A survey for the fishing cat (*Prionailurus viverrinus*) in coastal Kerala, India

Technical Report submitted to Panthera Corporation, New York

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Summary:

The fishing cat (*Prionailurus viverrinus*) is distributed through the Himalayan foothills into eastern and south-eastern India. There is a population in Rajasthan that is perhaps an isolated one. However, though its habitat (mangroves, wetlands, marshes and large water bodies) exists along the western coasts of India and the Western Ghats, there have been no authentic records of the species from this region, leading some authors to believe that it may have been extirpated from the region. It is not known if the cat still exists in relict populations or has recently been extirpated or even if it ever existed in this region at all.

We conducted a two and half month survey for the fishing cat along coastal Kerala to verify claims of its possible occurrence here. Our field survey lasted a week and we visited five districts and several localities to assess potential habitats and collect scat samples for indication of fishing cat presence. We also interacted with locals for any information on the cat. Thereafter, scats were analysed in the laboratory at IISER Pune and assigned to predator species using molecular markers.

Our results from assessment of habitats, interaction with locals and scat analysis suggest that currently it is unlikely for the fishing cat to exist in the coastal belt of Kerala. The habitats are too fragmented, degraded and disturbed due to severe land conversion as well as impacts from the urban sprawl around.

Introduction:

This project developed from an earlier larger survey and phylogeographic study of the fishing cat (*Prionailurus viverrinus*) across India funded by Panthera Corporation, New York and conducted through the Sálim Ali Centre for Ornithology and Natural History, Coimbatore, India. Results of that study indicated genetic and hence physical continuity in fishing cat populations across the Himalayan foothills into the eastern and south-eastern parts of the country (Mukherjee 2011, Mukherjee et al. 2012). A small and perhaps currently isolated population exists in parts of Rajasthan (Sunquist and Sunquist 2002, Mukherjee 2012, GV Reddy and Ayan Sidhu pers. comm.). However, that survey did not include areas that had unauthenticated reports of fishing cat presence, such as the Western Ghats and Western coast of India. Pocock (1939) remarks on the type specimen of *P. viverrinus* as probably being from the Malabar Coast (Kerala) and mentions that this could be an assumption based on the observation that the donor submitted a specimen of a langur from the Western Ghats along with the fishing cat specimen, though notes on the specimen mentioned the locality as just 'India'. Nowell and Jackson (1996) suggest a likely occurrence of the fishing cat in the estuaries of Karnataka and another spot in the Western Ghats where they speculate a probable extirpation, both based on unauthenticated reports. Sunquist and Sunquist (2002) specifically mention the coastal belt of Kerala as a potential region of occurrence. No report definitively states the presence of the fishing cat on the Western coast and Western Ghats of India. One scenario suggests that the species was present in this region historically and at present occurs in small populations in danger of extinction or has already been extirpated from this region. The other, more remarkable situation, is of the cat never occurring here. Solving this is important not just to enable

conservation of this Endangered (Mukherjee et al. 2010a) species but also to trace its historical migration into Sri Lanka.

