

Proceedings
of the
First International Fishing Cat Conservation Symposium



25–29 November 2015
Nepal

Fishing Cat



Working Group

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Contents

Foreword	3
Acknowledgements	4
Participants	5
Summary	6
Fishing Cat Conservation Strategy	11
Presentations	
Phylogeography of the Fishing Cat in India	15
Shomita Mukherjee	
Fishing Cat in Southeast Asia: speculations on status	19
J. W. Duckworth	
Chitwan National Park and Buffer Zone at a glance	24
Chandra Shekhar Chaudhary	
Conservation status of the Fishing Cat in Chitwan National Park, Nepal	25
Rama Mishra	
Fishing Cat outside protected areas in Nepal Terai	27
Sagar Dahal	
Fishing Cat conservation in hill country, Sri Lanka	29
Ashan Thudugala	
Status of Fishing Cat in Parsa Wildlife Reserve, Central Nepal	32
Bidhya Sharma	
Radio-collaring Fishing Cats in urban wetlands	34
Anya Ratnayaka	
Identifying priority sites and conservation actions for Fishing Cat in Cambodia	37
Thaung Ret and Vanessa Herranz Muñoz	
Fishing Cat conservation in West Bengal, India	41
Tiasa Adhya	
Fishing Cat status in Vietnam	44
Daniel Willcox	
Status and conservation of Fishing Cat in Bangladesh	46
Hasan Rahman, Jennifer McCarthy and Kyle McCarthy (presented by Hasan Rahman)	
Ecology and conservation of Fishing Cat in Godavari mangroves of Andhra Pradesh	48
Giridhar Malla	
Community-based Fishing Cat conservation in the Eastern Ghats of South India	51
Murthy Kantimahanti	
Captive Fishing Cats in European zoos	55
Neville Buck	



Fishing Cat Species Survival Plan in North America	58
Linda Castaneda	
A recovery plan for otters in Southeast Asia	59
Katrina Fernandez (presented by Will Duckworth)	
Fishing Cat and otters in Pakistan	61
Angie Appel	
Strategic Planning	64
Kumar Upadhyaya	
References	66
Field visit to the Bandarjola islands	70
Press release: First ever Conservation Strategy for the Fishing Cat	72



Foreword

Almost three decades after the Fifth International Snow Leopard Symposium, conservationists working on behalf of the world's Fishing Cats met for the very first time. The five-day symposium took place in Nepal, and brought together participants from the range countries of Bangladesh, Cambodia, India, Sri Lanka and Nepal, and interested stakeholders from Germany, UK and USA. The range countries of Indonesia (Java), Myanmar, Pakistan, Thailand and Vietnam did not send representatives although the possible status of Fishing Cat in these countries was covered to some extent by participants. The meeting was supported by the Mohamed bin Zayed Species Conservation Fund (MbZSCF), Fishing Cat Fund, and the Cincinnati Zoo and Botanical Garden.

Going into the 2015 symposium Fishing Cat was one of four small cats considered Endangered by the IUCN Red List of Threatened Species (the others are Andean Cat, Bay Cat and Flat-headed Cat). In spite of this great concern for the future of Fishing Cat populations, and known losses in Southeast Asia there had been no international meeting to bring conservationists together. The paucity of funding to support Fishing Cat conservation efforts did not thwart conservationists in Cambodia, India, Nepal, Sri Lanka and Thailand. Supported in large part with funding from the MbZSCF, successful local efforts in India, Nepal and Sri Lanka, together with an effort in Thailand, inspired a belief that future conservation efforts could be guided by sharing experience and knowledge. To push global Fishing Cat conservation forward, this experience and hard-won knowledge had to be presented at an international forum. The successful proposal to support the First International Fishing Cat Conservation Symposium was submitted to MbZSCF by Angie Appel, Germany.

The date and place of the symposium were chosen by consensus to be May 2015, at the Koshi Bird Observatory in south-eastern Nepal. Though Nepal's devastating earthquake forced the meeting date and time to be postponed and relocated, nothing would prevent dedicated Fishing Cat conservationists from meeting in one place at the same time. After so many years of waiting the First International Fishing Cat Conservation Symposium began on 25 November 2015 at the Park View River Resort near Chitwan National Park, Kuleni, Nepal.

Each conservationist presented their efforts and shared their experiences, published in these proceedings. After each day's presentations long hours illuminated by candle light were spent relating experiences and discussing actions needed to save the world's Fishing Cats. The hallmark of the symposium was the high level of camaraderie, cooperation and sharing. Here were nearly all the world's experts on Fishing Cat conservation assembled in one place for the first time. Aided by candles and headlamps the revision of the Red List assessment was discussed.

The new generation of highly dedicated conservationists working tirelessly on behalf of Fishing Cat conservation is inspiring. Future support for existing efforts and additional support to fill gaps in our knowledge such as in Bangladesh, Pakistan and Myanmar is vital. The lessons gained by a failure to support an established conservation effort in Thailand by a uniquely talented person must never be repeated anywhere ever again. Funding agencies must accept that by any measure Fishing Cats are specialists, and no larger generalist species can act as umbrellas to protect their limited and often threatened habitats. Much of Southeast Asia had already been lost. The Javan Fishing Cat subspecies has likely followed the Javan Tiger into extinction. Fishing Cats in Vietnam have no laws protecting them and any that remain might be a lost cause. The existence of Cambodia's last Fishing Cats depends on bold conservation actions. Despite these setbacks, Fishing Cat conservationists will never give up. Donors should not give up either.

Jim Sanderson



Acknowledgements

The symposium participants are grateful to the Mohamed Bin Zayed Species Conservation Fund, the Fishing Cat Fund and the Cincinnati Zoo and Botanical Garden for providing the funding to make this symposium possible.



We thank Prativa Kaspal for her efforts in preparing the initial symposium scheduled to be held in May 2015 at the Koshi Bird Observatory in south-eastern Nepal. In April, the Himalayas suddenly thwarted our plans. When the earthquakes happened, temples fell to rubble, people died, houses became too dangerous to stay in and roads too precarious to travel on. So we decided to postpone the symposium to 25–29 November. Sadly, Prativa could not join us during this time.

Angie is indebted to the Chaudri family for giving her a home away from home during her stay in Kathmandu. She especially thanks Sangeeta for her patience and the always delicious food.

In early November it became apparent that the political unrest and ongoing strikes in southeastern Nepal would make traveling to the Koshi Bird Observatory too adventurous. Sharad Singh and the team of Himalayan Nature hosted our crisis meetings and served dainty food. Sharad found a new venue and organised our safe transport. Thank you all!!



We particularly thank Sagar Dahal for all his logistical assistance despite the severe fuel shortage. He made sure that all participants coming from abroad were accommodated in the [MountainChild Guest House](#). We thank all the Guest House staff for the great service and indulgently bearing our fluster at departures.

Taxi driver Dipendra Shrestha deserves a special mention. He was always there when needed and waited patiently at the airport, sometimes for hours.

Kumar Upadhyaya and his colleagues of the Human Resource Development Centre generously provided boards and office space. Angie appreciated the inspiring conversations and the never ending flow of sweet tea.



Tiasa Adhya thanks Hem Sagar Baral and Sailendra Raj Giri of Zoological Society of London Nepal who arranged for her to pass the turmoil at the international border near Birgunj safely. We were all relieved when we finally met her in Narayanghat.

Thanks are due to Palat Chaudhary and his team at Park View River Resort in Kuleni for hosting us, preparing amazing food and making our stay enjoyable. J. W. Duckworth thanks Palat and his staff for accommodating him several days early and allowing excellent wildlife viewing. Palat guided us on a jungle walk across the Bandarjola islands in the Narayani river – an unforgettable day!!



We are much obliged to Ram Chandra Kandel, Chief Warden of Chitwan National Park, who waived park entrance fees and allowed us to explore the Bandarjola islands.

Kanak Mani Dixit and Manju Khadgi of Yalamaya Dhokaima Cafe kindly arranged the Baggi Khana conference hall for our press conference on 2 December 2015.





Participants and guests



Anya Ratnayaka, Environmental Foundation (Guarantee) Limited, Sri Lanka
Tulshi Laxmi Suwal, Small Mammals Conservation and Research Foundation, Nepal
Sharad Singh, Himalayan Nature, Nepal
Rama Mishra, Central Department of Zoology, Tribhuvan University, Nepal
Sanjan Thapa, Small Mammals Conservation and Research Foundation, Nepal
Jim Sanderson, Small Wild Cat Conservation Foundation, USA
Sagar Dahal, Small Mammals Conservation and Research Foundation, Nepal
Murthy Kantimahanti, Eastern Ghats Wildlife Society, India
Hasan Rahman, Department of Entomology and Wildlife Ecology, University of Delaware, USA
Shomita Mukherjee, Sálím Ali Centre for Ornithology and Natural History (SACON), India
Bidhya Sharma, Institute of Forestry, Nepal
Sailendra Raj Giri, Zoological Society of London, Nepal
Vanessa Herranz Muñoz, Bastet Conservation, Spain
Neville Buck, Aspinall Foundation, United Kingdom
Tiasa Adhya, National Centre for Biological Sciences, India
Giridhar Malla, Wildlife Institute of India, India
Thaung Ret, Center of Biodiversity Conservation, Royal University of Phnom Penh, Cambodia
Ashan Thudugala, Postgraduate Institute of Science, University of Peradeniya, Sri Lanka
Kumar Upadhyaya, Human Resource Development Centre, Nepal
J. W. Duckworth, United Kingdom
Hem Sagar Baral, Zoological Society of London, Nepal
Linda Castaneda, Cincinnati Zoo and Botanical Garden, USA
Angie Appel, Germany
Karan Bahadur Shah, Himalayan Nature, Nepal
Daniel Willcox, Save Vietnam's Wildlife, Vietnam
Hari Pariyar, Tiger Mountain Pokhara Lodge, Nepal
Chandra Shekhar Chaudhary, Chitwan National Park, Nepal



Summary

The Fishing Cat Working Group (FCWG) was founded in spring 2011 with the aim of compiling and disseminating information about the Fishing Cat *Prionailurus viverrinus* and encouraging conservation action for the species. Some FCWG members are involved in surveying ecology and status of the Fishing Cat in several range countries. Some have compiled available information on the historical distribution of the Fishing Cat. Together, we are determined to address conservation needs including mitigating threats to the survival of wild Fishing Cat populations.

Already in 2012, we conceived the idea of organising a symposium to provide an opportunity for exchanging experiences gained by wildlife biologists and conservationists who work in Fishing Cat-related projects. The First International Fishing Cat Conservation Symposium was held between 25 and 29 November 2015 in Nepal and attended by 25 participants from nine countries. Two guests, Hem Sagar Baral and Chandra Shekhar Chaudhary, joined us on 25 November.

On the first day of the symposium, Angie Appel welcomed participants and guests. She announced that FCWG member Tiasa Adhya had recently been selected as one of seven nominees for the international Future for Nature Award 2016. She also showed a short video of a pair of Fishing Cats hunting in Keoladeo Ghana National Park, northern India. This sequence was taken at the end of the 1980s and is possibly the oldest documentary about wild Fishing Cats.

The following presentations revolved around initiatives and projects in Fishing Cat range countries and in captivity.

Projects in Nepal

Nepal is the northernmost confirmed range country for Fishing Cat, although the species is present only in the southern lowlands, the Terai. Historical records comprise several specimens obtained by Hodgson (1836), one specimen collected in the eastern Terai (Hinton and Fry 1928) and two collected at two locations in the western Terai (Mitchell 1977). McDougal and Smith (1984) reported its presence also in Chitwan National Park in the central Terai.

In 2011, Pandey et al. (2012) initiated the first research project on Fishing Cat in Nepal. They assessed its status in and around Koshi Tappu Wildlife Reserve in the eastern Terai and conducted several awareness raising events in local schools.

In spring 2012, **Rama Mishra** explored the specific habitat used by Fishing Cats in Chitwan National Park. She surveyed an area of 160 km² in the alluvial floodplains of Rapti, Reu and Narayani rivers. Most of the records obtained were at locations with dense and tall grass around. For details see her presentation titled “Conservation status of the Fishing Cat in Chitwan National Park, Nepal” on pages 25–26.

During a survey on small mammals, **Sagar Dahal** and his colleague had captured a Fishing Cat in a live trap in Chitwan National Park (Dahal and Dahal 2011). Since then Sagar is determined to search for Fishing Cat from eastern to western Terai and find the links between population units. For details see his presentation “Fishing Cat outside protected areas in Nepal Terai” on pages 27–28.

In 2014, **Bidhya Sharma** conducted surveys in Parsa Wildlife Reserve, which is adjacent to Chitwan National Park in the central Terai. For details see her presentation “Status of Fishing Cat in Parsa Wildlife Reserve, Central Nepal” on pages 32–33.

Nothing is known to date about the presence of Fishing Cat in the western Terai, where two protected areas, Shuklaphanta Wildlife Reserve and Bardia National Park, and a vast array of unprotected wetlands possibly have habitat suitable for the species. In the Terai east of Koshi Tappu Wildlife Reserve, there is no protected area but several river valleys and wetlands in human-dominated landscape that warrant targeted surveys.



Projects in India

A large part of what is known today about Fishing Cat ecology has been researched and published by Indian authors. Haque (1988) encountered a Fishing Cat scavenging on a cow carcass in Keoladeo Ghana National Park. Mukherjee (1989) observed Fishing Cats in the wetlands of the same protected area on numerous occasions while studying dietary composition, habitat occupancy and activity patterns of sympatric carnivores. Haque and Vijayan (1993) analysed food habits of Fishing Cats inhabiting this national park.

Shomita Mukherjee continued working on Fishing Cat in India in 2010. She set out to determine genetic diversity and connectivity among Fishing Cat populations occurring in the Indian Terai, in the Sundarbans and on India's east coast. She also searched for Fishing Cat along the Kerala coast in south-western India, from where only historical accounts exist, all open to some degree of question. For details see her presentation "Phylogeography of the Fishing Cat in India" on pages 15–18.

Since 2011, **Tiasa Adhya** has been documenting and mapping the distribution of Fishing Cat outside protected areas in Howrah and Hooghly districts, West Bengal. Her initial surveys revealed that 27 Fishing Cats were killed in just 18 months between 2010 and 2011 in the districts. She also found that the Fishing Cat has a broad dietary spectrum with fish as primary prey and an almost similar proportion of rodents. Tiasa was instrumental in forming Fishing Cat Protection Committees and works with local communities to initiate a community-owned Fishing Cat conservation area. For details see her presentation "Fishing Cat conservation in West Bengal, India" on pages 41–43.

Giridhar Malla studies the ecology of Fishing Cat in mangrove habitats of the Godavari Delta in Andhra Pradesh. For details see his presentation "Ecology and conservation of Fishing Cat in Godavari mangroves of Andhra Pradesh" on pages 48–50.

Since 2012, **Murthy Kantimahanti** has been documenting the presence of Fishing Cat in coastal Andhra Pradesh, where the Krishna River delta possibly hosts the southernmost Fishing Cat population in India. He initiated a community-based Fishing Cat conservation programme and trains local youths in survey methods. For details see his presentation "Community-based Fishing Cat conservation in the Eastern Ghats of South India" on pages 51–54.

Large knowledge gaps exist regarding the distribution of Fishing Cat in India. A vast array of wetlands in the Indian Terai, in north-eastern India and along India's east coast has either not been surveyed, or information, if existing, has neither been published nor been made available to the FCWG.

Projects in Sri Lanka

In 2011, Andrew Kittle made 49 locations available to the FCWG where he had collected reports about Fishing Cat in the country. These records and reports suggest presence of Fishing Cat in many protected areas from coastal wetlands to hill forests in the country's interior. For two years, Sri Lanka looked like a 'safe haven' for Fishing Cat, until two people made us realise that it is not so secure.

Since 2014, **Ashan Thudugala** has been monitoring potential threats to Fishing Cat in the country. He initiated a research and conservation project in the hilly region and organises awareness programmes for school children and students. He also started setting up road signs at spots along highways where Fishing Cats have been killed in road accidents. For details see his presentation "Fishing Cat conservation in hill country, Sri Lanka" on pages 29–31.

Colombo is the only metropolis in the world known to harbour Fishing Cats, despite the urban sprawl on the city's wetlands. Equipped with one camera-trap **Anya Ratnayaka** set out in 2013 to find out what happened to the city cats. To date she radio-collared three Fishing Cats that have come into conflict with people, one of them for killing several Butterfly Kois, carp worth about US\$ 60 each. For details see her presentation "Radio-collaring Fishing Cats in urban wetlands" on pages 34–36.



Records in Bangladesh

Bangladesh has 43 designated wetlands including saltwater swamps, freshwater marshes and lakes, and human-made reservoirs; almost half of the country's people depend on resources of these wetlands, which are undergoing conversion and degradation (Islam 2010).

