

Coolidge
Prionailurus rubiginosus

Conservation Management Plan to Increase Population Numbers of the rusty-spotted cat
(*Prionailurus rubiginosus*) in India and Sri Lanka



The rusty-spotted cat (*Prionailurus rubiginosus*)

Prepared For:

Paul Smiths College
Wildlife Management Class
Spring, 2019

Prepared By:

Benjamin Coolidge
Paul Smiths College
Senior, Fisheries and Wildlife Science

A paper submitted in partial fulfillment of the requirements for the degree of Bachelor of Science
in Fisheries and Wildlife Sciences – Wildlife concentration at Paul Smith's College



Coolidge

Prionailurus rubiginosus

EXECUTIVE SUMMARY

Rusty-spotted cats (*Prionailurus rubiginosus*) are one of the smallest cats in the world. They are distributed in select parts of India and Sri Lanka. The International Union for Conservation of Nature (IUCN) Red List considers rusty-spotted cats to be near threatened. They can be found in moist, deciduous forests, especially during the dry season. Their diet consists of mostly small mammals, but they have been known to prey upon birds and amphibians as well. Rusty-spotted cats have a voracious appetite and fast metabolism that has resulted in them being called the hummingbirds of the felid family. Ecological concerns involving rusty-spotted cats include anthropogenic factors like deforestation and roadways passing through their habitat. Sociocultural and economic factors affecting populations of rusty-spotted cats include poaching due to livestock kills and hunting for bushmeat. This management plan focuses on rusty-spotted cat populations in areas that are anthropogenically impacted. The goal of this management plan is to gain a better understanding of the status of rusty-spotted cat populations and natural history, as well as to increase population numbers of rusty-spotted cats in India and Sri Lanka by increasing survival rates in rusty-spotted cats over the age of 1 year. The objectives of this goal are to increase annual survival rates of rusty-spotted cats by 10% by 2039 and reduce rusty-spotted cat habitat degradation by 30% by 2029. Populations of rusty-spotted cats thrive in pristine habitats that have no human impacts. To properly manage for this species, areas need to be protected in order to ensure that the rusty-spotted cat will continue to have suitable forest habitat to live and reproduce in.

Coolidge

Prionailurus rubiginosus

ACKNOWLEDGEMENTS

I would like to thank Dr. Ross Conover for the guidance he has provided, as well as my peers in Wildlife Management for all the suggestions on how I could improve. I would also like to thank my other professors who have helped me to gain the knowledge I required for the completion of this plan along with my bachelor's degree in Fisheries and Wildlife Science at Paul Smiths College. Lastly, I would like to thank my family for their continual love and support. I couldn't have done it without them. Thank you all so much!

Coolidge
Prionailurus rubiginosus

TABLE OF CONTENTS

<i>Executive Summary</i>	2
<i>Acknowledgements</i>	3
<i>History</i>	5
<i>Natural History</i>	5
Species Identification	5
Breeding	5
Diet	6
Habitat.....	7
Disease.....	8
Distribution	8
<i>Conservation Needs</i>	9
Ecological	9
Sociocultural and Economic	9
Legal	10
Statement of Need	10
<i>Management</i>	10
Goals and Objectives	10
Actions	11
<i>Conclusion</i>	16
<i>Literature Cited</i>	17
<i>Appendix A</i>	19
<i>Appendix B</i>	22

Coolidge

Prionailurus rubiginosus

HISTORY

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2016) lists the rusty-spotted cat (*Prionailurus rubiginosus*) as near-threatened. The IUCN acknowledges that rusty-spotted cat populations are declining, and they have listed threats concerning the cats. There are no restoration plans in place, however, the IUCN acknowledges that conservation actions and further research is needed (Miththapala 2006).

There is little known about the rusty-spotted cat. It resides in India and Sri Lanka, but information on distribution is lacking. There is not accurate data on population densities, but it is regarded as an extremely rare cat (Miththapala 2006). For the purpose of this management plan, surrogate species will be used to determine the best ways in which rusty-spotted cats can be managed for.

