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Reunion with the mother: a successful rehabilitation strategy for displaced wild Rusty-spotted Cat *Prionailurus rubiginosus* (I. Geoffroy Saint-Hilaire, 1831) (Mammalia: Carnivora: Felidae) kittens

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COMMUNICATION

Reunion with the mother: a successful rehabilitation strategy for displaced wild Rusty-spotted Cat *Prionailurus rubiginosus* (I. Geoffroy Saint-Hilaire, 1831) (Mammalia: Carnivora: Felidae) kittens

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Abstract: One of the common challenges for wildlife rehabilitators and conservationists is dealing with displaced young animals, needing intervention and help. Most commonly, such displaced animals are moved to zoos or rescue centers where they are hand-raised. In some cases, the hand-raised animals are rehabilitated back in the wild following suitable protocols. For young animals that are not injured or ill, however, reuniting them with their mothers in the wild might be the best option. There are few reports on such reunion efforts. We report successful reunions of 26 Rusty-spotted Cat *Prionailurus rubiginosus* kittens with their mothers in the period of six years in the Junnar Forest Division, Maharashtra, India. The kittens found by the villagers were examined for injuries or signs of sickness, and physiological parameters were recorded. If found healthy, they were placed in a plastic basket at the same location in the evening of the same day for a reunion with their mothers. In all cases, the mother cat was in the vicinity and took the kittens away after a brief period. The success of reunion effort was confirmed by direct observation or vocalization of the kittens combined with the presence of pugmarks of an adult cat at the site, or just by the presence and appearance of pugmarks. The results of our efforts show that displaced kittens of small wild cats can be successfully reunited with their mothers, provided that the time gap between separation and reunion effort is minimized.

Keywords: Displaced wildlife, human-wildlife interaction, small wild cat, wildlife rehabilitation, wildlife rescue.

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Ethics statement: All suitable protocols for animal safety, welfare and ethics were followed during this work.

Author details: Dr. Ajay Deshmukh is a wildlife veterinarian with an extensive experience in Leopard handling, captive management, and managing and mitigating the negative interactions between Leopards and people. Dr. Yaduraj Khadpekar is a wildlife veterinarian working in the field of wildlife medicine and conservation for 15 years. Mr. Mahendra Dhore has been working in the study area for more than a decade for the mitigation of Leopard-human negative interactions and for conservation awareness. Mr. Baijuraj MV is a wildlife biologist with two decades of experience in wildlife conservation, rescues, conflict mitigation and conservation awareness.

Author contribution: Ajay Deshmukh—the work described in this paper was carried out by Dr. Deshmukh and his team. Yaduraj Khadpekar—the data analysis and the manuscript writing has been done by Dr. Khadpekar for this article. Mahendra Dhore—has been involved in all the field work described in this paper along with Dr. Deshmukh. Baijuraj MV—has contributed in the writing of this manuscript.

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INTRODUCTION

Displacement and separation of young animals from their mothers is not an uncommon occurrence in the wild. Conservationists and wildlife rehabilitators around the world frequently come across young wild animals without their mother, needing help. There are a number of reasons why the young animals may get separated from their mothers, such as natural calamities (Barman et al. 2014), human activities (McTurk & Spelman 2005), death of the mother due to hunting (Pajetnov & Pajetnov 1998) or natural causes (Singh et al. 2011). The common strategies followed for such rescued young animals are hand-raising them to rehabilitate to the wild, or taking them permanently to a captive facility such as a zoo or a lifetime care facility and hand-raise them there. Hand-raised animals have been successfully rehabilitated in the wild such as in case of Asian Elephants *Elephas maximus* (Perera et al. 2018), Greater One-horned Rhinoceros *Rhinoceros unicornis* (Barman et al. 2014), Common Wombat *Vombatus ursinus* (Saran et al. 2011), and Giant Otter *Pteronura brasiliensis* (McTurk & Spelman 2005).

Another option that is less frequently followed, is the immediate or soonest possible reunion of the displaced young animal with its mother. For the young animals that are temporarily separated from their mothers and are not injured or ill, this might be the best suitable option (Sparks & Casey 1998). Indeed, such reunions have been successfully accomplished for infants of wildlife as diverse as the Western Chimpanzee *Pan troglodytes verus* (Pruetz & Kante 2010) and the Giant Otter (Lima & Marmontel 2011). In our knowledge, however, organised efforts for the reunion of cubs or kittens of wild cats with their mothers have not been reported so far.

