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Captive Ocelots at Trinidad's Emperor Valley Zoo: Retrospective and Suggested Management

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ABSTRACT

To facilitate research and conservation of ocelots (Leopardus pardalis) in Trinidad, data was compiled in January 2014 and April 2015 on previous and current individuals housed at the Emperor Valley Zoo in Port of Spain as well as on maintenance and housing conditions. Historical records (genetic, spatial and temporal) had been destroyed by water, but interviews with zoo managers and employees produced considerable data. Ocelot breeding at the zoo is currently unmanaged because of a lack of staff. The genetics and geographic origin of the current housed ocelots is unknown. It is suggested that a structured breeding programme would maximise the breeding success of the current population at the zoo. This way the viability of the captive ocelots would be enhanced by increased genetic diversity obtained through additions of confiscated or accidentally trapped ocelots. Several captive breeding strategies are suggested to increase the success of ocelot breeding and survival of kittens either for release into the wild or for display animals in the zoo.

Key words: Captive breeding, conservation.

INTRODUCTION

The ocelot (*Leopardus pardalis)* is a medium-sized felid (7.0-15.8kg) that ranges from the southern United States (Arizona, New Mexico and Texas) throughout Central and South America, excluding coastal areas. They also range along the Pacific Coast south of Ecuador and all of South America (Murray and Gardner 1997; González *et al*. 2003). Ocelots inhabit a variety of habitats, from moist tropical forests to drier scrublands (Navarro 1993; Eizirik *et al.* 1998; Ahumada-Carrillo *et al.* 2013). Ocelots are solitary and require vast expanses of habitat and home ranges for feeding as well as defendable territory for breeding. Average home ranges are approximately 26.09±7.33 km^2, with the home ranges being slightly larger for males than females (Dillon and Kelly 2008). They are nocturnal, resorting to concealment in trees or dense bush in the daytime (Nowell and Jackson 1996). Mothers provide continual care for their offspring for three months, after which the family leaves the den so the young can learn hunting skills (Zerinskas and Pollio 2013).

Populations of large felids such as jaguars, lions and leopards have been severely reduced by humans throughout the ranges of the species (Inskip and Zimmermann 2009; Khan 2008); however, populations of smaller species of felids such as the ocelot are also at risk because the pelts and fur are highly prized (Khan 2008). Among the spotted cats, from the early 1960s to mid-1970s the ocelot was most heavily exploited internationally for its pelts (Nowell and Jackson 1996).

Ocelots formerly ranged throughout Trinidad and Tobago (Nelson 2004). They were extirpated from Tobago at around the eighteenth century (Rooks 2014). They still range throughout Trinidad (Nelson 2004) but are considered rare and threatened, and their populations are decreasing (EMA 2004) because of habitat loss and fragmentation and by hunting and trapping for the pet trade (Rooks 2014).

Except for Nelson (2004), little is known about current natural breeding populations of ocelots in Trinidad. This lack of information raises conservation concerns. Zoos traditionally are used as *ex situ* stores of genetic information, serving to maintain breeding populations or simply to preserve species whose existence is threatened (Swanson *et al*. 2003). In Trinidad, the Emperor Valley Zoo (EVZ) in Port of Spain serves those functions, hosting a population of ocelots that possibly originated in Trinidad. The EVZ, founded in 1947, contains exhibits that spread over 7.2 acres (ZSTT Inc. 2009) and includes several ocelot displays. To facilitate research on ocelots in Trinidad, especially in regard to maintenance of genetic diversity, we assayed the current status of the population of captive ocelots at the EVZ.

METHODOLOGY

Information about the status of ocelots at the EVZ was obtained by interviewing senior zoo managers and staff and by reviewing the limited data available about previous and

current ocelots at the EVZ. Data sought for each animal (whether caught in the wild, confiscated or captive-born) included gender and origin, length of time of each individual in captivity (births and deaths) as well as historical captive breeding successes. Characteristics of each of the ocelot exhibits (four exhibits - display and two housing enclosures - concrete) were noted, along with presence/number of cage mates (or ocelots only) in each enclosure.

