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Conservation Biology

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20 February 2014

Leopardus Tigrinus

Description: The *Leopardus tigrinus* is one of the smallest wild cats in South America; and the smallest cat in Brazil (Oliveira-Santos et al. 2012). *L. tigrinus* is roughly the size of a domestic house cat, with its weight ranging from 1.8-3.4 kg (Silva-Pereira 2010). The average body length is 710 millimeters and the cat's tail is roughly one-third of its body length averaging 250 millimeters in length. Males tend to be slightly larger than the females (Gardner 1971). The species' coat is of a yellowish-brown or ochre coloration patterned prominently with open rosettes (Trigo et al. 2013). Cases of melanism, or dark pigmentation, have been reported but are not as common (Oliveira-Santos et al 2012). These characteristics spots are what give the *L. tigrinus* its common names of little spotted cat, little tiger cat, tigrina, tigrillo, and oncilla. The names tigrillo, little tiger cat, and little spotted cat are sometimes used interchangeably with other small Neotropical cats species which can lead to confusion. The species is closely related to other feline species with overlapping habitat areas and similar colorations; namely, the ocelot, *Leopardus pardalis*, the margay, *Leopardus weidii*, Geoffroy's cat, *Leopardus geoffroyi*, and the pampas cat, *Leopardus colocolo* (Trigo et al. 2013).

Distribution: The *L. tigrinus* is reported to have a wide distribution from as far north as Costa Rica to as far south as Northern Argentina. However, its exact distribution is still under

study, as there have been few reports of occurrences in Central America. The majority of the recorded observation shows it to occupy the northern countries of South America, primarily Brazil as illustrated in Figure 1 (Trigo et al. 2013). The species occurs at a very low density throughout its distribution, especially when in areas with other wild cat species (Oliveira-Santos 2012). There has been shown to be a clear connection to *L. tigrinus* abundance in an area in relationship to *L. pardalis*, ocelot, abundance. Actual population estimates are difficult to find and vary greatly, most likely because the species is so rare. Numbers found estimating the species density range from 1-5 individuals per 100 kilometers squared. Although in dense Amazon forests that rate drops to 0.01/100km² and in areas without or with low ocelot populations the rate rises to 5-20 /100km² (de Oliveira et al. 2013) . Additionally, the *L. tigrinus* is known to be able to adapt and survive in a wide variety of habitats. In northeastern Brazil it occurs in tropical savannah and dry scrublands (Trigo et al. 2013). In other areas of its range it occupies lowland natural grasslands, Araucaria pine forests, as well as denser montane forests at low elevations (Silva-Pereira et al. 2010)(Oliveira-Santos et al. 2010). In Central America, though, the *L. tigrinus* is predominantly found in denser, cloud forests at higher elevations (de Oliveira et al. 2013). Studies also show that the *L. tigrinus* is able to adapt to many degraded areas affected by human activity than other Neotropical cats; for instance, it has been found in fragments of highly degraded Atlantic forests in South Brazil where density was much lower for larger felids (Oliveira-Santos 2012).

Figure 1: Distribution of *L. tigrinus* depicted in red. (Trigo et al. 2013)



Ecology: Furthermore, the species is an adept climber but spends most of its time terrestrially and is primarily a solitary creature. The *L. tigrinus* shares a similar diet to other small wild cats which overlap in areas of its distribution, namely the ocelot and margay. They share the primary prey of cricetid rodents, but also have been shown to feed on other small mammals, small birds, and lizards. They also occasionally eat small amounts of grasses or vegetation (Silva-Pereira et al. 2010). However, there are some differences between species diets in that the *L. tigrinus* does not consume larger mammals, over 1000g, and tends to have more birds in its diet (Wang 2002). There have been some studies on the complex niche-overlap of these feline species showing that the abundance of cricetid rodents is key to allowing the species to coexist. The studies on overlapping diets have also illustrated that the *L. tigrinus* is the subordinate species which hunts opportunistically and avoids conflict with larger cats (Silva-Pereira et al. 2010). The competitive relationship between the cats is also seen in its behavior.

In areas with no other cats, the *L. tigrinus* was completely nocturnal. However, when larger cats, like the ocelot or margay which are strictly nocturnal, are in the same area with the oncilla it becomes cathemeral (Oliveira-Santos 2012). Cathemeral meaning it has sporadic activity during day and night with its most active period in the morning. Also, as previously discussed, the species is found more abundant in degraded or anthropogenically affected areas where larger cats, mainly ocelots, do not thrive. This illustrates that the *L. tigrinus* may benefit from competitive release due to human impacts on its habitat (Di Bitetti et al. 2010).