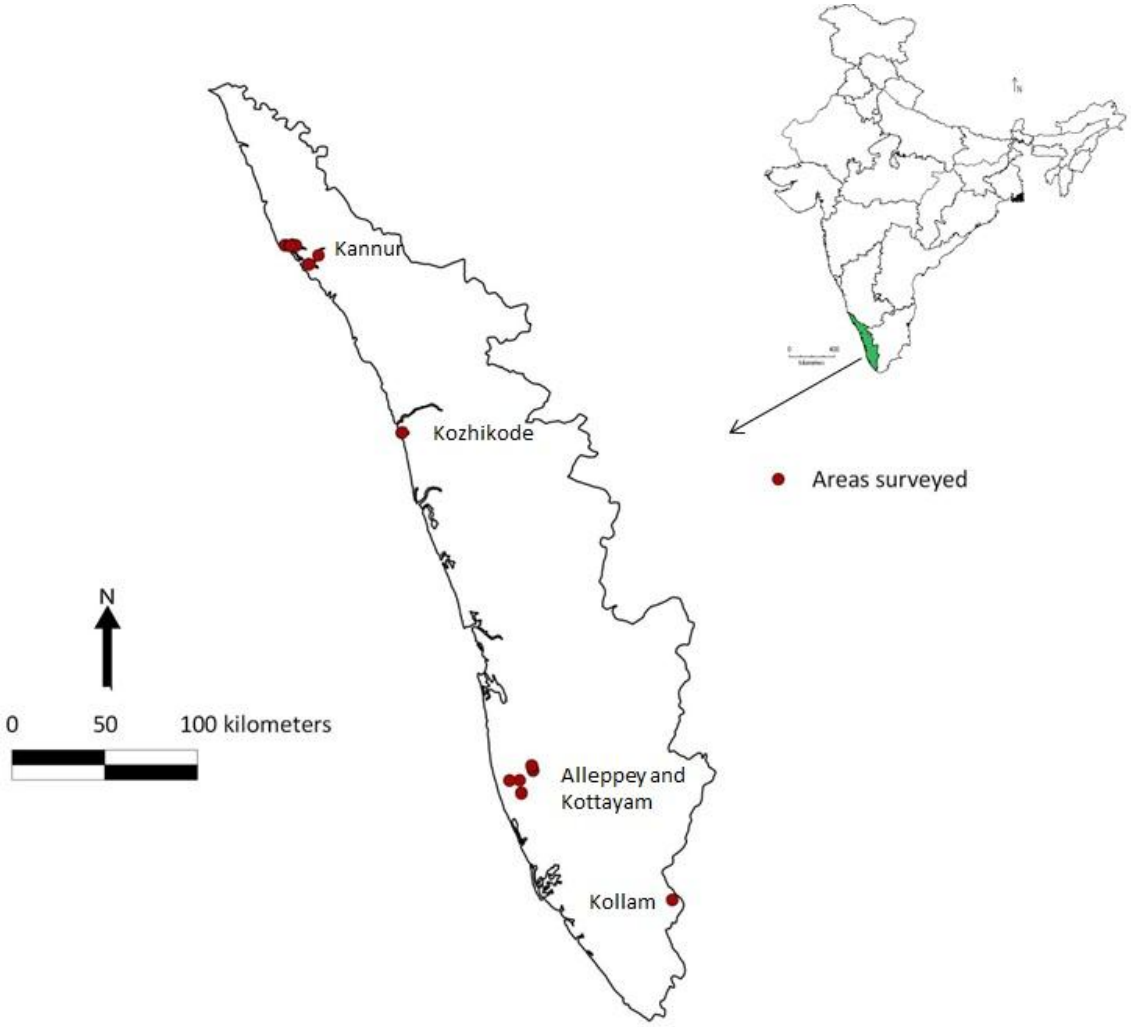
We proposed a survey of coastal Kerala for the presence of the fishing cat since potential habitats of the species exist in this region but no recent effort has been made to evaluate them from a conservation perspective. Since resources were scarce, we limited the survey to a two and a half month period (15th January to 31st March 2013) in some select sites that had the highest probability of occurrence. Additionally we visited Shindurney, a Protected Area in Kollam district since there is a large reservoir that could be potential habitat for the cat. However, the duration spent in Shindurney was too short (a couple of hours) to assess the region and we have not included that in this report.

Objective:

Survey the coastal parts of Kerala for the presence of the fishing cat, through an assessment of habitats and scat analysis using molecular techniques.

Methods:

On the week long field survey (20th to 27th January 2013), five districts were covered and the locations visited are presented in the map below and in Table 1.



Map showing locations visited on the fishing cat survey in Kerala.

Table 1: Places visited on the survey where habitat observations were made and scat samples were collected.