NATURAL HISTORY

Species Identification

Rusty-spotted cats are regarded as one of the smallest cats in the world, weighing in at a mean of one kilogram for females and 1.5 kilograms for males. On average, females are measured at 370mm. They resemble a small domestic house cat (*Felis catus*). Their coats are described as a russet color with rust colored patches along the body and stripes on the face (Figure 4) (Miththapala 2006).

Reproduction

A study on rusty-spotted cats bred in captivity revealed that sexual maturity is reached within one year of birth. Average size of litters is between one and three individuals. Gestation was recorded to be between 67 and 71 days (Dmock 1997). For the purpose of this plan,

Coolidge

Prionailurus rubiginosus

population models were run in order to determine which life stages are most vulnerable and which stages are most important for reproduction. Life stages were broken into five categories (1-4 months, 4-12 months, 1-2 years, 2-3 years, and 3+ years). Reproduction in rusty-spotted cats only occurs within age classes 3, 4, and 5 (Figure 1). The population model revealed that age class 5 (3+ years) is most important for reproduction (Table 1). This management plan will focus on increasing survival rates in age class 5. By doing so, survival rates in all other age classes is expected to increase as well.

Diet

Rusty-spotted cats (*Prionailurus rubiginosus*) have been called the hummingbirds of the felid family because of their fast metabolisms and voracious appetites. They eat 6% of their body weight daily (Miththapala 2006). They consume birds, small mammals, domestic ducks and poultry, and sometimes frogs and other amphibians. There is limited data on diet preference for rusty-spotted cats, but a study done by Rajaratnam et al. shows prey selective preferences of leopard cats (*Prionailurus bengalensis borneoensis*), a close relative of rusty-spotted cats. In the study, 72 scat specimens from leopard cats were examined. The study found that the leopard cats had consumed 14 prey species composed of small mammals, rodents, birds, and amphibians, but 97.2% of prey remains found in scat belonged to small mammals, specifically rodents. This was expected because rodents dominate the small mammal communities in tropical rain-forests. The paper stated that highly opportunistic diets like that of the leopard cat holds true for most tropical rain-forest felids (Rajaratnam et al. 2007). We can use this data to deduce that rusty-spotted cats would have similar diets, but that they might exploit a wide variety of prey depending on habitat and prey selection.

Coolidge

Prionailurus rubiginosus

Rusty-spotted cats have been documented most frequently relating to moist, deciduous forests (Miththapala 2006). This may be due to the high abundance of rodents in these forests. During the dry seasons, rusty-spotted cats relate more intensely to rainforests, and we can surmise that this may have something to do with the small mammal populations also relating more intensely to rainforests during dry seasons. Human impacts, such as deforestation, would decrease the amount of areas that would hold abundant populations of small mammals, and therefore could potentially decrease populations of rusty-spotted cats (Miththapala 2006).

Habitat

Rusty-spotted cats are found in moist deciduous forests (Miththapala 2006), especially during dry seasons (Kalle et al. 2014). They are also found in scrub forests and grasslands. In Sri Lanka specifically, they are found anywhere with forest cover (Miththapala 2006).

Rajaratnam et al. radio-collared leopard cats to determine what forest type was most related to by the cats. The leopard cats occupied forest types that were conducive to capturing prey. These areas were shown to have a lesser abundance of prey than other forest types examined, but the predation success rate for leopard cats was greatest in these areas, meaning that leopard cats favor high catchability rates over prey density (Rajaratnam et al. 2007). Leopard cats in the same study selected forest types that had greater amounts of cover when resting and breeding. We can assume that rusty-spotted cats would have similar behaviors when selecting forest types that are most favorable to predation success, as well as areas for rest and reproduction. From these results, we can learn how human impacts such as deforestation can be detrimental to both areas in which rusty-spotted cats hunt, and areas where they reproduce.

