countries, even a hybrid five generations or more removed from a wild ancestor needs to be quarantined for four months, or given a rabies vaccination at three months of age and tested for rabies at the age of four months.⁴⁶

V. REASONS TO REGULATE: HYBRID CATS ARE A THREAT TO HUMAN HEALTH AND A DANGER TO WILDLIFE, AND MAY HAVE SIGNIFICANT CONGENITAL HEALTH ISSUES

A. Hybrid Cats Threaten Human Health and Safety

1. Hybrid Cats are Larger and More Aggressive than Domestic Cats

The unrestricted propagation of hybrid cats poses a risk to human health. Due to their recent wild ancestry, some breeds of hybrids are larger than their domestic counterparts. Savannah cats, for example, can be up to twice as big as domestic cats, and may have a standing vertical leap of over eight feet.⁴⁷

Anecdotal reports suggest these breeds may be more aggressive than domestic cats. One breeder mentioned that certain Bengals “can rip you to ribbons.”⁴⁸ And just last year, a loose Savannah cat brought panic to a Detroit neighborhood whose residents were “unnerved by [the] supersized cat.”⁴⁹ Big Cat Rescue has recorded similar experiences, with founder Carole Baskin

⁴² Kim, *supra* note 12.

⁴³ *International Law*, HYBRIDLAW, <http://www.hybridlaw.com/international-hybrid-law-links.php> (last visited Apr. 24, 2014).

⁴⁴ Markula, *supra* note 9, at 11.

⁴⁵ *International Law*, *supra* note 43.

⁴⁶ *Id.*

⁴⁷ Markula, *supra* note 9, at 16.

⁴⁸ Levy, *supra* note 3.

⁴⁹ Niraj Warikoo, *Big Cat Has Northeast Detroit Neighborhood on Edge*, DETROIT FREE PRESS (August 24, 2013), <http://www.freep.com/article/20130824/NEWS01/308240015/Detroit-big-cat>.

explaining that “they bite. Even in play, even if they love you, they bite and I have scars all over my hands . . .,” and that “they want to eat your other pets.”⁵⁰ This enhanced aggression is a threat to human health, particularly to children.

2. No Rabies Vaccine is Approved for Hybrids, Leading the CDC to Recommend Hybrid Cats Should Not be Kept as Pets

Perhaps most sobering is the risk of rabies posed by hybrids. Due to the differing biology between hybrid and domestic cats, there is currently no rabies vaccine approved by the United States Department of Agriculture or the American Veterinary Medical Association for use among hybrids. Although veterinarians routinely vaccinate hybrids in an effort to prevent the disease, such use of the vaccine is not explicitly authorized by any governmental body.⁵¹ Indeed, a report prepared by the Centers for Disease Control (“CDC”) has cited this as a sufficient reason to conclude that hybrid cats should not be kept as pets.⁵²

Four states—Connecticut,⁵³ Alabama,⁵⁴ Rhode Island,⁵⁵ and Alaska⁵⁶—have restricted hybrid cats explicitly because of this rabies concern. Norway and Sweden, which ban first-through fourth-generation hybrids, allow fifth- or later-generation hybrid cats only after a four-month quarantine or successful rabies titer test after inoculation.⁵⁷ With new species come new risks, and some jurisdictions have simply concluded that the privilege of having an exotic-looking pet does not warrant the enhanced threat of rabies transmission.

3. Hybrid Cats May Increase the Risk of Toxoplasmosis Transmission

Toxoplasmosis is a parasitic disease commonly found in felids, particularly house cats. The disease can also be transmitted to humans, and while often benign, the CDC has explained that it can have especially severe consequences in pregnant women and people with compromised immune systems.⁵⁸ Further, the CDC has targeted toxoplasmosis as one of five “Neglected Parasitic Infections” requiring further attention and public health action.⁵⁹

The threat of toxoplasmosis is especially acute in felid cats, whose diseases go untreated. Hybrid cats introduce even further complications, as their differing biology, ecological range, and diet from domestic cats could lead to different strains of the parasite and vastly different

⁵⁰ *Hybrid Facts: What About Hybrid Cats?*, *supra* note 7; *see also* Declaration of Carole Baskin, Exhibit A.

⁵¹ Declaration of Dr. Rachel Addleman-Seder, Exhibit C ¶ 8.

⁵² National Association of State Public Health Veterinarians, Inc., *Compendium of Animal Rabies Prevention and Control, 2011*, MORBIDITY AND MORTALITY WKLY. REP. RECOMMENDATIONS AND REP., Nov. 4, 2011, 1–14.

⁵³ Kevin E. McCarthy, *2000-R-0680 Report: Bengal Cat Laws*, Connecticut General Assembly (July 11, 2000).

⁵⁴ ALA. CODE § 3-8-1 (West 2013).

⁵⁵ R.I. DEPT. ENVTL. MGMT., FISH & WILDLIFE, RULES AND REGS. GOVERNING IMPORTATION AND POSSESSION OF NATIVE WILDLIFE (2006).

⁵⁶ Jill Burke, *Finches and Chimps and Sloths, Oh My!*, ALASKA DISPATCH (Jan. 13, 2010).

⁵⁷ *International Law*, HYBRIDLAW, *supra* note 43.

⁵⁸ *Parasites - Toxoplasmosis (Toxoplasma Infection)*, Centers for Disease Control, www.cdc.gov/parasites/toxoplasmosis (last visited May 7, 2014).

⁵⁹ *Id.*

disease dynamics.⁶⁰ Allowing the continued proliferation of this new species could potentially turn a relatively manageable disease into a public health disaster.

B. Hybrid Cats Pose an Extreme Threat to Californian Wildlife and Fragile Ecological Systems

1. Hybrid Cats are Larger and More Effective Hunters of Wildlife than Are Domestic Cats

Hybrid cats pose a threat to wildlife if they escape or are released into the wild. Unfortunately, many such cats are already being released from their homes. Carole Baskin, the CEO of Big Cat Rescue, which rescues and provides homes for non-domestic cats (including hybrid cats), has written an expert declaration for this petition in which she describes the large number of hybrid cats she and her team encounter on a regular basis. When she and her team are called to examine and contain a wild cat, it almost always ends up being a hybrid cat.⁶¹ Moreover, when beyond human supervision, all cats are “commensal domesticates,” meaning that they can revert to a feral state in the wild.⁶² Once feral, hybrid cats’ inborn hunting instincts turn them into natural predators.

In support of this petition, Dr. Bernie Tershy, a professor at the University of California, Santa Cruz, who specializes in conservation biology and the impacts of feral cats on Californian ecosystems, has written and signed a declaration describing the potential negative impacts of hybrid cats on California. Dr. Tershy first explained that the feral problem is not unique to hybrid cats: feral cats are responsible, at least in part, for 14% of all vertebrate extinctions since 1600, and in California they have continually devastated the populations of many bird, mammal, and reptile species.⁶³

Hybrid cats, when feral, further exacerbate this threat to wildlife, as hybrids tend to be larger and more aggressive than their domestic counterparts. Larger cats can kill larger prey, thereby exposing new niches of Californian wildlife to feline predators.⁶⁴ The Savannah cat, for example, is bred from the wild Serval, which normally eats prey of 200 grams or less but can take down much larger animals as well.⁶⁵ The Serval also has a 49 percent hunting success rate, higher than lions (30 percent) and much higher than the average cat species, including feral housecats (10 percent).⁶⁶ According to Dr. Tershy, if these wild cats’ predatory instincts are passed down to the hybrids, then released or escaped cats could decimate wildlife populations.⁶⁷ And if those hybrids can further breed with each other or with existing ferals, the effects could be even more widespread.

Hybrid cats could also potentially escape predation from the animals that normally control feral cat populations—primarily coyotes and great horned owls—due to their larger size

⁶⁰ Declaration of Dr. Bernie Tershy, Exhibit B, p. 5.

⁶¹ Declaration of Carole Baskin, Exhibit A.

⁶² Levy, *supra* note 3.

⁶³ Declaration of Dr. Bernie Tershy, Exhibit B, pp. 1–3.

⁶⁴ *Id.*

⁶⁵ Markula, *supra* note 9, at 15.

⁶⁶ *Id.* at 12.

⁶⁷ Declaration of Dr. Bernie Tershy, Exhibit B, pp. 3–5.

and different camouflage.⁶⁸ Because predation is one of the main barriers keeping feral cats from expanding too far into the wild, a decrease of this predatory pressure could greatly expand their survivability and geographic range.⁶⁹ In turn, this could expose entirely new ecosystems to the harms posed by feral cats. Carole Baskin described this threat as “strapping a nuclear warhead to the feral cat problem.”⁷⁰

2. Hybrid Cats Have the Potential to Become an Invasive Species

As frightening as individual hybrid cats are to native wildlife, their potential to become an invasive species is a truly catastrophic risk. Once in the wild, hybrid cats (most of which are not neutered or spayed⁷¹) can interbreed with existing feral cats,⁷² which by some estimates number “in the tens of millions” in the United States.⁷³ If the hybrid cats have any survival or reproductive advantages over the feral cats, their genetic information could spread deeply and broadly across the existing population.⁷⁴ Furthermore, if any of the relevant traits are genotypically dominant, they could become permanent fixtures in the feral gene pool.⁷⁵

According to Dr. Tershy, the result could be a new breed of feral cats, with enhanced size, aggression, and hunting prowess.⁷⁶ Such a breed would have all the hallmarks of an invasive species: it is non-native to the ecosystem, and its introduction could cause environmental harm or harm to human health.⁷⁷ Indeed, feral cats are already classified as an invasive species by the California government, with a documented high spread rate and severe potential for ecological damage.⁷⁸ A new, potentially enhanced breed of feral cats could make this existing problem even worse.

The dynamics of invasive species are complex, and there remain many unknown parameters regarding hybrid cats, which are relatively novel animals that have never been studied in the wild. Such unknowns include the critical mass required for a self-sustaining population, the propagule pressure (a composite measure of the non-native species’ presence in a region), the breeding habits of hybrids within feral colonies, the relative effects of hybrid vigor versus hybrid depression (the improvement or degeneration of certain functions within hybrids),

⁶⁸ *Id.* at 4–5.

⁶⁹ *Id.*

⁷⁰ Declaration of Carole Baskin, Exhibit A.

⁷¹ *Id.*, at 11.

⁷² Declaration of Dr. Bernie Tershy, Exhibit B, pp. 3–5.

⁷³ *Feral Cats FAQ*, AM. SOC’Y FOR THE PREVENTION OF CRUELTY TO ANIMALS, <http://www.asPCA.org/adopt/feral-cats-faq> (last visited Apr. 24, 2014).

⁷⁴ Phillip McClean, *Evolutionary Genetics*, N. D. ST. U., <http://www.ndsu.edu/pubweb/~mcclean/plsc431/popgen/popgen4.htm> (last visited Apr. 24, 2014).

⁷⁵ Dr. Carol Booth, *Submission on Draft Environmental Assessment of the Suitability of the Import of the Savannah Cat (Domestic Cat x Serval Hybrid Specimens) into Australia*, INVASIVE SPECIES COUNCIL (August 16, 2008), http://www.invasives.org.au/documents/file/sub_savannah_cats_july08.pdf.

⁷⁶ Declaration of Dr. Bernie Tershy, Exhibit B, pp. 4–5.

⁷⁷ *Frequently Asked Questions (FAQ): What is an Invasive Species?*, THE NAT’L INVASIVE SPECIES COUNCIL, http://www.invasivespecies.gov/main_nav/mn_faq.html#what_is (last visited Apr. 24, 2014).

⁷⁸ *The California Invasive Species List*, INVASIVE SPECIES COUNCIL OF CALIFORNIA, <http://www.iscc.ca.gov/species.html> (last visited Apr. 24, 2013), citing Invasive Species List and Scorecards for California: *Felis Catus*, UC DAVIS INFO. CTR. FOR THE ENV’T, <http://ice.ucdavis.edu/invasives/scorecard/felis-catus-scorecard> (last visited Apr. 24, 2014).

and so forth. These uncertainties should serve as a sobering precaution against a potential crisis, however, not as an excuse to avoid taking action.