Hasan Rahman, Jennifer McCarthy and Kyle McCarthy used a presence-only computer model to predict the distribution of Fishing Cat in the country based on 24 observations. For details see Hasan Rahman's presentation "Status and conservation of Fishing Cat in Bangladesh" on pages 46–47.

More is known about dead Fishing Cats in the country than about live ones. Between January 2010 and March 2013, national newspapers reported 82 incidents involving Fishing Cats that were captured by local people; 14 individuals were rescued and released without being monitored; 30 individuals were fatally injured, and the fate of 38 Fishing Cats remained unknown (Chowdhury et al. 2015). The authors called for urgent measures to protect the species. Yet, a conservation project has not been initiated to date, nor have targeted surveys been conducted in the country.

Records in Southeast Asia

J. W. Duckworth collated records of Fishing Cat in Southeast Asia excluding Cambodia and Vietnam. Southeast Asia comprises a large proportion of the global range of Fishing Cat but has provided very few recent records. This is of considerable concern. Thailand, Myanmar, Java and also Cambodia and Vietnam have extensive suitable coastal habitat, all have undoubted Fishing Cat records and some might hold large populations. All are seriously undersurveyed, so it is equally possible, on the information available, that Fishing Cat is close to extinction in all five. Lao PDR, Malaysia and Sumatra lack confirmed records; present occurrence in Lao PDR and Malaysia is likely to be marginal at best, but in Sumatra could be substantial, although the species might not occur there at all.

The overwhelming majority of recent, post-1980 records from Southeast Asia come from coastal areas. In this region, there is very low overlap in Fishing Cat known localities with 'typical' conservation. Many erroneous claims muddle the picture: Fishing Cat can be very difficult to identify even for those particularly interested in it. To take the current information base for Southeast Asia as an adequate basis to know the priorities there risks overlooking major opportunities, which will not be there for ever given the pace of habitat change and level of hunting.

For details see his presentation "Fishing Cat in Southeast Asia: speculations on status" on pages 19–23.

The first project in Cambodia

Since the upsurge in mammal survey and conservation effort in Cambodia in the late 1990s, there have been many claims of Fishing Cat in the country. A high proportion of these claims is incorrect or lack evidence to allow confirmation. Only one individual was photographed by a camera-trap (Rainey and Kong 2010).

The first survey targeting Fishing Cat was initiated in November 2014. **Thaung Ret** and **Vanessa Herranz Muñoz** presented details of the project "Identifying priority sites and conservation actions for Fishing Cat in Cambodia" on pages 37–40.

This survey focused on a small proportion of potential Fishing Cat range in the country. There is a vast area yet to be surveyed for Fishing Cat.



Records in Vietnam

Daniel Willcox collated historical and modern records of Fishing Cat in Vietnam where the cat is included in the mammal lists of many protected areas and wildlife surveys. Historical specimens indicate at least former presence around Nha Trang at about 12° 30' N. Verifiable records traced during and after the 1980s are only from the U Minh area of the Mekong Delta, but a post-2000 survey in this area failed to find Fishing Cat. The Red River Delta might hold a Fishing Cat population but the conservation status of most hunting-sensitive animal species there is poor because of the illegal wildlife trade. A concerted search for Fishing Cat in the country is urgent as it may be approaching national extinction, and might not occur in any of the high-profile protected areas of the country. For details see Daniel's presentation "Fishing Cat status in Vietnam" on pages 44–45.

What Fishing Cat and otters share

Katrina Fernandez represents the IUCN SSC Otter Specialist Group. She suggested that Fishing Cat and otters share a great proportion of the same basic habitat types and thus face similar threats throughout their range, such as draining of wetlands for agriculture, water pollution, excessive hunting and extensive commercial fishing. As Katrina could not attend our symposium as planned, J. W. Duckworth presented "A recovery plan for otters in Southeast Asia" on pages 59–60.

Angie Appel collated the scarce information on historical records of Fishing Cat and modern records of otters in Pakistan's Sindh Province. A few recent reports indicate that Fishing Cat is still present in the westernmost range country. She recommends to conduct surveys in the near future. For details see her contribution "Fishing Cat and otters in Pakistan" on pages 61–63.

Captive breeding programmes

Neville Buck gave an overview on the captive Fishing Cat population in European zoos. He informed about good enclosure design, health care issues, feeding recommendations and good practises for successful reproduction. For details, see "Captive Fishing Cats in European zoos" on pages 55–57.

Linda Castaneda introduced us to the Fishing Cat Species Survival Plan in North America and her efforts to support in situ Fishing Cat conservation through the recently founded Fishing Cat Fund. For details, see "Fishing Cat Species Survival Plan in North America" on page 58.

Both Neville's and Linda's participation in the FCWG is highly appreciated. Their support contributes to building a bridge between ex situ and in situ conservation of Fishing Cat.



Planning the Fishing Cat Conservation Strategy

On 26 November, Kumar Upadhyay introduced participants to the concepts of strategic analysis and impact chain. For details, see his presentation about “Strategic Planning” on pages 64–65.

Subsequent to his presentation, Kumar facilitated the conservation strategy planning workshop and plenum sessions on 26 and 27 November. Under his guidance we prepared a list of threats and constraints pertaining to Fishing Cat conservation, and formed three working groups. Shomita Mukherjee, Giridhar Malla, Anya Ratnayaka, Rama Mishra, Tulshi Laxmi Suwal, Karan Bahadur Shah, Daniel Willcox and Thaung Ret formed the group working on ecological issues. Tiasa Adhya, Vanessa Herranz Muñoz, Sharad Singh, Hasan Rahman, Sailendra Raj Giri, Sanjan Thapa and Jim Sanderson formed the group working on policy and legal issues. The group working on socio-cultural issues comprised Angie Appel, J. W. Duckworth, Sagar Dahal, Murthy Kantimahanti, Neville Buck, Bidhya Sharma, Linda Castaneda, Hari Pariyar and Ashan Thudugala. The groups' tasks were defined as:

- suggest a vision, i.e. an ideal state for the end of this century
- suggest a goal to achieve in about 10 years
- define 5-year objectives for the identified issues, to achieve the goal
- identify practical actions which in combination include all that reach objective.

The “Fishing Cat Conservation Strategy” developed during these two days is presented on pages 11–14.

Jungle walks and paperworks

On 28 November, we explored the Bandarjola islands of the Narayani river, one of Rama Mishra's survey sites in Chitwan National Park. Impressions from our field visit are shown on pages 70–71.

On 29 November, we discussed the IUCN Red List reassessment for Fishing Cat and prepared the press conference scheduled for 2 December in Kathmandu. Our press release is shown on pages 72–73.

Slok Gyawali attended our press conference and wrote the article [Fighting for the Fishing Cat](#).



Fishing Cat Conservation Strategy

Vision

Wild Fishing Cat populations are viable across their native range and habitats, culturally valued globally and living in harmony with humankind.

Goal

Ensure survival of wild Fishing Cat populations

Ecological issues

Objective 1

Maintain persistence of populations in human-dominated landscapes

Activities

- Monitor agricultural practices such as cropping patterns, pesticide use and harvest patterns
- Monitor wetland use by people
- Generate information on Fishing Cat diet
- Monitor prey base
- Monitor people's attitudes on Fishing Cat, quality of wetland habitats and hunting rate

Coordinators

Giridhar Malla, Sagar Dahal, Anya Ratnayaka

Contributors

Tiasa Adhya, Shomita Mukherjee, Vanessa Herranz Muñoz, Bidhya Sharma, Rama Mishra

Objective 2

Close information gaps on conservation status

Activities

- Focus surveys on range countries where distribution and current status is unclear, such as Pakistan, Bhutan, Myanmar, Malaysia, Vietnam, Sumatra and Java
- Produce Fishing Cat distribution maps based on confirmed records
- Maintain a network with researchers working on other taxa for authentic Fishing Cat records
- Produce habitat distribution maps
- Monitor prey base
- Undertake water quality analysis in study sites
- Create a manual on best practices and standardized techniques for Fishing Cat monitoring across range countries
- Produce identification guides for relevant stakeholders; report in peer-reviewed publications
- Identify Fishing Cat populations that are vulnerable to sea level rise and formulate mitigation plans
- Identify and prioritize threats using standardized methods
- Research to understand whether solid waste is a threat
- Research to understand whether chemical contamination is affecting Fishing Cats
- Assess and revise IUCN Red List data periodically

Coordinators

Shomita Mukherjee, Sagar Dahal

Contributors

Murthy Kantimahanti, Tiasa Adhya, Angie Appel, Karan Shah, Will Duckworth, Ret Thaung, Anya Ratnayaka, Ashan Thudugala, Sagar Dahal, Sharad Singh, Hasan Rahman, Giridhar Malla, Rama Mishra, Bidhya Sharma, Daniel Willcox

First International Fishing Cat Conservation Symposium, November 2015



Policy and legal issues

Objective 3

Strengthen stakeholders' engagement in Fishing Cat conservation

Activities

- Identify stakeholders at all levels
- Collaborate with stakeholders and hold meetings to develop strategy to promote Fishing Cat conservation
- Increase and diversify funding sources for Fishing Cat conservation
- Network to facilitate transfer of Fishing Cat scat and hair samples between range countries for genetic analysis
- Initiate transboundary Fishing Cat conservation units
- Develop a Fishing Cat identification and conservation manual
- Share relevant manuals and plans with stakeholders

Coordinator

Tiasa Adhya

Contributors

Vanessa Herranz Muñoz, Jim Sanderson, Sagar Dahal, Ret Thaung, Hasan Rahman, Anya Ratnayaka, Neville Buck, Will Duckworth, Angie Appel, Daniel Willcox

Objective 4

Include Fishing Cat in the stakeholder policy agenda

Activities

- Identify enforcement and implementation needs
- Develop strategies to address enforcement and implementation needs
- Identify and review contradictions in policies

Coordinator

Tiasa Adhya

Contributors

Karan Shah, Anya Ratnayaka, Daniel Willcox



Socio-cultural issues

Objective 5

Reduce conflict between humans and Fishing Cats throughout their range

Activities

- Educate local people about Fishing Cat diet and ecological services
- Encourage local people to get involved in Fishing Cat conservation zones
- Initiate community-based incentive programs to motivate people towards Fishing Cat conservation
- Market products made by local people in Fishing Cat conservation communities
- Campaign for law enforcement regarding prey depletion in Fishing Cat habitat
- Initiate changes in livestock husbandry
- Vaccinate and deworm domestic carnivores
- Campaign for natural water courses and restoration of mangroves and reed habitats
- Maintain existing distribution and size of wetlands

Coordinator

Ashan Thudugala

Contributors

Sagar Dahal, Anya Ratnayaka, Vanessa Herranz Muñoz, Ret Thaung, Tiasa Adhya, Bidhya Sharma, Murthy Kantimahanti, Giridhar Malla, Sharad Singh, Rama Mishra, Angie Appel

Objective 6

Reduce human induced mortality on Fishing Cat populations and habitat loss

Activities

- Enforce Fishing Cat protection status
- Develop a Fishing Cat conservation manual
- Enforce law on use of non-selective hunting methods
- Encourage hunters to transform into Fishing Cat conservationists
- Initiate livestock insurance schemes
- Initiate alternative practices in production of fodder for livestock
- Establish road signs, bumps and underpasses in areas where Fishing Cats are killed in traffic accidents

Coordinator

Murthy Kantimahanti

Contributors

Ashan Thudugala, Tiasa Adhya, Ret Thaung, Vanessa Herranz Muñoz, Hasan Rahman

**Objective 7**

Raise global awareness on Fishing Cats

Activities

- Increase positive media coverage about Fishing Cats
- Intensify social media campaigning through Fishing Cat stamps and global Fishing Cat Day
- Develop Fishing Cat marketing strategy
- Promote internship and volunteer program in successful Fishing Cat conservation projects
- Encourage university students to work in Fishing Cat conservation
- Introduce Fishing Cat conservation in school curricula
- Introduce Fishing Cat conservation into children's literature
- Produce audio-visual education material for Fishing Cat conservation
- Organize Second International Fishing Cat Conservation Symposium in 2017 or 2018

Coordinators

Angie Appel, Linda Castaneda

Contributors

Ashan Thudugala, Neville Buck, Rama Mishra, Sharad Singh, Will Duckworth, Ret Thaung, Bidhya Sharma, Anya Ratnayaka, Vanessa Herranz Muñoz, Sagar Dahal, Tiasa Adhya, Daniel Willcox



Phylogeography of the Fishing Cat in India

We conducted a phylogeographic study on the Fishing Cat from 2010 to 2012 to determine genetic diversity and connectivity among existing populations. Known records suggested that the cat is patchily distributed, which is not well documented in the IUCN distribution map of 2010.

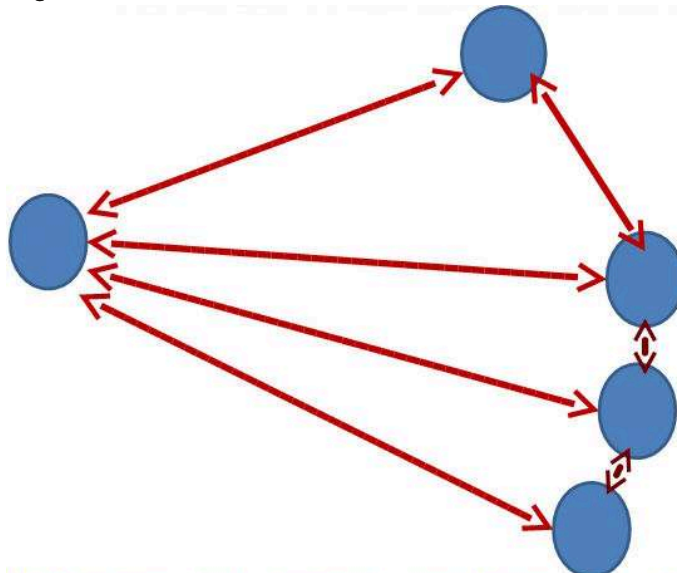


IUCN distribution map of 2010



Records collected in India between 2010 and 2012, indicated by yellow markers.

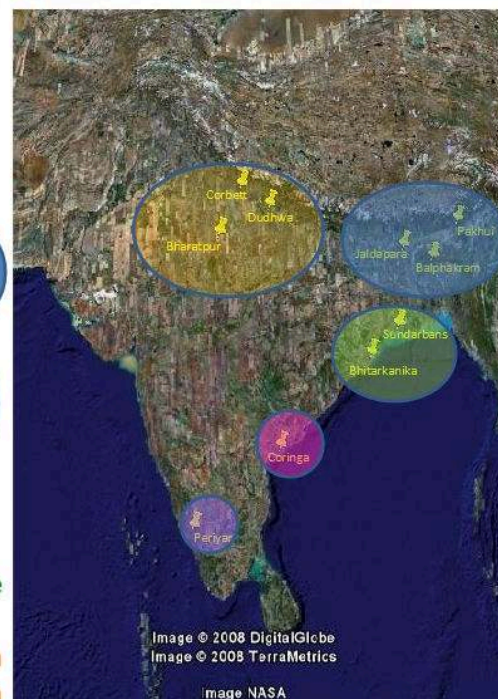
This study would rectify the error in the map as well as provide information on the cat's current status, if indeed its distribution were patchy and if there were any unique populations that needed urgent attention.



Northeastern and northern populations may be connected through Nepal.

Bharatpur – is it isolated or connected to the northern population? What is the current situation – is there a recent (50 – 100 years) physical break in contact?

Are southern populations isolated?



Isolated populations and genetic exchange

as distance increases genetic exchange decreases



We collected faeces samples from known locations of occurrence, extracted DNA and used a felid specific primer to ascertain if the faeces belonged to a cat. The amplified region was then sequenced and compared to existing sequences available to determine identity. The genetic information was compared with available information on other cats in India for a relative measure of genetic structure, if populations are genetically distinct.

Additionally, we conducted a survey in 2013 along coastal Kerala, an area which has provided a few unauthenticated reports. We used molecular faeces analysis, conducted interviews with local people and visually assessed habitat quality.

During an earlier study in Bharatpur, Rajasthan, I had observed that Fishing Cats deposit faeces on visually distinct objects such as cement tanks and culverts. We also observed this behaviour in Dudhwa Tiger Reserve, Katarniaghat Wildlife Sanctuary, Sundarbans Tiger Reserve and Coringa Wildlife Sanctuary.



Collecting faeces in Dudhwa Tiger Reserve



Fishing Cat faeces in Coringa WS

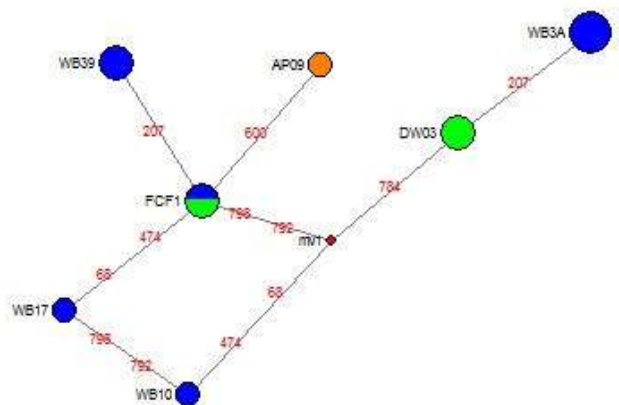


Fishing Cat faeces in Sundarbans

To locate scats we made use of this habit and collected 151 faeces during the 2010–2012 survey; 19 were identified as from Fishing Cats.