Coolidge

Prionailurus rubiginosus

Disease

In 1996, Rudiger Dmoch studied a group of rusty-spotted cats that had been captively bred in the Frankfurt Zoo. He determined that rusty-spotted cats are not very susceptible to disease (Dmoch 1996). Unfortunately, there is limited data on diseases in populations of wild rusty-spotted cats. One concern, however, is that diseases could be transferred from domestic and feral cats to populations of wild cats such as the rusty-spotted cat. Feline Immunodeficiency Virus is one of the diseases in question. Nishimura et al. found in their 1999 study that FIV was transferred to Tshushima leopard cats from domestic cats (Nishimura et al. 1999). FIV is a pathogen that causes immunodeficiency and is not unlike AIDS in humans. Infected felines usually don't live past five years since acquiring the virus (Barr et al. 1989). Tshushima leopard cats are relatives of the rusty-spotted cat, and therefore we can assume that rusty-spotted cats are at risk for a similar transmission. With this knowledge, we can better manage for rusty-spotted cats by determining a way to decrease the chances of an intra-species disease transmission between domestic or feral cats and the rusty-spotted cat by decreasing chances of the two groups having contact.

Distribution

The rusty-spotted cat has a very limited geographic distribution. They are located in India, more specifically a small, isolated area of north India known as the Kashmir region, and southern India. There are reports of rusty-spotted cats in the Panna National Park in Central India. They have also been documented in Sri Lanka (Figure 5) (Miththapala 2006).

Coolidge

Prionailurus rubiginosus

CONSERVATION NEEDS

Ecological

Habitat degradation is a major concern for rusty-spotted cats. Alterations such as road networks are assumed to be partially responsible for the ever-declining populations of this species due to numerous carcasses found dead on or near roads. Feral dogs are beginning to become more of a problem for populations of rusty-spotted cats (Miththapala 2006). Hybridization with domestic cats is also a concern (Nayak et al. 2017). Cross-breeding would be detrimental to the integrity of rusty-spotted cat genetics because it would create a smaller gene pool (Miththapala 2006). Intra-species competition is also a concern, although further research is recommended (Miththapala 2006).

Sociocultural and Economic

Rusty-spotted cats are killed not only for their flesh, but also because they are sometimes mistaken for leopard cubs (Miththapala 2006). A study was done in the Western Ghats of India that shows leopard cat (*Prionailurus bengalensis*) population densities being lower in areas such as agricultural plots and other areas impacted by humans. Camera surveys suggested that rusty-spotted cats are sympatric with leopard cats, leading us to believe that things like agriculture have impacted rusty-spotted cat populations (Srivathsa et al. 2015). Rusty-spotted cats have also been known to prey on domestic ducks and poultry, which in turn costs the farmers valuable profit and leads to retaliation hunting (Rajaratnam et al. 2007).

Coolidge

Prionailurus rubiginosus

Legal

The trade of rusty-spotted cats in India is prohibited. In Sri Lanka, the cats are considered highly threatened and are therefore highly protected (Miththapala 2006). This being said, poaching of rusty-spotted cats is still an issue and needs to be addressed if proper management is to be applied.

STATEMENT OF NEED

The need for rusty-spotted cat management involves addressing all economic, sociocultural, and ecological issues that pose threats to this species. They are listed as near-threatened on The International Union for Conservation of Nature (IUCN) Red List of Threatened Species, and without proper management, will soon be listed as threatened (Miththapala 2006). Populations of rusty-spotted cats are declining due to habitat degradation, competition, hunting pressure (Miththapala 2006), and hybridization (Nayak et al. 2017). Actions need to be taken in India and Sri Lanka to ensure that this species is no longer ignored, further research is performed, and management is put into place to prevent further population decline.

MANAGEMENT

Goals and Objectives

Goal: Increase populations of rusty-spotted cats in India and Sri Lanka within the next 20 years to a sustainable population.

Objective 1- Increase annual survival rates of rusty-spotted cats by 10% by 2039

Objective 2- Reduce habitat degradation of the rusty-spotted cat by 30% by 2029.

Coolidge

Prionailurus rubiginosus

Actions

Objective 1- Increase annual survival rates of rusty-spotted cats by 10% by 2039.

