

Dangerous Animals in Captivity: Ex Situ Tiger Conflict and Implications for Private Ownership of Exotic Animals

P.J. Nyhus,^{1*} R.L. Tilson,² and J.L. Tomlinson¹

¹*Franklin and Marshall College, Lancaster, Pennsylvania*

²*Minnesota Zoological Gardens, Apple Valley, Minnesota*

The risks associated with tiger attacks on people in the wild are well documented. There may currently be more tigers in captivity than in the wild, but relatively little is known about the risks of injury or death associated with owning and managing captive tigers and other large carnivores. The purpose of this study was to conduct a global assessment of attacks by captive tigers on people, with particular emphasis on cases in the United States. Our analysis of 30 international media sources and additional documents uncovered 59 unique incidents in 1998–2001 in which people were reportedly injured or killed by captive tigers. In the United States, seven people were reportedly killed and at least 27 were injured—a rate of 1.75 fatal attacks and at least nine nonfatal attacks per year. All but one fatal attack in the United States occurred in situations where tigers were privately owned or held in private facilities. Forty-two percent of the victims were classified as visitors, and almost one-quarter of the victims were under the age of 20. These results suggest that the victims underestimated the dangers posed by direct contact with these animals. In this work we review current legislation regarding captive ownership of tigers and other large exotic animals, and contradict claims by those who support private ownership of tigers and other large felids that the risks associated with owning and viewing these animals are insignificant. We conclude that the growing number of people who own tigers and other large exotic animals is cause for concern because of the danger to the animals, the handlers, and the public. The problem of private ownership of dangerous exotic animals has broad implications for tiger and large-carnivore conservation, public health, and animal welfare. We support the regulation of private ownership of dangerous exotic animals, and encourage scientific analysis of this contentious issue. *Zoo Biol* 22:573–586, 2003. © 2003 Wiley-Liss, Inc.

Key words: *Panthera tigris*; captive management; risk assessment; fatal attacks; exotic pets; ex situ conservation

*Correspondence to: Philip J. Nyhus, Department of Earth and Environment, Franklin and Marshall College, Lancaster, PA 17604-3003. E-mail: philip.nyhus@fandm.edu

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INTRODUCTION

The tiger (*Panthera tigris*) is one of the world's most endangered large carnivores. As few as 5,000–7,500 animals remain in the wild, spread among hundreds of small, disjunct populations across south, east, and southeast Asia [Nowell and Jackson, 1996; Seidensticker et al., 1999]. Captive breeding programs have been established to maintain viable populations of all five extant subspecies. In North America, approximately 290 tigers are managed by the American Zoo and Aquarium Association (AZA) Tiger Species Survival Plan (SSP). Altogether, some 800 tigers in captivity are coordinated through a global conservation strategy (GCS) among regional programs in North America, Europe, Australasia, and Asia.

In addition to the population of captive tigers in professionally managed zoos, an unknown number of these animals are kept as exotic pets by individuals, and in nonaccredited zoos, circuses, and safari parks. The population of tigers held in such conditions may actually exceed the number of tigers in the wild and in populations actively managed by the world zoological community combined. In the United States, newspapers and other sources have provided unsubstantiated reports that 7,000 [API, 2001] to 10,000 [Peterson, 2002] tigers may be in private hands. However, it is plausible that as few as 5,000 and as many as 12,000 of these animals exist, given the large number of animals that are kept illegally or are not recorded. It has been estimated that several thousand tigers reside in the state of Texas alone [Siderius, 2002]. Most of these tigers are of mixed origin and of unknown lineage [Green, 1999], and thus contribute little if anything to existing conservation programs, such as the AZA Tiger SSP.

The dangers of tigers in the wild are well known [Tilson and Nyhus, 1998]. Historically, thousands of people have been killed by wild tigers in Asia [McDougal, 1987; Boomgaard, 2001], and even today tens to hundreds of people are killed by wild tigers annually in tiger-range states. Little is known, however, about the number of people killed or injured by tigers and other large cats in captivity, and no central database tracks these attacks. When captive tigers do attack people, the most serious incidents are frequently reported by the local, national, and even international press.