Hybrid cats pose a novel invasive threat. Normal domestic cats cannot interbreed with the only two native cat species in California, the mountain lion (*Felis concolor*) and the bobcat (*Felis rufus*). According to Dr. Tershy, Feral hybrid populations could therefore occupy a new ecological niche, minimizing competition from other similarly-sized predators. For example, they may hunt animals too large for feral cats but too small for bobcats and mountain lions. Moreover, if these hybrids are too big or too aggressive to be hunted by coyotes and great horned owls—the main forces keeping feral cats in check—they could also expand into geographic regions of California currently untouched by feral cats.⁷⁹

The effect of feral cats on the environment is already enormous. By one metric, they are already responsible for the extinction of as many as thirty-three species,⁸⁰ with many more endangered or on the brink of extinction. By another, as discussed above, they are responsible for 14% of all vertebrate extinctions since 1600.⁸¹ Further super-charging the feral population in California by allowing the introduction of wild DNA is a careless risk well outside CDFW's regulatory goal of restricting animals that “pose a threat to native wildlife,” 14 C.C.R. § 671(b), and its statutory mandate to restrict animals that are a “menace to native wildlife,” Cal. Fish & Game Code § 2118.

3. Australia Banned Cat Hybrids Due to Invasive Species Concerns

If California were to ban hybrids on these grounds, it would hardly be the first jurisdiction to do so: Australia and New Zealand both imposed hybrid cat restrictions due to the potential threat of such animals to native wildlife. A brief retelling of the story is offered below.

In 2008, an Australian cat breeder sought to import Savannah cats into the country. A public outcry followed, leading to extensive public debate and scientific study of the potential impacts of hybrid cats on Australian ecosystems.⁸² One such study was a report commissioned by the government of Queensland, the second-largest state in Australia. This report,⁸³ reproduced as Exhibit D, evaluated the risk of Savannah cats becoming an invasive species. The study assessed twenty distinct factors, ultimately determining the following:

- “Cross-breeding could result in increased hunting efficiency within the feral cat population” (page 13);
- Savannah cats are a “highly dangerous” risk to public safety (page 21);

⁷⁹ Declaration of Dr. Bernie Tershy, Exhibit B, pp. 3–5.

⁸⁰ Rebecca Morelle, *Cats Killing Billions of Animals in the US*, BBC NEWS: SCI. & ENV'T (Jan. 29, 2013), <http://www.bbc.co.uk/news/science-environment-21236690>; declines in native wildlife in Australia have also been attributed to invasive cat and fox populations. Markula, *supra* note 9, at 16.

⁸¹ Declaration of Dr. Bernie Tershy, Exhibit B, pp. 1–3.

⁸² *Savannah Cats & Other Hybrids*, INVASIVE SPECIES COUNCIL, <http://www.invasives.org.au/page.php?nameIdentifier=savannahcatshybrids> (last visited Apr. 24, 2014).

⁸³ Markula, *supra* note 9. The ultimate publication of this report followed the actual promulgation of the Australian regulations.

- They posed an “extreme” threat of establishing a wild population (page 22); and
- There was an “extreme” risk of Savannah cats becoming a pest following establishment (page 23).

The Queensland report concluded that Savannah cats were an “extreme” overall threat to the state. Other organizations came to similar conclusions. The Invasive Species Council (“ISC”), an Australian non-profit organization dedicated to “protect[ing] the Australian environment from weeds, feral animals and exotic pathogens,”⁸⁴ expressed concern that Savannah cats could establish wild populations that would threaten native wildlife. The group also noted that the risks of hybrid cats establishing wild populations increased over time, and that such a problem was likely irreversible once started. On these grounds, the ISC urged the government to ban Savannahs, as well as “to apply the same caution to other variants and hybrids.”⁸⁵

The Australian government responded favorably to these concerns. In August of 2008, after evaluating the evidence, Federal Environment Minister Peter Garrett explained:

“On all the evidence that I have seen, the risks associated with allowing this cross-bred cat into the country when we already have up to 12 million feral cats wreaking havoc on native fauna, are simply too great. That is why I have banned the import of these cats immediately.

The scientific assessment presented to me found that the Savannah Cat posed an extreme threat to Australia’s native wildlife and the advice suggests each generation could retain the more efficient hunting traits of the wild African Serval.

My decision follows over 500 submissions from interest groups and the general public, petitions calling on me to take this action with thousands of signatures as well as consultation with the states and territories, in addition to the scientific report.

The submissions I received during the public comment period were overwhelming in their support to stop the importation of the Savannah cat. Of the 549 submissions received, 526 supported the proposed amendment. . . .

My role as Federal Environment Minister is to make decisions based on the best possible outcome for the Australian environment. I have an obligation under the Convention on Biological Diversity to protect Australia’s biodiversity and I take that responsibility very seriously.”⁸⁶

⁸⁴ About Us, INVASIVE SPECIES COUNCIL, <http://www.invasives.org.au/page.php?nameIdentifier=aboutus> (last visited Apr. 24, 2014).

⁸⁵ Booth, *supra* note 75.

⁸⁶ The Honorable Peter Garrett MP, *PG/113: Savannah Cat Banned*, OFFICE OF THE MINISTER FOR THE ENV’T, HERITAGE AND THE ARTS, (Aug. 3, 2008), <http://www.environment.gov.au/minister/archive/env/2008/pubs/mr20080803.pdf>.

Garrett issued regulations banning Savannah cats and all other hybrid cats, except for Bengal cats of the fifth generation or later. New Zealand enacted the same restrictions.⁸⁷ The regulations in these countries are among the strictest in the world, and they are also the *only* regulations promulgated after extensive scientific evaluation of the issue.

Australia and California have the same obligations to protect wildlife and the native ecosystem. Petitioners urge CDFW and FGC to take the same measures to fulfill these duties as Australia did in 2008. The California government restricts less dangerous animals (e.g. ferrets, sugar gliders, and hedgehogs) on the grounds that they might endanger wildlife.⁸⁸ In order to ensure a consistent and non-arbitrary enforcement of the Fish & Game Code, CDFW should also restrict hybrid cats, which pose a far greater long-term threat to Californian wildlife and the ecosystem.

C. Animals are Harmed by the Market for Hybrid Cats in California

1. Reproductive Isolation Prevents Successful Breeding, and May Cause Suffering Among Dams and Newborn Kittens

Hybridization between domestic cats and wild cat species is a fundamentally artificial process that must overcome many biological and behavioral obstacles. Biologists collectively refer to such barriers as “reproductive isolation,” a process by which members of different species are naturally prevented from producing viable offspring.⁸⁹

First among such barriers is pre-zygotic isolation, a set of behaviors and biological characteristics that prevents fertilization.⁹⁰ Domestic cats and wild cats, such as the Serval, are very different in size, which can lead to painful mating between the species. In addition, they are not natural breeding partners, and the smaller and tamer domestic cats are often attacked and sometimes killed by the wild cats during the process.⁹¹ Additional protections in the reproductive system also function to prevent the hybrid fertilization of an egg.

If fertilization is successful in spite of these mechanisms, so-called post-zygotic isolation may then operate to prevent the successful birth and proliferation of offspring.⁹² Hybrid cats have a very high incidence of premature births, natural abortions, fetal absorptions, and obstructed labor, largely due to differing gestational periods between the different species involved.⁹³ Males of the first, second, and third generations are also typically sterile,⁹⁴ and may

⁸⁷ *International Law*, HYBRIDLAW, *supra* note 44.

⁸⁸ *Why Can't I Have a Hedgehog, Sugar Glider, Ferret, or Other Restricted Non-Native Species as a Pet in California?*, CAL. DEPT. OF FISH AND WILDLIFE, http://www.dfg.ca.gov/wildlife/nongame/nuis_exo/hedgehog/index.html (last visited Apr. 24, 2014).

⁸⁹ Scott Freeman, BIOLOGICAL SCIENCE, Pearson Education (2nd Ed. 2005): 539–40.

⁹⁰ *Id.*

⁹¹ *Hybrid Facts: What About Hybrid Cats*, *supra* note 7.

⁹² Freeman, *supra* note 89 at 539–40.

⁹³ *What is a Hybrid Cat?*, THE WILDCAT SANCTUARY, <http://www.wildcatsanctuary.org/education/species/hybrid-domestic/what-is-a-hybrid-domestic/> (last visited Apr. 24, 2014).

⁹⁴ Markula, *supra* note 9, at 6; *Hybrid Facts: What About Hybrid Cats?*, *supra* note 7.

be killed by breeders, or sold into the fur trade, because they serve no purpose in propagating the hybrid line and are not themselves suitable as pets.⁹⁵

All told, the breeding process for hybrid cats takes a tremendous toll on the cats involved. Female cats are continuously bred with unnatural partners, suffer frequent miscarriages, and ultimately are separated from their young, which themselves may then be killed, isolated for future breeding, or sold as pets. Male hybrids fare even worse, as their natural sterility increases their chances of being killed by the breeders. Both sexes must also deal with the health concerns associated with hybridization and forced breeding, as discussed below.

2. Many Congenital Health Disorders are More Common among Hybrid Cats as Compared to Pure Domestic Cats

Even those hybrid cats who do survive the breeding process may then face a lifetime of health concerns associated with hybridization. Hybrid cats are prone to a number of serious health disorders, including many congenital disorders. This is likely due in part to the prevalence of autosomal recessive disorders, which accumulate in breeds maintained through inbreeding,⁹⁶ a feature common among hybrid cat lines. These diseases are also attributable to incompatibility between wild and domestic genes, and between the disparate morphological characteristics of the separate species.

Few peer-reviewed studies have been conducted on hybrid cats to test the relative risk of disorders compared to pure domestic cats. This is perhaps due to the recent creation of these breeds. The research that has been done has also focused mainly on Bengal cats, the most popular hybrid breed. However, even these few studies show increased congenital health risks among hybrid cats.

- A 2012 study of Bengal kittens found an increased incidence of thoracic wall deformities, including scoliosis, concavity of the chest wall, and pectus excavatum (a hollowing of the chest cavity).⁹⁷
- In 2011, a group of veterinarians studied cases of retinal dystrophy, a wide range of eye conditions that can lead to blindness. They observed higher levels of the disorder among certain cat breeds, including Bengals, who are also prone to a novel early-onset primary photoreceptor disorder, which can cause moderate to severe vision problems.⁹⁸

⁹⁵ *Hybrid Facts: What About Hybrid Cats?*, *supra* note 7; Declaration of Dr. Rachel Addleman-Seder, Exhibit C, ¶ 6.

⁹⁶ Freeman, *supra* note 89 at 294–95, 533–35.

⁹⁷ TM Charlesworth & CP Sturgess, *Increased Incidence of Thoracic Wall Deformities in Related Bengal Kittens*, J. FELINE MED. SURG., 14(6):365–68 (June 2012); *see also* HY Yoon et al., *Surgical Correction of Pectus Excavatum in Two Cats*, J. VET. SCI. 9(3):335–37 (Sept. 2008).

⁹⁸ K Narfström, M Menotti-Raymond & M Seeliger, *Characterization of Feline Hereditary Retinal Dystrophies Using Clinical, Functional, Structural, and Molecular Genetic Studies*, VETERINARY OPHTHALMOLOGY 2011.14, Supplement 1, 30–36 (2011).

- A 2011 study of Bengal cats observed high levels of recurrent demyelination, a disease of the central nervous system that causes sensory and motor deficiencies, associated with polyneuropathy, a neurological disorder threatening groups of nerves.⁹⁹
- In 2004, Swedish veterinarians observed a novel type of nasal dermatitis among Bengal cats. This painful dermatological condition results in “fissures, crusts, erosions and ulcers” on the nose.¹⁰⁰

While peer-reviewed studies in this field are currently scarce, the anecdotal and experiential evidence is far from it. In support of this petition, Dr. Rachel Addleman-Seder, a board certified veterinarian of feline medicine with over fifteen years clinical veterinary experience, nine of which have been devoted exclusively to feline medicine, attests to the numerous and significant health issues she has witnessed among hybrids within her practice.¹⁰¹ Her observations are far from unique; many groups, comprising veterinarians, veterinary insurance companies, and cat rescue organizations, have noticed a high prevalence of severe health issues among hybrid cats, including:

- Eye conditions such as cataracts¹⁰² and progressive retinal atrophy¹⁰³;
- Hypertrophic cardiomyopathy, a dangerous enlarging of the heart tissue that can lead to sudden cardiac arrest¹⁰⁴;
- Feline infectious peritonitis, an always fatal multi-systemic disease that commonly causes a buildup of abdominal fluid (in the “wet” form) or neurologic or gastrointestinal disease (in the “dry” form)¹⁰⁵;
- *Tritrichomonas foetus*, a protozoan parasite that causes digestive and reproductive problems¹⁰⁶;

⁹⁹ AC Bensfield et al., *Recurrent Demyelination and Remyelination in 37 Young Bengal Cats with Polyneuropathy*, J. VETERINARY INTERNAL MED. 2011 Jul–Aug; 25(4):882–89 (2011).