Action 1.1: Conduct studies involving rusty-spotted cat populations and behavior by camera trapping in areas known to contain rusty-spotted cats. Populations will be studied to determine accurate population sizes so that accurate management can be planned for. Camera trap stations will be set up in multiple habitat types to determine what habitat is selected for (Kalle et al. 2014). This will be achieved by recording how many individuals are seen in each habitat type. By gaining an understanding of the number of individuals in each habitat type, we can determine what habitat type rusty-spotted cats primarily relate to, and therefore properly plan for habitat protection and management.

Action 1.2: Acquire more data about the diet of rusty-spotted cats by examining their scat to determine what prey type is primarily selected for. Knowing the preferred species of prey can help determine areas that would be most beneficial when choosing areas to be protected for rusty-spotted cat habitat (Rajaratnam et al. 2007). Leopard cats relate to specific habitat according to what habitat their primary prey species relates to, so we can hypothesize that rusty-spotted cats will do the same (Rajaratnam et al. 2007). If this holds true for rusty-spotted cats, prey selection and prey habitat preference should be considered if rusty-spotted cats are to be properly managed.

Action 1.3: Conduct studies to acquire data about survivorship in different age classes of rusty-spotted cats by radio-collaring individuals in each age class and tracking them until each individual has transitioned into the next age class or has remained in the final age class for one year (Kasper et al. 2016). By examining survival rates in populations of

Coolidge

Prionailurus rubiginosus

leopard cats in both pristine habitat and human impacted habitat, we determined that survival rates are highly affected by anthropogenic impacts (Murayama 2008). After running a population model incorporating survival rates from our surrogate species (leopard cat), we hypothesized that increasing survival rates in adult rusty-spotted cats, especially in the adult age class, is most vital for increasing populations (Table 1). By studying survival rates through radio-telemetry data, we can determine if this actually holds true for rusty-spotted cats.

Action 1.4: Use Geographic Information Systems (GIS) and a Habitat Suitability Index (HSI) to determine which areas in India and Sri Lanka meet all the habitat requirements (Kushwaha and Roy 2002). This will aid in the selection of pristine areas to be protected and managed for the use of rusty-spotted cats.

Action 1.5: Survey locals in areas known to contain rusty-spotted cats to determine what threats the species faces.

This action might not result in accurate data due to lack of cooperation among locals who view rusty-spotted cats as a nuisance species because of the damage caused to domesticated poultry, ducks, and other small livestock (Rajaratnam et al. 2007).

Action 1.6: Implement new laws that prohibit the hunting of rusty-spotted cats in India and Sri Lanka. Implement laws that prohibit habitat degradation in all forms such as logging, agricultural practices, and additional road systems that would cut through or border protected areas, leading to increased mortality from roadkill incidents (Karanth et al. 2008).

Coolidge

Prionailurus rubiginosus

Action 1.7: Create buffer zones between protected habitat and roadways. Death from motor vehicles is known to account for a high percentage of rusty-spotted cat mortality (Karanth et al. 2008), therefore implementing buffer zones would decrease the exposure that rusty-spotted cats have to roadways (Swift 1986).

No Action: By not implementing laws that prohibit hunting and habitat degradation, rusty-spotted cat habitat will continue to be imposed upon by human interactions. By not implementing new regulations, as well as reinforcing old regulations, rusty-spotted cat populations will continue being impacted by hunting pressure, and population numbers will not have a chance to grow to a sustainable number (Minin et al. 2016). If buffer zones are not implemented, mortality will remain high due to roadkill incidents, and if more data is not acquired, increasing survival rates of rusty-spotted cats will not be achieved due to lack of information about their needs.

Final Course of Action: Actions 1.1, 1.2, 1.3, 1.4, 1.6, 1.7

Justification of Actions: All of the factors stated above are factors that in some way impact survival rates of rusty-spotted cats. If rusty-spotted cats are to be properly managed for, all of these factors need to be considered. Conducting more research is essential for gaining the required knowledge needed for adequately managing for this species. Having a better understanding of the natural history of this species will help us to understand the needs of rusty-spotted cats and therefore properly plan for management. Stronger regulation is needed to make sure that populations of rusty-spotted cats don't keep getting exploited by humans, leading to further decline in their population numbers. And finally, establishing protected areas of pristine habitat with buffer zones between

Coolidge

Prionailurus rubiginosus

this habitat and roadways is needed to ensure rusty-spotted cat survival and to help promote maximum reproduction within the existing population.