District	Locality	Habitat type
Kannur	Ezhom, Pazhyangadi	Mangrove, aquafarms, paddy fields
	Chempallikunde	Aquafarm, abandoned paddy fields
	Ramapuram East and West	Reed beds, degraded mangrove
	Pappinissery, Chungam, Naniyur, Mayyil Panchayat, Koduvally, Thalassery	Relatively intact mangrove
Kozhikode	Kadalundi	Mangrove islands (degraded)
Kottayam	Neelamperoor	Paddy fields and reed beds
Alleppey	Kavalam	Tall grass, abandoned paddy fields
	Bootapandi Kayal	Temple pond
	Thankankary	Tall grass, abandoned paddy fields
	Judge 6000	Paddy fields and canals
Kollam	Ashramam	Highly disturbed mangrove

On reaching a location/district we made contact with naturalists and Forest Department personnel who could provide information on possible records of the cat or of potential habitats (wetlands, mangroves and marshy areas). We also interacted with locals who we encountered within the areas we surveyed for any information on small cats. While interacting with locals we were careful not to give leads on the description of the fishing cat that could bias their response. We instead asked them to describe the cats that they had seen in their locality with questions regarding tail length, body size, coat patterns and any behaviour if observed. We also asked locals to direct us to wetlands, marshy areas and mangrove patches in their locality.

Based on information obtained on habitats we visited specific sites for sample collection. All scats encountered were collected since visual assignment to the predator, especially in areas where several sympatric carnivores potentially coexist, is not accurate. Scats were collected in zip-loc bags or vials containing alcohol and transferred to IISER Pune, for further analysis. DNA from scats were extracted using commercially available extraction kits from

QIAGEN (QIAAmp) and were assigned to the predator species by using the felid specific primer for the 16s rRNA region and a restriction digestion with Hae III, Ase I and Dpn I, following Mukherjee et al. (2010b).

Results:

In the Kannur, Kozhikode, Kottayam and Trivandrum districts we surveyed mangroves, aquaculture farms, paddy fields, lakes or 'Kayals' and small wetlands. We also surveyed the backwater canal systems in Alleppey district.

Mangroves in Kannur. Many such patches of mangrove are converted to aquaculture or paddy fields. Some are later abandoned.

Abandoned aquaculture farm in Kannur district. Originally this was a mangrove patch.

Kayal with small mangrove islands in Pazhyangadi, Kannur.

Canal in Alleppey. The canals were not just polluted and clogged but there were no large fish in them that could sustain a 12-15 kg cat.

Canal and paddy fields in Alleppey.

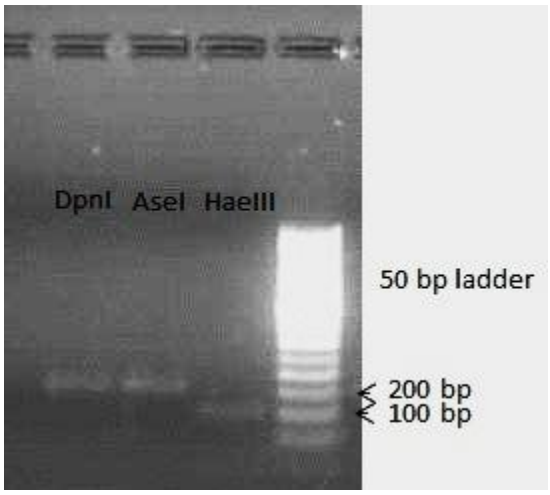
One small intact mangrove patch opposite the Parassinikadavu temple in Kannur district had a record of a fishing cat that was trapped and held in captivity at the Parassinikadavu Snake Park in the 1990's. After the death of the cat the skin was kept at the Snake Park but after a fire in the Park in 1996 the skin could not be traced. There were no further details or photographic evidence provided and the record remains unauthenticated.

Information obtained from locals did not suggest the presence of fishing cats in the areas surveyed since there was no local name for the species and all descriptions of cats that they were aware of in their locality matched with jungle cat.

Local showing a patch opposite his house in Alleppey where a wild cat visits regularly. He said the cat comes to catch fish but the description he gave of the cat (big ears and long legs) matched the jungle cat.

A total of 53 scats were collected. Of these 14 were positive for felids. Restriction digestions were carried out on 10 scats. Four scats had insufficient predator DNA after amplification with felid primers and were not included in the restriction digestions. We could identify 6 Jungle cats and 2 house cats from the restriction digestion profiles. Restriction profiles of PCR products from two scats did not give clear results and were classified as unknown. No scat was assigned to fishing cat.

Scats along an aquaculture farm in Kannur. Laboratory analysis of scats from here assigned them to jungle cat.