¹⁰⁰ K Bergvall, *A Novel Ulcerative Nasal Dermatitis of Bengal Cats*, VETERINARY DERMATOLOGY. August 2004;15 Supplement 28 (2004).

¹⁰¹ See Declaration of Dr. Rachel Addleman-Seder, Exhibit C

¹⁰² *Bengal Cats*, VETERINARY PET INSURANCE (VPI), <http://www.petinsurance.com/healthzone/pet-articles/pet-breeds/Bengal-Cats.aspx> (last visited Apr. 24, 2014).

¹⁰³ *Id.*; *Hybrid Facts: What About Hybrid Cats?*, *supra* note 7.

¹⁰⁴ *Bengal Cats supra* note 102; *What is a Hybrid Cat?*, *supra* note 93; Declaration of Dr. Rachel Addleman-Seder, Exhibit C, ¶ 14.

¹⁰⁵ LD Pesteanu-Somogyi et al., *Prevalence of Feline Infectious Peritonitis in Specific Cat Breeds*, J. FELINE MED. SURG., 8(1):1–5 (Feb. 2006); *Bengal Breed Characteristics*, VETSTREET, <http://www.vetstreet.com/cats/bengal> (last visited Apr. 24, 2014).; *What is a Hybrid Cat?*, *supra* note 93; *see also* Declaration of Dr. Rachel Addleman-Seder, Exhibit C, ¶ 12.

¹⁰⁶ ET Bell et al., *Naturally Occurring Tritrichomonas Foetus Infections in Australian Cats: 38 Cases*, J. FELINE MED. SURG. 12(12):889–98 (Dec. 2010); EJ Kather et al., *Determination of the In Vitro Susceptibility of Feline Tritrichomonas Foetus to 5 Antimicrobial Agents*, J. VET. INTERN. MED. 21(5):966–70 (Sept.–Oct. 2007); DA Gunn-Moore et al., *Prevalence of Tritrichomonas Foetus Infection in Cats with Diarrhoea in the UK*, J. FELINE MED. SURG. 9(3):214–18 (JUNE 2007); *Bengal Breed Characteristics*, *supra* note 105; *What is a Hybrid Cat?*, *supra* note 93.

- Inflammatory bowel disease, most commonly causing profuse diarrhea, but also potentially causing chronic vomiting and/or weight loss¹⁰⁷;
- Polydactyly, an increased number of toes on the cat's paws¹⁰⁸;
- Pyruvate kinase deficiency, causing potentially fatal blood anemias¹⁰⁹;
- Luxating patella, a dislocation of the kneecap which can be painful and cause difficulty when walking¹¹⁰; and
- Hydrocephalus, a deforming and dangerous buildup of cerebrospinal fluid in the cavities of the brain, which can cause convulsions, mental disability, or death.¹¹¹

3. Human Treatment of Hybrid Cats Also Threatens their Long-Term Health and Well-Being

In addition to their biological problems, hybrid cats are also subjected to human-caused harms associated with the cat breeding market. According to Dr. Addleman-Seder, because early-generation cats are often not suitable as pets due to their wild behavior, they are frequently kept in poor conditions and used solely to breed later-generation animals.¹¹² Early-generation male hybrids are also typically sterile, and may be killed right after birth due to their uselessness to the breeders.¹¹³

Dr. Addleman-Seder further explained that among the hybrids that do manage to find homes, additional challenges await them. Hybrids often have behavioral problems seen less frequently in pure domestic cats, such as urine spraying, nocturnal tendencies, aggression, hunting, and attacking other animals within the home. A widely disproportionate number of these cats therefore end up abandoned or discarded, often finding themselves in the few cat shelters that accept hybrids. Unsuitable for adoption, and with behavioral and health problems beyond the limited capacity of resource-strapped shelters to address, a majority of these cats are euthanized.¹¹⁴

Hybrid cats are perhaps the greatest victims of the market for such pets in California. Many generations of unlucky cats need to be born, bred, and discarded before suitable pets are produced. And even then, these artificially produced animals are at risk of a host of debilitating medical conditions infrequently seen in pure domestic cats. As a final insult, the “wild” nature of these cats—ironically, the feature often advertised in their sale—can ultimately lead to their abandonment and death. Surely, a regulatory structure designed to “provide for animal welfare”

¹⁰⁷ *Hybrid Facts: What About Hybrid Cats?*, *supra* note 7; see also JE Foley et al., *Isolation of Helicobacter Canis From a Colony of Bengal Cats with Endemic Diarrhea*, J. CLIN. MICROBIOL. 37(10):3271–75 (Oct. 1999).

¹⁰⁸ *Hybrid Facts: What About Hybrid Cats?*, *supra* note 7.

¹⁰⁹ R.A. Grahn et al., *Erythrocyte Pyruvate Kinase Deficiency Mutation Identified in Multiple Breeds of Domestic Cats*, BMC VET. RES. 2012; 8:207 (Oct. 2012); Declaration of Dr. Rachel Addleman-Seder, Exhibit C, ¶ 15.

¹¹⁰ *What is a Hybrid Cat?*, *supra* note 93.

¹¹¹ *What About Hybrid Cats*, *supra* note 7; Levy, *supra* note 3.

¹¹² Declaration of Dr. Rachel Addleman-Seder, Exhibit C, ¶ 5.

¹¹³ *Id.*

¹¹⁴ *Id.*

owes more to these cats than it currently delivers. *See* 14 C.C.R. § 671(b); 14 C.C.R. § 671.1(c)(3)(E) (“A breeding plan shall . . . not result in risk to animal welfare”). California can do better for these animals.

VI. ECONOMIC EFFECTS

The economic costs of the proposed amendments would be minimal. There would be no change to California’s economic competitiveness, no economic effects on individuals, and only small effects on a limited number of businesses and employees. The regulatory costs, which would be built in to the existing regulatory framework, would also be small. At the same time, California could potentially reduce future expenditures by avoiding large environmental and health costs.

The only people or businesses directly affected by the amendments would be the hybrid cat breeding facilities, of which there are a few dozen in the state of California, and most of which are fairly small.¹¹⁵ These businesses, which currently profit from the dangerous and exploitative practices discussed in detail in this petition, would have to alter their business models in order to remain in compliance with the amended regulations. They could shift their breeding to domestic breeds, or could continue to breed hybrid cats that have an acceptably diluted wild ancestry, as outlined in the proposed amendments below. No other people are expected to be economically impacted by these regulations.

The regulatory costs of the amended regulations would also be negligible. Cat breeders within the state already must comply with the regulatory requirements contained within CAL. FISH & GAME CODE §§ 31751 – 31766, and within CAL. HEALTH & SAFETY CODE §§ 122045 – 122315, thereby providing the mechanisms by which the new regulations could be enforced. The new regulations would, of course, require the State to issue notices to hybrid cat breeding facilities notifying them of the amendments and ordering them to cease any illegal activities, and the State would then have to follow up to guarantee compliance. These would likely be one-time costs, however, and would be minimal: once the regulations are promulgated, the market for hybrid cats in California would likely decline quickly and drastically.

There are also some potential economic gains from these proposed amendments. As discussed above in Section V.B, the conceivable effects of hybrid cats on the Californian ecosystem are enormous; by regulating the possession, breeding, and importation of these animals, the Department of Fish and Wildlife could prevent large future costs of environmental degradation, invasive species control, and endangered species protection.

Similarly, the regulation of these animals can reduce state rabies testing costs. When a potentially rabid animal bites a human, under many circumstances it must be euthanized and decapitated, and the head must be sent to the local health department for testing.¹¹⁶ Because there is no approved rabies vaccine for hybrid cats, federal protocols mandate this procedure for many hybrid cat bites. This expensive and alarming procedure can be reduced by restricting these animals. Along the same lines, the State could also reduce future healthcare expenditures on the

¹¹⁵ See *supra*, Section II.B.

¹¹⁶ *Rabies, Information for Veterinarians*, Centers for Disease Control, http://www.cdc.gov/rabies/specific_groups/veterinarians/index.html (last visited May 8, 2014).

treatment of pet attacks and novel strains of toxoplasmosis, as discussed in Section V.A. These potentially large gains would offset the minimal costs explained above.

VII. PROPOSED AMENDMENTS

Current law inadequately addresses the substantial threats the hybrid cat market poses to human health, Californian wildlife, and animal welfare. Consequently, Petitioners seek to amend the law to:

- Define hybrid cats;
- Include hybrid cats as restricted animals;
- Promulgate restrictions on the importation, transportation, possession, and breeding of hybrid cats;
- Provide limited exceptions for grandfathered cats; and
- Prevent the unauthorized release and abandonment of hybrid cats.

Petitioners hereby request that the Department, acting through the Commission, amend the California Code of Regulations, Title 14, by amending §§ 671, 671.1, and 671.6 as follows. Note that a strikethrough indicates language deleted under the amendments, while an underline indicates language added under the amendments. All other language shall remain unchanged.

14 C.C.R. § 671(c)(6)(K):

Order Carnivora -Raccoons, Ringtailed Cats, Kinkajous, Coatis, Cacomistles, Weasels, Ferrets, Skunks, Polecats, Stoats, Mongoose, Civets, Wolves, Foxes, Coyotes, Lions, Tigers, Ocelots, Bobcats, Servals, Leopards, Jaguars, Cheetahs, Bears, etc.:

1. Family Felidae - All species (W) except:
 - a. *Acinonyx jubatus* (cheetahs) -(D).
 - b. ~~Domestic cats and hybrids of domestic cats are not restricted.~~ Felis catus (domestic cats) are not restricted.
 - c. Hybrid cats are restricted as follows (W/D):
 - i. For the purposes of this section and section 671.1, “hybrid cat” includes:
 - (A) The offspring from a mating of a domestic cat and a cat of any other felid species;
 - (B) Any animal represented or advertised to be a cat hybrid by any name or description;

- (C) All offspring and all subsequent generations of any animal described in (A) or (B).
- ii. Hybrid cats are live restricted animals and may not be imported, transported, or possessed, except under c.iii.
- iii. A hybrid cat may be possessed or transported, but not imported, if:
 - (A) The cat is spayed or neutered, and the owner received a permit from the Department for such animal prior to [date of enacting]; or
 - (B) The owner has a registered pedigree, with a nationally or internationally recognized breeding association or registry, showing such cat to be at least four generations removed from a non-domestic felid ancestor.
- iv. In any action taken by any official of the state or any municipality to control rabies, a hybrid cat shall be considered not vaccinated for rabies in accordance with accepted veterinary practice.

14 C.C.R. § 671.1(c)(3)(E):

Breeding Plan. Only persons who apply for a Breeding or Single Event Breeding for an Exhibitor permit are required to comply with these requirements. A breeding plan shall include the items listed below and allow the department to determine that the breeding of the species will not result in risk to animal welfare, wildlife populations, livestock and poultry health, public health and safety; and there is an authentic and legitimate scientific, conservation, exhibition, or educational use certified by a recognized scientific, conservation or educational institution, or licensed professional in breeding or exhibition of restricted species. [The department will not consider the possession, sale, or export of hybrid cats as pets to be an authentic or legitimate use.] Breeding of restricted species is prohibited unless specifically authorized by the department. The breeding plan is required with the original application annually and when applying to add a new species to the breeding plan. The breeding plan shall include all of the following in order to be considered complete:

14 C.C.R. § 671.6:

(e) No person shall release into the wild without written permission of the Commission any restricted hybrid cat, as defined by subsection 6719(c)(K)(1)(c).


VIII. CONCLUSION

By arbitrarily excluding hybrid cats from regulation, current law fails to adequately address the substantial risk posed by these animals. The unregulated importation, breeding, transport, and possession of these animals involve significant and unnecessary dangers to public health, native wildlife, and animal welfare in California. The increased aggressiveness of, and lack of an approved rabies vaccine for, hybrid cats have the potential to harm humans. Native wildlife is threatened by the presence of hybrid cats, whose wild characteristics and ability to interbreed with feral cat populations make possible the propagation of a new and enhanced invasive species. Furthermore, hybrid cats face increased risks of serious congenital defects, early-generation termination, and abandonment or euthanasia by owners unprepared for their wild behavior.

The amendments proposed by Petitioners would address these concerns by restricting early generations of wild-domestic hybrids, imposing certain requirements on grandfathered cats, and prohibiting breeding of these hybrid animals. Failure by the Department and the Commission to adopt such amendments would continue to put the State of California at risk, and would fail to serve the Department's stated responsibilities of protecting native wildlife, preserving animal welfare, and maintaining the safety of the public.