Assessment Protocol: Objective 1 will be considered completed when an Increased understanding of rusty-spotted cat natural history and threats has been achieved through the publishing of scientific research, and when annual survival rates of rusty-spotted cats have increased by 10%. An evaluation will be conducted in 2030 to determine if these conditions have been met.

If this objective is not met within 10 years, the next step should be determining why the research was not done and what can be done to facilitate the completion of research through funding and education. In addition, threats should be reevaluated. At this point, action 1.5 should be implemented to see if a better understanding of threats that rusty-spotted cats face can be gained through surveying locals.

Objective 2- Reduce habitat degradation of the rusty-spotted cat by 30% by 2029.

Action 2.1: Establish regulations protecting selected areas from deforestation and other forms of habitat degradation as well as hunting and other activities that prove damaging to populations of rusty-spotted cats. This will ensure that selected areas will remain as pristine as possible for rusty-spotted cat reproductive purposes since it is hypothesized that rusty-spotted cats will only achieve maximum reproductive rates in pristine habitats (Murayama 2008).

Action 2.2: Establish protected areas that are considered pristine habitat in order to ensure reproductive success of rusty-spotted cats. This will be achieved after buffer zones have been established between areas that experience anthropogenic impacts and

Coolidge

Prionailurus rubiginosus

areas that are considered pristine rusty-spotted cat habitat (Karanth et al. 2008; Swift 1986; Murayama 2008).

Action 2.3: Allow limited use of areas known to contain rusty-spotted cats for activities such as hunting and logging.

Although this action might be more socially accepted, Murayama's study in 2008 shows that even the slightest human impact can be detrimental to the reproductive success of leopard cats, a close relative to rusty-spotted cats. We can hypothesize that rusty-spotted cat reproductive success would experience similar results.

No Action: By taking no action, rusty-spotted cat habitat will continue to be negatively impacted by human activities, and reproductive success will not return to its maximum potential. This will result in a continuation of the decline of rusty-spotted cat populations in India and Sri Lanka (Aditya and Ganesh 2018).

Final Course of Action: Actions 2.1, 2.2

Justification of Actions: Action 2.1 is essential in creating an incentive for not negatively impacting rusty-spotted cat habitat. It will allow rusty-spotted cats to flourish in areas that not exposed to human impacts at all. Action 2.2 is important because it establishes areas that are specifically for the conservation of rusty-spotted cats. These areas could lead to things like educational programs in the future.

Assessment Protocol: Objective 2 will be considered complete when rusty-spotted cat habitat is no longer being degraded by human impacts and populations of rusty-spotted cats have begun to increase in these areas. If rusty-spotted cat habitat is still being degraded by 2030, new actions should be created in order to reduce the amount of

Coolidge

Prionailurus rubiginosus

human impacts in areas known to contain rusty-spotted cats. Pristine habitats are essential for rusty-spotted cat survival; therefore we cannot properly manage for this species without first completing this goal.

CONCLUSION

The rusty-spotted cat is a species that deserves our protection. Its populations are declining because of human impacts including deforestation for roadways and agriculture, and because of poaching. This management plan outlines the threats that populations of rusty-spotted cats face and what we need to achieve if we want to increase their populations. If actions 1.1, 1.2, 1.3, 1.4, 1.6, 1.7, 2.1, and 2.2 are effectively implemented, we can expect to see rusty-spotted cat populations begin to increase to a sustainable population size by the year 2039. Rusty-spotted cats are not the only small felids that are being subjected to these sorts of anthropogenic impacts. Populations of small cats all over the world are experiencing similar declines, and without proper management, we might see the extinction of many species within our lifetime. Educational efforts need to be made to ensure that small felids, including the rusty-spotted cat can continue to flourish in pristine habitats just as they did before humans made their impact.