The Rusty-spotted Cat *Prionailurus rubiginosus* is the smallest cat species in Asia (Menon 2014; Nayak et al. 2017). It is resident in India, Nepal, and Sri Lanka (Mukherjee et al. 2016). The population in India is thought to be fragmented as intensive irrigated agriculture negatively impacted its prime habitat; dry and moist deciduous forests (Mukherjee et al. 2016). Although the data on the current population trend are scarce, the species is currently categorised as Near Threatened on the IUCN Red List (Mukherjee et al. 2016). The authors have come across many displaced Rusty-spotted Cat kittens that were in a situation where they could be reunited with their mothers. Except for one report on the possible natural reunion of a kitten with its mother (Sharma 2007), there is no other record of reuniting Rusty-spotted Cat kittens with their mothers in situ. Therefore, this may be the first report on successfully reuniting multiple Rusty-spotted Cat kittens with their mothers in the wild.

STUDY AREA

All the reunions occurred within the Junnar Forest Division in Pune District in the state of Maharashtra, India (Fig. 1). The terrain of the area is made up of the northern part of Western Ghats with hills and valleys. The hills do not have many large trees but are mostly grassy with boulders. The most common occupation in the area is farming, and the crops of sugarcane, grapes, and onion dominate the cultivated parts of the valleys (Athreya et al. 2011). Due to the large areas of sugarcane cultivation (Image 1), which provide suitable habitat and cover for the Leopard *Panthera pardus*, the division is known for high Leopard density and a close co-existence of Leopards and humans (Jhamvar-Shingote & Schuett 2013). Although there are no published records of Rusty-spotted Cat in the division before this report, the species has been recorded during camera trap surveys in adjoining areas (Athreya et al. 2016).

A wildlife rescue team lead by Ajay Deshmukh and Mahendra Dhore had been working in the study area since 2009 for the mitigation of human-Leopard conflict, and thus are well-known to the local villagers and the forest department officials.

MATERIALS AND METHODS

When the kittens were handed over to the rescue team, they were first placed in a plastic basket and moved away from the location. They were transported to either the nearest forest department office or to the rescue team office. There they were checked for any visible injuries. Their ages were estimated based on their body size and locomotor abilities described by Dmoch (1997). Physiological parameters such as rectal temperature, heart rate (HR; heart beats/minute), and respiration rate (RR; respirations/minute) were recorded. Once the kittens were found to be healthy through this examination, they were left undisturbed in the basket in a quiet area. No attempts were made to feed them before reunion. For the reunion attempt with the mother, they were taken in the evening to the exact spot where they were found. The basket with the kittens was left on the ground at the location. This procedure was always carried out after 18.00h to minimise the possibility of