IX. EXHIBITS (SEE ATTACHMENTS)

- A. Declaration of Mrs. Carole Baskin (Founder/CEO of Big Cat Rescue)
- B. Declaration of Dr. Bernie Tershy (Ecologist and Conservation Biologist)
- C. Declaration of Dr. Rachel Addleman-Seder (Veterinarian)
- D. Queensland, Australia Report on Hybrid Cat Risk Assessment



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On Behalf of Petitioner
ANIMAL LEGAL DEFENSE FUND

Additional Petitioners:
BORN FREE USA
BIG CAT RESCUE
WILDCAT HAVEN
WILDCAT SANCTUARY

EXHIBITS

EXHIBIT A



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I have had over 30 years' experience with wild cats and am the founder and CEO of Big Cat Rescue, the world's largest accredited sanctuary dedicated entirely to exotic cats. We rescue and provide a permanent home to non-domestic cats, and almost never even consider rescuing hybrid cats because of the vast problems they present.

We are seeing an alarming escalation in the number of hybrid cats being abandoned by their owners. While we track the number of wildcat species who are abandoned each year, we have never been able to accurately track the number of hybrids in peril because those numbers have been too huge. This is a serious and growing problem in America for a number of reasons:

First, hybrid cats have a number of behavioral and health problems that I have seen far too often in my experience with Big Cat Rescue. Despite the fact that we do not have space for all of the hybrid cat requests that we get for placement, we have had to rescue a number of them because we are registered with the state as wildlife rehabbers, in addition to being licensed as a sanctuary. If someone thinks they have a Florida Panther trapped in their garage, I am the one who gets the call to go do something about it. When someone reports a bobcat has killed their domestic cat, dog, or livestock, I am the one who goes to check it out. When someone traps a "panther" because it has been lurking around their house and stalking their children, I get the call. One such call was that of a "Florida panther" stalking a little old lady. This call and most of these calls turn out to be hybrid cats.

Animal Control and local Humane Societies know hybrid cats rarely work out as pets. Also, the liability to such shelters is so great that in most cases these cats are euthanized with no attempt to adopt them out. When I end up in the field, rescuing some terrorized family from a hybrid cat, I know I either have to build it a cage or it will be killed. Because of that, I have had a number of hybrid cats, and I am very familiar with their behavioral and health complications, such as:

- A. Hybrids suffer from genetic defects that often require surgery and special diets because they cannot properly digest their food. The most common ailments I have seen are inflammatory bowel disease and projectile diarrhea.
- B. Hybrids bite. Even in play, even if they love you, they bite, and I have scars all over my hands from them. Hybrids are far too rough to live with domestic cats and dogs, and they are certainly not safe to have around children or the elderly.
- C. Hybrids spray. Their wildcat parents would have been hard-wired to mark many square miles of territory, and this is actually the number one reason I hear from people trying to get rid of their hybrids. Male or female, neutered or not, hybrids spray copious amounts of acidic, foul-smelling urine all over everything, and everyone, that they want to mark as theirs.
- D. Hybrids are notorious for loud howling throughout the night. Neither their wild parent nor their domestic parent is known for this, but it seems to be ubiquitous among hybrids. This sound is chilling and very loud and I have never found anything that will curb it or even limit it to normal human waking hours. It seems

to accompany carrying toys around in their mouths, and is a sad reminder of how confused these cats are about where they belong.

E. There are no rabies vaccines approved for use in wildcats, nor in their hybrid offspring. We use a killed virus vaccine on our wildcat species and on our hybrids, but there is no way to know if it is effective on either.

Second, allowing the private possession of exotic cat hybrids is like strapping a nuclear warhead to the feral cat problem.

The menace to native wildlife is probably the most pressing reason to ban the private possession of hybrid cats. If a person asks what will happen to their hybrid cat if they turn them in to Animal Control or a local Humane Society, they will learn that there is no hope of the animal being adopted. This results in people abandoning their hybrid cats to the wild.

Hybrid cats are much better hunters than domestic cats, due to their recently wild genes, and thus they can do much more damage to the ecosystem than feral cats alone. Add to that the likelihood of breeding with the feral cat population and you end up with much larger cats, capable of killing bigger and a wider array of native wildlife. This includes amphibious species that normal feral cats would otherwise avoid, because wild cats will readily go in the water after prey, unlike the domestic cat species.

Introducing wild cat traits into the feral cat population also imbues them with the wild cats' enhanced ability to evade humans, avoid traps, cross rivers, and travel much farther distances, which can spread the devastation into pristine areas that do not currently have feral cat populations.

In addition, hybrid cats are susceptible to all of the same domestic cat diseases, and now we are learning that they are contracting domestic dog diseases as well, including canine distemper, parvo, and parasites and diseases that were previously carried primarily by raccoons. Hybrid cats can therefore spread these diseases into the wild populations as well.

There are so many reasons why private ownership of exotic cats and their hybrids should be banned, and yet only one real reason to allow it: the ill-gotten gain of the breeders. Feel free to contact me if I can be of help.

A handwritten signature in black ink that reads "Carole Baskin". The script is cursive and fluid, with the first name "Carole" and last name "Baskin" clearly legible.

Carole Baskin
Founder and CEO
Big Cat Rescue

Exhibit B

Comments on proposed importation of hybrid cats to California: 23 Apr. 2014

Bernie Tershy, PhD

Coastal Conservation Action Lab

University of California, Santa Cruz.

Member, Invasive Species Specialist Group of the IUCN

Importance of California's Biodiversity

Compared to the World's countries, California ranks about 17th in breeding bird richness and 39th in mammal richness. Compared to the rest of the United States, California ranks first in plant and animal species richness as well as single state endemic species richness (Stein et al. 2000, CDFW 2003). Although it comprises only 4% of U.S. land area, California houses more than 30% of all plant and vertebrate species in the U.S. and ranks in the top 5 states for richness of every group of vertebrates except freshwater fish (Stein et al. 2000, CDFW 2003).

Status of California's Biodiversity

California's spectacular biodiversity took millions of years to evolve and assemble, but its future is uncertain. California has more threatened species (1,822) than any other U.S. state and a higher percentage of species threatened (31%) than any state except Hawaii (Stein et al. 2000). In California, as elsewhere, the two largest threats to biodiversity are habitat loss and invasive species (responsible for 73% and 33% of California extinctions, respectively) (B. Tershy unpublished analysis of IUCN and USFWS data).

Fortunately, California has not yet experienced much permanent loss of biodiversity. Only about 29 California species (fewer than 0.5%) have gone globally extinct in the last 100 years. Furthermore, well-established and effective conservation actions exist that can protect the majority of the State's threatened species and assist in the successful re-introduction of species extinct from California but persisting outside the state.

Hope for California's Biodiversity

California's network of terrestrial protected areas covers a remarkable 46% of the state (<http://www.calands.org/>), and our understanding of how to configure and manage protected areas to protect biodiversity is steadily improving. Although many areas critical for the survival of threatened species remain unprotected, tools are available to identify and prioritize those lands, as are innovative approaches to protecting them.

Global leadership in the development of effective environmental protection strategies has led to a California much less polluted than it was 25 years ago (Parrish et al. 2011). Although damaging toxins continue to be identified (e.g. atrazine, brodifacoum), a 2013 ban on lead ammunition—to help protect the critically endangered California Condor (CA Assembly Bill number 711)—demonstrates California's continued leadership in effective environmental regulation. Finally, the successful re-introduction of locally extinct Roosevelt and Tule Elk, Bald Eagles, island fox and California Condors to the wild demonstrates that even the most endangered of California's species can be saved.

The relative health of California's biodiversity is remarkable considering the sheer scale and magnitude of California's agricultural development, suburban sprawl, water diversion, resource extraction and pollution combined with the intentional and unintentional introduction of over 1500 species and a history of over-hunting and over-fishing. Somehow, to paraphrase Aldo Leopold, we have managed to save almost all the pieces and, remarkably, now have a second chance to move into the future with thriving populations of nearly the full complement of California's flora and fauna.

Fortunately, California is a wealthy state with a long history of environmental leadership and one of the world's smartest and most innovative populations. More than any high biodiversity region in the world, California has the economic, cultural and intellectual

resources needed to have both thriving human communities and thriving ecosystems with their full diversity of species.

Future Threats to California's Biodiversity

Although imperfect, the states' systems of protected areas provide the raw material for habitat that species can recover on. With increasingly effective environmental regulations on wildlife harvest and pollution, the creation of new protected areas and smarter development, in the future overharvest, pollution and even habitat loss may become less significant drivers of new extinctions. If this happens, then the most pressing challenges will be the damaging impacts of invasive species within natural and protected areas and the inability of protected areas to meet the needs of all their current species as California's climate changes.

In California, the days of government agencies casually introducing new species are long gone, and increasingly smart policies focus on preventing the importation or release of new species, as well as early detection in the field and, when necessary, rapid response eradication or control.

Impacts of feral cats on California's Biodiversity and Global Biodiversity

Feral cats are one of California's most damaging invasive vertebrates. Globally, they are responsible, at least in part, for 14% of all vertebrate extinctions since 1600 (Medina et al. 2011). In California, they depredate a wide variety of threatened birds (e.g. California Black and Clapper Rails), mammals (e.g. Moro Bay Kangaroo Rats) and reptiles (e.g. giant garter snake), particularly on islands and where endangered species habitat is adjacent to suburban development (a situation common in the state). Removal of feral cats has protected two California threatened species: the Scripps Murrelet which was not listed because their main threat, feral cats and invasive rats, had been removed from most of their breeding islands; and the Island Night Lizard, which is being de-listed following cat removal from their island habitat.

Possible Negative Impacts of Hybrid Cats on California's Biodiversity

The California Department of Fish and Wildlife should ban the possession and importation of hybrid cats in the state. The available data on the biodiversity importance of the state, the large number of threatened vertebrates, the well-documented impacts of feral cats on threatened vertebrates, both globally and in California, combined with the well-demonstrated tendency for pets to escape or be abandoned, strongly indicate that continuing to allow hybrid cats in California can be detrimental to California and U.S. biodiversity for some of the following six reasons:

1. Once introduced to the state, hybrid cats are likely to become feral at some point. Even the most expensive and well cared for pets escape, fall out of fashion or are abandoned for idiosyncratic reasons.
2. Feral hybrid cats may breed amongst themselves or interbreed with existing feral house cats. In either scenario there is significant potential to greatly expand the negative biodiversity impacts of feral cats both spatially and to new native species.
3. New types of cats will have traits (morphological, behavioral and physiological) that will allow them to have a larger spatial niche than already present feral housecats. In part this may be due to physiological tolerances, but more significant will be their potential to avoid predation by larger predators (e.g. coyotes, bobcats) that currently regulate feral housecat populations in natural areas. Thus, they can impact native species in areas where existing feral cats are absent or have very low densities.
4. Hybrid cats also have traits (morphological, behavioral and physiological) that should enable an expanded prey size and prey type niche. Thus, they can negatively impact a greater variety of California species than existing feral cats.

5. Feral cats are important sources of toxoplasmosis, a disease previously thought to be relatively benign, but increasingly known to impact wildlife and humans. Hybrid cats, with different ranges and diets, have some potential to spread toxoplasmosis in different ways, thus altering disease dynamics.
6. Points 2-5 above apply to individual hybrid cats that do not become feral, but, like many pet cats in California, are allowed to roam for at least part of most days. This is particularly problematic for threatened species, such as Kangaroo rats and rails, that are common in natural areas adjacent to housing developments.

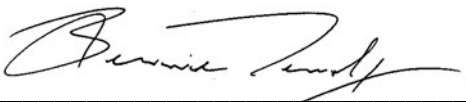
All evidence indicates that it is irresponsible for the California Department of Fish and Wildlife to allow the possession and importation of hybrid cats unless the Department can demonstrate that points 1-6 above are not valid in the near-term in California.

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Dr. Bernie Tershy, Ph.D.