The purpose of this study was to carry out a global assessment of attacks by captive tigers on people, with particular emphasis on attacks in the United States. We began this study out of concern that little was known about the risks of owning large, dangerous carnivores in situations in which regulatory oversight, staff training, and management are often minimal. The issue has been raised by the mass media, and medical journals have described serious and fatal injuries resulting from tiger attacks on adults and children by privately-owned animals [Clark et al., 1991; Oller and Udekwu, 1996; Wiens and Harrison, 1996; Chapenoire et al., 2001]. However, much less has been published in the broader wildlife and conservation literature on this subject. We believe this problem of private ownership has serious implications for tiger and large-carnivore conservation, as well as for public health and the welfare of tigers and other large exotic animals in human care.

The tiger is the world's largest cat, one of the most widely recognized species in the world, and an icon of dangerous animals in general. It provides an excellent case study, because a large number of attacks are noted by the media. We recorded data, when it was available, on 1) the number of attacks; 2) the date of the attacks, and the location and context in which they occurred; and 3) the characteristics (e.g., age and

sex) of the victims. We concentrated on cases in the United States, and examined the implications of these findings for the management of tigers and large carnivores in general, and for domestic legislation and policies regarding private ownership of exotic animals in particular. Although this study focuses on tigers, we hope it will initiate additional studies and contribute to broader discussions about the risks and implications of private ownership of all large exotic animals.

MATERIALS AND METHODS

We systematically collected articles about human injuries and deaths inflicted by captive tigers in 1998–2001 using several online search engines—most notably Lexis-Nexis, material collected by the Tiger Information Center (www.5tigers.org), and material sent to us in our professional capacity. Articles from 30 international media sources were used. Several additional internet sources, including sites sponsored by People for the Ethical Treatment of Animals (PETA; www.circuses.com/cattacks.html) and the Feline Conservation Federation (FCF; www.lioc.org), provided additional information and cases.

All articles were summarized and coded. Duplicate articles from multiple sources were noted but not included in the final summaries. The locations where the incidents occurred were categorized as 1) zoos, animal parks, and sanctuaries; 2) non-zoo entertainment facilities; and 3) private residences and facilities. Victims were categorized as visitors or handlers (Table 1). Injuries were categorized as serious (requiring emergency medical care) or minor. We recognized from the outset that the number of human injuries reported by the media were likely lower (possibly

TABLE 1. Summary of terms used to classify types of facilities and status of victims

Category and classification	Terms included in classification
Type of facility	
Zoos, animal parks, and sanctuaries	AZA-accredited Zoo Public zoo Safari park Animal refuge/sanctuary
Non-zoo entertainment	Circus Theme park
Private owners and facilities	Private owner Animal rental company Private (non accredited) zoo
Status of victim	
Visitor	Visitor Relation Acquaintance Tourist Stranger
Handler	Handler Employee Keeper Owner Trainer

much lower) than the actual number of injuries. However, we believe these media reports provided the best available data for these analyses.

RESULTS

In the 4 years covered by the study, the media reported a total of 59 incidents in which people were seriously injured or killed by captive tigers—an average of approximately 15 victims per year (Table 2). In the United States, 27 people were reportedly injured and seven were killed; two were listed as having been attacked, but it was unclear whether they were injured or killed. In 20 of these cases, the injured victims required emergency medical care, in three cases the injuries were minor, and in the rest the severity of the injuries was unclear. Internationally, nine people were reportedly injured, 12 were killed, and two more were either injured or killed by tigers. In six of these cases the injured victims required emergency medical attention; the remaining cases were unclear.