Coolidge

Prionailurus rubiginosus

Literature Cited

- Aditya, V. and T., Ganesh. 2018. Deciphering forest change: linking satellite-based forest cover change and community perceptions in a threatened landscape in India. *Stockholm* 1:1-11.
- Barr, M., P., Calle, M., Roelke, and F., Scott. Feline immunodeficiency virus in nondomestic felids. *Journal of Zoo and Wildlife Medicine* 20:265-272.
- Dmock, R. 1997. Husbandry, Breeding, and Population Development of the Sri Lankan Rusty-spotted Cat *Prionailurus rubiginosus phillipsi*. *International Zoo Yearbook* 35:115-120.
- Kalle, R., Ramesh, T., Qureshi, Q., and Sankar, K. 2014. Estimating Seasonal Abundance and Habitat Use of Small Carnivores in the Western Ghats Using an Occupancy Approach. *Journal of Tropical Ecology* 30:469-480.
- Karanth, K. K., R. A., Kramer, S. S., Qian, N. L., Christensen. 2008. Examining conservation attitudes, perspectives, and challenges in India. *Biological Conservation* 141:2357-2367.
- Kasper, C. B., A., Schneider, and T. G., Oliveira. 2016. Home range and density of three sympatric felids in the Southern Atlantic forest, Brazil/area de vida e densidade de tres felideos simpaticos na Mata Atlantica do Brasil. *Brazilian Journal of Biology* 14:228-240.
- Kushwaha, S. P. S., P. S., Roy. 2002. Geospatial technology for wildlife habitat evaluation. *International Society for Tropical Ecology* 43:137-150.
- Minin, E., R., Slotow, L., Hunter, F., Pouzols, T., Toivonen, P., Verburg, N., Williams, L., Petracca, and A., Moilanen. 2016. Global priorities for national carnivore conservation under land use change. *Scientific Reports* 6:23814
- Miththapala, S. 2006. The Ecology of the Wild Cats of Sri Lanka. *The Fauna of Sri Lanka* 235-256.
- Murayama, A. 2008. The Tsushima Leopard Cat (*Prionailurus bengalensis euptilura*). *Imperial College London* 1-95.
- Nayak, S., Shah, S., and Borah, J. 2017. First Record of Rusty-spotted Cat *Prionailurus rubiginosus* (Mammalia: Carnivora: Felidae) from Ramgarh-Vishdhari Wildlife Sanctuary in Semi-Arid Landscape of Rajasthan, India. *Journal of Threatened Taxa* 9:9761-9763.
- Nishimura, Y., Y., Goto, K., Yoneda, Y., Endo, T., Mizuno, M., Hamachi, H., Maruyama, H., Kinoshita, S., Koga, M., Komori, S., Fushuku, K., Ushinohama, M., Akuzawa, T., Watari, A., Hasegawa, and H., Tsujimoto. 1999. Interspecies transmission of Feline Immunodeficiency Virus from the domestic cat to the Tshushima cat (*Felis bengalensis euptilura*) in the wild. *Journal of Virology* 73:7916-7921.

Coolidge

Prionailurus rubiginosus

Rajanathan, R., M., Sunquist, L., Rajaratnam, and L., Ambu. 2007. Diet and habitat selection of the leopard cat (*Prionailurus bengalensis borneoensis*) in an agricultural landscape in Sabah, Malaysian Borneo. *Journal of Tropical Ecology* 23:209-217.

Srivathsa, A., Parameshwaran, R., Sharma, S., Karanth, K. U. 2015. Estimating Population Sizes of Leopard Cats in the Western Ghats Using Camera Surveys. *Journal of Mammalogy* 96:742-750.

Swift, L. W. 1986. Filter strip widths for forest roads in the Southern Appalachians. *Southern Journal of Applied Forestry* 10:27-34.