Exhibit C

Declaration of Dr. Rachel Addleman Seder, DVM, ABVP (feline)

I, Dr. Rachel Addleman Seder, hereby declare as follows:

1. I have personal knowledge of the facts set forth in this declaration. The facts set forth are true to the best of my knowledge and recollection.
2. I am a veterinarian and Board Certified in Feline Medicine as a Diplomate of the American Board of Veterinary Practitioners. I am the chair of the examination committee for the Feline Specialty examination of the American Board of Veterinary Practitioners. I am a member of the Feline Welfare Committee of the American Association of Feline Practitioners and a member of the American Veterinary Medical Association. I have fifteen years of clinical experience as a veterinarian providing care for animals and nine of those years spent in feline exclusive practices.
3. I am the primary author of the American Association of Feline Practitioners ("AAFP") position statement on Hybrid Cats. The AAFP opposes the breeding of and ownership of Hybrid Cats based on four tenets: (a) the welfare concerns of the non-domestic (wild) feline, (b) public safety, (c) public interest, and (d) a lack of species advancement. I am an associate author of the AAFP position statement on Ownership of Non-Domestic Felids. The AAFP supports and encourages federal, state, and local ordinances and laws that prohibit the importation and ownership of non-domestic (wild) felids by individuals.
4. Because of my experiences with hybrid cats, I strongly support this petition to prohibit the shameful and unnatural interbreeding of two genetically independent species. This practice does nothing to further either feline but serves only the vanity and financial gain of man.
5. I have significant welfare concerns for the wild, hereafter referred to as non-domestic, feline involved in the breeding, as well as early generations that are known to be non-domestic-like in their behavior. Non-domestic feline welfare, indeed all animal welfare, is dependent on adequate nutrition, appropriate climate and lighting control, space requirements, and environmental enhancements to allow for normal behavior and social interactions. These wild animals have repeatedly been found to be housed in substandard and unsafe conditions. For animals not exhibited to the public, e.g. a zoo, there are no regulations as to how non-domestic felines are housed.
6. Non-domestic cats like the Serval (*Leptailurus serval*) and the Asian Leopard Cat (*Prionailurus bengalensis*) have 38 chromosomes, and domestic cats (*Felis catus*) have 36 chromosomes. The hybrid offspring (F1) have have 37 chromosomes. Male offspring are sterile, but surprisingly the females are fertile. F1 females are then bred to one of the parent species to produce offspring, of which the males (F2) may be infertile also. The males have improved fertility around the third (F3) and fourth generation (F4). Sterile males do not mean decreased testosterone. A sterile male will have all the typical characteristics and behavior of an intact male, including marking, aggression, attraction to queens in heat, etc. F1 cats may be only slightly smaller than their non-domestic parent,

with each subsequent generation approaching the size of a domestic cat. These F1, F2, and F3 sterile male cats may or may not be marketed for purchase, with some reports of cats that are sold into the fur trade, as their wild behaviors make them undesirable pets.

7. I have witnessed the aggressive and unpredictable nature of hybrid cats. Many of my colleagues complain bitterly that hybrids are a hazard to be around. I am no longer willing to attempt to handle early generation cats without sedation. Sedation is an obvious requirement when there are signs of aggression, but recently I witnessed a family-raised Savannah kitten (F3) attack the face of a pregnant employee without any warning. The unpredictable and vicious nature of these cats has led our hospital to require sedation prior to examination of any cat that is known to be an F1, F2, or F3 hybrid. It appalls me how often I hear owners of these hybrid cats reporting bites that they received themselves. In my opinion, early generation hybrid cats do not make safe family pets.

8. Rabies vaccinations are not approved for use in hybrid cats. I do recommend vaccination for the safety of the cat and people around it, but neither the FDA nor current law recognize its effectiveness. Therefore, if a hybrid cat bites someone, that cat will be treated as "unvaccinated" whether it has been given a vaccine or not. As an unvaccinated animal the state veterinarian may demand it to be euthanized, decapitated, and sent in for testing. Veterinary liability insurance carriers generally advise against treating hybrid cats and may not provide coverage if an accident involving a hybrid cat occurs. A homeowner may be declined for coverage if they own a hybrid cat.

9. The public interest is at risk since it is impossible to determine the specific filial generation by a visual exam. Hybridization can only be determined by specific testing which involves chromosome numbers to differentiate a true hybrid from a false hybrid or imitation hybrid. A DNA-verified pedigree extending back to the exotic cat foundation would be necessary to determine the degree of wild ancestry of the hybrid.

10. The Bengal is so commonly plagued with chronic and poorly treatable diarrhea, the moniker "Bengal Diarrhea" is widely used among veterinarians to describe their particular Inflammatory Bowel Disease. Expensive laboratory testing is required to differentiate a common gastrointestinal parasitic infection, *Tritrichomonas foetus*, which may be equally difficult to treat.

11. I have witnessed the fatal effects of Feline Infectious Peritonitis, a coronavirus, which in its most common 'wet' form causes the abdomen of a kitten to swell with fluid and is 100% fatal. Young animals are most commonly afflicted. This fatal disease is not limited to Bengals, but as cattery raised purebred cats, I see an increased number of Bengals affected compared to the general population.

12. Hybrid kittens, even F3 kittens, may be prone to low birth weight. In addition, the queens often provide poor maternal care and may suffer from agalactia, or poor milk production. Thus, many kittens must be tube fed milk.

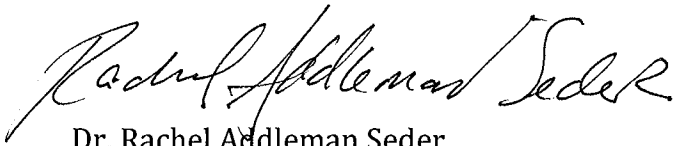
13. Bengals are an increased risk for hypertrophic cardiomyopathy, an enlarged heart that can lead to heart failure and death. Screening involves routine echocardiograms as there is no genetic test.

14. Pyruvate kinase deficiency is a metabolic disorder that causes anemia and may be fatal. It has been identified in the Savannah and the Bengal. A genetic test is available, but the accuracy is not known for hybrid cat breeds, as the DNA sequences are different.

15. There are reports of heritable juvenile cataracts among hybrids. Progressive retinal atrophy (PRA) has been reported causing blindness usually between 3-5 years of age. Genetic testing is available for PRA but its accuracy in a hybrid cat is unknown.

16. In my practice I have seen several cases of young Bengals who have lost the ability to walk due to a breed-specific disease called Bengal Polyneuropathy Syndrome, or recurrent demyelination. Bengal Polyneuropathy is not easily managed long-term and these pets are often humanely euthanized.

17. Many veterinarians simply refuse to treat early generation hybrid cats due to ethical, legal, and practical safety concerns. I believe legislation to protect the animals and protect the public is greatly needed.

A handwritten signature in cursive script, reading "Rachel Addleman Seder". The signature is written in black ink and is positioned above the printed name.

Dr. Rachel Addleman Seder

Exhibit D

Pest animal risk assessment



Serval hybrids

Hybrids of
Leptailurus serval (serval) and
Felis catus (domestic cat),
including the 'savannah cat'

**Anna Markula, Martin Hannan-Jones
and Steve Csurhes**

Invasive Plants and Animals
Biosecurity Queensland
Department of Primary Industries and Fisheries
GPO Box 46, Brisbane 4001

January 2009



Queensland Government
Department of Primary Industries and Fisheries

*Note: This is a draft. Please forward any comments on errors, or additional information, to the authors.

This assessment should be read in conjunction with a separate risk assessment that has been prepared for the serval.

The Department of Primary Industries and Fisheries (DPI&F) seeks to maximise the economic potential of Queensland's primary industries on a sustainable basis.

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Front cover: Close-up of a 4-month old F1 Savannah cat. Note the ocelli on the back of the relaxed ears, and the tear-stain markings which run down the side of the nose.

Photo: Jason Douglas. Image from Wikimedia Commons under a *Public Domain Licence*.

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Introduction

The common name ‘savannah cat’ is a poorly defined marketing name first used by a small number of professional cat breeders and tends to be applied to F₅ hybrids derived from captive cross-breeding between wild African servals (*Leptailurus serval*) and domestic cats (*Felis catus*). Such animals are also referred to as ‘serval hybrids’, ‘American savannah cats’ and ‘designer cats’.

This assessment is relevant to all hybrids of servals and domestic cats, but is predominantly focused on the F₅ hybrid ‘savannah cat’.

Serval hybrids, including the so-called ‘savannah cat’, are classified according to a filial number (the number of generations that a particular animal is removed from the original serval breeding stock), as follows:

F₁ hybrid is the progeny resulting from breeding a female domestic cat with a male serval.

F₂ kittens are derived from F₁ females mated to a male domestic cat that has morphological attributes considered ‘desirable’ by the breeder. Desirable attributes include ‘long neck, large ears set high on the head, long, lean and tall body and a beautiful clear coat’ (Sand Hollow Savannahs 2008).

F₃ kittens are the result of breeding an F₂ female with a male domestic cat (again selected for its ‘desirable’ traits).

F₄ kittens are the offspring of an F₃ female and a ‘desirable’ male domestic cat.

F₅ kittens are the offspring of an F₄ female and either an F₄ male or a domestic cat male. Male F₄ hybrids are the first generation of males that are not fully sterile; F₅ and later generation hybrid males are usually fully fertile and can thereafter be used for further breeding (Gaines 2004).

Filial number does not indicate the percentage of serval genetic material contained within a particular animal. Some breeders back-cross savannah cats with servals (as opposed to domestic cats) which results in later generation savannah cats (such as F₅) having a higher ‘percentage’ of serval genes (Miller 2002). It is not possible to scientifically measure the percentage of serval genes in a particular savannah cat.

While the savannah cat was recognised as a breed by The International Cat Association in 2000 (TICA 2004), it has not been recognised as a breed by the Cat Fanciers’ Association (CFA 2005). TICA recognises different breeds resulting from domestic-wild crosses as domestic cats, including the Bengal, the Chausie and the Savannah cat breeds. The president of the American Cat Fanciers’ Association commented: ‘we do not want to support designer breeds for the fad pet market’ (New York Times, 12 May 2005).

In the USA, the name ‘savannah cat’ is used interchangeably for all filial levels of serval-domestic cat hybrids and the TICA-recognised breed.

Identity of taxa under review

	Serval	Domestic cat
Class	Mammalia	Mammalia
Order	Carnivora	Carnivora
Family	Felidae	Felidae
Subfamily	Felinae	Felinae
Genus	<i>Leptailurus</i>	<i>Felis</i>
Species	<i>serval</i>	<i>catus</i>
Author	Schreber 1776	Linnaeus 1758
Synonyms	<i>Felis serval</i> , <i>Caracal serval</i>	<i>Felis silvestris</i> , <i>Felis domesticus</i> , <i>Felis silvestris catus</i> , <i>Felis silvestris domesticus</i> , <i>Felis catus domesticus</i>

For many years there has been disagreement on the appropriate nomenclature and classification applicable to the Felidae (cat family) due to the relatively recent evolutionary diversification (speciation) within the family and resulting similarities in morphology and genetics. It is generally accepted that felids can be split into two subfamilies: Pantherinae, which includes all the big cats (*Panthera* spp., lion, tiger, leopard and clouded leopard); and Felinae which includes all the other small and mid-sized cats including the cougar, cheetah, lynx, caracal, serval, wild cats and the domestic cat (Wilson and Reeder 2005). However, over the past three decades a body of evidence has emerged on the exact nature of the Felidae phylogeny; that is, the true relatedness between the various species.

The phylogentic relationships among the Felidae were traditionally studied on the basis of physical morphology, but more recent studies have included both morphological and molecular techniques, including karyology (Wurster-Hill and Centerwall 1982; Modi and O'Brien 1988), the genomic occurrence of two felid endogenous retroviruses (Benveniste, RE and Todaro 1974; Benveniste, RE et al. 1975; Reeves RH 1984); albumin immunological distance (Collier and O'Brien 1985); comparative morphology (Salles 1992); allozyme electrophoresis (O'Brien et al. 1987; Pecon-Slaterry et al. 1994); two-dimensional protein electrophoresis (Pecon-Slaterry et al. 1994); and chemical secretions from scent glands (Bininda-Emonds et al. 2001). Other recent studies have focused on the use of mitochondrial genes such as 12S RNA and cytochrome b (Janczewski et al. 1995); or the analysis of Restriction Fragment Length Polymorphism (RFLP) of mitochondrial sequences (Johnson et al. 1996); or 16S rRNA and NADH-5 (Johnson and O'Brien 1997); or combining analysis of the sequences of four genes (12S rRNA, 16S rRNA, NADH-5 and cytochrome b) with morphological and karyological characters (Mattern and McLennan 2000) to produce phylogentic trees of the Felidae. Non-coding segments of DNA (introns and SINES) within Y chromosome genes Zfy and Zfx (Pecon-Slaterry and O'Brien 1998); segments within single-copy X-Y homologs SMCY, UBE1Y, and ZFY (Pecon-Slaterry et al. 2004) have also been used to create felid phylogenies. These analyses have identified eight major felid lineages, although their chronology, branching order and exact composition were not until recently definitively resolved, in part because not all species were included in each of these earlier analyses.