Haplotype networks

A haplotype is a sequence that is different from another sequence of the same region in at least one base pair. Haplotype diversity is a measure of genetic variation. Within 12 samples, haplotype diversity revealed seven haplotypes for Fishing Cat. Each circle in the graph to the right depicts a haplotype, and the size of the circle denotes the number of samples. The breaks on the arms connecting circles are the mutations. Each nick or number is a single mutation, and hence the number of mutations separating two haplotypes would indicate extent of genetic difference between the two. The small minute red dots in the haplotype network are “missing” haplotypes, i.e. haplotypes that are predicted to be present and may not have shown up due to poor sampling or loss due to population reduction. This case is very likely to be due to inadequate sampling. This network is not robust because of the limited sample size, but it shows that populations from the



Fishing Cats from India (n=12) with seven haplotypes: blue from West Bengal; green from Dudhwa and Katarniaghat; orange from Coringa.



Sundarbans and Terai, i.e. Dudhwa and Katarniaghat, share haplotypes. So they are genetically connected. As these are mitochondrial data that depict information from a certain depth in time, this connection could be a signal from the past. Contemporary populations could be fragmented recently and not connected physically. This hypothesis will have to be corroborated through camera trap and faeces surveys in areas between two known populations. The genetic data, though meagre, inform us that the Fishing Cat is likely to have considerable genetic variation. This needs further exploration through sampling in new, not sampled and less rigorously sampled localities like Andhra Pradesh, Assam and Bharatpur. Nuclear DNA data would provide additional information on current variation, though it is difficult to obtain this information from faeces.

Assessment of potential threats

An assessment of potential threats conducted during this survey indicates that habitat loss, hunting and fragmentation of populations were the major issues.

Habitat loss

- Agricultural development in Sundarbans, Howrah and Hooghly
- Urbanization in and around Kolkata city's Salt Lake area
- Industrialization such as brick factories in Howrah and Hooghly

Habitat loss can wipe out entire populations, is very difficult to halt or address and is a lost case unless there is political will to conserve.



Agriculture in Fishing Cat habitat, West Bengal

Hunting

- Illegal trade around the Indo-Nepal border
- Food: tribal people in the Sundarbans eat them
- Conflict: in the Sundarbans and Howrah, Fishing Cats are killed when they take chickens and domestic ungulates

This can be addressed and is being done by Tiasa Adhya and her team in small pockets in West Bengal.

Fragmented populations

- Fragmented habitats
- Genetic isolation
- Increased vulnerability to extinction

Loss of genetic diversity is the result of fragmented populations. In some cases habitats exist but Fishing Cats are hunted to extinction like in Saagar Island in Sundarbans, in Hooghly and Howrah districts. The threat of fragmented populations is very difficult to halt or address, and a lost case unless there is a policy level change in land use.



Forest staff and volunteers in Coringa



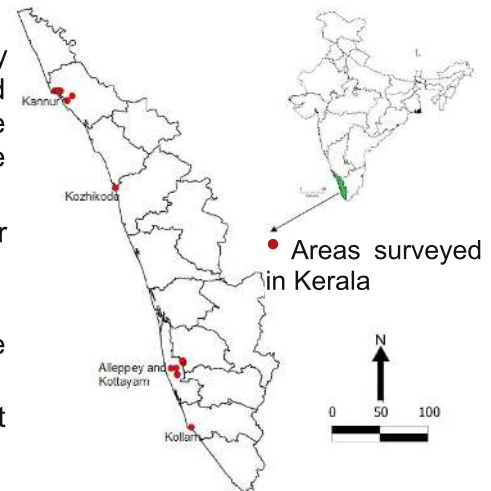
Volunteers in Sundarbans



Survey in Kerala

The survey along the Kerala coast did not produce any positive result for the Fishing Cat from the 51 faeces collected in five districts. Additionally, our arguments against the putative presence of Fishing Cats along coastal Kerala are based upon the following observations:

- The mangroves and canals surveyed were in very poor shape.
- Canals did not have fish to support a medium sized cat.
- The description of cats seen by locals was that of Jungle Cat *Felis chaus* (long legs, short tail, large ears).
- Locals did not have a local name for the Fishing Cat unlike in other areas where it occurs.



Canal in Alleppey



Canal in Alleppey



Solid waste at survey site in Kannur



Solid waste at survey site in Kozhikode

Fishing Cat may have never occurred along the west coast of India perhaps due to high salinity levels along this coast. The Arabian Sea is reported to be more saline than the Indian Ocean and Bay of Bengal. Moreover, there are no major rivers flowing into the west coast of India unlike the Ganges, Godavari and Krishna on the east coast. This is however a hypothesis and needs to be tested. Niche models incorporating salinity as a variable might help suggest limits.

Acknowledgements

Uma Ramakrishnan from NBCS and Ramana Athreya from IISER Pune collaborated in the phylogeography work; Dayani Chakravarty, Navya Ramesh, Tiasa Adhya, Ovee Thorat, Prachi Thatte participated as volunteers. P. V. Karunakaran and Ranjini J., my colleagues from SACON, collaborated in the Kerala survey.



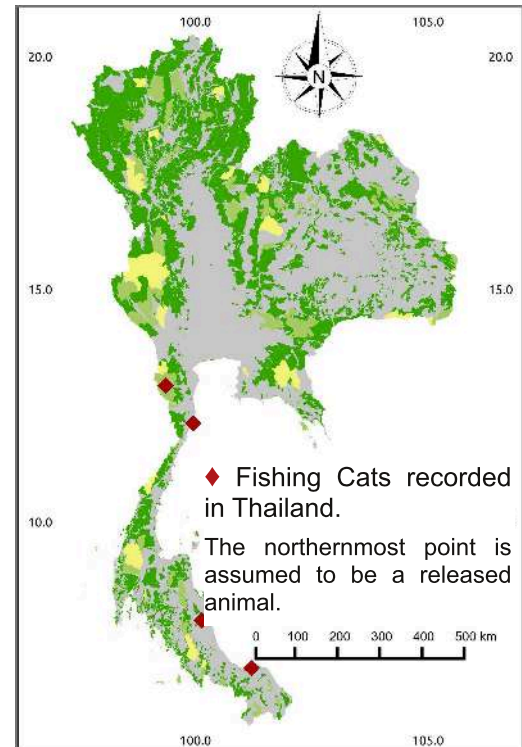
Fishing Cat in Southeast Asia: speculations on status

Southeast Asia is taken here to comprise the area from Myanmar in the north-west to Indonesia in the south-east. This region comprises a large proportion of the global range of Fishing Cat, by coarse land area. But it has provided very few recent records. This is of considerable concern. This contribution covers Thailand, Myanmar, Lao PDR, Malaysia and Indonesia.

Thailand

Tantipisanuh et al. (2014) compiled the non-*Panthera* cat results of a multi-institutional collaboration, involving 24 camera-trap surveys in 16 survey areas spread across the country, supplemented by incidental records including a well-publicised request over social media (further details are given in Chutipong et al. 2014). These had various survey priorities, such as general mammal inventory, Tiger *Panthera tigris* focussed, Dhole *Cuon alpinus* focussed and civet (Viverridae) focussed surveys. They totalled about 60,000 camera-trap nights. There were many records of Mainland Clouded Leopard *Neofelis nebulosa*, Marbled Cat *Pardofelis marmorata*, Asian Golden Cat *Catopuma temminckii* and Leopard Cat *Prionailurus bengalensis*, but very few of Jungle Cat *Felis chaus* and of Fishing Cat.

Indeed, Fishing Cat was recorded by the surveys they collated in only three areas. In one of these a Fishing Cat – presumably the animal photographed – had recently been released by a wildlife rescue organisation. The other two areas were surveyed specifically for Fishing Cat. Had these specific surveys not occurred, there would have been no records of wild Fishing Cat, despite the huge survey effort overall. Another valid locality record came incidentally from a coastal water-bird researcher (Buatip et al. 2013; image of cat supplied for validation of identification).



The most important conclusion from this undertaking is that it would be very rash to make any deductions about wider Fishing Cat status in a country or region from camera-trapping that has not been targeting it. The spatial scale of this conclusion warrants further thought, whether it is at the level of choice of survey area, or of choice of camera-trap station location within survey area, or both.

The few recent records are all from disturbed coastal wetlands with few or no other mammals of conservation interest. There is no evidence of inland occurrence nowadays. Tantipisanuh et al. (2014) did not collate historical records. But there is a historical specimen identified as Fishing Cat labelled from Tak province, ca.17°11'N, 98°54'E (A. Wilting pers. comm. to Duckworth et al. 2009) which, if identification and locality are valid, proves occurrence well inland in Thailand, at least formerly.

An important question then becomes whether Fishing Cat could still inhabit inland Thailand. Certainly this could be possible, if it lives outside 'good wildlife habitat', like it does on the coast, because suitable survey effort is so patchy outside the 'good wildlife habitat'. However, it should not be assumed to do so, and the lack of any credible recent inland claim – a road-kill, a photograph by a birdwatcher (Thai inland wetlands receive heavy coverage from birdwatchers, many of whom are equipped with excellent cameras), or other – suggests that nowadays it is not common in inland Thailand, if it occurs there at all. A comprehensive collation of historical records and other indications from Thailand would be very useful, to assist in considering the recent population trend there.



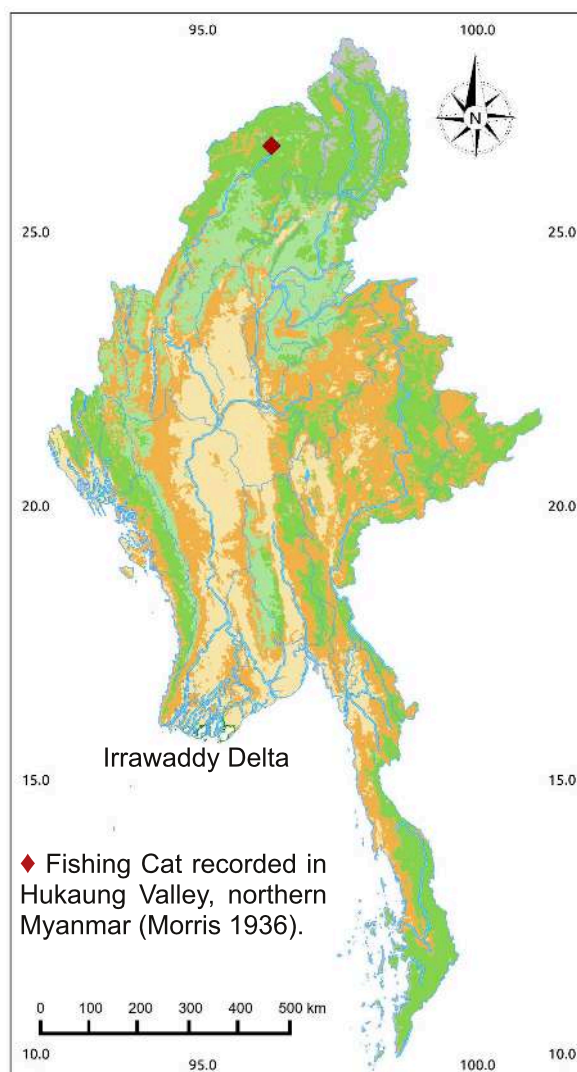
Lao PDR

Duckworth et al. (2010) reviewed claims of Fishing Cat in the country. Lao PDR has received much less camera-trapping than in Thailand. Thus, while there is no valid camera-trap record from the country, this does not indicate a lack of Fishing Cats there, particularly given that there has been no specific search. There is no coast, making it difficult to infer from Thailand or Vietnam where to look in Lao PDR for the species. There are multiple historical and recent claims: all except one proved to be in error or with insufficient detail to assess their validity. The exception was a 1996 sight-record by a very cautious and able observer, J. A. Wolstencroft. The description is fully consistent with Fishing Cat. This record was from the northern Annamites, in a river amid hill evergreen forest typical of Lao PDR. It is difficult to see why if Fishing Cat were there it would not be, or have been, widespread in the country. This region of the Annamites then supported various hunting-sensitive large mammals already by then much reduced in the rest of the country (Duckworth 1998). Very heavy hunting there and almost across the country (e.g. Coudrat et al. 2014a, 2014b) means that it may now never be possible to determine the original Lao status of Fishing Cat – if it ever occurred there at all. Much use is made of village interview as a substitute for survey in Lao PDR, and this almost invariably considers Fishing Cat common wherever in the country such interviews take place. It is impossible, given the lack of any objectively verifiable record, that Fishing Cat is widespread and common in Lao PDR. Similarly, even such real survey as does now occur often uses under-experienced personnel, meaning that incorrect claims of Fishing Cat continue, e.g. that in Ahumada et al. (2011), for which the camera-trap image was conveniently placed on the internet, and was certainly that of a Leopard Cat.

Myanmar

Than Zaw et al. (2014) undertook a non-*Panthera* cat records collation similar in scope to that for Thailand (Tantipisanuh et al. 2014), in that it covered the whole country, and was based around camera-trapping. There were many fewer survey areas and much lower overall effort than in Thailand. They included a close-to-comprehensive collation of historical records. They traced no targeted survey effort for Fishing Cat in the country. There were no camera-trap records, although, with no specific search, this does not mean the species is absent (see above). They found only one historical record: from 1935 in the Hukaung Valley (Morris 1936, Carter 1943) in habitat similar to the Terai, and thus in ecological terms more like South than Southeast Asia. Several Fishing Cats in the Yangon Zoo were said by staff to be the progeny of animals from the Irrawaddy Delta, a region totally unsurveyed for Fishing Cat, but similar in habitat the areas known to be occupied in adjacent Bangladesh. They also found one mount in a souvenir shop. Survey of the delta is very important: it could be found to hold large numbers of Fishing Cats but the habitat and human pressures there could change rapidly, given the pace of change currently in the country.

Inland Myanmar remains an unknown, but the lack of inland records provides food for thought. In colonial times, Myanmar held many British people whose typical leisure activity was hunting,





particularly of ducks, waders, notably snipes, and other wetland birds. There is, therefore, relative to the rest of Southeast Asia, copious documentation of lowland inland wetland Myanmar's birds. Many colonial bird-shooters were broad-minded general naturalists and would have been likely to know, record and shoot Fishing Cat were it in their areas. The absence of specimens from inland Myanmar, excepting the ecologically anomalous Hukaung, from this period strongly suggests the species did not use inland wetlands as typical of the rest of the country even then.

Malaysia

There is no comprehensive published overview of Fishing Cat claims from the country, although Duckworth et al. (2009) presented various relevant information. There is no certainty that Fishing Cat inhabits the country, but there are some indications from West (= peninsular) Malaysia. One, reportedly a wild-trapped animal from Negeri Sembilan, lived in a Melaka zoo over 1967–1977 (van Bree and Khan 1992). Several old specimens with imprecise localities are plausibly from trade and originated outside the country: but, equally, there is no evidence that they were not wild-caught in peninsular Malaysia. A published camera-trap record purporting to be a Fishing Cat in Taman Negara (Kawanishi & Sunquist 2003) is more likely to be a Leopard Cat (Duckworth et al. 2009). Like Myanmar, Malaysia held many British hunters during the colonial era, but they went more after 'jungle' big-game rather than water-birds; so the lack of colonial hunter specimens does not shed much light on the then status of Fishing Cat in the country.

Indonesia – Java

Melisch et al. (1996) undertook a track-based survey during the 1990s of the western part of the island. All localities with records were coastal or nearly so, although the extent to which that might reflect survey area selection is not clear. Sign-based identifications are at high risk of error when undertaken visually. However, the Javan carnivore community is simpler than that in mainland Southeast Asia, and there was a good locality overlap of 1990s track records with historical specimens. Filming by A. Compost (pers. comm. to Duckworth et al. 2009) around this time proved survival in at least two areas, the islet of Pulau Dua and the mainland, at Ujung Kulon. The current status is poorly known; the island could potentially be important for the species.



Indonesia – Sumatra

Duckworth et al. (2009) reviewed claims of Fishing Cat from the island. A number of recent field claims, were all either in error (camera-trap pictures) or were not assessable (signs). Extensive camera-trapping across the island has failed to find Fishing Cat but (see Thailand, above) this does not allow any inference on its status there because none of it was targeted for the species. Very large areas of potentially suitable habitat, coastal and deltaic wetlands, exist and have never been searched.