In the United States, attacks were reported in Florida ($n = 8$); Texas ($n = 5$); Kansas ($n = 4$); California, Nevada, and Ohio ($n = 2$ each); and Arkansas, Colorado, Idaho, Illinois, Indiana, Massachusetts, Minnesota, Mississippi, Nebraska, New Mexico, North Dakota, Oklahoma, and South Dakota ($n = 1$ each). One death occurred in a zoo not accredited by the American Zoo and Aquarium Association (AZA), and the rest occurred where tigers were privately owned or in non-accredited private facilities (Table 2). Tigers in private ownership and non-zoo entertainment facilities were responsible for 75% of all injuries. Three injuries occurred in facilities accredited by the AZA, including one of the three cases that did not require emergency care. In one of the other two incidents involving nonserious injuries, a man was slightly injured when he tried to remove his partner, who had been fatally attacked by a tiger. Injuries occurred equally between visitors and keepers in entertainment and private ownership situations, but less than half as many visitors as handlers were injured in zoos. Twice as many handlers as visitors were killed in private facilities. Victims ranged from the very young (3 years old) to adults. Seven children under age 10 were attacked by tigers. The two fatalities in this age group were killed by privately owned tigers. Victims were more frequently women in zoos and men in entertainment and private facilities. Attacks occurred most frequently when the victims came too close to the tigers when viewing them ($n = 11$ victims), handling or moving them ($n = 8$), being photographed with them ($n = 7$), or feeding them ($n = 4$), or the tiger escaped ($n = 4$).

Internationally, attacks by captive tigers were reported in India ($n = 6$); China ($n = 3$); Spain ($n = 2$); Australia and Russia ($n = 2$ each); and Indonesia, Thailand, Japan, Poland, Yemen, the United Kingdom, and Canada ($n = 1$ each). Reported attacks were most frequent among visitors to zoos and animal parks. Visitors accounted for seven of the eight deaths reported in zoos and animal parks, and just over half of all reported deaths (Table 2). Only keepers were reportedly killed in entertainment and private ownership situations. Three times as many men were killed in zoos as women. Victims were commonly attacked when they came too close to the tigers when viewing them ($n = 8$ victims), feeding the animals ($n = 4$), or during a performance ($n = 3$), or the tiger escaped ($n = 5$).

TABLE 2. Number of people reported killed and injured by captivity tigers between 1998–2001 in the United States and outside of the United States*

	Type of facility															
	Zoos, animal parks, and refuges				Non-zoo entertainment				Private owners and facilities				Total			
	I	K	U	Total	I	K	U	Total	I	K	U	Total	I	K	U	Total
In the United States																
Status																
Visitor	2	-	-	2	4	-	-	4	6	2	1	9	12	5	1	15
Handler	5	1	-	6	4	-	-	4	6	4	1	11	15	2	1	21
Total	7	1	-	8	8	-	-	8	12	6	2	20	27	7	2	36
Age																
0–10	2	-	-	2	1	-	-	1	2	2	-	4	5	2	-	7
11–20	-	-	-	-	-	-	-	-	3	-	-	3	3	-	-	3
21–40	-	-	-	-	2	-	-	2	2	1	1	4	4	1	1	6
41+	2	1	-	3	2	-	-	2	2	-	-	2	6	1	-	7
Unknown	3	-	-	3	3	-	-	3	3	3	1	7	9	3	1	13
Total	7	1	-	8	8	-	-	8	12	6	2	20	27	7	2	36
Gender																
Male	1	1	-	2	7	-	-	7	6	3	-	9	14	4	-	18
Female	6	-	-	6	1	-	-	1	4	2	1	7	11	2	1	14
Unknown	-	-	-	-	-	-	-	-	2	1	1	4	2	1	1	4
Total	7	1	-	8	8	-	-	8	12	6	2	20	27	7	2	36
Activity																
Too close for viewing	3	-	-	3	-	-	-	-	5	2	1	8	8	2	1	11
Handling/moving	-	-	-	-	1	-	-	1	3	4	-	7	4	4	-	8
Photo opportunity	-	-	-	-	6	-	-	6	1	-	-	1	7	-	-	7
Tiger escaped	2	1	-	3	-	-	-	-	-	-	1	1	2	1	1	4
Feeding animal	-	-	-	-	-	-	-	-	1	-	-	1	1	-	-	1
Cleaning cage	2	-	-	2	-	-	-	-	2	-	-	2	4	-	-	4
Performance	-	-	-	-	1	-	-	1	-	-	-	-	1	-	-	1
Total	7	1	-	8	8	-	-	8	12	6	2	20	27	7	2	36