APPENDIX A

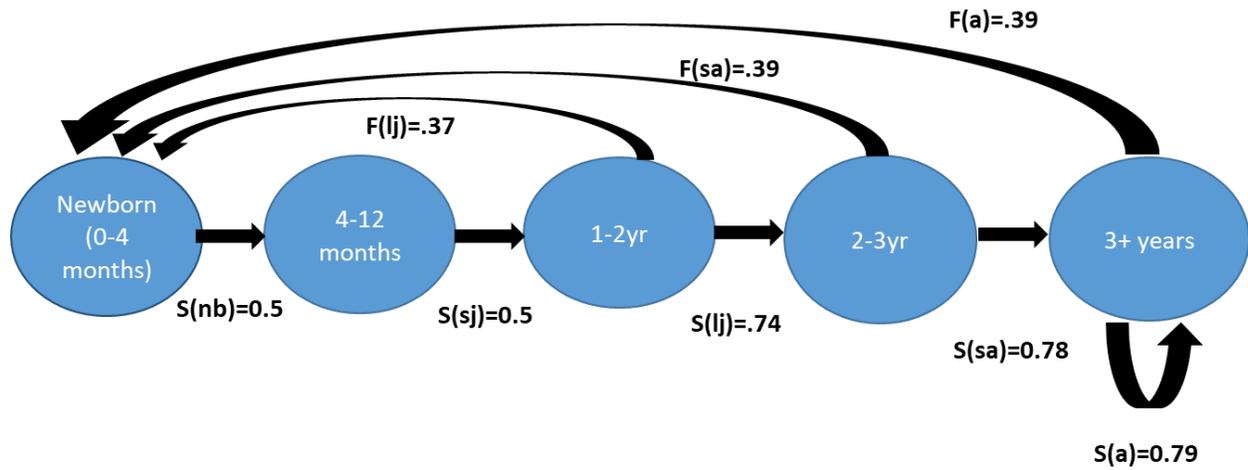


Figure 1. Life Cycle Diagram showing the life stages and fecundity of the rusty-spotted cat.

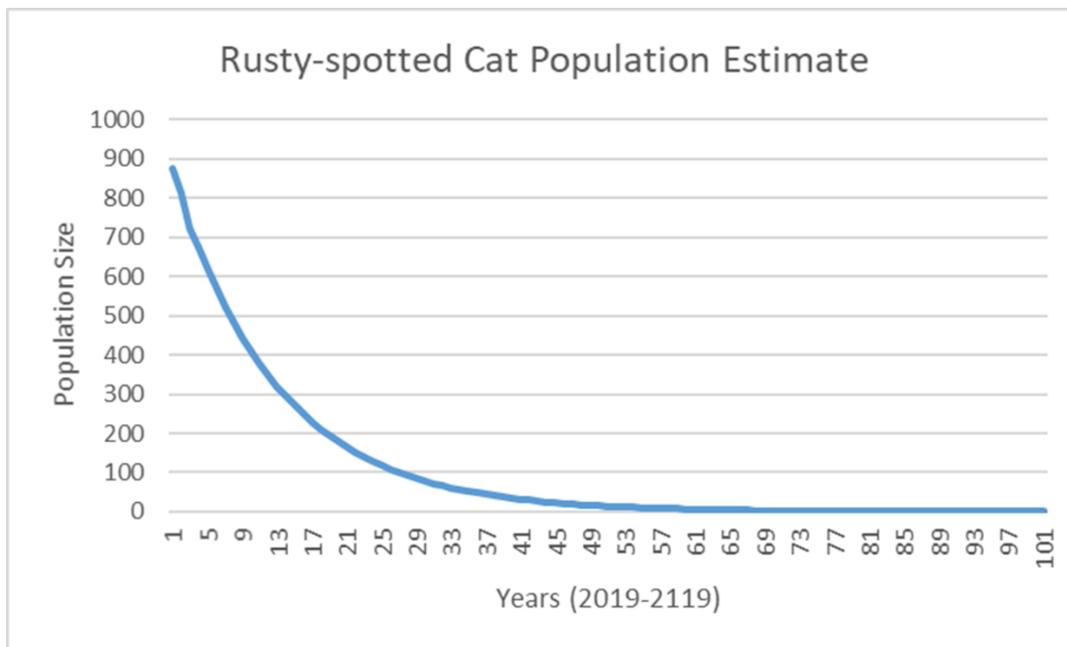


Figure 2. This graph represents a hypothetical depiction of what rusty-spotted cat populations experience when affected by anthropogenic impacts.