There are two specific indications of occurrence on the island: a recent captive, and a historical hunter testimony. The former is at a rural zoo in Siantar, in which all other animals are native to Sumatra, but it has proven impossible to determine the origin of this animal (Duckworth et al. 2009, Pusparini et al. 2014). The hunter testimony was provided by Delsman (1932) who provided a photograph from the hunter in question of a Fishing Cat in the flesh which had, unfortunately, been taken in Java. The same hunter said he had shot the species in Sumatra.



Captive Fishing Cat *Prionailurus viverrinus*, Siantar, Sumatra, Indonesia, 17 July 2008. Photograph by courtesy of C. R. Shepherd.



Fishing Cat *P. viverrinus* shot by Herr Pieters, Java, before 1932 (after Delsman 1932).

Summing up

Thailand, Myanmar, Java and also Cambodia and Vietnam have extensive suitable coastal habitat, all have undoubted Fishing Cat records and might hold large populations. All are seriously under-surveyed, so it is equally possible, on the information available, that Fishing Cat is close to extinction in all five. Lao PDR, Malaysia and Sumatra lack confirmed records; present occurrence in Lao PDR and Malaysia is likely to be marginal at best, but in Sumatra could be substantial, although the species might not occur there at all. The overwhelming majority of recent, post-1980 records from Southeast Asia come from coastal areas, with perhaps only one well inland, from the extreme lowlands of Cambodia (Rainey and Kong 2010). Review of historical specimens to determine former inland occurrence, and so possibly indicate areas to search, is urgently needed.

Fishing Cat has remained poorly known in Southeast Asia, reflecting two factors. In this region, there is very low overlap in Fishing Cat known localities with 'typical' conservation, in particular camera-trapping, areas. And erroneous claims muddle the picture. Fishing Cat can be very difficult to identify even for those particularly interested in it. Across mainland Southeast Asia, Fishing Cat is commonly listed in 'survey' reports based on villager information and on signs. These are rarely worth following up. Even claimed camera-trap photographs are usually in error. Claims of direct sightings are rarer but can be difficult to assess: a typical reply – received recently from a claim from highly implausible habitat – is "I know a Leopard Cat and find it quite distinct from a Fishing Cat". But they are not always quite distinct, and anyone making such an assertion reveals a cavalier approach to identification. There is a large body of expertise from assessing bird sight records, e.g. the annual reports of the British Birds Rarities Committee, which needs to be applied to Fishing Cat claims.

Next steps

It is very important to resolve the status of Fishing Cat in Southeast Asia. The information base is so fragmentary that some of what is suggested above may well turn out to be wrong. Poor information may lead to ineffective conservation. Certainly, to move forward taking the current information base for Southeast Asia as an adequate basis to know the priorities there would be very rash. Major opportunities, which will not be there for ever given the pace of habitat change and level of hunting, could be being overlooked.

***Uncertainties soluble without further field survey***

- General: compile a comprehensive listing of historical records, credible claims and, to reduce future confusion, errors and implausible / non-assessable claims, from across Southeast Asia.
- Myanmar and Lao PDR: none obvious.
- Thailand: does the habitat – type, condition and extent – of the three recent coastal locality records stand out in any way from the rest of the coast? Is there extensive suitable habitat so far unsurveyed?
- Malaysia: does habitat similar to that occupied on the Thai coast occur extensively in the peninsular Malaysia coastline?
- Sumatra: what is the current habitat condition of the areas (three, all coastal) mentioned by Delsman (1932) to hold the species? Have all possibilities been exhausted of determining the origin of the Siantar Zoo individual?
- Java: what recent camera-trapping has occurred in Java, how relevant is it for Fishing Cat, and what if anything can be concluded?

Field survey priorities**High**

- Myanmar: the Irrawaddy delta in particular, also other coastal areas.
- Sumatra: the three deltaic areas mentioned by Delsman and any other areas of similar habitat on the island.
- Thai coast: if habitat similar to the known areas remains extensive.

Moderate

- Inland Thai and Myanmar wetlands.

Low/negligible

- Lao PDR.
- Coastal West Malaysia: unless habitat similar to the known areas on the Thai coast is extensive and unsurveyed.

Not evaluated

- Java: information on recent surveys is needed to determine what further survey effort is warranted.



Chitwan National Park and Buffer Zone at a glance

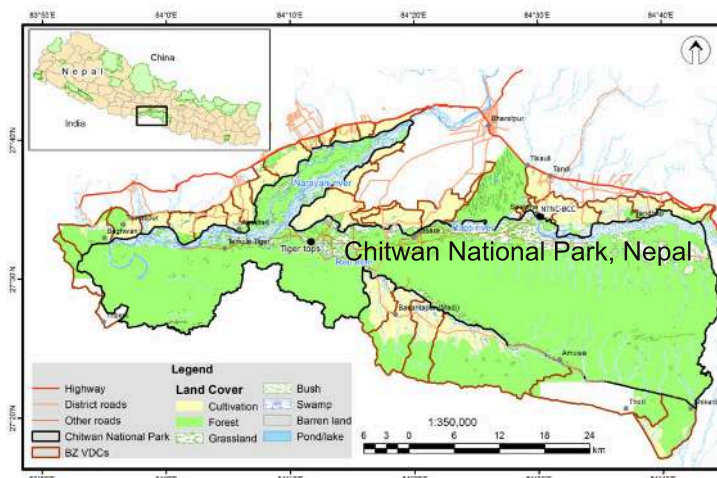
Chitwan National Park is located in the Inner Terai of south central Nepal and covers 932 km². It was designated in 1973 as IUCN Category II and declared a World Heritage Site in 1984. A 750 km² Buffer Zone was gazetted in 1996 spanning across four districts, including 34 Village Development Committees and two municipalities. There are 1,484 Buffer Zone User Groups, 21 Buffer Zone User Committees, 36,193 households and 223,260 people living in the Buffer Zone.

Bizhajari Lake is a Ramsar Site in the Buffer Zone. Major rivers are Narayani, Rapti and Reu. The area belongs to the Indo-Malayan biogeographic realm. Its tropical monsoonal climate is humid with temperatures of

8°–37° C and an average annual rainfall of 2,600 mm. Elevation ranges from 150 to 815 m.

Mammals include Greater One-horned Rhinoceros *Rhinoceros unicornis*, Tiger *Panthera tigris*, Asian Elephant *Elephas maximus*, Gaur *Bos gaurus* and Sloth Bear *Melursus ursinus*. Notable birds are Bengal Florican *Houbaropsis bengalensis*, Lesser Florican *Sypheotides indicus* and Great Hornbill *Buceros bicornis*. Notable reptiles include Asian Rock Python *Python molurus*, Gharial *Gavialis gangeticus* and Golden Monitor Lizard *Varanus flavescens*.

In the Fiscal Year 2010–11, 146,662 people visited the park, and the total revenue amounted to NRs 83,145,936 (US \$1,039,324).



Historical summary

Between 1946 and 1951, the area was protected as a Royal Hunting Reserve; Chitwan Valley was still forested, and the Rhino population estimated at 800 individuals. During the 1950s, land use changed rapidly. Forests were converted for farming, malaria was eradicated, and hill people migrated to Chitwan. In 1959, the Tikauli forest area was declared Mahendra Deer Park. By 1960, about 65% forest cover was lost, Wild Water Buffalo *Bubalus arnee* and Swamp Deer *Rucervus duvaucelii* extinct. In 1963, the forest south of Rapti river was declared a Rhino Sanctuary, and the Rhino Patrol started. In 1966, the Rhino population had dwindled to about 100 individuals. In 1973, the National Park and Wildlife Conservation Act was ratified and the park established with an area of 544 km². The Nepal Tiger Ecology Project started. In 1974, the Chitwan National Park Regulation was introduced. In 1975, the first management plan was prepared and the Nepal Army deployed for park protection. In 1977, the park's area was extended to 932 km². In 1978, the captive breeding of Gharials started.

In 1984, four rhinos were gifted to Dudhwa National Park, India. In 1985, the Elephant Breeding Centre was established. In 1986, Rhino translocation to Bardia National Park started. In 1994, the Park and People Programme was launched. In 1996, the Buffer Zone was declared.

In 2000, the Rhino count through sweep method was adopted, and 544 individuals were recorded. In 2001, the Management Plan for Chitwan National Park and Buffer Zone (2001–2005) was prepared. In 2002, the Tiger population was estimated at 40–50 individuals. In 2003, Bizhajari and associated lakes were declared a Ramsar Site, and Rhinos were translocated to Shuklaphanta Wildlife Reserve. A Rhino count conducted in 2005 revealed a population decrease to 372 individuals. In 2007, the Gaur population was censused at 296 individuals. In 2008, the Rhino population was censused at 408 individuals, and 65 Gharials were recorded. A Tiger census using camera traps in 2010 recorded 125 individuals. In 2011, 503 Rhinos, 81 Gharials and 312 Gaurs were counted. Rhinos counted in 2015 included 645 individuals.



Conservation status of the Fishing Cat in Chitwan National Park, Nepal

The objective of my study was to assess the status and threats to the Fishing Cat and associated small carnivores in Chitwan National Park. Specific objectives were to determine their distribution in the floodplains of Rapti, Reu and Narayani rivers, estimate their densities and identify threats to these species.

Study area

The study lasted from 25 March to 11 June 2012. For the sign and camera-trapping part my team and I selected four study blocks: Sauraha and Kasara situated along the Rapti river, the Reu river farther west near Tiger Tops Jungle Lodge (TTJL) and the islands in the Narayani river. The vegetation comprises sal forest, riverine forest and grassland with a faunal diversity of nearly 70 mammal species, over 525 bird species, and 55 amphibian and reptile species.

Material and methods

Each block was divided into 10 cells of 2 km x 2 km along wooded grassland, grassland, river bank, riparian and mixed forest and partly also in sal forest. We searched the grids for signs to determine the best possible locations for setting up camera traps.



Fishing Cat pugmark

We used Reconyx RM45 and Moultrie D-40 camera-traps that were active for 24 hours in all four blocks. Both models were set to take three consecutive images when an animal passed the motion sensors. Reconyx models triggered every 10 seconds, and Moultrie models at an interval of one minute. They were deployed roughly 30 cm above ground and 2–3 m from the center of a trail.

We maintained a distance of 0.5–1.5 km between camera-trap stations. In the Sauraha block, stations consisted of single camera traps that were active for 14 days. In the other three blocks we placed two camera traps per station, opposite each other and both focused on the center of the trail to photograph the whole body of an animal. These were active for 10 days each. A total of 78 stations comprised 22 in the Sauraha block, 19 in the Kasara block, 17 in the TTJL block and 20 in the Narayani islands' block.

A single event comprises one or more images taken at one camera-trap station, which are known or likely to show the same individual or other social unit, and have no gap longer than 60 minutes between successive such images. For data analysis I used two different methods for population and density estimation: capture-recapture analysis in CAPTURE program and spatially explicit capture-recapture analysis in SPACECAP program. In both programs, the confidence interval (CI) was calculated at 95%.

During the camera trapping period we conducted 35 semi-structured interviews with people who spent considerable amount of time in and around the park and know the area well. Respondents included one boat man, five wildlife technicians, eight park staff such as game scouts, wildlife veterinarians and officers, ten elephant drivers and 11 nature guides.

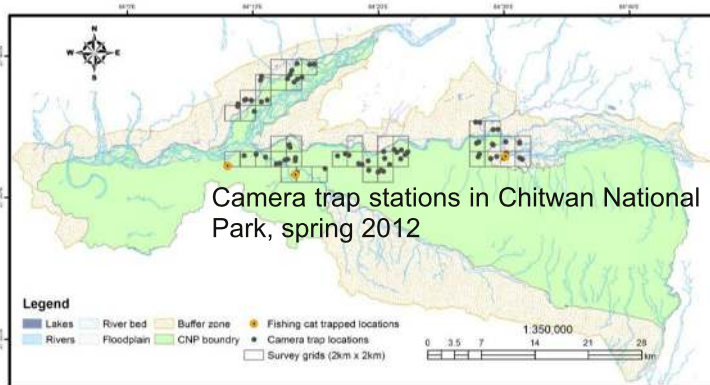


My colleagues and I setting up camera traps and recording site details



Results

The total survey effort was 868 camera-trap days across a total potential habitat area of 160 km². We obtained 19 photographs of Fishing Cat from three stations in six independent events. Three were taken in the Sauraha block, and the other 16 in two stations in the TTJL block. All three stations were located near lakes. From these photos we identified five individuals on the basis of their spot pattern.



The analysis in CAPTURE estimated a population of seven Fishing Cats with a 95% CI of 6–23 and a density of 4.37 individuals per 100 km². The analysis in SPACECAP estimated a population of 17.74 individuals with a 95% CI of 9–25 and a density of 6.06 individuals per 100 km².



Fishing Cat photographed in the western part of Chitwan National Park in April 2012

The camera traps also recorded Leopard Cat *Prionailurus bengalensis*, Jungle Cat *Felis chaus*, Large Indian Civet *Viverra zibetha*, Small Indian Civet *Viverricula indica*, Common Palm Civet *Paradoxurus hermaphroditus*, Small Asian Mongoose *Herpestes javanicus* and Indian Grey Mongoose *H. edwardsi*.

More than half of all respondents were of the opinion that wetlands have decreased in the park, affecting Fishing Cats severely. Other minor threats proposed included poisoning of wetlands, human disturbance, overfishing and poaching.

Recommendation

The Fishing Cat should be included in the list of protected animals of Nepal. Degradation and destruction of wetlands should be stopped and wetland restoration be prioritized. As the Fishing Cat population in Chitwan National Park is very small, periodic monitoring should be continued.

Acknowledgments

I thank my advisors Khadga Basnet and Rajan Amin, the members of the Fishing Cat Project Naresh Subedi, Babu Ram Lamichhane, Bishnu Lama, Harkaman Lama, Tirtha Lama and Ramesh Darai, the Department of National Park and Wildlife Conservation, my parents and family members. I am grateful to National Trust for Nature Conservation and Panthera Small Cat Action Fund for funding support.



Fishing Cat outside protected areas in Nepal Terai

The Fishing Cat is known as “Malaha Biralo” in Nepali; “Malaha” refers to a fisherfolk, and “Biralo” means cat (Baral and Shah 2008). It is also known as “Pani Biralo” meaning Water Cat.

Study of Fishing Cat in Nepal: 1980s to present

Location records of Fishing Cats have been generated during Tiger *Panthera tigris* monitoring and other biodiversity surveys in the Terai. McDougal and Smith (1984) reported Fishing Cat in Chitwan National Park (CNP) where one individual was radio-collared in the 1990s (J.L.D. Smith pers. comm. in Sunquist and Sunquist 2002), but results have not been published. Karki (2011) reported seven photos of Fishing Cats taken in CNP, where my colleagues and I live-trapped a Fishing Cat during a survey on small mammals (Dahal and Dahal 2011).

To date, only four studies focusing on Fishing Cat have been carried out in Nepal. In 2011, Pandey et al. (2012) recorded Fishing Cat in Koshi Tappu Wildlife Reserve in eastern Nepal and identified nine individuals from camera-trap photographs. Mishra (2013) and Sharma (2014) carried out surveys in Chitwan National Park and Parsa Wildlife Reserve, respectively. Only Dahal et al. (2015) recorded Fishing Cat outside a protected area.

First record of a Fishing Cat outside a protected area

In 2012, I suggested to carry out surveys outside protected areas to fill information gaps on distribution and habitat, identify threats and conflict with local people, and understand the latter's perception to initiate actions for long-term conservation (Dahal 2012).

In the cold season of 2014 and early 2015, I conducted a Fishing Cat targeted camera-trap survey in and around Jagadishpur Reservoir and Banganga river of Kapilvastu district in western Terai. In two months of survey comprising 318 camera-trap nights, I documented the presence of Fishing Cat for the first time outside a protected area in Nepal. A compilation of video footage recorded at these four locations is available at [this address](#).