TABLE 2 (continued)

	Type of facility															
	Zoos, animal parks, and refuges				Non-zoo entertainment				Private owners and facilities				Total			
	I	K	U	Total	I	K	U	Total	I	K	U	Total	I	K	U	Total
Outside the United States																
Status																
Visitor	1	7	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Handler	2	1	1	4	3	2	5	5	3	2	5	5	8	5	1	14
Unknown	-	-	1	1	-	-	-	-	-	-	-	-	-	-	1	1
Total	3	8	2	13	3	2	5	5	3	2	5	5	9	12	2	23
Age																
0-10	-	1	-	1	-	-	-	-	-	-	-	-	-	-	1	1
11-20	2	1	-	3	-	-	-	-	-	-	-	-	2	1	-	3
21-40	-	1	-	1	-	-	-	-	-	1	-	1	-	2	-	2
41+	-	4	-	4	-	-	-	-	1	-	-	1	1	4	-	5
Unknown	1	1	2	4	3	2	5	5	2	1	3	3	6	4	2	12
Total	3	8	2	13	3	2	5	5	3	2	5	5	9	12	2	23
Gender																
Male	2	6	-	8	1	1	2	2	1	2	3	3	4	9	-	13
Female	-	2	-	2	-	1	1	1	1	-	1	1	1	3	-	4
Unknown	1	-	2	3	2	-	2	2	1	-	1	1	4	-	2	6
Total	3	8	2	13	3	2	5	5	3	2	5	5	9	12	2	23
Activity																
Too close for viewing	2	6	-	8	-	-	-	-	-	-	-	-	2	6	-	8
Handling/moving	-	-	-	-	-	-	-	-	2	-	-	2	2	-	-	2
Photo opportunity	-	-	-	-	-	-	-	-	1	-	-	1	1	-	-	1
Tiger escaped	1	1	2	4	-	1	1	1	-	-	-	-	1	2	2	5
Feeding animal	-	1	-	1	1	-	1	1	-	2	-	2	1	3	-	4
Cleaning cage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Performance	-	-	-	-	2	1	3	3	-	-	-	-	2	1	-	3
Total	3	8	2	13	3	2	5	5	3	2	5	5	9	12	2	23

*Victims categorized by type of facility, status, age, gender, and activity when attacked.

I, injured; K, killed; U, unknown.

Collectively, the “typical” victim was an adult male handler who was injured by a tiger in his care. However, everyone coming in contact with tigers was at risk. Approximately 42% of all victims were classified as “visitors,” 24% of victims were under the age of 20, and 30% of the victims (when gender was identified) were females. Thirty-two percent of all victims, and 42% of victims killed were categorized as being too close to the tiger when viewing them. Risks associated with handling and moving tigers, dealing with escaped tigers, and feeding tigers were also high. One in five of the total reported injuries occurred when people were having their picture taken with tigers.

DISCUSSION

It is extremely difficult to gather accurate information about the risk of injury or death from captive tigers because there is no central database documenting such information. The mass media reports that form the basis of this study were considered to be the best available proxy for the true number of incidents. We consider the number of reported domestic deaths from tiger attacks to be fairly accurate, as such incidents are widely and repeatedly reported by different media sources when they occur. We suspect that the number of reported injuries is probably only a small fraction of the true number of incidents, based on a survey of owners of large cats conducted by the FCF (see Implications for Private Ownership below), and because most incidents (particularly minor ones) are not newsworthy, or it may be against the best interest of the owner/handler to publicize the information [Chapenoire et al., 2001]. This is particularly true in the summary of international reports, because only extreme cases involving visitors or dramatic cases of handlers being attacked would likely have been picked up by the international media. Nevertheless, despite the inherent limitations of using media reports to document such attacks, several conclusions can still be drawn from these data.

First, it is clear that tigers in captivity are dangerous animals that can cause serious harm to visitors and handlers alike any time they come in direct contact with these animals. Despite the appearance of pseudo-domestication in some trained tigers, these animals retain their predatory instincts and neural-visceral reflexes, and they can inflict serious wounds using their teeth or claws suddenly and without forewarning [Wiens and Harrison, 1996; Chapenoire et al., 2001].