The recent sequencing of the complete cat genome (see O'Brien et al. 2008 for a review) has allowed for extensive genetic comparisons across all of the Felidae. These studies have cumulated in the analysis by Johnson et al. 2006, which included sequences from 19 autosomal, 5 X-linked, 6 Y-linked and 9 mitochondrial gene segments across the 37 extant felid species (Figure 1).

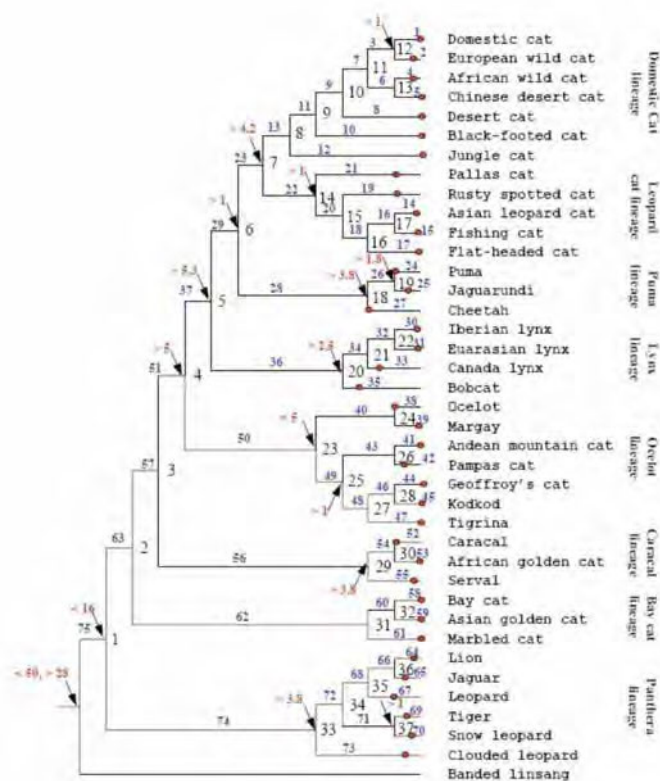


Figure 1. Felidae phylogenetic tree from Johnson et al. (2006)—supporting material available from <http://www.sciencemag.org/cgi/content/full/311/5757/73/DC1>.

The eight lineages as elucidated by Johnson et al. (2006) (in order of divergence) are:

- Panthera lineage (subfamily Pantherinae: *Panthera* spp. and *Neofelis nebulosa*)
- Bay cat lineage (subfamily Felinae: *Pardofelis* spp.)
- Caracal lineage (subfamily Felinae: *Caracal* spp.)
- Ocelot lineage (subfamily Felinae: *Leopardus* spp.)
- Lynx lineage (subfamily Felinae: *Lynx* spp.)
- Puma lineage (subfamily Felinae: *Puma* spp. and *Acinonyx jubatus*)
- Leopard cat lineage (subfamily Felinae: *Prionailurus* spp. and *Otocolobus manul*)
- Domestic cat lineage (subfamily Felinae: *Felis* spp.).

The caracal lineage, which includes the serval, diverged from the lineage leading to domestic cats approximately 8.5 million years ago. The leopard cat lineage, which includes the Asian leopard cat, *Prionailurus bengalensis*, diverged from the domestic cat lineage approximately 6.2 million years ago (Johnson et al. 2006).

The present-day domestic cat, *Felis catus* is descended from the North African wildcat *Felis silvestris lybica* that was domesticated in Egypt and the Near East more than 10 000 years ago and through mutation and selection has become the modern domestic cat. Randi and Ragni (1991) suggested that *Felis silvestris* be regarded as a polytypic species with the

domesticated form (*Felis silvestris catus*) and three wild subspecies: African wildcat (*F.s. lybica*), European wildcat (*F.s. silvestris*) and Asian wildcat (*F.s. ornata*). Driscoll et al. (2007) suggested that *Felis silvestris* consists of at least five subspecies: near eastern wildcat (*F.s. lybica*), European wildcat (*F.s. silvestris*), Southern African wildcat (*F.s. caffra*), Central Asian wildcat (*F.s. ornata*) and Chinese desert cat (*F.s. bieti*), and that *Felis catus* can be grouped most closely with *F.s. lybica*.

Over its wide distribution *Felis catus* is known to interbreed and hybridise naturally with the other subspecies of *Felis silvestris*. There is debate over the conservation significance of hybrids of the species *Felis silvestris* as a whole. Hybridisation and introgression was widespread in Scotland (Beaumont et al. 2001) and Hungary (Pierpaoli 2003) but hybrids occurred only rarely in Italy (Randi et al. 2001). There is significant conservation concern for isolated relict populations of *Felis silvestris silvestris* in Portugal (Oliveira et al. 2008) and Scotland (Joint Nature Conservation Committee 2007) since genetically pure specimens may no longer exist.

Man-made hybrids of *Felis catus* have been reported (or claimed to have been created) for a number of species within the subfamily Felinae (Hartwell 2007) (Table 1). These were either zoo ‘accidents’ or deliberate attempts to create founders of new domestic cat breeds. Some of these new breeds have been developed to the extent that they are now recognised by some of the world’s leading cat showing and breeding registries. These hybrid breeds have in turn been hybridised with other species in the Felidae to create even more breeds (Table 2).

Table 1. Felinae species that have hybridised with the domestic cat *Felis catus* (after Hartwell 2007)

Species	Hybrid (breed) name	Location and date of breed development	Lineage as per Johnson et al. 2006
Jungle cat <i>Felis chaus</i>	Chausie, (Jungle curl, Stone cougar)	USA 1995	Domestic cat
Black-footed cat <i>Felis nigripes</i>	—	—	Domestic cat
Leopard cat <i>Prionailurus bengalensis</i>	Bengal Pantherette Ussuri	USA 1963 USA 2000 —	Leopard cat
Rusty-spotted cat <i>Prionailurus rubiginosus</i>	—	—	Leopard cat
Fishing cat <i>Prionailurus viverrinus</i>	Machbagraal Viverral	USA 2001	Leopard cat
Jaguarundi <i>Puma jaguarundi</i>	—	—	Puma lineage
Manul <i>O. manul</i>	—	—	Puma lineage
North American lynx <i>Lynx canadensis</i>	—	—	Lynx lineage
Bobcat <i>Lynx rufus</i>	—	—	Lynx lineage
Geoffroy’s cat <i>Leopardus geoffroyii</i>	Safari	USA 1980s	Ocelot lineage

Table 1. Felinae species that have hybridised with the domestic cat *Felis catus* (after Hartwell 2007) (cont.)

Species	Hybrid (breed) name	Location and date of breed development	Lineage as per Johnson et al. 2006
Margay <i>Leopardus wiedii</i>	Bristol	USA 1980s	Ocelot lineage
Oncilla <i>Leopardus tigrinus</i>	—	—	Ocelot lineage
Serval <i>Leptailurus serval</i>	Savannah	USA 1997	Caracal lineage
Caracal <i>Caracal caracal</i>	—	—	Caracal lineage

Table 2. Hybrid cats used in further hybridisations (after Hartwell 2007).

First cross		Breed name	Second cross	New breed name
<i>Felis catus</i>	<i>Prionailurus bengalensis</i>	Bengal	<i>Prionailurus viverrinus</i>	Machbagral, Viverral
<i>Felis catus</i>	<i>Prionailurus bengalensis</i>	Bengal	<i>Leptailurus serval</i>	Savannah
<i>Felis catus</i>	<i>Prionailurus bengalensis</i>	Bengal	<i>Felis chaus</i>	—
<i>Felis catus</i>	<i>Prionailurus bengalensis</i>	Bengal	<i>Leopardus geoffroyii</i>	—
<i>Felis catus</i>	<i>Prionailurus bengalensis</i>	Bengal	<i>Lynx canadensis</i>	—
<i>Felis catus</i>	<i>Prionailurus bengalensis</i>	Bengal	<i>Lynx rufus</i>	—
<i>Felis catus</i>	<i>Felis chaus</i>	Chausie	<i>Felis silvestris silvestris</i>	Euro-Chausie
<i>Felis catus</i>	<i>Felis chaus</i>	Chausie	<i>Lynx rufus</i>	—

Early generation savannah cats typically exhibit some degree of hybrid inviability. Male savannah cats often retain larger size and are usually sterile until the F₅ generation, although females are fertile from the F₁ generation onward (All About Spots 2007). Reputed fertile F₄ males are being used in breeding programs in the USA (King 2008b, Stucki and Stucki 2008). Since back-crossing of savannah cats to servals is known to occur, it could be expected that fertility at F₄ should increase and possibly even appear in F₃ as it did in the Bengal cat breed.

Identification of hybrids

To the untrained eye, some cat breeds are not easily distinguished from each other or from their later generation hybrids. Breeds developed from the serval include spotted-tabby oriental shorthair, Egyptian mau and the oicat. All these breeds have a spotted coat. Identification on morphological grounds may be problematic. Most breed-registered cats in Australia are now micro-chipped when registered with the cat breed registries. Reading of their microchips and consulting 'registration' papers and/or registry databases should correctly identify most domestic cat/serval hybrids look-alikes. However, the 'registration papers' would need to be confirmed with the issuing registry. Re-chipping for the purpose of evasion of identification is possible. This is where the registered microchip of an animal is removed and another microchip from a legitimately registered animal of a similar looking breed is substituted. DNA testing might be used to identify an unchipped or suspected rechipped animal.

Species-specific mitochondrial DNA markers are routinely used in forensics (Melton and Holland 2007) and field population studies to confirm the species of origin of hair or scat samples (Fernandes et al. 2008). The mitochondrial DNA sequences are known for all the Felidae, e.g. 16S rRNA and NADH-5 (Johnson and O'Brien 1997; Johnson et al. 2006). However, the utility of this technique is limited in the case of hybrids as mitochondria are inherited on the maternal line. The breeding program for the savannah cat purports to start from a female domestic cat, so unless some back-crossing to a female serval has occurred, all domestic cat/serval hybrids should only carry *Felis catus* mitochondria.

Currently, the only commercial DNA-testing available for cats is a 'DNA Parentage Verification' test, which can provide information on the parentage of a particular cat. As currently offered, this test costs \$130 for dam, sire and offspring plus \$35 for each additional cat. This test is based on a panel of microsatellite markers (Lipinski et al. 2007; Menotti-Raymond 2005). To authenticate parentage of an individual, samples of the DNA of both parents are also required (Animal DNA Laboratory 2008). To use this commercial DNA test to confirm the parentage of a particular cat to five generations would require DNA samples of all the sixty-three animals in the cat's pedigree (i.e. the animal in question, its parents, grandparents back to great-great-grandparents) and cost \$2230. This test does not directly identify the breed or species. There is also a validated forensic version of this test (Menotti-Raymond et al. 2005; Coomber et al. 2007) suitable for evidentiary samples.

There is an alternative genetic approach that can be used to infer whether an individual animal belongs to a species or breed or is a hybrid of such. As an inference-based approach it would not necessarily stand up to evidentiary requirements. This approach uses a Bayesian model-based clustering algorithm called STRUCTURE (Pritchards et al. 2000) that identifies (K) genetically distinct subpopulations on the basis of the allele frequency at each microsatellite locus. The STRUCTURE algorithm additionally provides an estimation of the proportion of an individual's genome (Q) that originates from each of the K subpopulations. This approach has been used for the identification of hybrids of domestic cats *Felis catus* and European wild cats *Felis silvestris silvestris* (Randi et al. 2001, Italy and South Africa, 128 cats, 12 loci; Pierpaoli et al. 2003, 336 cats, Europe wide, 12 loci; Oliveira 2008, Portugal, 98 cats, 12 loci). It has also been used with large data sets of domestic cats to differentiate known breeds and post priori assign cats to these breeds e.g. Lipinski et al. 2008 who genotyped thirty-eight microsatellites in 1176 cats across 22 breeds and 17 random-bred populations; and Menotti-Raymond et al. (2008) who genotyped eleven microsatellites in 1040 cats across 38 breeds.

In their study, Menotti-Raymond et al. (2008) linked the Bengal cat and Ocicat on the basis of the proportion of shared alleles algorithm from composite genotypes (Figure 2a) and could not separate the Egyptian Mau from the Bengal on the basis of STRUCTURE defined populations (breed group 8, Figure 2b).