Fishing Cat recorded at Jagadishpur Reservoir, Kapilvastu district, on 26 December 2014



Locations of Fishing Cats recorded near Jagadishpur Reservoir and Banganga river



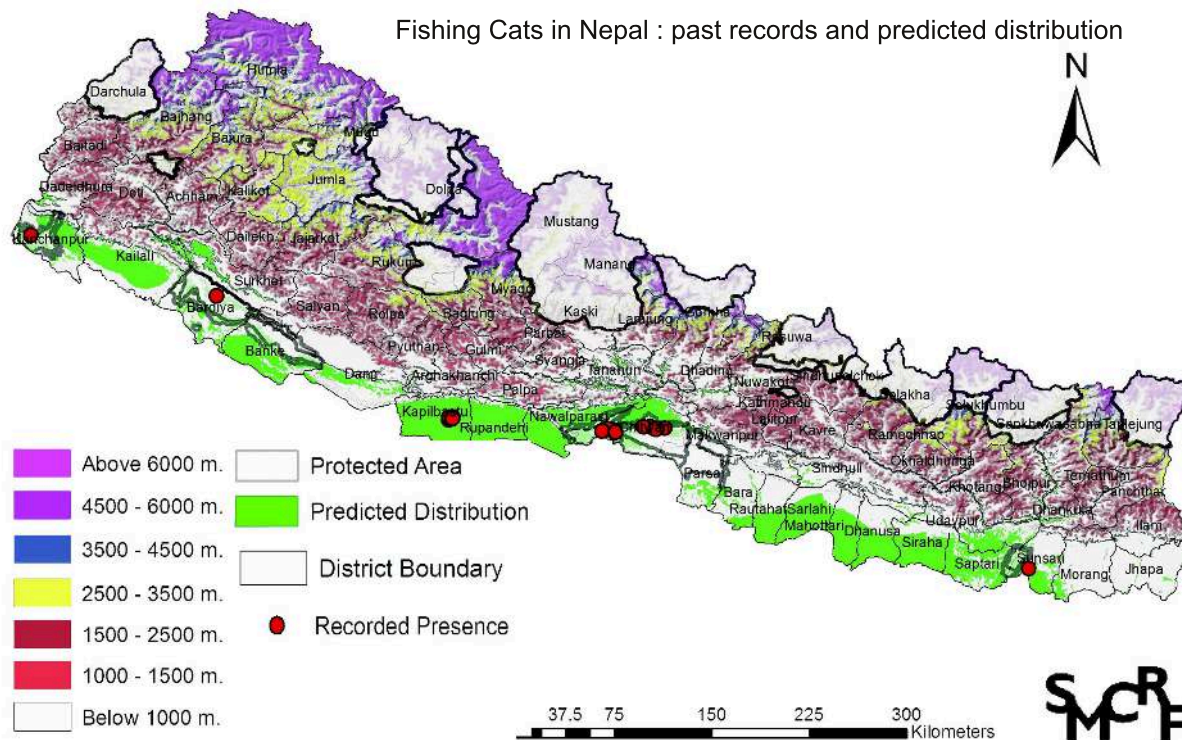
Subsequently, my colleagues and I conducted a conservation awareness program in this area. We distributed booklets about Fishing Cat to more than 700 school children and 280 adults in local communities.

Photo to the left taken during a conservation awareness program with school children.



Predicted distribution of Fishing Cat in Nepal

Based on coordinates of past records, Suraj Baral produced a map showing predicted distribution of Fishing Cat using the software MaxENT. This model predicts a total distribution area of 16,425 km² in the Nepal Terai.



Threats to Fishing Cat in Nepal

Local people often use poison and electrocution for fishing in rivers. This practice of exploiting the natural fish resource constitutes a highly plausible potential threat to Fishing Cat in Nepal, given the high proportion of the population likely to be living outside protected areas. This warrants further research, but even in advance of this, these unambiguously illegal activities should be curtailed.

My future plans

Next, I will start a survey in Bankalwa of Sunsari district in eastern Nepal where a Fishing Cat was collected between August 1920 and March 1921 by N. A. Baptista (Hinton and Fry 1923). I will also assess the habitat of 12 rivers from eastern to western Terai, namely Kankai, Mechi, Koshi, Kamala, Bagmati, Narayani, Gandaki, Tinau, Rapti, Karnali, Babai and Mahakali outside protected areas. Besides these two projects, I am also investigating Halkhoriya Daha, a wetland located in Bara district that recently has been incorporated into Parsa Wildlife Reserve.

My future plan is to study the ecology and behavior of Fishing Cat in the human-dominated landscapes of eastern Terai using radio-telemetry and diet analysis to investigate the cat's specific conservation requirements.

Acknowledgments

For supporting my surveys in the Terai I am grateful to Jim Sanderson, Angie Appel, Khadga Basnet, Shant Raj Jnawali, Naresh Subedi, Hem Sagar Baral, Shomita Mukherjee, Devan Sewell, Neville Buck, Babu Ram Lamichane, Suraj Baral, Kaustuv Raj Neupane and Madhu Nepal. For financial and logistical support I sincerely thank Mohamed bin Zayed Species Conservation Fund, Rufford Small Grants, National Trust for Nature Conservation, Himalayan Nature, Wild Oasis, ZSL Nepal and Small Mammals Conservation and Research Foundation.



Fishing Cat conservation in hill country, Sri Lanka

Four wild cat species inhabit Sri Lanka: Leopard *Panthera pardus*, Fishing Cat, Jungle Cat *Felis chaus* and Rusty-spotted Cat *Prionailurus rubiginosus*. The Fishing Cat is the second largest cat and distributed from coastal wetlands to hill country forests. In some habitats like marshlands and watercourses, it is the top predator and plays an important role in balancing those ecosystems. It is considered a flagship species in these habitats.

Between 2014 and 2015, I carried out several surveys focusing on Fishing Cat in Sri Lanka's hill country and completed surveys in Mathale, Nuwara Eliya and Kandy districts located in the Central Province. Since June 2015, I work in the area around Minneriya National Park and Girithale located at 100–885 m elevation in the North Central Province. In the course of these surveys, I set up camera-traps, search for pugmarks, collect and analyse scat, conduct interviews with local people and collect information about road kills and veterinary records. I also monitor threats to the Fishing Cat and initiate necessary conservation actions for mitigating these threats.



Interviewing villagers to gather information about Fishing Cat and human-Fishing Cat conflict in Sri Lanka's Central Province

Threats



Massive deforestation in Wilpattu National Park, Sri Lanka between 2006 and 2011.

In Sri Lanka's hill country, many forest patches are covered or crossed by roads, or have been deforested in recent years to allow for expansion of urban areas. The Fishing Cat population is presumably severely affected by this habitat loss and fragmentation. Feeding grounds for Fishing Cat are diminishing and road kills increasing. Between July 2013 and November 2015, at least 52 Fishing Cats died in road accidents in 13 districts throughout Sri Lanka. Most were killed in Kandy district. The numerous road kills comprise a potential threat to Fishing Cat in Sri Lanka.

Poaching and non-intentional killing are also likely to affect the Fishing Cat population. Poachers use snares, poison, live wires and traps to catch Fishing Cats. They also shoot them. Some body parts of the cat are used as indigenous medicine by rural people. Widespread lack of knowledge means that Fishing Cat is often confused with Leopard *Panthera pardus* and Small Indian Civet *Viverricula indica*.



Fishing Cat trapped in a snare



Fishing Cat killed for skin and bushmeat. Photo credit: Samitha Harischandra



Conservation activities

Since 2014, I organize awareness programs for school children and villagers and educate them about wild cats in Sri Lanka and the need to protect them. Drama and art competitions are part of the school programs. With exhibitions about Fishing Cat and its importance I target the general public. In annual youth camps, university students have the opportunity to learn about survey methods and how to treat wounded animals. I also designed a booklet about wild cats in Sri Lanka, which will be useful in future programs for school children.



School children prepare for an art competition.



Students of University of Peradeniya participated in the first Fishing Cat Youth Camp in 2014.



Students of Open University of Sri Lanka learn how to treat wounded animals in 2015.



Wild Cats, a handbook for school children, is published in Sinhala and English languages.

To minimize the mortality rate of the Fishing Cat in road accidents, I designed road signs and information boards asking drivers to slow down. Signs and boards are placed at crucial accident-prone spots that will be monitored up to 12 months. In 2015, I identified 13 new locations along highways where I will place 30 more road signs and sign boards. I informed responsible authorities about the need to incorporate culverts and underpasses in future road construction.



Until November 2015, seven road signs and information boards draw attention of drivers along highways. So far, no road kills were recorded at these spots. They have even become a tourist attraction.

First International Fishing Cat Conservation Symposium, November 2015



These Fishing Cat cubs lost their mother in a road accident.

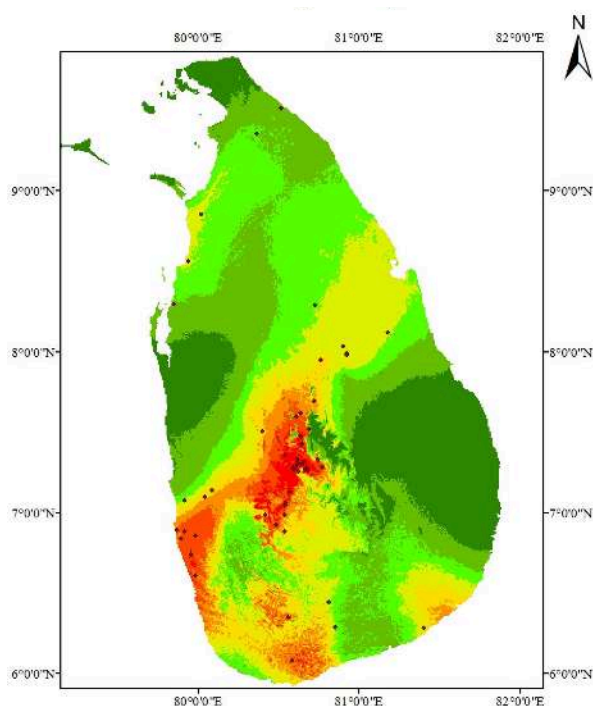


This enclosure for wounded Fishing Cats is part of a rehabilitation center built in Anuradapura area, North Central Province in 2015.

With the assistance of a veterinarian, I rescue and care for orphaned Fishing Cat cubs. Since 2015, I maintain a rehabilitation center where wounded Fishing Cats are treated until they can be released to the site where they were found. Permanently disabled Fishing Cats are kept in an enclosure with a small pond, a waterfall and trees.



Two Fishing Cats enjoy sitting on top of a waterfall in the enclosure.



Niche modelling

On the basis of collected data I prepared a preliminary niche model using MaxENT software. This model shows where Fishing Cats possibly occur by comparing environmental variables with the presence data.

◆ in the map point to locations where Fishing Cats are present; in red and orange colored areas the probability of Fishing Cat presence is high.

The model will be used in future conservation action planing and habitat management in Sri Lanka.

Acknowledgements

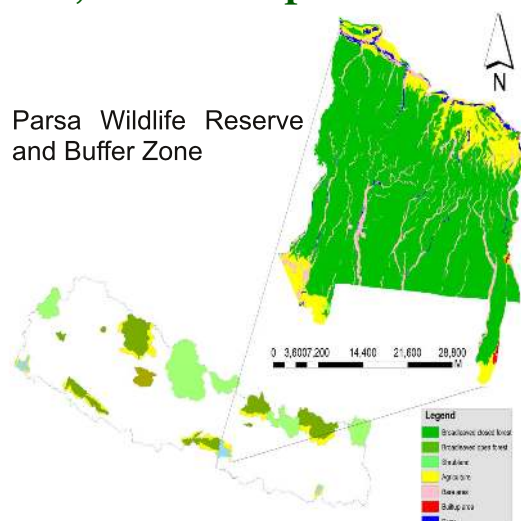
For supporting my surveys and conservation activities I thank Wildlife Conservation Network, Mohamed bin Zayed Species Conservation Fund, Wild Oasis, Houston Zoo, Big Cat Rescue, Aspinall Foundation and Small Cat Conservation Alliance.



Bidhya SHARMA

Status of Fishing Cat in Parsa Wildlife Reserve, Central Nepal

Dahal (2012) provided information on post-2010 records of Fishing Cat from Chitwan National Park, Koshi Tappu Wildlife Reserve, Suklaphanta Wildlife Reserve and Bardia National Park. Information on Fishing Cat is lacking from Parsa Wildlife Reserve. Lying adjacent to Chitwan National Park, this protected area provides habitat for many of the endangered species of the country and is thought to also host Fishing Cats (Jnawali et al. 2011). To date, its presence has however not been confirmed. With this study I aimed to collect baseline information about the cat in this area and assess probable threats. My team and I used interview survey, sign survey and camera-trapping as our prime methods.



Interview survey

To start with, we conducted interviews with 20 park staff to identify sites where Fishing Cat might occur and to collect relevant information about records in the reserve. We continued our interviews with 20 local people of the relocated villages Pratapur and Rambhori-Bhata as they lived inside the reserve area even after it was declared a protected area. Therefore, we assumed that they would have a better knowledge about Fishing Cat and the habitat used by the species.



Interviewing local people

We asked respondents whether they can distinguish between Fishing Cat and the other small cat species living in the reserve. We showed them photographs of Fishing Cat, Jungle Cat *Felis chaus* and Leopard Cat *Prionailurus bengalensis* and asked them about the ones they have sighted.

Of the 20 park staff, 13 said they were familiar with Fishing Cat. Among the local people, only two could tell the differences between the three small cat species. Though they did not have different names for each of the small cats, they could easily differentiate morphology and the habitat they generally occur in.

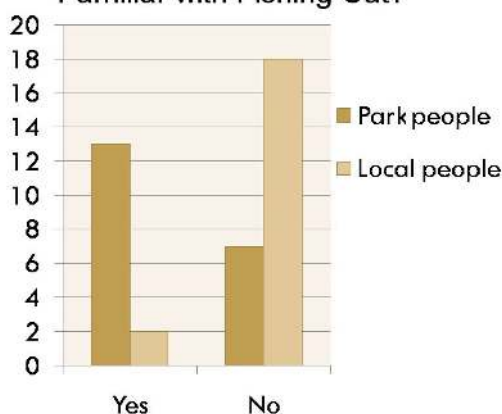
Only two of 40 respondents reported to have seen the species and described each with characteristics of their habitat. One of the reserve's senior wildlife technicians provided us with a photograph showing a latrine site that was taken in 2012. A game scout also claimed to have encountered a pugmark of a Fishing Cat.



Latrine site found in 2012. Photo by courtesy of Kapil Pokharel.

Respondents who knew the Fishing Cat were asked about suitable habitat for the cat in the reserve. Those who thought that habitat for Fishing Cat occurs suggested that the Bhata area is a probable site.

Familiar with Fishing Cat?



Response on familiarity with Fishing Cat



Sign survey

During the sign survey, we mainly followed marshes and swamps where we looked for signs and probable habitats of Fishing Cat. We focused our sign survey in the Pratapur and Bhata areas that were indicated as probable sites during talks with park staff. Our sign surveys lasted seven days in each of the two sites during March and April 2014. In addition, we surveyed the Bhata area for one more week in October 2014.

We failed to encounter any probable signs of Fishing Cats and found the area quite dry except the Bhata Khola, a river where we sighted some fish.



Bhata Khola in Parsa Wildlife Reserve

Camera-trapping survey



Setting up camera traps

We used Reconyx RM45 camera-traps and deployed them from 18 April to 4 May 2014. We placed 13 units in eight stations in the Pratapur area and 19 units in 14 stations in the Bhata area. We shifted them after eight nights from Pratapur to Bhata, where they were active for eight more nights. We maintained a minimum distance of 300 m between two camera-trap stations.

In a survey effort of 200 camera-trap nights, 26 wildlife species were recorded, including 19 species of mammals and seven species of birds, but no Fishing Cat. Carnivores

recorded comprise Tiger *Panthera tigris*, Leopard *Panthera pardus*, Jungle Cat, Sloth Bear *Melursus ursinus*, Golden Jackal *Canis aureus*, Large Indian Civet *Viverra zibetha*, Common Palm Civet *Paradoxurus hermaphroditus* and Crab-eating Mongoose *Herpestes urva*.

Conclusion

The presence of Fishing Cats in Parsa Wildlife Reserve still remains uncertain. The latrine site and verbal reports indicate the possibility that Fishing Cat lives in this protected area. Probable threats include over-fishing, poisoning of rivers and illegal hunting. Local people also come to Bhata during 5–6 religious fairs every year. In 2015, an area of 127.37 km² has been incorporated into the protected area including the wetland Halkhoriya Daha. Pugmarks that could be of Fishing Cat have been found there (Sailendra Raj Giri, pers. comm.). We recommend to conduct a more detailed and intensive survey focusing on the Bhata and Halkhoriya Daha areas.



Crab-eating Mongoose in Parsa Wildlife Reserve, spring 2014. Photo credit: Biodiversity Conservation Center, NTNC

Acknowledgements

For funding support I thank Mohamed Bin Zayed Species Conservation Fund and Idea Wild. Special thanks go to Babu Ram Lamichhane, Rama Mishra and Kapil Pokharel who facilitated this project. Neha, Bimala, Bikas, Bishow, Utsav, Dayaram and Gopal helped in various ways. I highly appreciated helpful suggestions from Sagar Dahal, Angie Appel, Jim Sanderson, Naresh Kusi, Raju Acharya, Yadav Ghimirey, Hem Sagar Baral, Dipendra Adhikari, Sailendra Raj Giri and Achyut Aryal. My whole family deserves a special mention.