Tigers (and other large cats) have the ability to cause significant trauma and hidden injuries [Wiens and Harrison, 1996]. The most common location for these injuries is the nape of the neck—tigers and other large cats can realign their jaws so that they can bite down between a victim’s vertebrae and into the spinal cord [Oller and Udekwu, 1996]. Bite wounds can also result in significant bacterial infections [Goldstein, 1992].

It was apparent in the majority of attacks that the victims probably underestimated the dangers posed by direct contact with these animals. Safety precautions, such as cages or chains, were often not sufficiently robust, or people ignored basic safety precautions by circumventing the effectiveness of these barriers. Most attacks occurred when the visitors or handlers approached the animals (e.g., they came too close to the cages, entered the cages to clean them or feed the animals, or were trying to move or otherwise handle the animals). Twelve people were harmed while getting their pictures taken with tigers or during tiger performances. In three

cases, the victims left the safety of their vehicles in animal-park safaris and were mauled by tigers while they were exposed.

Second, in the United States the probability that fatal attacks or injuries will occur is highest in situations where tigers are kept as exotic pets, whether in households or in private “roadside zoos.” This may reflect in part the likelihood that facilities and training are less controlled and there may be a greater opportunity for people, particularly children, to come in contact with these animals through petting, feeding, photo opportunities, and other situations that are less likely to occur in accredited institutions.

The number of children killed and injured by privately-owned tigers is notable. Children are at particular risk for several reasons. Young children are naturally curious and may not have the same inhibitions as adults when approaching a large carnivore inside or outside a cage. A child’s smaller body size increases the potential for serious or lethal injury. Size also appears to influence the attack response of tigers. Large cats instinctively strike the neck and shoulder of their prey to disable it, resulting in serious craniofacial and cervical spinal injuries [Leyhausen, 1979]. The small size of children may help to trigger this attack response [Oller and Udekwa, 1996]. Predatory behavior is also triggered by movement, making human children particularly stimulating as “prey” for big cats. For example, large cats, such as tigers and leopards, can frequently be seen stalking small children running and playing outside the animals’ enclosures at zoos. In the United States, the majority of attacks by mountain lions in the wild involve children, and 86% of fatal attacks are on children [Rollins and Spencer, 1995].

Third, people are at considerable risk when they visit international zoos. In part, this may reflect a lack of respect for the power of these animals by the victims. In several instances the tigers were provoked by visitors (e.g., people threw stones at or urinated on the tiger) or the victims actually entered the tiger’s enclosure. At present, no international zoo associations have accreditation programs similar to those administered by AZA; however, accreditation programs are being developed by the Australasian Regional Association of Zoological Parks and Aquaria (ARAZPA) and the European Association of Zoos and Aquaria (EAZA). It is likely that tigers seriously injure and kill their private owners in countries outside the United States as well, but this information is probably even less likely to be reported by the mainstream media than it is in the United States.

Implications for Private Ownership

The risk of a fatal attack by a tiger in the United States is low by absolute standards (1.75 deaths/year in the United States), but the risk of injury is at least nine attacks per year, and is almost certainly much greater given the large number of injuries that are not reported in the media. This level of risk is well within the range of risk that has resulted in ordinances and laws controlling some breeds of domestic dogs and other exotic animals.

The American Veterinary Medical Association [AVM, 2000], the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service [APHIS, 2000], the Centers for Disease Control and Prevention (CDC), and the AZA [Butler, 2001] oppose the possession of certain exotic animals, including tigers and other large cats, by individuals. APHIS notes that most people do not have the knowledge or experience to handle dangerous animals, such as tigers. Some owners

take their animals to inappropriate locations, such as schools or shopping malls, and many may not understand that a large cat that is “playing” can be extremely dangerous [APHIS, 2000]. In addition to the risk of harm to owners and others coming in contact with them, the tigers themselves often do not receive adequate health care, nutrition, or freedom to exercise, and may be exposed to unnecessary surgical procedures, such as declawing [APHIS, 2000].