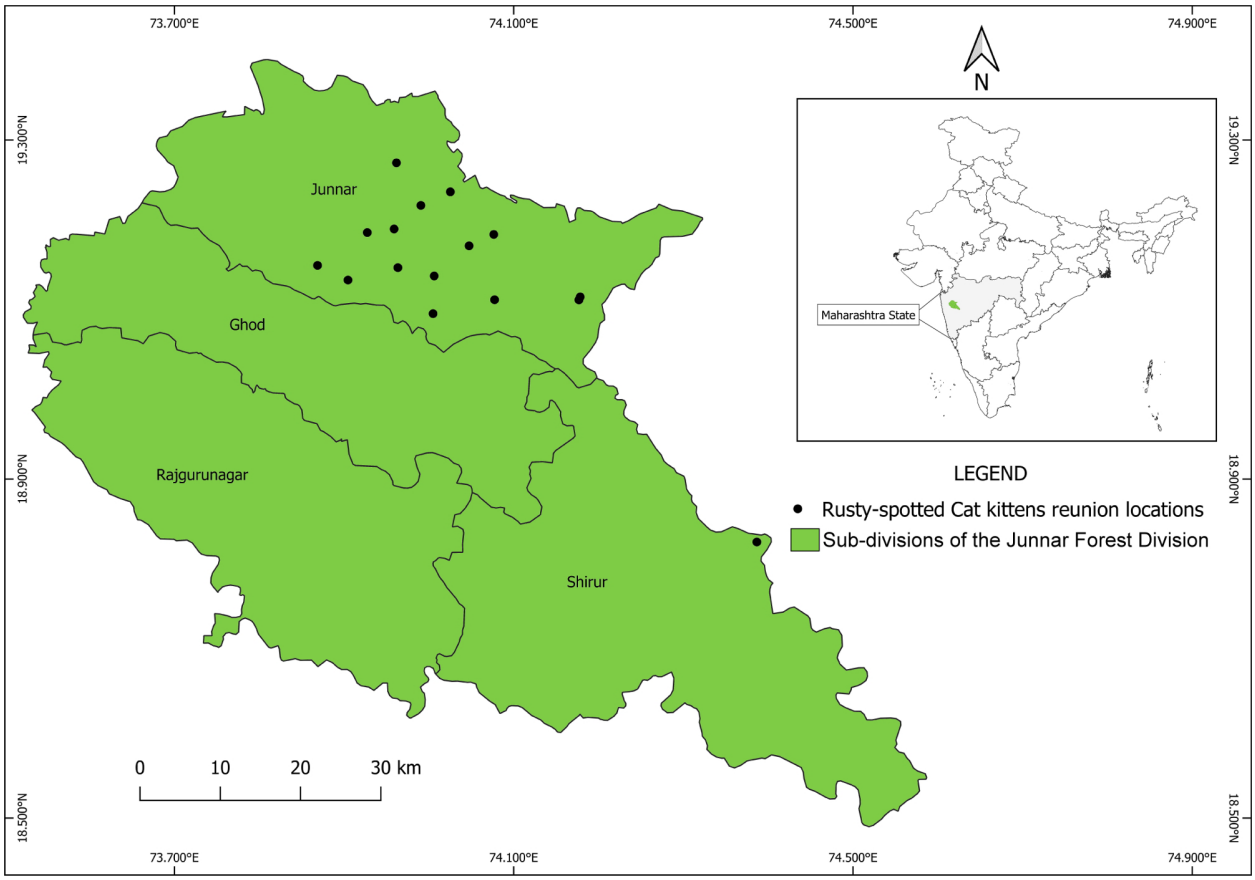

Figure 1. Junnar Forest Division in the state of Maharashtra, India, where all the reunions of Rusty-spotted Cat kittens with their mothers were carried out. The sections inside the main map indicate the sub-divisions within the Junnar Forest Division. The green portion in the small inset map shows the location of the Junnar Forest Division in India.

disturbance by human activities, and considering the crepuscular and nocturnal activity pattern of Rusty-spotted Cat (Nimalrathna et al. 2019; Bora et al. 2020). When possible, the rescue team of two to three members observed the kittens with the help of spot lights from a distance of 200–300 m until the mother came and picked them up. At other times, the rescue team moved 500–1,000 m away and went back periodically to check if the kittens were safe. If the kittens were not in the basket any more, the area was examined for pugmarks and signs of predation, to make sure that the kittens had been picked up by the mother. The reunion was confirmed by the direct observation of an adult female picking up and carrying the kittens away, or by the mewing sounds of the kittens combined with the presence of pugmarks of an adult Rusty-spotted Cat at the location, or just by the presence and appearance of pugmarks. For all the reunion events, we recorded the approximate time when the kittens were first spotted, the time when they were kept at the location for the reunion, and the estimated time when the mother took them.

RESULTS

A total of 26 kittens were reunited with their mothers in 18 reunion events between 2014 and 2019 (Table 1). Eight of these reunions involved a litter of two kittens. Out of these, four litters included a male and a female kitten. Their estimated ages ranged between 30 and 60 days.