Anya RATNAYAKA

Radio-collaring Fishing Cats in urban wetlands: the tale of the city cats

Phase 1 – pilot study

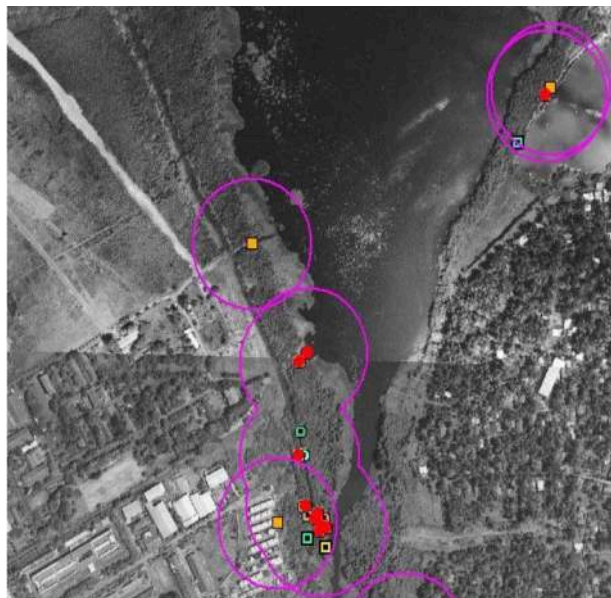
In 2006, a team led by Eric Wikramanayake set out in search of the urban Fishing Cat. They had heard rumours of young Leopards *Panthera pardus* roaming the wetlands of Colombo, Sri Lanka, and knowing that there was no rational explanation for having such a large predator confined to such small habitats without having some form of conflict with humans, they could only assume that the 'Leopards' in question were the elusive Fishing Cat.

Camera traps were set up at two sites in Colombo where Fishing Cats were seen the most – the Weras Ganga–Bellanwila–Attidiya Wetland and the Nawala–Rajagiriya Wetland. And it was not long before the species was recorded by a camera-trap.

However, with the country's civil war, the study had to be stopped due to security concerns in Colombo.



Fishing Cat captured by a camera-trap in the Weras Ganga–Bellanwila–Attidiya Wetland



Locations of Fishing Cats from camera-trap photographs and reliable reports. The purple circles represent a 100-meter radius around the locations where Fishing Cat was recorded at the Weras Ganga–Bellanwila–Attidiya Wetland.

Phase 2 – camera-trapping

The end of the civil war brought about a massive wave of development in Sri Lanka. Colombo was affected the most, as being the capital, it was in dire need of an upgrade. As a result, the government started a "City Beautification Project", and Colombo's urban wetlands were caught in its cross-hairs. It was not long before these habitats were being cleared, dredged, filled and dug up for flood control purposes and other development practices.



The state of the Weras Ganga–Bellanwila–Attidiya Wetland in 2013



Seeing all this habitat clearing, I asked myself “what has happened to the Fishing Cats now?” To answer this, I decided to revive the old study by first looking for Fishing Cat presence in what remained of Colombo’s wetlands. Armed with a single camera-trap given to me by Jim Sanderson on one of his visits to Sri Lanka in 2013, I set out on my quest. Fishing Cat presence surveys and interviews with residents living around the wetlands confirmed that there were Fishing Cats still seen on and off in the wetlands. However, how they were coping with their rapidly shrinking habitats was of concern.



Fishing Cat recorded by a camera-trap in the Sri Jayarawdarnapura Sanctuary, 2013.

Therefore, having secured some funding, I procured three Lotek Wildcell GPS/GSM collars, and proceeded to trap and collar Fishing Cats.

Phase 2 – collaring

Between 2013 and 2015, we collared and released three Fishing Cats. As Fishing Cats often come in to minor conflict with humans living around wetlands – the cats are notorious for catching and eating fowl from small-scale poultry farmers – the Department of Wildlife Conservation is often called to remove the animals from such areas. For example, many are found trapped in chicken coops. Unfortunately, in most cases, the problem Fishing Cat is released at a different location, without any consideration of whether it would come into conflict with any other Fishing Cat at the new release site. Therefore, out of the three cats we collared, two were translocated individuals, which allowed us to get a basic understanding of how they behave at a new location.



Lotek GPS/GSM collar drops off after six months.

Translocated Fishing Cats

Both translocated cats were captured in semi-urban settings, and were released in the Sri Jayawardenapura Sanctuary and Thalawathugoda Biodiversity Study Park, respectively. They both showed high levels of restlessness, and never stayed at one site for more than three days. I also noticed that, whenever possible, the Fishing Cats avoided entering the urban wetland habitats, possibly to avoid conflict with resident Fishing Cats. Of course, more translocated Fishing Cats need to be collared and monitored to get a better understanding of translocation-related behaviour.



FCM01 'Houdini' photographed during his release in the Sri Jayawardenapura Sanctuary



FCM03 'Wadduwa' on 19 July 2015 in the Thalawathugoda Wetland



FCM02 'Mizuchi' recorded on 14 June 2015 at an outdoor pond in Thimbirigasyaya, Colombo 05, where he came fishing for Butterfly Koi worth about US\$ 60 each.

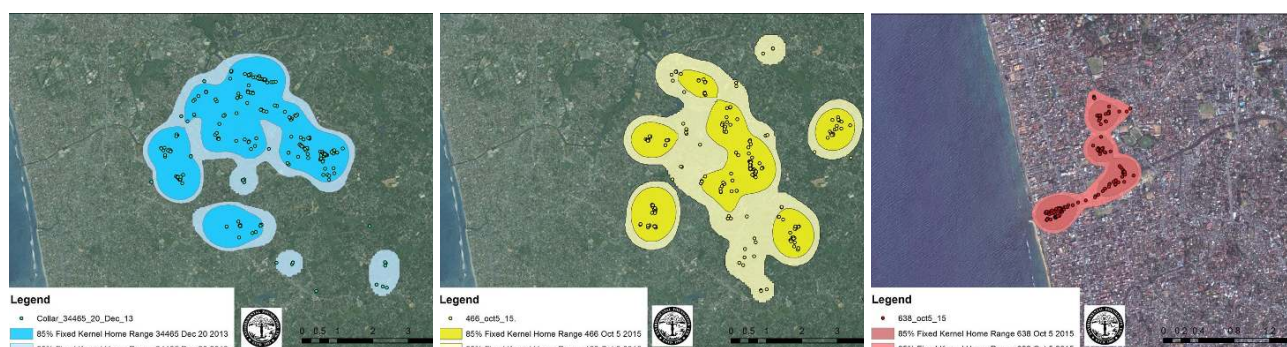
Resident Fishing Cat

In 2015, we captured and relocated a Fishing Cat in the heart of Colombo 05, a highly urbanised area with the closest wetland being four km away. I discovered this cat by accident, after the landlord of our office mentioned that his carp were going missing. **CCTV cameras were set up around the pond to find out who was stealing the fish. Seeing a Fishing Cat was a surprise to us all!** He was later captured, collared and released in the same area.

His territory was highly urbanised, and ground surveys showed that he was living in roofs and abandoned gardens found in the Thimbirigasyaya area. Interviews with residents in the area also confirmed that he was catching fish from outdoor home ponds.

What we have learned so far

Home range estimations from the GPS location data collected from the three cats collared to date show that the cats, though living in highly urbanised areas, tend to spend more time in 'green areas', i. e. wetland fringes, paddy fields, abandoned lots, gardens, abandoned houses and houses with large gardens.



Fixed Kernel Home Range estimates (95%) of the three collared cats.

Blue: FCM01's movement after translocation; the areas that he frequented the most are in dark blue, about 11 km² in size tracked over four months in 2013.

Yellow: FCM03's movement after translocation; the areas that he frequented the most are in dark yellow, about 8 km² in size tracked over five months in 2015.

Red: FCM02's home range in Thimbirigasyaya; the areas that he frequented the most are in dark red, about 2 km² in size tracked over four months in 2015.

Of course more cats need to be collared before we draw any real conclusions here, but from what we have seen so far, if 'green areas' are kept intact in Colombo, urban wildlife such as the Fishing Cat may be able to survive alongside humans in the city.

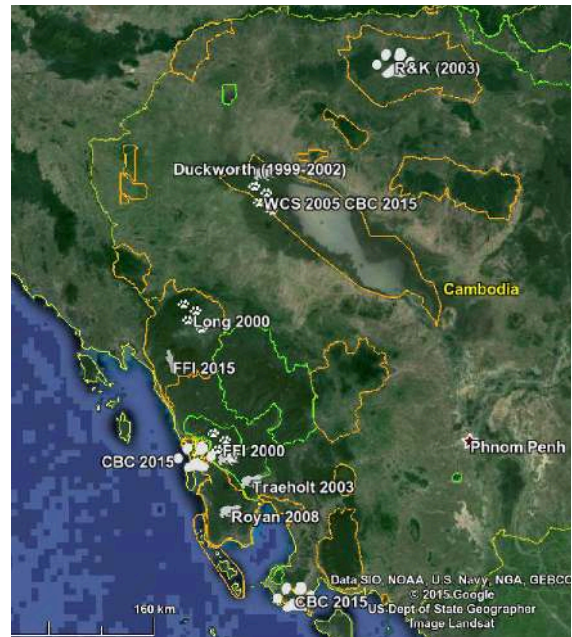
Acknowledgments

Thanks to the Environmental Foundation (Guarantee) Limited for providing organisational support for my work. I am also indebted to my advisors Eric Wikramanayake, Manori Gunawardena and Jim Sanderson, and my field assistants Maduranga Ranaweera and Fiona Fern. For financial support I thank the Rufford Small Grants Fund, Mohamed bin Zayed Species Conservation Fund, MAS Active Linea Intimo and The Leopard Trust. Special thanks must also be given to the Department of Wildlife Conservation and the Sri Lanka Land Reclamation and Development Corporation for the assistance they have provided me throughout this project.



Identifying priority sites and conservation actions for Fishing Cat in Cambodia

Very little is known about the Fishing Cat in Cambodia. Prior to our surveys, only one individual was photographed by a camera-trap, i.e. in 2003 at Kulen Promtep Wildlife Sanctuary in northern Cambodia (Rainey and Kong 2010). Other records consist of captive animals that were confiscated between 1999 and 2002 (Duckworth et al. 2005), although hunting of Fishing Cat is prohibited in the country. Fishing Cats have also reportedly been seized in south-eastern Cambodia, and in 2008 kittens were found abandoned in a village in Botum Sakor National Park in south-western Cambodia (Royan 2009). Fishing Cats were thought to have been hunted for food by local villagers in the Tonle Sap area in 2010 (Jim Sanderson, pers. comm.). The Wildlife Alliance rescue team seized two kittens, assumed to be Fishing Cats, one from Prey Nup district, the other from Koh Kong province in 2014 in western Cambodia (S. Gauntlett, pers. comm.).



Fishing Cat records in Cambodia



Wetland in Peam Krasop Wildlife Sanctuary

Cambodia has extensive areas of wetland habitats similar to those in other countries where Fishing Cat populations have been documented, e.g. in Thailand by Cutter and Cutter (2009), and in India by Adhya et al. (2011).

Cambodian mangrove forests have not suffered the same levels of exploitation as in neighbouring countries (Marschke and Nong 2003).

Whilst the decline of the Fishing Cat over much of its range is undeniable, very few surveys targeting the cat specifically were undertaken in Southeast Asia (Duckworth et al. 2014, Willcox et al. 2014). Thus, surveying potentially suitable habitat is a priority for Fishing Cat conservation. (Royan 2009, Rainey and Kong 2010, Duckworth et al. 2014). To address the paucity of data on the Fishing Cat in Cambodia, we set out to survey four potential areas along the coast: Peam Krasop Wildlife Sanctuary (PKWS) and Botum Sakor National Park in Koh Kong province, Ream National Park (RNP) and Prey Nup district in Preah Sihanouk province.

Methods

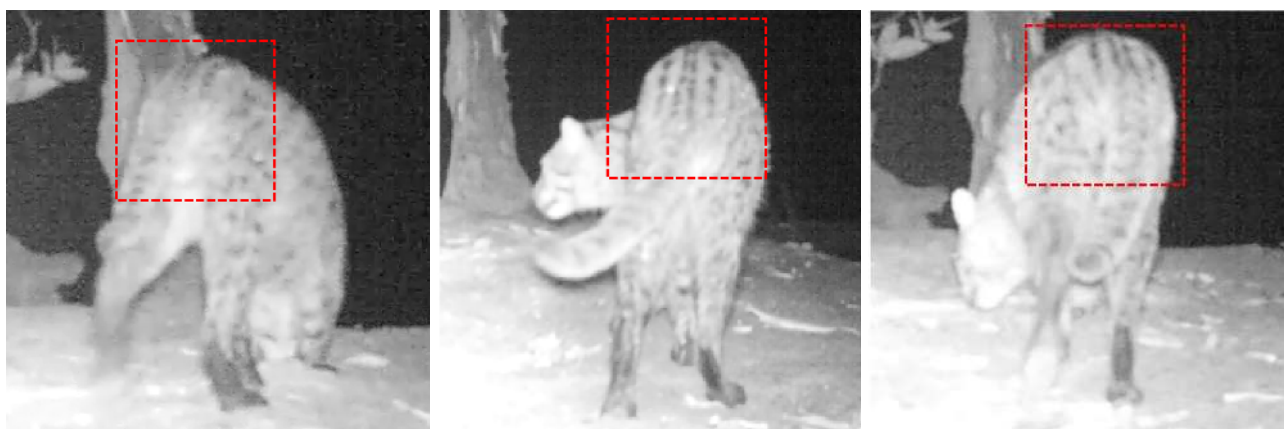
To identify potential sites in the study areas we conducted informal interviews with knowledgeable local people who are likely to come into contact with Fishing Cats such as hunters, fisherfolk and owners of shrimp and fish farms. Then we employed local guides for site scoping along the edge of water bodies for possible Fishing Cat signs such as tracks, scat and food remains. Between January and May 2015 we deployed a total of 13 camera-traps at mangrove, forest and waterhole locations. Bushnell 8MP Trophy Cam HD Hybrid Trail cameras were set to take three consecutive photos followed by a 60-second video when the motion sensor was activated. Fresh fish was used as bait on first deployment to attract Fishing Cat.



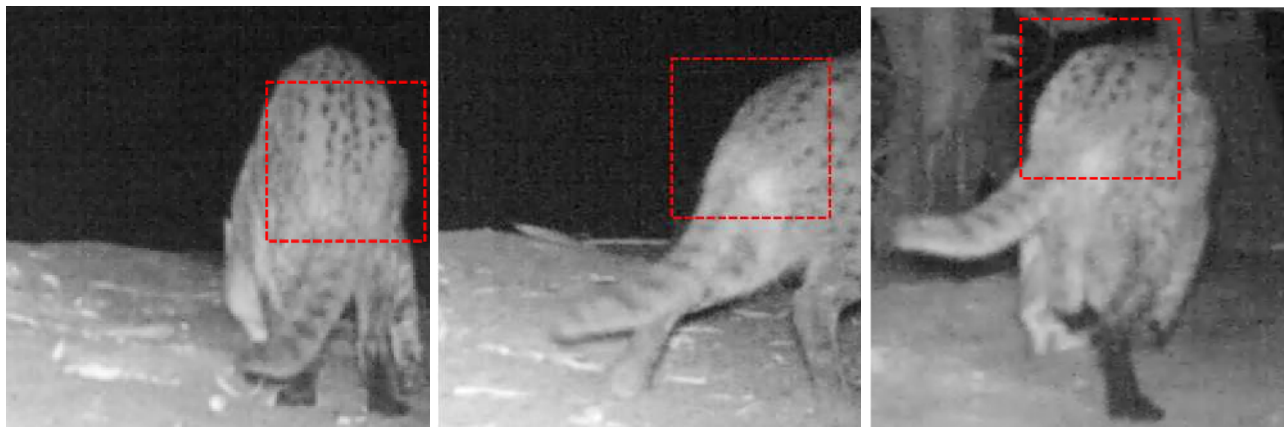
Results

Data were recovered from 11 cameras over 1,058 camera-trap days. One camera had been stolen and another failed to function for the whole period. Cameras recorded altogether 12 wildlife species: Fishing Cat, Leopard Cat *Prionailurus bengalensis*, Common Palm Civet *Paradoxurus hermaphroditus*, Large-spotted Civet *Viverra megaspila*, Smooth-coated Otter *Lutrogale perspicillata*, Small Asian Mongoose *Herpestes javanicus*, Sunda Pangolin *Manis javanica*, Hog Deer *Axis porcinus*, Red Muntjac *Muntiacus muntjak*, Sambar *Rusa unicolor*, Long-tailed Macaque *Macaca fascicularis* and Asian Water Monitor *Varanus salvator*. Eight of these species were recorded in PKWS, five in Botum Sakor National Park, four in RNP and three in Prey Nup district.

Fishing Cat was recorded only in PKWS and RNP. We identified two individuals in PKWS on the basis of distinct spot pattern on their backs. One is a male as its testicles are clearly visible. The other may be a female as no testicles are visible. They visited the same camera-trapping station in mangrove habitat, both on four separate occasions. In RNP, we obtained one photo of a single Fishing Cat.