The AZA in particular has long opposed ownership of exotic animals as pets. The AZA Felid Taxon Advisory Group (TAG) has stated that it strongly opposes private ownership of wild felids as exotic pets [Mellen et al., 2000]. The AZA Tiger SSP management group also does not endorse the private ownership of tigers in non-AZA-accredited institutions or in institutions that fail to meet the recommendations set forth by the AZA Roadside Zoo Task Force [Tilson et al., 2002]. Although one or two AZA member facilities still handle hand-raised tigers in public places or have staff who enter enclosures with tigers, the AZA is concerned that in addition to the risks to owners and animals, privately-owned tigers and other large felids do not contribute to scientifically-managed conservation programs established to maintain genetic variation and viability in captive populations. Moreover, few of these nonaccredited facilities conduct tiger field conservation and scientific research activities that are comparable to those of accredited zoos and their conservation partners. Furthermore, the consequences of tiger–human conflict are often tragic for the tiger, which is often euthanized or moved. During the 2002 Tiger SSP Master Plan meeting, there was a consensus among the participants that handling tigers in public places puts the public at risk of injury or death, promotes private ownership and a false sense of security in handling big cats, and results in the animal losing dignity as an ambassador of the wild [Tilson et al., 2002]. The AZA Animal Welfare Committee is currently drafting a policy statement on the use of animals in entertainment.

At present, 12 states ban the private possession of exotic animals (Alaska, California, Colorado, Georgia, Hawaii, Massachusetts, New Hampshire, New Mexico, Tennessee, Utah, Vermont, and Wyoming), seven states have a partial ban (Connecticut, Florida, Illinois, Maryland, Michigan, Nebraska, and Virginia), and 15 states require a license or permit to possess exotic animals (Arizona, Delaware, Indiana, Maine, Mississippi, Montana, New Jersey, New York, North Dakota, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Dakota, and Texas) [API, 2001; Duckett, 2001]. In addition, a growing number of counties and cities have passed ordinances that regulate or ban the private ownership of certain exotic animals.

A comparison of exotic-animal regulations in states with the most reported tiger attacks (Florida, Texas, and Kansas) is illustrative of the different laws in place in different areas. In Florida, tigers and other large cats (*Panthera*) can not be kept for personal use, but can be held by commercial exhibitors. Smaller “class II” animals can be kept as pets. All permits require adherence to structural cage requirements. In Texas, a state law passed in 2001 requires counties to regulate or prohibit the ownership of dangerous wild animals, including tigers. There had been little regulation in the state after the Texas Parks and Wildlife Department stopped regulating exotic animals in 1997 [Siderius, 2002]. Registration now requires a permit fee, compliance with caging requirements, \$100,000 liability insurance coverage, and an acceptable veterinary care program. In Kansas, exotic felines may be kept, bred, sold, imported, and purchased, with no limits in time or number. Wildlife must be

confined, and all activity is subject to federal or state rules and regulations. Overall, many state regulations regarding the ownership of exotic dangerous animals are limited in scope. To address this, the AZA Roadside Zoo Task Force has drafted and is currently distributing model state legislation for exotic animals [Baker, 2001], with the hope that it will result in stronger and more effective state regulations governing exotic animal ownership.

The Endangered Species Act (ESA) regulates the import, export, possession, taking, sale, and transport of endangered species, but does not regulate private possession [API, 2001]. Tigers and other large carnivores are widely available through paper and electronic outlets, such as the Animal Finders Guide (www.animalfindersguide.com), and other avenues [Green, 1999].

In 2000, the Shambala Wild Animal Protection Act (H.R. 5057) was introduced in the U.S. House of Representatives in an attempt to amend the Animal Welfare Act to establish restrictions and controls on the killing, personal possession, care, breeding, import, export, transportation, and transfer of possession of protected wild animals, including tigers. The bill proposed that all owners of protected wildlife be required to obtain a permit. Federal, state, and local governments; research facilities; zoos; animal parks; and wildlife sanctuaries already regulated or licensed by federal or state governments would have been exempt. Permits would be handled by the Animal and Plant Health Inspection Service of the Department of Agriculture, which would require information from applicants regarding age, experience, staff training, proof of liability insurance, proof of veterinary care, compliance with applicable state and local laws, proof of appropriate local license and surety bond information, and provisions for final disposition of the animal. The act would have enabled the Secretary of Agriculture to establish housing and care standards developed by zoo biologists and veterinarians, both to protect public safety and to ensure the proper care and welfare of the animal. However, the bill died in the House Agricultural Committee and has not yet been reintroduced.