A technical requirement for this Bayesian approach to work is the availability of a panel of microsatellites that amplifies all loci for both the serval and the domestic cat. Lipinski et al. (2007) reported that some of the international parentage and identification panel of markers had null alleles in the Asian leopard cat and serval cat hybrids. It would also require access to one of the above-mentioned large data sets, with inclusion of minimum sets ($n = 27$) of known servals from the USA, and known cat/serval hybrids ($n = 27$) from the Savannah breeding program in the USA. The Menotti-Raymond dataset already includes the Bengal, ocicat, oriental shorthair and Egyptian mau, but the Lipinski dataset would also require the addition of Bengal, ocicat and oriental shorthair samples ($n = 3 \times 27 = 81$).

It is unlikely that owners of cats of these breeds would make DNA available if it were to lead to the seizure and destruction of animals and prosecution of owners and/or importers of the Savannah breed.

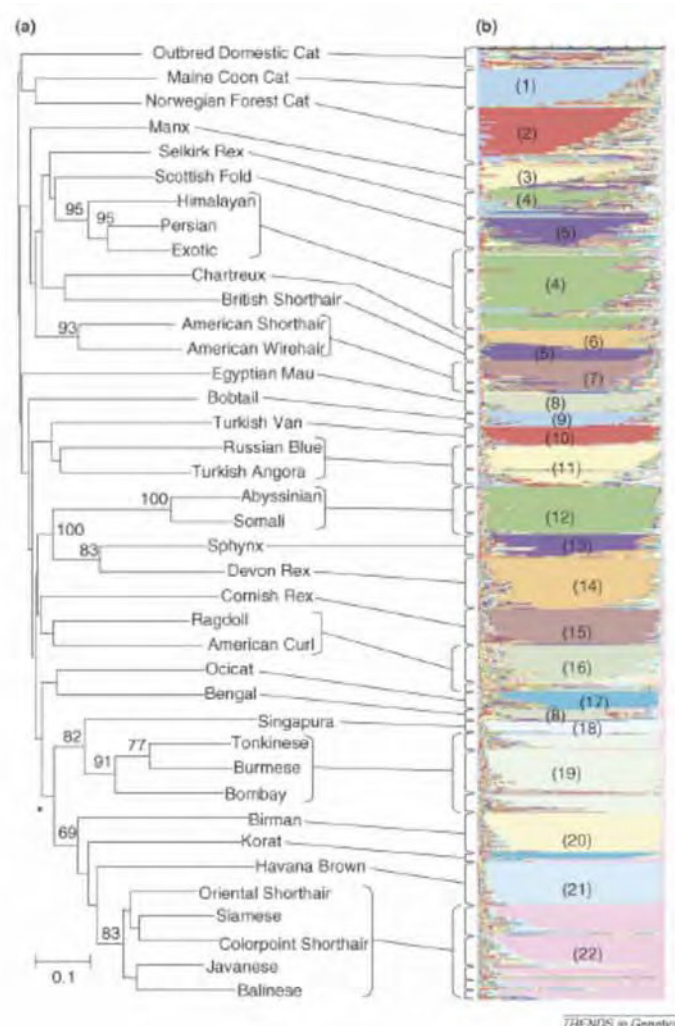


Figure 2. Phylogenetic neighbour-joining tree for individuals from 38 cat breeds based on distance matrices generated from the proportion of shared alleles algorithm from composite genotypes (column a). The histogram (b) generated from STRUCTURE analysis of 1040 cats showing shows the proportion of each individual's genome that originated from 22 populations (from O'Brien et al. 2008).

Description

Morphologically, the F5 hybrid savannah cat shares features of both the domestic cat and the wild serval, from which it was developed. A savannah cat's face is somewhat more triangular than a common domestic cat and its ears are exceptionally large, and positioned high on the head. Compared with an ordinary domestic cat, the savannah cat has a long, lean neck and long, slender legs, with elongated toes. The back legs are slightly longer than the front legs. Fur colour is variable, with various combinations of black, brown spotted tabby, silver spotted tabby and black smoke. The coat pattern comprises large, dark spots and other bold markings, which closely resemble the wild serval. The savannah cat can perhaps be described as a smaller replica of the serval (Breed standard—TICA 2008).

There is significant genotypic variation in savannah cats, with variation in size, even within a single litter. F1 males (first generation crosses between the wild serval and a domestic cat) can weigh from 8–11 kg, stand 40–45 cm tall at the shoulder, and have a body length (chest to rump) of 55–60 cm. F4 and F5 males can weigh from 6.3–8.2 kg, stand 32.5–38 cm tall, and be 40–45 cm long. Females are slightly smaller (Hummel 2007). There have been reports of male savannah cats weighing more than 18 kg (All About Spots 2007).

Biology

Life history

Gestation period: 63 days for domestic cats and 73 days for servals—because of the difference in gestation periods, early generation savannah cats are often born prematurely.

Young per birth: 1–2 for F1 savannah cats (Sand Hollow Savannahs 2008)
3–5 (average) for other generations (Krautheim 2007)

Birth interval: Not known exactly—breeders generally limit their animals to two litters per year. Savannah cats can breed again 4–5 weeks after giving birth. Ordinary domestic cats can produce 2–3 litters per year (Pet-Yard.com 2007)

Weaning: 8–12 weeks (Gaines 2004)

Sexual maturity: Not known exactly
7–12 months for ordinary domestic cats (Pet-Yard.com 2007)
18–24 months for servals (Webber 2004)

Sexual activity: Not known

Life span: Not known but thought to be comparable to ordinary domestic cats (c. 15 years) (Krautheim 2007)

Savannah cat breed history

The first savannah cat was born on April 7, 1986 in the USA, when Ms Judee Frank was able to crossbreed a serval with a domestic cat. One of the kittens from this animal was later purchased by Mr Patrick Kelley, who then decided to establish the savannah cat as a recognised new breed of cat. Another breeder (Ms Joyce Sroufe) worked with Mr Kelly to further develop the savannah cat breed. The International Cat Association (TICA) did not accept the savannah cat as a recognised breed until 2000 (All About Spots 2007). By 2005, TICA had registered 1023 savannah cats, all of them non-neutered (TICA 2005).

The savannah is not a currently recognised breed with either of the two national cat breeding and showing bodies in Australia (Co-ordinating Cat Council of Australia (CCCA) and Australian Cat Federation Inc. (ACF)) or with their four affiliated associations in Queensland (Queensland Feline Association Inc (QFA); Queensland Independent Cat Council Inc (QICC); Feline Control Council of Queensland Inc (FCCQ); and Council of Federated Cat Clubs of Queensland (CFCCQ)). However, if the breeding of savannahs becomes established in Australia, the major associations will probably recognise the savannah breed, as they have previously done for Bengal hybrids.

Behaviour

Savannah cats are very active and can leap 2.5 m high from a standing position. Wild-type behaviour can be observed in early generation or non-socialised savannah cats. For example, they may hiss and growl at strangers. They also make noises similar to a serval, such as chirping and loud hissing (Winchester 2008).

Diet

Savannah cats have no special health care or dietary requirements. All cats are obligate carnivores and since they cannot synthesise sufficient amounts of the essential amino acids taurine and arginine from other amino acids, they acquire arginine and taurine from animal tissue protein sources. Some breeders recommend a partial or complete raw diet with at least 32% protein and no by-products (Ward-Osborne 2007).

In Africa, servals are a generalist predator feeding on lizards, snakes, frogs, small birds (quails, quelea, teal), insects, fish, ground squirrels, hyraxes, mole rats, domestic poultry, small antelopes, flamingos, vleis, rats, hares and duiker (Cat Survival Trust 2002; Sunquist et al. 2002).

Feral cats in Australia also have a generalised diet that includes a variety of lizards, frogs, small birds, insects, fish, small mammals, domestic poultry and rabbits (Long 2003).

Servals achieve an extremely high rate of hunting success (49% of hunting attempts yield prey) (Geertsema 1985), compared with lions (30%) and most other cat species (10%) (Cat Survival Trust 2002).

Predators and diseases

Health issues specific to savannah cats are unknown due to the taxon's recent development (All About Spots 2007).

Some vets comment that savannah cats exhibit 'hybrid vigour' (heterosis) (Greig 2007).

Legal status of serval hybrids including savannah cats (overseas)

In the United States, there are restrictions on owning hybrid cats in some states. It is illegal to own hybrid cats in the state of Nebraska, since hybrid cats are not classified as the species *Felis domesticus* (Lyons 2008). In Massachusetts, savannah cats from the F₁, F₂, and F₃ hybrid generations are not considered to be domestic cats under Massachusetts law (MGL:131, sec 77A), and it is illegal to possess such animals (Massachusetts Division of Fisheries and Wildlife 2007). In New York State, only hybrids removed from a wild felid parentage for a minimum of five generations are allowed as pets. The justification for the New York State law is that 'it is very difficult to track an animal's lineage; therefore making it difficult to determine what generation hybrid a cat may be' (New York State Assembly 2007). Hybrid cats are illegal under New York City law (New York City Administrative Code 2000), illegal in the state of Hawaii (State of Hawaii 2006), and in the state of Georgia (Georgia Department of Natural Resources 2007).

In the United Kingdom, the filial number of a particular hybrid cat determines if a permit is required for import: 'Certain hybrid animals may be subject to the provisions of the Convention on the International Trade in Endangered Species (CITES) and will require a CITES permit to enter the UK from third countries. A hybrid animal regulated under CITES is one that in its previous four generations has a parent the species of which is listed in Appendix I or II of CITES' (DEFRA 2006).

In Queensland, servals and their hybrids are declared pests under the Queensland Land Protection (Pest and Stock Route Management) Act 2002 and cannot be kept without a permit. Permits are not available for animals kept as pets.

Legal status of serval hybrids including savannah cats in Australia

The Australian government regulates the import of serval hybrids into Australia.

The serval is listed under Section 303EB(1) of the *Environment Protection and Biodiversity Conservation Act 1999* on the 'List of Specimens Taken to be Suitable for Live Import Part 2', which is the list of live specimens that require an import permit.

The serval is a CITES Appendix II listed species, so for the purposes of the *Environment Protection and Biodiversity Conservation Act 1999*, the definition of animal hybrids used by the CITES Conference of the Parties resolution 10.17 is used (as revised at the fourteenth meeting of the Conference of the Parties, The Hague (Netherlands), 3–15 June 2007). By this definition, a hybrid animal that has in its previous four generations of lineage one or more specimens included in Appendix I or II of the Convention shall be subject to the provisions of the Convention just as if they were the full species. Under this interpretation, F₁ to F₄ hybrids of *Leptailurus serval* (serval) and *Felis catus* (domestic cat) are treated as *Leptailurus serval* (serval). Servals can only be imported for an 'eligible non-commercial purpose only, excluding household pets'.

Domestic cats are listed under the *Environment Protection and Biodiversity Conservation Act 1999* Section 303 EB(1) as 'Specimens Taken to be Suitable for Live Import Part 1', which is the list of animals that do not require an import permit. However, this excludes any specimen of *Felis catus* derived from cross-breeding with: (a) a *Felis serval* or (b) a savannah cat (*Felis catus* × *Felis serval*).

The disease risk of imported animals is considered under the provisions of the *Quarantine Act*.

Potential distribution and impact in Queensland

It is difficult to accurately predict the potential geographic distribution of the savannah cat in Australia, simply because it is artificial hybrid that does not occur in the wild. However, it is reasonable to predict that its potential range is likely to be comparable to that of its progenitor species; the serval and the domestic cat.

Climate-based predictions have been generated for the wild serval (Figure 3) and the domestic (feral) cat (Figure 4), using CLIMATE, a climate modelling computer program. Based purely on an assessment of climatic parameters, large areas of Queensland appear suitable for both species, and hence their hybrids, especially the tropical savannahs of north Queensland. However, it is important to note that other habitat requirements, such as the availability of food, will influence range and abundance within this broad climatic envelope.

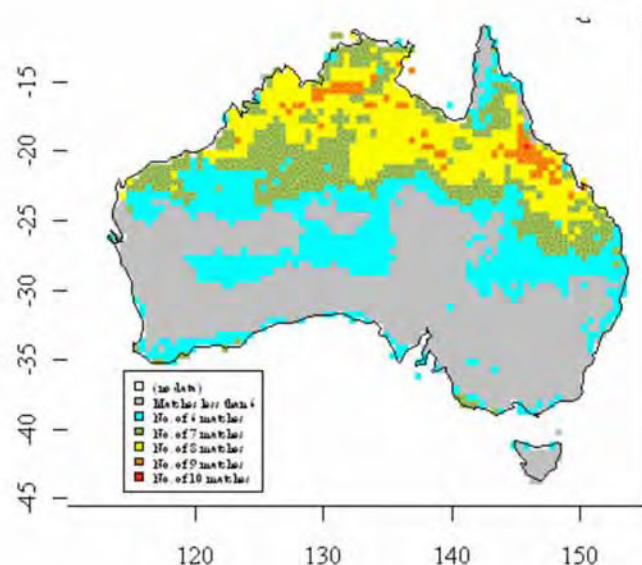


Figure 3. Potential distribution of the serval in Australia (red, orange and yellow indicates a high climatic suitability, green and light blue indicates marginal climatic suitability and grey indicates unsuitable climate).