Male Fishing Cat recorded on 2 February, 5 February and 1 March 2015 in Peam Krasop Wildlife Sanctuary



Female Fishing Cat recorded on 11 February, 1 March and 19 April 2015 in Peam Krasop Wildlife Sanctuary

We interviewed 36 people in four villages. Results indicated that local people catch Fishing Cats opportunistically in illegal snare traps and eat the meat or sell it locally. Most respondents could not distinguish between Fishing Cat and Leopard Cat. Some villagers declared fear of the Fishing Cat because its local Khmer name 'kla trey' means 'fish tiger'. Half of the respondents said that they would do nothing if a Fishing Cat attacks their livestock or fishing net. Only 12.5% said that they would try to catch and kill the cat.

Shortly after the project finished we were informed that one Fishing Cat was killed in PKWS in retaliation for raiding a fishing net.



Next step: Cambodia Fishing Cat Project



In the framework of the Cambodia Fishing Cat Project we will follow up on the findings at PKWS and RNP with a focus on mitigating threats to the Fishing Cat population. Planned activities include to develop conflict prevention and mitigation measures, hold workshops in communities to raise awareness, create and distribute outreach materials, and set up permanent educational banners. We will also collaborate with PKWS and RNP authorities to create a Fishing Cat conservation plan.

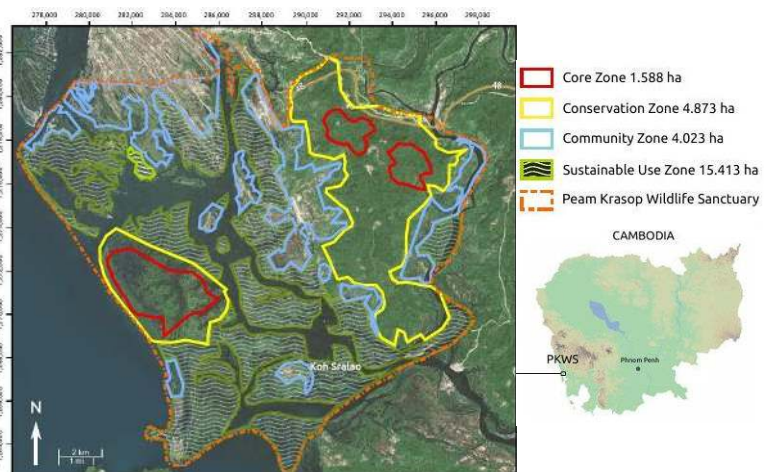
Ecological data on Fishing Cat population status will be gathered through extensive and systematic camera-trapping, research on habitat use and in future stages also radio-collaring. On the basis of obtained results we will provide recommendations for an integrated wildlife conservation program to ensure long-term protection of the Fishing Cat, other globally threatened species and their habitat.

Poster sample for raising awareness on Fishing Cat in local communities.

Threats and conflicts

PKWS covers 237.5 km² and holds one of the largest and densest mangrove forests in Southeast Asia. Over 10,000 people live in 13 villages and are highly dependent on natural resources, mainly fish and crabs. Overexploitation of wildlife and non-timber forest products, land clearance for agriculture, charcoal production, illegal hunting and sand-dredging of waterways are major threats to this ecosystem (An et al. 2009).

Local people persecute Fishing Cats as the latter compete for fish and destroy fishing gear.



Management zones in PKWS. Map adapted from An et al. (2009)



Smooth-coated Otters and a Fishing Cat use the same elevated platform located in the Koh Sralao community zone of PKWS.



RNP covers 210 km² and features extensive areas of mangrove forests and mudflats, lowland and dwarf evergreen forest as well as freshwater marshes. Over 30,000 people live in five communes overlapping or bordering the protected area and depend on its resources. In 1997, it was estimated that more than one third of RNP had been heavily degraded by farming, logging, mangrove clearance for aquaculture, charcoal burning and exploitation of natural resources (Emerton et al. 2002). A part of the protected area



has been demarcated for economic land concessions. Disputes are ongoing between local stakeholders and large-scale investors over use of demarcated land.

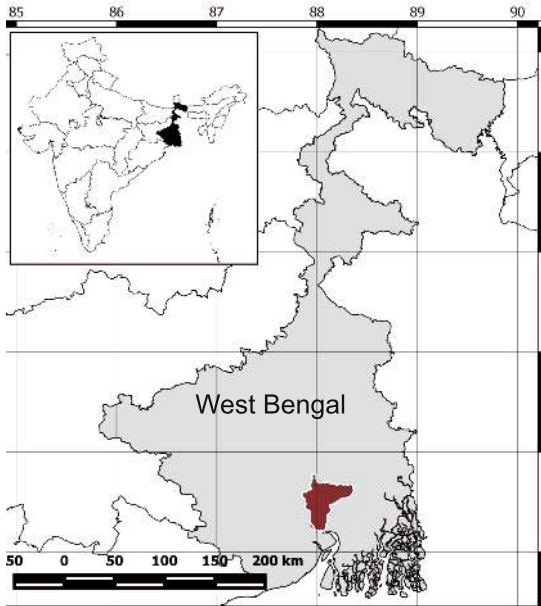
The Fishing Cat was photographed in the area demarcated for economic land concession. This population may be severely affected by future development for either agriculture or tourism destinations.

Acknowledgements

This project was generously funded by the Critical Ecosystem Partnership Fund. We thank the Minister and the Head of General Administration of Nature Conservation and Protection of the Ministry of Environment and the Department of Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries for permitting this research; Rob Overtoom for allowing access to Prey Nup; and local rangers and local authorities who assisted in the field. We also would like to thank Chi Tikea, GIS technical officer at Sustina Green Co. Ltd. for his assistance with GIS.



Fishing Cat conservation in West Bengal, India



Ecological research on Fishing Cat outside protected areas is sparse in India. Our initiative in West Bengal's Howrah district was one of the first attempts to research how Fishing Cat persists in a human-dominated landscape. We documented and mapped the distribution of Fishing Cat in Howrah district, an unprotected area of 1,467 km² and worked with multiple departments to address conservation issues.

Our research revealed that Fishing Cat is strongly tied to marshy grasslands including those dominated by reed *Phragmites* and reedmace *Typha*, which are natural vegetation types, as well as cultivated tall graminoids like *Saccharum*. These graminoids do not only provide ecosystem services like detoxification and water recharge, but also are used traditionally and valued as crops.

Map showing location of Howrah district in red.

Threats to Fishing Cat in Howrah district

Habitat loss is thought to be the biggest threat to the Fishing Cat population in Howrah district. About 44% of marshlands were converted for industrialization and urbanisation in the last decade. Marshlands are considered to be wastelands even though they provide the valuable ecosystem services outlined above. Since the Indian legal framework provides provisions for wetland protection, our team worked with lawyers to prevent marshland degradation for industrialization.



We recently won a legal suit, in which the Calcutta High Court ordered halting illegal fill up of 500 ha of marshland. During this process, we realized that contradictions in stakeholder policies of wetlands make these habitats vulnerable to conversion. We are currently in the process of reviewing policies to change the neglecting attitude towards marshlands as a wetland ecosystem and thereby aid in Fishing Cat conservation.

Poaching by local people is an additional threat that exacerbates Fishing Cat persistence problems. Between April 2010 and March 2011, 27 Fishing Cats were killed in just 12 months in the district. Fishing Cats are killed in retaliation for attacking livestock, and also hunted for meat and skin by tribal people (Adhya et al. 2011). In August 2015, we campaigned successfully for the arrest of five poachers, and thus set an exemplary instance. They face a jail term of three years and a penalty of 10,000 Indian rupees, equivalent to US\$ 154 or 137 €.



Between 2010 and 2011, 27 Fishing Cats were killed in the course of 18 months in Howrah district.



Fishing Cat diet

Our analysis of 169 Fishing Cat scats revealed that the Fishing Cat's primary food is fish. Contrary to local perceptions, we found that less than 5% of its diet comes from goats, suggesting that it either does not prefer goats or does not have access to the same. On other hand, almost 70% of scats had remains of rodents, which are considered agricultural pests. Depending upon seasonal change in diet, a Fishing Cat might take 365 to 730 rodents a year; this presumably helps small-scale farmers and may prevent rodent-borne diseases (Adhya 2015).

Fishing Cat Protection Committees

The negative interactions between Fishing Cat and fishermen need management interventions with a multi-department approach. Our collaboration with the elected representative local government, the three-tiered panchayat system, Howrah Zilla Parishad, resulted in the formation of 157 Fishing Cat Protection Committees. This is the first such instance in India. Usually, conservation initiatives partner with the Forest Department, which gives limited infrastructural support in human-dominated landscapes.



Members of a Fishing Cat Protection Committee sensitize local people through aural campaigns and distribution of posters.

Local people equate Fishing Cat with less threatened and often more commonly found wildlife like Common Palm Civet *Paradoxurus hermaphroditus* or Jungle Cat *Felis chaus*. They were mostly unaware of the fact that the Fishing Cat is the State Animal of West Bengal. In other words, the species is grossly undervalued. Our continuous engagement since 2011 with communities sharing space with Fishing Cat has resulted in mass sensitization about the species. We used national and local media, cable channels, street plays, dramas, films and aural campaigning in cars and street assemblies to spread the message of legal implications of killing Fishing Cats.

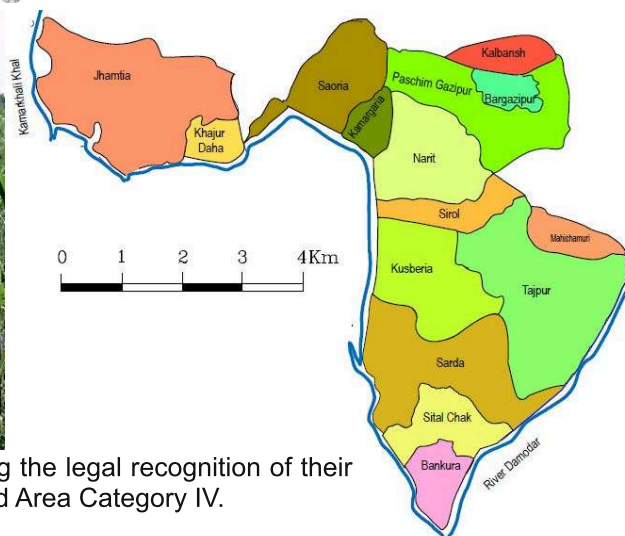
Fishing Cat Biodiversity Heritage Site

We are facilitating the declaration of a block of villages as a Biodiversity Heritage Site under the provisions of the Indian Biodiversity Act, 2002. This act has provisions for recognizing the representation and participation of multiple stakeholders. It also gives the stakeholders autonomy so that the conservation effort is bottom-up in spirit and inclusive in general.

By definition, Biodiversity Heritage Sites “are well defined areas that are unique, ecologically fragile ecosystems – terrestrial, coastal and inland waters ... with the presence of a rare and threatened species ... and having significant cultural, ethical or aesthetic values and are important for the maintenance of cultural diversity, with or without a long history of human association with them.” The characteristic features of Biodiversity Heritage Sites are

- 1) areas that contain a mosaic of natural, semi-natural, and human-made habitats, which together contain a significant diversity of life forms,
- 2) representative agro-ecosystems with ongoing agricultural practices that sustain this diversity
- 3) that offer refuge or corridors for threatened and endemic fauna and flora, such as community conserved areas or urban greens and wetlands
- 4) all legal land uses whether government, community or private land could be considered
- 5) as far as possible those sites may be considered which are not covered under Protected Area network under the Wildlife Protection Act, 1972 (GoI 2003).

One can visualize a Biodiversity Heritage Site as a legally recognised key biodiversity area with the status of an IUCN Protected Area Category IV.



Adding a 'pride value' to the communities by facilitating the legal recognition of their villages as a Biodiversity Heritage Site, IUCN Protected Area Category IV.

We chose to facilitate the legal recognition of 18 villages as Biodiversity Heritage Site for Fishing Cat conservation. These villages cover an area of approximately 30 km² and consist of around 1,040 ha of marshland, criss-crossed by canals, dotted with fish ponds, paddy and vegetable fields, orchards and human habitation. The total human population of the proposed site is 39,720 as of January 2015 and predominantly consists of traditional reed cultivators and reed-cutting labourers along with fishermen, small-scale farmers and itinerant workers. The landscape is thus a mosaic of different land-uses and people connected to these land-uses through their occupation. These people and the land-use is governed through elected representatives with different responsibilities in multiple tiers of administration, government officials of Administration, Fisheries, Agriculture and Land departments. The Forest Department remains the sole authority to give legal protection to wildlife occurring in this landscape. Since the future of the Fishing Cat depends on the attitudes of multiple stakeholders and their responsible participation in its conservation, our future work will be focussed on developing a Fishing Cat Action Plan in collaboration with stakeholders.

Acknowledgements

We thank Jim Sanderson from the Small Cat Conservation Alliance, the Mohammed Bin Zayed Species Conservation Fund, the Wildlife Conservation Trust and various Fishing Cat well-wishers for their support towards our project. We also thank the Kushberia Gram Panchayat, Sarda Gram Panchayat, Tajpur Gram Panchayat, Jhamtia Gram Panchayat, Mr Manas Basu of the Howrah Zilla Parishad, the West Bengal Forest Department and the local organisation Sarada Prasad Tirtha Janakalyan Samiti.



Daniel WILLCOX

Fishing Cat status in Vietnam

Vietnam has two major deltas, the Mekong Delta and the Red River Delta, and a coastline that is over 3,000 km in length. The country has a diverse set of habitats, many of which are known to support Fishing Cat. Conservation status of the species in the country is however largely unknown but is presumed to be poor. Vietnam is one of the centres for the illegal wildlife trade, and most natural habitat in the country, particularly in the lowlands and coastal areas, has been lost.



Douc *Pygathrix* and other seized meat. Photo credit: Wildlife Conservation Society

Historical records

Vietnam is the only country in Indochina to have historical Fishing Cat specimen records. All four specimens were collected in the early 20th century. Two were collected from the coastal town of Nha Trang. One was from “Choi Moi, Annam”, which is suspected to be close to the same town. The fourth was labelled as “Cochinchina”, which could be anywhere in the Mekong Delta. Historical accounts from the time stated that Fishing Cat was rare in Indochina, though this may in part be due to poor mammal survey and collection effort in habitats likely to support the species, and therefore not an accurate representation of the species's status.

Modern records

The opening up of the country in the mid-1990s produced a spate of wildlife surveys, many of which generated Fishing Cat claims. Nearly all of these were based on either interview reports and/or of tracks or other field signs that had been visually assigned to the species, and were therefore unconfirmed reports.

The only confirmed modern records of the species have all come from the Mekong Delta. In 1997 several captive Fishing Cats were seen in a small private menagerie in Ca Mau town, leading the surveyor at the time to speculate a probable local origin (Safford et al. 1998). Surveys in 2000 in the nearby U Minh Thuong National Park confirmed the species's persistence there with several camera-trap records, as well as a dead Fishing Cat that had been apparently poisoned (Nguyen et al. 2004). The habitat at this site is a small very human-



There is no consensus on which species this stuffed skin and skull is, from Cao Bang province, north-eastern Vietnam, 1965.



impacted wetland mosaic of open swamp, seasonally-inundated *Melaleuca* forest and grasslands. The entire protected area is surrounded by paddy fields, for which an intense harvesting regime is in place; three rice harvests a year are not unusual. The area can in no way be considered a pristine natural wetland and in many ways represents what we now consider to be 'typical' Fishing Cat habitat in the region; this is clearly a species that does not require pristine areas of natural habitat to persist.



Typical habitat in the U Minh wetlands, which includes U Minh Ha National Park and U Minh Thuong National Park. Habitat includes human-made canals with *Phragmites* reeds dominating the bunds (top left), open swamp (left) and *Melaleuca cajuputi* plantations, some of which are now inactive and have been left untended (above).

Follow up surveys, targeted at small carnivores, in the nearby U Minh Ha National Park have since failed to detect the species. There have been no confirmed Fishing Cat records in Vietnam since the 2000 record. The species may be approaching national extinction in most of Vietnam; there is a high human population density along nearly all of its coastline and a pervasive wildlife trade that involves nearly all mammal species in the country. Small carnivores are targeted by this trade, mainly for the commercial trade in wildlife meat.

However, there have been too few targeted surveys in the Mekong Delta to be completely confident of the species's status there. And there are some parts of the Mekong Delta that still support populations of another highly threatened small carnivore with which Fishing Cat shares a strong association: otters. Given the ease in which Fishing Cat can be overlooked, there is an urgent need for a targeted camera-trap survey in U Minh Thuong National Park and possibly also Mui Cau Mau. The latter retains a relatively large expanse of coastal mangroves but has been under-surveyed for mammals. The former is in urgent need of surveying and increased conservation investment, not only because there is a reasonable chance that it still supports a Fishing Cat population, but because it is one of only a handful of sites in mainland Southeast Asia that supports the Endangered Hairy-nosed Otter *Lutra sumatrana*.