In January 2003 the "Captive Wildlife Safety Act" (H.R. 1006, S. 269), backed by the AZA, the Humane Society of the United States, and the International Fund for Animal Welfare, was introduced. This bill would prohibit anyone from importing, exporting, transporting, selling, receiving, acquiring, or purchasing in interstate commerce prohibited wildlife species (defined as any live tiger, lion, cheetah, jaguar, or cougar) by amending the Lacey Act amendments of 1981. The Lacey Act already prohibits the import, export, selling, acquisition, or purchase of fish, wildlife, or plants taken, possessed, transported, or sold in violation of U.S. law or in interstate or foreign commerce involving fish, wildlife, and plants protected by the Convention on International Trade in Endangered Species (CITES) or by state law. Zoos, circuses, and research facilities already inspected by a federal agency, such as the U.S. Department of Agriculture, would be exempt. Accredited sanctuaries and universities, licensed rehabilitators and veterinarians, incorporated human societies, and federally-licensed and inspected breeders or dealers would also be exempt. The bill was introduced in the House by Representative Howard "Buck" McKeon (R-CA). Senators Jeffords (D-VT), Ensign (R-NV), Wyden (D-OR), Levin (D-MI), and Smith (R-OR) introduced the Senate version. At the time this manuscript was submitted, the House bill had 16 cosponsors and the Senate bill had eight cosponsors.

Supporters of private ownership of tigers and other large cats, such as the Phoenix Exotic Wildlife Association, Inc. (www.phoenixexotics.org), and the FCF (www.lioc.org), present several arguments against restrictive legislation. They claim that many owners of exotic animals are law-abiding citizens who care for their animals and the safety of others, and should not be punished for the careless or unsafe actions of others. Supporters maintain that they have a constitutional right to keep exotic animals on their own land if they practice proper husbandry. Finally, it has been argued that the risk of injury or death by exotic animals is low compared to other activities that remain unregulated.

The first argument is similar to that used by owners of dangerous breeds of dogs. In the case of large cats, many states, counties, and municipalities have already found that the risk of public harm outweighs the interests of private individuals to own these animals. The second argument may be the most compelling, but considerable precedent already exists for regulating the possession of animals. For example, the ESA allows the U.S. Fish and Wildlife Service to prosecute individuals who illegally possess endangered species, and under the Lacey Act the federal government can prosecute people who have obtained animals from other countries or states illegally [API, 2001].

The risk of serious injury or death by a tiger in captivity is serious. Efforts to minimize these risks by comparing the total number of injuries or fatal attacks to the total number of other sources of injury or death, such as dog bites, fail to take into consideration that a relatively small number of animals are responsible for a relatively large number of attacks. Also, the harm a tiger or other large carnivore is capable of inflicting is tremendous.

Data used to support the third argument comes from an internal survey carried out by the FCF in 1998–1999 (<http://legal.lioc.org/Risk.html>). This study examined anonymous survey responses from 126 private owners of large felines (a total of 5,241 cat years of experience) and concluded that the risk of injury associated with private captive husbandry of wild felines is comparable to that associated with ownership of domestic dogs. The study reported 635 injuries, of which 573 required first aid (453 injuries to owners, 104 to family members and employees, 13 resulting from authorized contact by members of the public, and three resulting from unauthorized contact by members of the public), and 52 required professional care (38 injuries to owners, 16 to family members and employees, four resulting from authorized contact by members of the public, and four resulting from unauthorized contact by members of the public). Sixty-two escapes were reported.