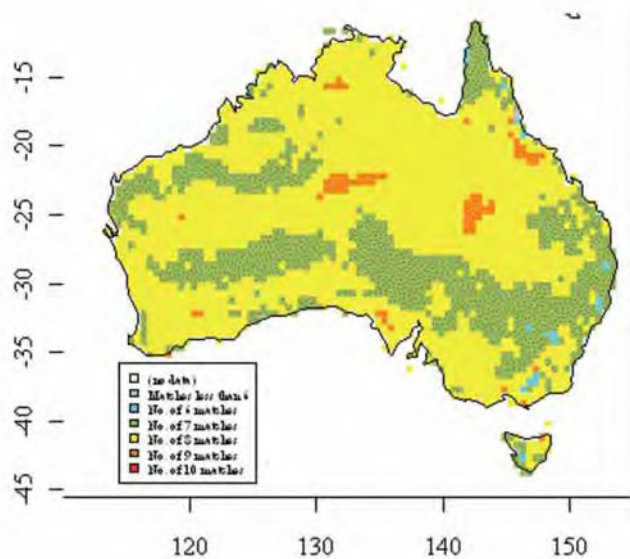


Figure 4. Potential distribution of the feral domestic cat (red, orange and yellow indicates a high climatic suitability, green and light blue indicates marginal climatic suitability and grey indicates unsuitable climate).

After reviewing the biological and ecological attributes of the serval and the feral domestic cat, this study suggests that the savannah cat is well suited to a broad range of habitat types, comparable to feral domestic cats. While it is difficult to predict exactly which habitats are most suitable, this study speculates that tropical savannahs are most suitable, followed by open grasslands in semi-arid areas and perhaps riparian habitats within the arid zone. The wild serval is known to have a broad habitat range, across tropical savannahs and extending to high altitude and adjacent arid zones in Africa. It is also commensal, occupying the margins of towns and settlements. Even though the savannah cat is not a pure serval, this taxon still exhibits many of the serval's wild traits, such as size, agility and behaviour.

While 90% of the wild serval's diet comprises prey items less than 200 g, it is known to take medium-sized mammals, birds and reptiles. Hence, it is reasonable to predict that Australian small and medium-sized vertebrate fauna are at risk, and that there do not appear to be any dietary limitations to the hybrid's survival in the wild.

Perhaps of most concern is the potential for genetic material from the savannah cat hybrid (and from the wild serval) to enter the existing feral cat population in Australia. Given the size and agility of the wild serval and the savannah cat, it seems reasonable to expect that cross-breeding with feral domestic cats could result in considerably larger feral cats. Also, considering the high kill-rate of the wild serval (50%), in comparison to feral cats (10%), any cross-breeding could result in increased hunting efficiency within the feral cat population.

Australian small to medium sized mammals have already suffered a high extinction rate, due largely to introduced predators. There is a good chance that the savannah cat will exacerbate this problem. Since European settlement, eighteen species of mammals have become extinct in Australia and a further nine have disappeared from the mainland and persist only on islands. Many other mammal species have declined to remnant mainland populations. These declines are strongly biased towards the arid and semi-arid zones and towards species within a critical weight range (35 g – 5.5 kg, Burbidge and McKenzie 1989). Ground-dwelling species in open habitats were particularly vulnerable. While there has been debate about the cause (e.g. Morton 1990), predation by feral cats and foxes has always been considered a factor. It is also well recognised that reintroduction of endangered, ground-dwelling mammal species in Australia is likely to fail unless cat and fox predation can be controlled (Serena 1994, Sinclair et al. 1998). A recent assessment of the likely causes of mammal decline in Australia strongly argues that predation by foxes and cats is largely responsible (Johnson 2006).

The declines in Australia's mammal fauna have also been concentrated in the southern two-thirds of the continent, coinciding with the distribution of foxes (Morton 1990). There are numerous species of mammals within the critical weight range that occur in northern Australia and some have experienced marked declines in southern Australia (Strahan 1995). The potential distribution of the serval overlaps the range of many of these species and includes Australia's extensive tropical savannah woodlands, a habitat preferred by the serval. Savannah cats are approximately twice the weight of feral cats in Australia and so have the potential to take prey similar to the size taken by foxes in southern Australia.

It is important to note that these predictions are speculative and based more or less on what we know about the wild serval (refer to separate risk assessment on the serval). This study was unable to find any published information on impacts of savannah cats since they are a new breed.

Numerical risk assessment using the Bomford assessment

A numerical risk assessment system developed by Bomford (2006) is widely applied in Australia to assess the level of risk posed by particular vertebrate species. This approach enables numerical ranking and prioritisation of large numbers of species. Firstly, a species' potential distribution is predicted using climate-modelling computer programs. The remaining steps involve allocation of scores for a number of attributes relevant to a species' pest status, including biology, costs to the economy, the environment and society, and management efficacy.

Using the Bomford system, serval/domestic cat hybrids were assessed as an 'extreme' threat to Queensland (refer Appendix 1).

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Appendix

Risk Assessment

Using the Bomford (2006) system, hybrids of *Leptailurus serval* (serval) and *Felis catus* (domestic cat) in Queensland were considered an 'Extreme' threat.

Species:		Hybrids of <i>Leptailurus serval</i> (serval) and <i>Felis catus</i> (domestic cat)
Date of assessment:		26 June 2008
Literature search type and date:		See references
A. Risks to public safety		
Factor	Score	Comments
A1. Risk to people from individual escapees (0–2)	1	Servals that are kept as pets have attacked unprovoked, causing serious injuries that require hospitalisation. Feral domestic cats can attack causing injury if cornered and threatened.
A2. Risk to public safety from individual captive animals (0–2)	1	Physical safety: apart from someone entering an enclosure or otherwise being in reach of a captive animal, there is nil or low physical risk to public safety. Disease transmission. Zoonotic diseases known to pass from cats to humans include: cat-scratch disease (bartonellosis), by far the most common zoonotic disease associated with cats, with approximately 25 000 people diagnosed every year in the United States; Salmonellosis, fungal infections (e.g. ringworm; protozoal infections such as toxoplasmosis caused by <i>Toxoplasma gondii</i>). People with weakened immune systems, or infants whose mothers are infected during pregnancy, can develop severe illness. Risk of disease transmission to humans should be no more than from existing pet domestic cats.
Stage A. Public safety risk score = sum of A 1 to 2 (0–4).	2	Highly dangerous
B. Risk of establishing a wild population		
Factor	Score	Comments
B1. Degree of climate match between species overseas range and Australia (1–6)	6	Both the serval and domestic cat have extreme climate match to Australia. The hybrid is not expected to be any more limited by climate than its progenitors.
B2. Exotic population established overseas (0–4)	4	Servals only exist in wild populations in Africa and are kept as pets in the United States and Europe. There is no record of servals establishing outside of Africa. Feral populations of domestic cats are common throughout the world.
B3. Taxonomic Class (0–1)	1	Mammal
B4. Non-migratory behaviour (0–1)	1	The serval is non-migratory in its native range. The feral domestic cat is also non-migratory.

B. Risk of establishing a wild population (cont.)		
Factor	Score	Comments
B5. Diet (0–1)	1	<p>The serval has a generalist diet that includes a variety of prey species: lizards, snakes, frogs, small birds (quails, quelea, teal), insects, fish, ground squirrels, hyraxes, mole rats, domestic poultry, small antelopes, flamingos, vlei rats, hares and duiker.</p> <p>The feral domestic cat in Australia has a generalised diet that includes a variety of lizards, frogs, small birds, insects, fish, small mammals, domestic poultry and rabbits. The hybrid would be expected to utilise at least the same range of prey.</p>
B6. Lives in disturbed habitat (0–1)	1	Servals and domestic cats adapt very well to human agricultural environments. Domestic cats live in a wide range of disturbed habitats including urban.
B7. Overseas range size (0–2)	2	Introduced range of domestic cats is quite large covering several continents. Servals are now restricted to sub-Saharan north, central and southern Africa.
B. Establishment Risk Score = Sum of B1 to B7 (1–16).	16	Extreme
C. Risk of becoming a pest following establishment		
Factor	Score	Comments
C1. Taxonomic group (0–4)	2	Carnivora
C2. Overseas range size including current and past 300 years, natural and introduced range (0–2)	2	<p>Serval: 12.5 million km² (based on distribution in Nowell and Jackson, 1996).</p> <p>Domestic cat: >30 million km²</p>
C3. Diet and feeding (0–3)	3	The serval, domestic cat and hybrid are all strict carnivores and arboreal.
C4. Competition with native fauna for tree hollows (0–2)	2	The serval can use hollow trees to shelter young.
C5. Overseas environmental pest status (0–3)	3	The serval is not an environmental pest in any country or region. The feral domestic cat is a severe environmental pest in many countries, especially islands.
C6. Climate match to areas with susceptible native species or communities (0–5)	5	<p>The species has more than 20 × 10% climate match (closest match) grid squares, and/or more than 100 grid squares within a 30% climate match, that overlap the distribution of any susceptible native species or communities.</p> <p>Of those species on the EPBC Act threatened species list, feral cats are considered a threat to 37 mammals, 36 species of birds (with 5 of these—the Christmas Island pipistrelle, orange bellied parrot, spotted quail-thrush (Mt Lofty Ranges), herald petrel and Gilbert's potoroo—being critically endangered), 7 reptiles and 3 amphibians.</p>
C7. Overseas primary production pest status (0–3)	2	Moderate pest of primary production in any country or region—will take domestic poultry.

C. Risk of becoming a pest following establishment (cont.)		
Factor	Score	Comments
C8. Climate match to susceptible primary production (0–5)	3	Commodity damage score = 85
C9. Spread disease (1–2)	2	All birds and mammals (likely or unknown effect on native species and on livestock and other domestic animals)
C10. Harm to property (0–3)	0	\$0
C11. Harm to people (0–5)	3	Injuries or risk of harm moderate; unlikely to be fatal and few people at risk (see A1). Human exposure to zoonotic disease not likely to be greater than that posed by current domestic cat.
C. Pest Risk Score = sum of C1 to C11 (1–37).	27	Extreme
Summary		
Stage A. Risk to public safety posed by captive or released individuals. (Public safety risk score = 0—not dangerous; 1—moderately dangerous; ≥2—highly dangerous)	2	Highly dangerous
Stage B. Risk of establishing a wild population. (For birds and mammals: Establishment Risk Score ≤6—low establishment risk; 7–11—moderate establishment risk; 12–13—high establishment risk; ≥14—extreme establishment risk).	16	Extreme establishment risk
Stage C. Risk of becoming a pest following establishment. (Pest risk score: <9—low pest risk; 9–14—moderate pest risk; 15–19—high pest risk; >19—extreme pest risk).	27	Extreme pest risk
VPC threat category	Extreme	

Table 3 Calculating Total Commodity Damage Score

Industry	Commodity Value Index ¹	Potential Commodity Impact Score (0–3)	Climate Match to Commodity Score (0–5)	Commodity Damage Score (columns 2 × 3 × 4)
Sheep (includes wool and sheep meat)	10	1	5	50
Cattle (includes dairy and beef)	10	0	Not estimated	0
Timber (includes native and plantation forests)	10	0	Not estimated	0
Cereal grain (includes wheat, barley sorghum etc)	10	0	Not estimated	0
Pigs	2	0	Not estimated	0
Poultry and eggs	2	2	5	20
Aquaculture (includes coastal mariculture)	2	1	5	10
Cotton	2	0	Not estimated	0
Oilseeds (includes canola, sunflower etc)	2	0	Not estimated	0
Grain legumes (includes soybeans)	2	0	Not estimated	0
Sugarcane	2	0	Not estimated	0
Grapes	2	0	Not estimated	0
Other fruit	2	0	Not estimated	0
Vegetables	2	0	Not estimated	0
Nuts	1	0	Not estimated	0
Other livestock (includes goats, deer, camels, rabbits)	1	1	5	5
Honey and beeswax	1	0	Not estimated	0
Other horticulture (includes flowers etc)	1	0	Not estimated	0
Total Commodity Damage Score (TCDS)	—	—	—	85