Restriction digestion profiles of three enzymes HaeIII, AseI and DpnI. The amplified product of the 16srRNA gene of the mitochondrial DNA is 210 base pairs long. Any result that shows a smaller band indicates digestion has taken place and the amplicon is cut. Here HaeIII has cut the amplicon but AseI and DpnI have not. This profile matches that of a house cat. MtDNA of different species of cats show different profiles with these three enzymes thus aiding identification.

Discussion:

The coastal areas surveyed showed no indication of current presence of fishing cats from the scat samples analysed or from our observations of potential habitats and discussions with locals. All the sites visited, were in hugely human-dominated landscapes.

Within India the fishing cat is distributed primarily in the east (Bengal, Assam, Orissa, some parts of Andhra) and along the foothills of the Himalayas in the Terai tract (Pocock 1939, Sunquist and Sunquist 2002). They also occur in pockets of Rajasthan with records from Keoladeo Ghana National Park, Bharatpur (Nowell and Jackson 1996, Sunquist and Sunquist 2002) and one recent camera trap record from Ranthambhore Tiger Reserve by GV Reddy and Ayan Sadhu (pers. comm.). Given their strong association with water bodies, it seems unconvincing that they do not occur in Kerala where there is seemingly plenty of habitat available. However, certain observations do support the suggestion of absence of the species from this region, though reasons for its absence are speculative. The locals were

familiar with other cats present in the region such as the jungle cat, leopard cat and rusty spotted cat and could describe them well. They even have local names for these cats. However, there seemed to be no local name for the fishing cat unlike in other areas of the country where fishing cats are found (pers. obv.). The cat is fairly large (at 12-15 kg body mass it is much larger than the jungle cat, leopard cat and rusty spotted cat) and in eastern and northern India occurs around human habitations (Mukherjee et al. 2012). If present along coastal Kerala, it would perhaps not go unnoticed, given its size. Additionally, during scat collection we did not come across any site that had large depositions of scat, behaviour peculiar to the fishing cat seen across its distribution range in India (Mukherjee et al. 2012). We cannot conclude if fishing cats have only relatively recently been extirpated from this region or had never occurred along coastal Kerala.

Arguments for recent extirpation/current absence are plausible given our observations on the state of the areas that could form potential habitat for the species. Many mangrove patches have been converted to paddy fields or aquaculture farms and have gone through several stages of land conversion. Some aquaculture farms are abandoned but retain water in them. The wetlands, canals, marshes and mangroves that we visited were all deeply fragmented into small remnant patches of less than 1 km^2 area and polluted with waste from neighbouring urban sprawls. With such severe disturbance and fragmentation it is unlikely that the fishing cat could currently survive in these patches. Additionally, the absence of the fishing cat from the backwaters of Alleppey could be related to the absence of large fish (1 kg and above) in the canals and in the village ponds, unlike in Bengal where locals eat fresh water fish and cultivate them in their home ponds. The backwaters too are full of algae and plastic waste.

Trash in a mangrove patch in Kannur

Trash washed into and trapped in a mangrove patch in Kozhikode.

The more puzzling argument would be of the species never occurring in this region, especially since they do occur in Sri-Lanka and their route into Sri-Lanka would very likely have been through Southern India. Even if they would have taken the route through South-East India (Andhra/Tamil Nadu), it remains unconvincing that they never would have entered the western coast or the Western Ghats. The only explanation we could think of, given this argument, would be higher salinity levels along the west coast as compared to the east coast (Shankar and Shetye 2001) as well as due to the much higher inflow of large rivers (and hence freshwater) along the east coast (Ganges and Godavari) as compared to the much smaller input of freshwater into the mangroves and coastal areas of the west coast. Perhaps the salinity levels along the western cost of India limit fishing cat occurrence. This is speculative but can be tested through niche models incorporating salinity gradients. However, they could occur in inland areas with fresh water sources along the Western Ghats and absence of records from this region remains puzzling.

We conclude that given our observations on the condition of the wetlands, water bodies, mangroves and canals along coastal Kerala and discussions with locals, it is unlikely that the fishing cat currently occurs in the region. This was supported by results from the scat sampling done in this region.

Acknowledgements:

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Our trip through Kerala would not have been complete without sampling the delicious cuisine of the region. We thank Karunakaran and Prasanth's families for some scrumptious meals.

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