These data and conclusions are interesting and deserve further scrutiny. First, they suggest that injuries, including those that require medical attention, are probably more common than would be suggested by our review of mass media reports. Second, while most injuries were to owners, a sizeable number of victims were family members or the public. Third, escapes clearly do happen, which implies a potential risk to the public of attack by large felids kept as pets.

Although the FCF study was not limited to tigers, it confirms our observations that private owners and keepers of large cats in captivity are most at risk of injury, but visitors and the public also face risks from contact with large felines.

The FCF study also had some serious limitations. For example, the data were not collected from a random sample of respondents and likely self-selects for

individuals predisposed to answering such a survey—those private owners who take their responsibilities seriously, follow legal regulations, and have permits. The study recorded no fatal injuries, and thus the authors concluded that the risk of fatal injury from captive husbandry of nondomestic cats is less than $1.9\text{E-}4$ per cat year exposure.

According to data available from the CDC, in 1995–1998, 401 deaths were reported for all types of animal bites and stings. Using aggregated population estimates, this is a crude rate of 0.04 bite and sting deaths per 100,000. As a comparison, from 1979 through 1988, dog attacks claimed at least 15 lives annually in the United States (pit bull breeds were responsible for 41.6% of these deaths) [Sacks et al., 1996]. From 1989 to 1994, dogs were responsible for 109 deaths, an estimated 7.1 deaths per 100 million people per year [Sacks et al., 1996]. While the total number of dog-related fatalities is greater than the number of fatal tiger attacks, these numbers hide the fact that an estimated 35% of American households owned an estimated 52 million dogs in 1994 [Sacks et al., 1996]. The CDC recently estimated that 4.5 million Americans are bitten by dogs annually, almost half of whom are children under age 12 [Mitka, 2001]. Approximately 334,000 people are treated in emergency rooms, and another 466,000 are treated for dog bites in other medical settings [Mitka, 2001].

If the ratio of animals to fatal attacks is compared, tigers are considerably more dangerous than dogs. Using the 1994 figure of 52 million dogs in private ownership [Sacks et al., 1996], and an annualized rate of fatal attacks of 18 deaths per year, fatal dog attacks occur at a rate of 0.000000346 ($3.46154\text{E-}07$) fatal attacks/year/total population of dogs. Fatal tiger attacks (1.75/year) occur at a rate of 0.00025 (assuming 7,000 tigers) to 0.000125 (assuming 14,000 tigers) fatal attacks/year/total population of tigers, a rate that is orders of magnitude greater than that for dogs. In other words, adjusting for the vastly greater number of dogs in private ownership, tigers are 360–720 times more likely to be involved in a fatal attack than dogs. This is significant because dog attacks have already prompted widespread efforts to enact dangerous-dog laws and efforts to adopt restrictions on certain breeds.

CONCLUSIONS

1. Tigers are dangerous animals that retain their wild instincts, and they must be treated with extreme caution. The large (and possibly growing) number of people who own tigers is a cause for concern.

2. This study shows the significant danger posed by captive tigers, even when they are cared for by professionals and held in facilities that take all required safety precautions. The risk of tigers causing human injury or death is highest when this risk is underestimated, such as when tigers are kept as pets, used as a prop for photographs, or people come in direct contact with them to feed, clean cages, or pet them—with or without a cage separating people and tigers.

3. A growing number of states regulate the private possession of exotic animals. We suggest that effective federal legislation is needed to reduce the risks posed by tigers to people, and to encourage the safe and humane treatment of tigers and, ultimately, other dangerous exotic animals. As an alternative, individual states should be encouraged to take similar measures until such federal legislation can be

enacted, but it is unclear whether such a fractured approach will lead to real change in many of the states with the greatest problems. We also support efforts by the AZA, APHIS, and other institutions to educate the public about why wild animals do not make good pets, and to encourage and enforce the highest ethical guidelines for animal care.

4. We are concerned that insufficient attention has been given to this matter. It is likely that more tigers live in captivity than in the wild, yet there is little discussion in the scientific literature regarding the implications of this trend for tiger conservation and welfare, and public health and safety. We hope this study will encourage additional studies and further discussion about the management of tigers, as well as other dangerous animals, in captivity.

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