The presence of kittens was reported to the rescue team by either the villagers or the forest department staff. In all the cases, the kittens were first spotted by the villagers and reported to either the forest department or to the rescue team. All kittens were found in sugarcane fields (Image 2). In instances when the rescue team was directly informed by villagers, the team conveyed the information to the relevant forest department officials for further actions and coordination. It is important to mention here that in about 80% of instances, the kittens were picked up and handled by the villagers before the rescue team could reach the location. At other times, even though the kittens were not picked up by the

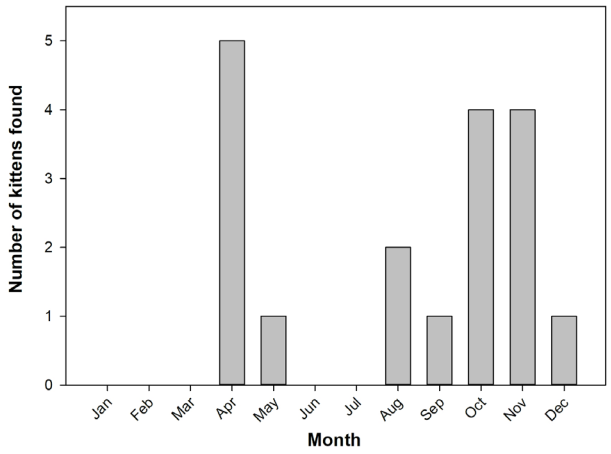

Figure 2. The highest number of displaced Rusty-spotted Cat kittens were found in early summer (April), followed by early winter (October and November).

villagers, they had to be removed from the location to avoid stress from human activities, crowding, noise, and possibility of handling by the villagers.

During the assessment of physiological parameters, the minimum rectal temperature recorded was 37.8°C while the maximum was 38.9°C. The mean rectal temperature among all kittens was 38.4°C (n=26). RR ranged between 16–40, and the HR was within the range of 126–180. It was not possible to measure the body weights of all the kittens, however, the body weights of the kittens that were weighed (n=10) ranged from 100g to 300g.

Table 1. Temporal details of reunion events with approximate time when kittens were spotted by the villagers (Rescue time), time when the kittens were taken to the location for reunion (Return time), and estimated time when the kittens were picked up by the mother cat (Reunion time).

Reunion event	Month and year	Rescue time	Return time	Reunion time
1	iv.2014	14.30h	18.45h	22.30h
2	x.2014	13.15h	18.20h	21.20h
3	xi.2014	13.20h	18.20h	21.20h
4	iv.2015	14.45h	18.35h	21.35h
5	x.2015	14.40h	18.30h	21.30h
6	xi.2015	14.45h	18.35h	21.35h
7	v.2016	14.05h	18.10h	22.30h
8	ix.2016	14.20h	18.20h	22.40h
9	xii.2016	14.10h	18.35h	20.35h
10	iv.2017	13.20h	18.20h	22.00h
11	x.2017	12.25h	18.00h	20.00h
12	xi.2017	13.30h	18.10h	19.15h
13	iv.2018	13.25h	18.35h	21.35h
14	x.2018	13.35h	18.40h	21.40h
15	xi.2018	13.25h	18.35h	21.35h
16	iv.2019	15.20h	19.10h	21.10h
17	viii.2019	11.30h	18.15h	22.15h
18	viii.2019	13.10h	18.05h	22.05h

Image 1. Habitat with sugarcane fields in the study area. © Akash Dolas, Wildlife SOS.

Image 2. A Rusty-spotted Cat kitten that was found in a sugarcane field © Akash Dolas, Wildlife SOS.

The highest number of kittens were found in the early summer or early winter during the sugarcane harvesting season (Fig. 2). No kittens were reported in late winter or late summer. The villagers spotted the kittens during mid-day between 11.00 and 15.30 h. All the reunions of the rescued kittens occurred at late evening or night on the same day they were found. Among all the reunion efforts, the maximum time gap between finding a kitten and taking it back for the reunion, was >6h 45min. After the kittens were brought to the location for the reunion, the minimum time recorded for a successful reunion was 1h 5 min, while the maximum was 4h 20min.

During the reunions that the rescue team members were able to observe directly, the mother cats were noticed to approach the baskets with the kittens very slowly and cautiously. During approach, they stopped and looked around frequently before continuing the approach. Many times, the mother sat 3–6 m away from the basket for 20 to 30 minutes and kept looking around, before she approached the basket. In some instances, after such pause, the mother walked around the basket keeping some distance and sat down again for some period before approaching the basket. The kittens were noticed to become very active and vocal with lot of mewing, once they noticed the mother approaching. They kept looking in the direction of the mother until she reached the basket. After reaching the basket, the mothers licked the kittens for some time before picking and carrying them away. When there were more than one kitten, the mother carried away one kitten first, kept it inside the crop cover, and came back for the second kitten with the same cautious approach.