Reproduction: Most studies on the *L. tigrinus* focus on its diet or relationship with other Neotropical felines, but not much is known about its behavior in the wild or wild breeding habits. In captivity, facilities in Brazil study the reproductive cycles of the oncilla in captivity as well as experiment with aiding reproduction with artificial insemination, embryo cryopreservation and in vitro fertilization. Studies in captivity show that males kept alone or in a breeding pair instead of a group increased reproduction rates. This is consistent with the *L. tigrinus* solitary nature reported in the wild. Males are most likely able to reproduce year round in the most southern distribution, as there was found to be a peak in reproduction in summer months or warmer weather. Females have several estrous cycles in a breeding season and also show the ability to reproduce, ovulate, year-round at more southern distributions. Additionally, these studies have shown that small cats, like the *L. tigrinus*, are more stress prone in captivity which strongly affects their reproductive ability (Swanson 2004).

Taxonomy: The *L. tigrinus* is one of seven spotted cats in Latin America which is a descendant of the ocelot lineage (Swanson 2004). Until recently the oncilla had four subspecies; the *L. tigrinus guttulus*, *L. tigrinus oncilla*, *L. tigrinus tigrinus*, and *L. tigrinus pardinoides* (“Catalogue of Life”). As of research in 2013, the *L. tigrinus guttulus* was classified as its own

separate species: *Leopardus guttulus*. The *L. guttulus* occupies south and southeastern Brazil and is so isolated from other populations of *L. tigrinus* of more northern and central Brazil that there has been no current or even recent past gene flow between the populations. Genetically they are different species but there few noted physical difference between the two; only a noticed trend of a lighter pelt and usually smaller rosettes of the *L. tigrinus* (Trigo et al. 2013). There are also indications that the populations in Costa Rica may have been isolated from populations in Brazil for 3.7 million years and may also be a separate species. However, there is not enough research or information currently to confirm that claim (de Oliveira et al. 2013). Additionally, there is evidence of hybridization of the *L. tigrinus* with Geoffroy's cat, *L. geoffroyi*, where they overlap in southern Brazil and the pampas cat, *L. colocolo*, in areas of habitat overlap in central Brazil (Trigo et al. 2013). This new data shows the lack of detailed knowledge about the history and genetic makeup of the Neotropical cats. As well as presenting more conservation challenges for a new species and understanding the complex genetic flows of three different species.

Status: As of 2008 the *L. tigrinus* was listed as vulnerable by the International Union of Conservation of Nature. It has also been declared a vulnerable species by Argentina, Brazil, and Columbia independently. The species populations are declining and its overall population is projected to decline by 30% over the next 18 years mostly due to habitat loss (de Oliveira et al. 2013).

Threats: The *L. tigrinus* population was greatly reduced with the massive fur trade in the 1970's and 80's. Although the international fur trade has been outlawed, local hunting and illegal fur trade and pet trade still affect its populations. The biggest threat to the species is habitat loss and fragmentation due to human development. The creation of wood and pulp plantations, pastures, roads, housing, ranching, and mining all either fragment or degrade habitat

at an increasing rate (de Oliveira et al. 2013). Human populations are also growing in *L. tigrinus* native habitat and so is human resource consumption (Swanson 2004). So the problem of habitat loss more than ever continues to negatively impact the oncilla. Another aspect of this issue is the competitive relationship of the Neotropical felines. As larger cats need more pristine habitat, and *L. tigrinus* is more abundant in areas with fewer large cats; it is more abundant in these degraded areas often with less conservation protection and more poaching (Di Bitetti et al. 2010).

Conservation: Conservation efforts of this species at this time are relatively few. Some land is protected in parts of its habitat that overlap with other protected wild cat species. However, as illustrated before, the *L. tigrinus* is often more abundant outside of these protected zones as a result of the presence of large cats. Hunting the species is also prohibited in all of the countries where it occurs, but this is largely difficult to enforce completely (de Oliveira et al. 2013). Some ex situ conservation is being attempted in primarily Mexico and Brazil. Organizations like the Sao Paulo Zoo and Mata Ciliar focus on organizing captive breeding and genetic management of many wild cats including the *L. tigrinus*. However, there is still a lot of research and training being done to make these programs more effective (Swanson 2004). There is an overall lack of information and research about the *L. tigrinus*'s reproduction and behavior in the wild. As illustrated by the discovery of a second species, there is also a lack of information surrounding its evolutionary history. In addition there is a need for understanding its future genetic path as hybridization occurs between the *L. geoffroy* and *L. colocolo*. So much more needs to be learned to adequately protect and conserve the *Leopardus tigrinus*.

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