RESULTS

Currently there are no physical data records (soft or hard copies) regarding ocelots at the EVZ because in the 1990s water destroyed the historical records of ocelots and other animals housed there. Ocelots have been housed at the EVZ for more than 25 years, with some individuals having survived 15 years in captivity (R. Wallace [EVZ Assistant Curator] and N. Biptah [Curator] pers. comm.). Information obtained from staff at the EVZ indicates that the maximum number of ocelots housed at the EVZ at any time was 10. However, staff considers the EVZ to have the capacity to house as many as 16 ocelots, depending upon their interactions with each other (inclusive of the Brigand Hill Animal Rehabilitation Keep) (BH ARK) - a sister facility to the EVZ (established late 2009).

As of January 2014, the EVZ hosts nine ocelots (four males and five females) (Table 1) housed in six enclosures (four display enclosures all fenced with habitat enrichment using vegetation, as well as two concrete enclosures). In April 2015, changes were noted as indicated in Table 1.

Up until January 2014, nine ocelots were housed at the EVZ for 4-15 years, (three males and six females) with all six females having been housed the longest. The two females housed together were confiscated from Maraval, and are thought to be sisters although no genetic tests have been conducted to confirm their relationship, and their place of origin is unknown (suspected from Venezuela

Table 1. Ocelot housing and historical data.

Enclosure	No. of Ocelots	Sex	Enclosure Type	Source	Housed	Comments	Data Collection Date
1	1	♂	concrete	confiscated	EVZ	Chaguanas	Jan. 2014
2	1	♀	concrete	trapped	EVZ	Bobtail	Jan. 2014
3	2	1♂, 1♀	display	trapped	EVZ	Reproductive	Jan. 2014
4	2	1♂, 1♀	display	trapped	EVZ	Non-reproductive	Jan. 2014
5	2	♀	display	confiscated	EVZ	Maraval[1]	Jan. 2014
6	1	♀	display	born at zoo	EVZ	Patches	Jan. 2014
1	1	♀	concrete	confiscated	EVZ	Temporarily housed for observation	Apr. 2015
2	1	♀	concrete	trapped	EVZ	Bobtail	Apr. 2015
3	1	♂	display	confiscated	EVZ	Chaguanas	Apr. 2015
4	1	♂	display	trapped	EVZ	Change in reproductive status[2]	Apr. 2015
5	2	♀	display	confiscated	EVZ	Maraval[1]	Apr. 2015
6	1	♀	display	born at zoo	EVZ	Patches	Apr. 2015
7	2	1♂, 1♀	caged	trapped	BH ARK	Replacement[3]	Apr. 2015

EVZ = Emperor Valley Zoo
BH ARK = Brigand Hill Animal Rehabilitation Keep
display = fenced display with vegetated habitat enrichment
caged = caged with vegetated enrichment
1. Confiscated from Maraval but possibly not from Trinidad
2. Male and female previously non-reproductive, separated because of suspected pregnancy, female moved to enclosure 1 for observation
3. The male (trapped) that was previously reproductive, female died, replacement female

based on size and colouration, which are larger and spotted differently - pers. comm. N. Biptah, Curator EVZ).

The reproductive pair housed together in the display enclosure reproduced regularly (approximately every two to three years).

Survival of kittens has been low (deaths within a few weeks of birth), however there have been at least three surviving cubs born at EVZ. These include twin births within the last decade. One female (Patches) born at EVZ was the last survivor of this reproductive pair (approximately seven years old) and she is housed alone (Table 1).

One of the two males housed in the concrete enclosure was confiscated from a private owner in Chaguanas; its origin is also unknown. The trapped female housed in a concrete enclosure (Bobtail) has been alone for quite some time since she does not interact well with other ocelots.