Coolidge
Prionailurus rubiginosus

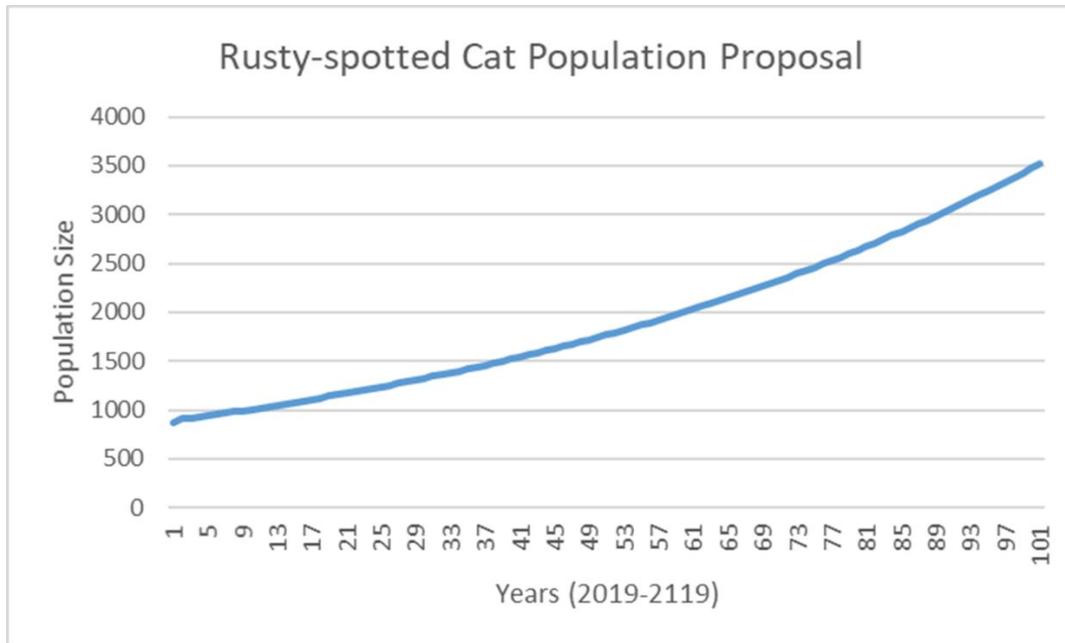


Figure 3. This graph represents a hypothetical depiction of what rusty-spotted cat populations will experience when in a pristine habitat with no anthropogenic impacts.



Figure 4. An adult rusty-spotted cat (*Prionailurus rubiginosus*).

Coolidge
Prionailurus rubiginosus



Figure 5. The possible distribution of the rusty-spotted cat in India and Sri Lanka.

APPENDIX B

	$F(nb)$	$F(sj)$	$F(lj)$	$F(sa)$	$F(a)$
Newborn:	0	0	0.37	0.39	0.46
4-12m:	0.55	0	0	0	0
1-2y:	0	0.55	0	0	0
2-3y:	0	0	0.74	0	0
3+y:	0	0	0	0.78	0.92

Table 1. Population model analysis of the rusty-spotted cat showing that survival in age class 5 is most important for reproduction.

Sensitivity matrix					
		$F(sj)$	$F(lj)$	$F(sa)$	$F(a)$
0-4 months	0.2154	0.0429	0.0233	0.0170	0.1412
4-12 months	0.1458	0.0791	0.0429	0.0313	0.2603
1-2yrs	0.2688	0.1458	0.0791	0.0577	0.4798
2-3yrs	0.3287	0.1783	0.0967	0.0706	0.5868
3+	0.3877	0.2103	0.1141	0.0833	0.6921
Elasticity matrix					
	$F(h)$	$F(sj)$	$F(lj)$	$F(sa)$	$F(a)$
0-4 months	0	0	0.008495148	0.006535686	0.064067441
4-12 months	0.079098275	0	0	0	0
1-2yrs	0	0.079098275	0	0	0
2-3yrs	0	0	0.070603127	0	0
3+	0	0	0	0.064067441	0.628034609

Table 2. Elasticity and Sensitivity Matrices showing age class 5 as the most important for rusty-spotted cat survival.