DISCUSSION

All of the 18 reunion attempts were considered to be successful, as the female Rusty-spotted Cats came to pick up the kittens within > 4h 20min. No kitten was lost to predation. We observed that the females remained in the vicinity of the locations where the kittens were found. Under favourable conditions such as same location, late evening hours, and no disturbance from people, they accepted the kittens back and carried them

away. The key to successfully reuniting the mother and kittens is to provide this opportunity to them as quickly as possible after separation.

All the kittens were found during the sugarcane harvesting season, indicating that sugarcane fields provide cover for females with kittens and access to prey. Arthreya (2010) also reported two kittens found during the cutting of sugarcane in October and December 2008 in Ahmednagar District, Maharashtra. Leopard and Sunda Leopard Cats *Prionailurus javanensis* were also found in sugarcane fields, apparently attracted by a wide variety of prey (Jhamvar-Shingote & Schuett 2013; Lorica & Heaney 2013).

The Rusty-spotted Cat exhibits some tolerance for human-modified habitats and the vicinity of human settlements (Nowell & Jackson 1996; Athreya 2010). In one occasional instance, a Rusty-spotted Cat even gave birth in a farmhouse (Nowell & Jackson 1996).

In captivity, the Rusty-spotted Cat gives birth at any time of the year (Dmoch 1997). We came across approximately one to two months old kittens, mostly in April, also in October and November (Fig. 2). This might be due to the seasonality of crop harvesting in the region. The sugarcane harvest in the region generally begins in October with the opening of sugar factories. While in April, the speed of harvest in the last remaining sugarcane fields is increased by farmers as the sugar factories are about to close. This possibly results in an increased sighting of Rusty-spotted Cat kittens by villagers in sugarcane fields. Many times, the kittens were picked up and moved by the farmers as they wanted to urgently continue the sugarcane harvest. In a few cases, the kittens were mistaken by the villagers as Leopard cubs and were, therefore, moved away from the field for their own safety. In captivity, Rusty-spotted Cat kittens start moving about at the age of one month but frequently get tired and fall asleep (Dmoch 1997). Weaning begins at the age of 35 to 40 days, but suckling is continued in some cases until two months of age (Dmoch 1997). Information on the maternal care and development of kittens of the Rusty-spotted Cat in the wild is lacking. We speculate that the kittens were spotted by the people when the mother had left them for a brief period for hunting and feeding. In each of these events, the rescue team members made efforts to communicate with the villagers and farmers involved, and give them information about Rusty-spotted Cat and Leopards. The members also requested the villagers not to handle and remove the kittens they come across, and inform forest department officials about their presence.

Although there is no information available on normal physiological parameters in Rusty-spotted Cat, the parameters recorded in the rescued kittens were considered to be healthy as compared to the Domestic Cat *Felis catus* (Eldredge et al. 2011). None of the kittens exhibited any sign of sickness and were considered to be healthy and fit for the reunion.

Minimizing the time of separation between kittens and mothers appears to be an important contributing factor for a successful reunion. Leopard females in the wild are known to accept their cubs after a separation period as long as six days (Ajay Deshmukh unpub.). During such long periods, however, attempts were made on each night for the reunion. Our experiences from similar reunion attempts for displaced Leopard cubs indicate that the frequency of the mother returning to the location to look for cubs reduces with the increasing time gap between the separation and the reunion attempt. In case of the reunited Rusty-spotted Cat kittens, all the reunions happened on the evening of the same day. The mother cats were in the vicinity of the location where the kittens were found and returned on presumably hearing the kittens' vocalizations. None of the reunion events needed deployment of any artificial means to attract the mother to the kittens. We conclude that displaced Rusty-spotted Cat kittens can be successfully reunited with their mothers, provided that the time gap between the finding of kittens and reunion attempt is minimized.

We do not have any evidence that a delay of more than 24 hours would reduce the chance for a successful reunion. We, however, recommend that any reunion attempt should be made in the evening to minimize the disturbance from human activities, and that the handling of kittens before the reunion should be kept minimum. If the reunion does not happen on the same day, attempts should be made on the following nights until the absence of the mother in the vicinity is confirmed. Based on our experience with Rusty-spotted Cats and Leopards, such reunion protocols can be replicated for the kittens or cubs of other wild cat species.

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