In April 2015, the number of ocelots housed at EVZ was seven (two males and five females) and two housed at BH ARK (one male and one female). The male from the reproductive pair (previously housed together for 15 years) was moved from EVZ to BH ARK since the female passed away within the last year due to old age (pers. comm. B. Ragubir-Waldropt and D. Charleaux, Zookeeper 3). The current female housed with this male was recently trapped by a hunter from Central Trinidad in agricultural lands in Freeport. However, the previously non-reproductive pair reported in January 2014 (housed together for the last decade) recently mated and the female has since been isolated for observation for pregnancy status in a separate concrete enclosure.

Ocelots not housed at the EVZ or BH ARK are released into the wild. At least three releases into the Arima Valley have been conducted within the last decade (pers. comm. N. Biptah, Curator).

These releases have been rehabilitated, captured ocelots. However, these wild releases were not at the capture sites.

DISCUSSION

Globally, the biology and status of many species of wild felids are mostly unknown, especially regarding smaller felids such as the ocelot (Morais *et al.* 2002). Ocelot conservation and recovery plans are important for the continued survival of the species. One of the most effective recovery scenarios for wild ocelots is protection and restoration of their habitat (Haines *et al.* 2006). Additional strategies, such as propagation of captives, also are highly recommended for conservation of rare and endangered species such as the ocelot (Wielebnowski 1998). Management practices for captive ocelots should include considerations for territorial requirements, intraspecific interactions, reproductive behaviour, and parental care (Wielebnowski 1998).

The presence of breeding pairs (within the last decade and current) is an indication of the potential for establishing a successful ocelot breeding programme. At this time, a lack of human resources at the EVZ precludes management of captive breeding of ocelots; only maintenance of individuals is performed. Although the breeding pairs produce offspring, a structured breeding programme cannot be initiated with them because of lack of information about their genetic diversity and pedigree. Within the last year (2014-2015), only one female has been added to the EVZ collection.

The EVZ is not alone in being challenged in these areas. A basic requirement for establishing a successful captive breeding programme is knowing the biology and reproductive traits of the species (Swanson *et al.* 2003). *In situ* ocelot management is difficult because the species is extremely elusive and thus difficult to study; hence the lack of adequate distribution and population data for Trinidad. In the USA and South America, captive breeding of ocelots is hindered by diminished genetic variation, lack of basic biological data on reproduction and behaviour, and improper husbandry conditions (Morais *et al.* 2002). In South American zoos, success rates of captive breeding programmes of felid species are notoriously low. In studies done by Swanson *et al.* 2003, it was found that most felids (>95%) in the surveys conducted were of wild-born origin, and <20% of these had subsequently produced offspring in captivity as a result of low birth numbers (usually only 1-2 kittens per litter) as well as low sperm counts and presence of abnormal sperm in males (Morais *et al.* 2002; Swanson *et al.* 2003).

Inbreeding depressions such as physiological deformities and expression of deleterious genes are always possible in captive populations; however, with the addition of confiscated and wild ocelots to those already at the EVZ, increases in overall genetic variation might produce increases in the number of viable offspring annually.

Although ocelots are considered to be among the smaller felids, compared to their larger relatives such as jaguars and leopards, they nevertheless require large territories. Lacking the proper mental and ecological stimulation, many captive, wild-caught felids express signs of cage stereotypy such as pacing, which is a sign of ill mental health and which can lead to a decrease in biological and reproductive health (Mason 2006). This behaviour was not observed in any of the ocelots at the EVZ; however, pacing was displayed by a jaguarundi (*Herpailurus yagouaroundi*), another species of small felid, in an enclosure at the EVZ, suggesting that the potential exists for cage stereotypy to occur in ocelots housed in similar enclosures.

Captive breeding of ocelots at the EVZ to maintain a

population should be continued so there would be no need to extract individuals from the wild for display. In addition, a structured captive breeding programme geared towards periodic releases of ocelot offspring into the wild in Trinidad would be a worthwhile conservation goal, providing pedigree and opportunistic additional stock was available (such as confiscated individuals).

To achieve this, the EVZ would need to train staff in proper handling techniques for ocelots targeted for release into the wild. A collaborative effort would be needed among the EVZ, biologists, NGOs, local citizens, and hunters. Moreover, breeding of ocelots intended for reintroduction into the wild should be considered only after baseline surveys of ocelot populations have been conducted to determine which regions of Trinidad could support additions to the existing populations of this apex predator. Management prior to breeding must include determination of the genetic pedigree of each ocelot to avoid potential inbreeding depression.

Confiscated ocelots whose areas of origin in Trinidad are known should be rehabilitated and released into their area of origin as soon as possible. Conflicts may arise if these areas are heavily hunted or impacted by agriculture. This supports the need for genetic mapping of populations within Trinidad to determine suitable release areas where genetic integrity can be maintained without human-wildlife conflicts.

Conservation efforts should be geared towards basic and applied studies of ocelot reproduction at the EVZ, with adequate records being kept of numbers and histories of resident ocelots. A systematic inventory programme should be initiated at the EVZ, compiling information on captive populations and relaying that information to other facilities housing similar animals. In this manner, through research on their captive ocelots, the EVZ could contribute significantly to ocelot conservation globally while amassing baseline data on the genetics and biology of ocelots in Trinidad. By doing so, the EVZ would also serve as an "ark" for ocelot survival, providing an opportunity for establishing self-sustaining captive populations to be used for reintroduction into the wild in the future (Wielebnowski 1998), if the genetic pedigree is deemed suitable.

Regarding physical management of ocelots at the EVZ, a number of different approaches could be considered. Ocelots currently are maintained for display and interactive purposes. We suggest managing housing for a variety of purposes: display, interaction, public display (breeding pairs), not for public display (breeding pairs), and eventually captive-bred offspring for release into the wild. Breeding pairs whose offspring are targeted for release into the wild should be housed in separate enclosures, and human contact with them should be kept to a minimum. The offspring should be able to hunt on their own and develop an appropriate fear of humans to reduce the risk of future undesirable human-wildlife conflicts (Zerinskas and Pollio 2013). To prevent improper filial and sexual imprinting, by the age of three months ocelot kittens should begin learning to hunt, with the goal of future release into the wild. This strategy has been successful with other felid species such as tigers and cheetahs (Wielebnowski 1998). Unless these 'educating for release' strategies are to be employed, breeding of ocelots for release into the wild should not be considered at the EVZ.

The EVZ should also maintain records of tag and DNA data for all captive and released ocelots for monitoring, evaluation of success, and managing pedigree. This strategy should be extended to ocelots in other private collections in Trinidad as well as to ocelots trapped in the wild to provide data on the genetic history of ocelots in Trinidad. Several breeding strategies are useful in minimising the occurrence of inbreeding depression. Van Oosterhout *et al.* (2007) suggested that reduced levels of immunogenetic variation caused by inbreeding and lack of exposure to natural parasites may increase susceptibility of captive-bred individuals to infectious diseases. The threat of disease outbreak is particularly high when naive captive-bred hosts are released into wild populations (Van Oosterhout *et al.* 2007). Susceptible captive-bred ocelots could facilitate transmission of parasites throughout a wild population, initiating an epidemic of a pathogen such as the fungus *Aspergillus fumigatus*, which was diagnosed to be infecting an ocelot with chronic rhinitis at the EVZ (De Gannes *et al.* 2013). A risk such as this could potentially be reduced by exposure of captive ocelots to wild environments before their release to allow them to develop antibodies.

In conclusion, the EVZ should establish a breeding programme for ocelots as outlined above, in a structured manner, with detailed recording of pedigree and spatial distribution of ocelots in Trinidad.

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