Acknowledgements

Special thanks to the staff at the Carnivore and Pangolin Conservation Program and Save Vietnam's Wildlife for supporting me during these surveys and literature reviews.



Hasan RAHMAN, Jennifer McCARTHY, Kyle McCARTHY

Status and conservation of Fishing Cat in Bangladesh

Bangladesh has the largest delta in the world, created by sediments brought down by the Ganges and Brahmaputra rivers. The land area is a recent formation with a large part consisting of flood plains, rivers, swamps, lakes and mangrove forests. It is one of the most densely populated countries in the world with 1033 people per km² (BBS 2011). Despite this humongous population pressure, Bangladesh still harbors eight cat species including the Fishing Cat (Khan 2008).

We used a presence-only model to predict the distribution of Fishing Cat in Bangladesh based on 24 Fishing Cat observations across the country.

Method

We used Maximum Entropy (Phillips et al. 2006) to model Fishing Cat distribution and collected land cover data from Bangladesh Forest Department with a cell size of one km². The land cover variables include percentage of wetland and mangrove forest, river and river distance and elevation. The climatic variables include maximum temperature in the warmest month, minimum temperature in the coldest month and precipitation in the wettest and driest months. The climatic variables and elevation data were downloaded from the WorldClim database (Hijmans et al. 2005). We calculated percentage of wetland and mangrove forest on the basis of Fishing Cat home range size of roughly 10 km² (Sunquist and Sunquist 2002).

Results

Flood plains in the country's northeast and southwest, and mangrove forests in the Sundarbans are the most suitable habitat for Fishing Cat with 75-100% suitability. In terms of variable contribution, elevation contributed most with 36.7% and permutation importance (PI) is about 28.5. The land cover variables 'wetland' and 'mangrove' contributed 31% and a PI value of 30.6. None of the climatic variables contributed significantly to the prediction, although minimum temperature in coldest month had a high PI of 32.7.

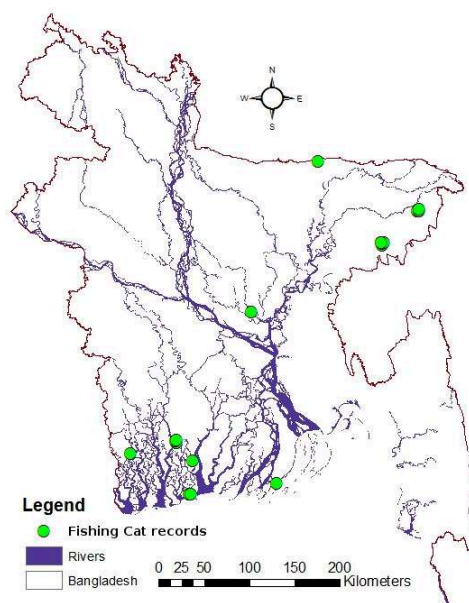
Considering area under the curve write out (AUC), percentage of wetland and mangrove is the most important variable with an AUC value of 70. The minimum temperature in coldest month had an AUC value of 0.63, and elevation an AUC value of 0.57.

Discussion

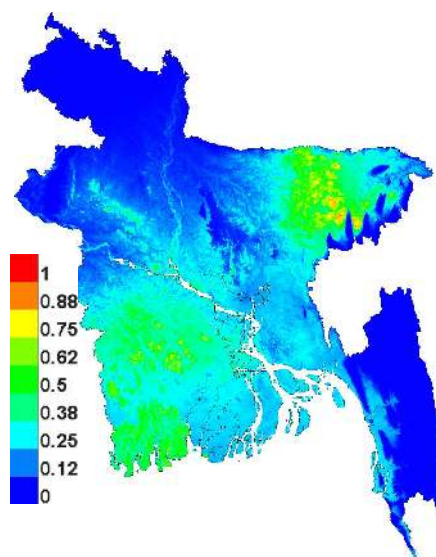
We cross-validated our prediction with Chowdhury et al. (2015) who collected human-Fishing Cat conflict incidents from news reports. Our prediction and the map provided by Chowdhury et al. (2015) coincide largely and validate our prediction of Fishing Cat distribution in Bangladesh.

Threats to the Fishing Cat in Bangladesh

Though Bangladesh has a vast array of landscapes suitable for the Fishing Cat, the species faces a plethora of threats. One of the key threats is direct mortality; people kill it due to a negative



Map of Bangladesh with locations where Fishing Cat was observed between 2008 and 2015.



Predicted distribution of Fishing Cat in Bangladesh



perception about predators. Around 30 Fishing Cats are known to have been killed in a period of three years in Bangladesh (Chowdhury et al. 2015). Conversion of wetlands for unplanned development, agricultural expansion and industrial pollution might also be key threats to the Fishing Cat.

Sundarbans, the largest tract of mangrove in the world, might harbour one of the safest Fishing Cat population due to the lower levels of human stressors in that region.

Challenges for conservation

Bangladesh faces many challenges to conserve the Fishing Cat. Many stakeholders are involved in Fishing Cat habitats. Several government bodies are involved in decision making process and administering Fishing Cat habitat. By law, the species is under the jurisdiction of Bangladesh Department of Forests. However, there are other agencies such as Departments of Land, Agriculture, of Fisheries and also of Environment that are involved in managing Fishing Cat habitats.



Fishing Cat captured in Barishal in January 2009. It was badly beaten by local people and in a critical condition when Forest Department officials and police later rescued it. Photo: Daily Star



Polluted water in a creek

Lack of public education plays a significant role in Fishing Cat survival as well. Erroneous perceptions of people about the cat leads to direct killing of Fishing Cats. People consider the cat a threat to their life and livelihood. And the huge human density also affect Fishing Cat in a number of ways. Huge population pressure influences unplanned development including conversion of suitable habitat.

Under these circumstances, we propose to build up strong political advocacy platform, by which we can influence government and people to cooperate in the conservation of this iconic species of wetland and mangrove forest. We also propose building up networks of school children, so that we can create a new generation of conservationists who will be environmentally responsible and contribute to conservation of Fishing Cat and the cat's habitat.

Future research needs

We lack proper science to make sound conservation decisions regarding management and conservation of the Fishing Cat in Bangladesh. Therefore, we recommend to initiate a long-term ecology project on Fishing Cat by using radio-telemetry, fecal DNA sampling, locally trained scat detection dog, hematophagous leech DNA. The last one is currently being tested at the University of Delaware. If it works, then it will open up a new horizon in studying secretive predators in tropical countries.

We can only hope for a better future for Fishing Cat by ensuring proper education, political advocacy and long-term research.

Acknowledgements

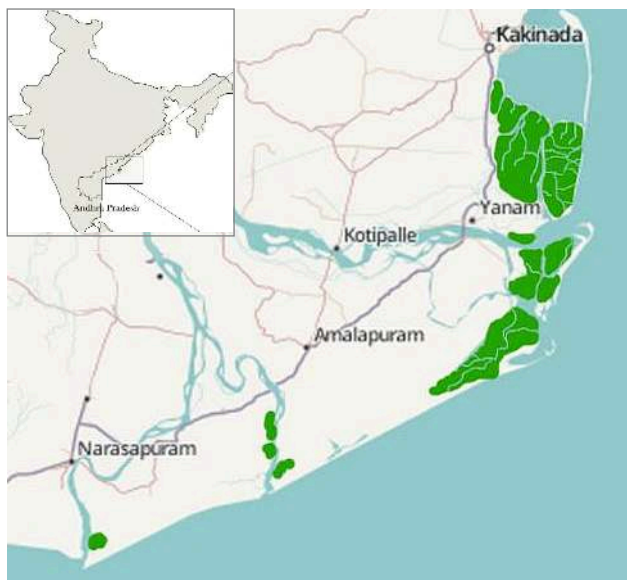
We thank all who contributed Fishing Cat sighting data: Abu Abdullah Diyan, Suprio Chakma, Rezu Ajam, Samiul Mohsanin, Shahriar Caesar Rahman, Istiak Sobhan, Sakib Ahmed and Mohammad Foyzal. Thanks are also due to Matt Boone and Tim Schreckengost for their invaluable help in preparing GIS maps. We are grateful to our donors Panthera, Mohamed bin Zayed Species Conservation Fund, Rufford Small Grants and National Geographic Society Big Cat Initiative. Hasan Rahman is particularly thankful for travel assistance from the Department of Entomology and Wildlife Ecology at the University of Delaware.



Giridhar MALLA

Ecology and conservation of Fishing Cat in Godavari mangroves of Andhra Pradesh

The Fishing Cat is one of the most elusive and secretive small cats in India. It occurs in both inland and coastal wetlands including mangroves and is well adapted to such habitats, but little is known about its ecology and behavior (Mukherjee et al. 2012). Hence, with this project I tried to understand its status, distribution pattern and habitat requirement in a mangrove ecosystem in the Godavari River basin in Andhra Pradesh, India.



Study area

The study was carried out in the Coringa Wildlife Sanctuary, which is located in the Godavari Delta in Andhra Pradesh between 16°30' and 17°00' N latitudes and 82°14' and 82°23' E longitudes. It includes three reserve forests, namely Corangi, Corangi Extension and Bhairavapalem Reserve Forests (Sivakumar et al. 2012). This mangrove forest covers an area of 235.7 km², is the second largest contiguous surviving stretch of mangroves in India, and is a part of the East Godavari River Estuarine Ecosystem (Sathiyaselvam and Sreedhar 2015). Numerous mudflats and narrow creeks that criss-cross the area are subject to tidal intrusion resulting in high productivity, that supports a population of Smooth-coated Otter *Lutrogale perspicillata* (Nagulu et al. 1998) and Olive

Godavari Delta and its mangrove forests, in green

Ridley Turtle *Lepidochelys olivacea* (Tripathy et al. 2003). Moreover, these mangrove forests are also an Important Bird Area wherein 286 bird species have been recorded, of which 50 species are migratory (Islam and Rahmani 2004).

Methodology

I conducted a questionnaire survey with 53 respondents in eight mangrove-dependent villages surrounding the sanctuary. For sign and camera-trapping surveys I divided the protected area into 203 cells, each 1 × 1 km in size. Cells were selected on the basis of habitat use of Fishing Cat such as mangroves, aquaculture ponds, villages, agriculture and mudflats.



Fishing Cat scat on *Avicennia* tree inside Coringa Wildlife Sanctuary



Enquiring about Fishing Cat presence with local people

All evidence, including direct sightings, was geo-positioned with a GPS device. Indirect and provisional evidence like faeces and pugmarks was also noted down.



Setting up camera-traps in Coringa Wildlife Sanctuary



Camera-traps were set up in three blocks of the sanctuary area covering all vegetation types like *Avicennia*, *Avicennia-Exocoecaria* and *Rhizophora*, with a total of 198 camera-trap stations from December 2014 to August 2015. To estimate the Fishing Cat population I used spatially explicit capture-recapture (SECR) framework.

Results

Of 203 cells, 70 were located in mangrove forests, 43 around the sanctuary aquaculture ponds, 25 in villages, 41 in agriculture fields surrounding the sanctuary and 24 in mudflats inside the sanctuary. We found evidence for the presence of Fishing Cat in 43 mangrove forest cells, 12 aquaculture pond cells, 14 village cells, 9 in agriculture cells but not in mudflats. A naïve estimate suggests that the probability of detecting Fishing Cat is highest in mangrove forests (65%), followed by villages (56%). This was corroborated by results of the questionnaire survey; about 90% of the people interviewed could apparently identify Fishing Cat, as well as Smooth-coated Otter and Golden Jackal *Canis aureus*.

During the camera-trapping sessions, 1341 photographs of Fishing Cat were taken, from which I identified 54 individual Fishing Cats based on their stripe patterns on the neck, fore and hind limbs.



Camera-trap photographs of Fishing Cats taken in January 2015 in Coringa Wildlife Sanctuary



Camera-trap photographs of Fishing Cats taken in January and May 2015 in Coringa Wildlife Sanctuary

Total abundance was estimated at 75.0 ± 7.7 (SE 62.8 – 94.3) individuals. The density estimates using SECR were $0.53 \pm$ (SE 0.94)/km². The male and female sex ratio was estimated at 1:1.5.

Of all photographs showing Fishing Cats, 65% were taken during low tide and 35% during high tide. This suggests that they often use exposed tidal flats as platforms for hunting fish in the water. 35.5% of these photographs show Fishing Cats during waning gibbous phases, and 24% show them during full moon phases. Their higher activity during these two lunar phases coincides with a higher level of fish movement in and out of mangrove creeks, a phenomenon taken advantage of also by local fisherfolk.

Threats

Likely and confirmed current threats to Fishing Cat and its habitat in the Coringa Wildlife Sanctuary include habitat degradation and destruction due to

- proliferation and encroachment of aquaculture ponds
- heavy industrialization just outside the sanctuary and the reserved mangrove forests
- reduction in river flow and sediment discharge, suitable levels of which are essential for survival of mangroves; construction of large dams such as Polavaram Dam, under construction, as well as sand-mining in Godavari River would lead to damaging reduction in both variables.

Potential future threats are sea level rise and increased erosion of mangroves on seaward side, over-exploitation of fish and competition with the local fishers during their hunting times. Feral cattle staying in the sanctuary is another possible threat as cattle feed on the newly recruited mangrove saplings.

Conservation

Coringa Wildlife Sanctuary is a good habitat for Fishing Cat and could be one of the major strongholds in India and indeed globally. The likelihood of occurrence of Fishing Cat increases with presence and extent of mangrove cover.

Conservation measures that I propose in this area include:

- Creating more awareness about Fishing Cat and its threatened status among local people.
- Maintaining a minimum distance between mangrove habitats and aquaculture ponds.
- Prohibiting the usage of lethal electric fences in these ponds.
- Increased protection of mangrove habitats outside protected areas.

Acknowledgements

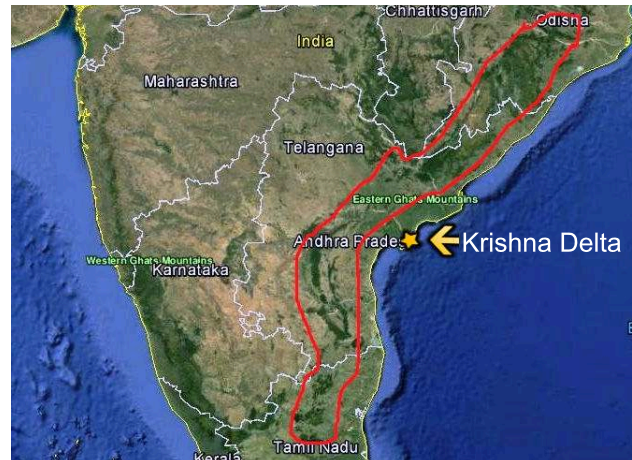
I would like to thank India GEF Coastal and Marine Programme of United Nations Development Programme, Ministry of Environment, Forests and Climate Change and Andhra Pradesh Forest Department for funding support. I would also like to thank the Director of the Wildlife Institute of India, my supervisor K. Sivakumar and my friends and field staff at Coringa Wildlife Sanctuary.



Community-based Fishing Cat conservation in the Eastern Ghats of South India

The Eastern Ghats are a discontinuous chain of mountain ranges spreading across three states on the east coast of India. A wide variety of habitats like wetlands, scrub jungles and grasslands abound across the Eastern Ghats. In this region, there have been only few Fishing Cat records with evidence-based information.

The main objectives of our work are to document historical and contemporary presence of the Fishing Cat along India's east coast and promote awareness about importance of Fishing Cat conservation for sustenance of wetland ecosystems among all the identified stakeholder groups.



Eastern Ghats on India's east coast

The Krishna Wildlife Sanctuary, nestled on the estuary of the River Krishna in the Krishna and Guntur districts of Andhra Pradesh, is home to innumerable species of wild flora and fauna including the endangered Fishing Cat. It is one of the rarest eco-regions of the world owing to the fact that it harbors vast tracts of pristine mangrove forests. In this scenario, we think that the Krishna Wildlife Sanctuary and the surrounding areas have one of the last remaining tracts of thick primary mangrove forests in South India.



Mangrove forests outside Krishna Wildlife Sanctuary. Creeks are ideal places in which to look for tracks.

This sanctuary potentially holds one of the most significant Fishing Cat populations in the world. And yet, neither concrete surveys on Fishing Cat nor community-based Fishing Cat conservation efforts have been carried out here.



Wetlands at Krishna Delta



Krishna meets the Bay of Bengal



Our conservation program



Training local youth in setting up camera-traps outside protected areas

In 2014, my colleagues and I initiated a community-based Fishing Cat conservation program outside the Krishna Wildlife Sanctuary in Andhra Pradesh. We identified few unprotected areas where there has been a high incidence of human-wildlife interaction.

By involving a few enthusiastic youths from local communities, we started setting up remotely triggered camera-traps in spots where we found evidence of Fishing Cat presence in the form of tracks and scat. As a result, camera-trap images of Fishing Cats have been recorded in several locations in the delta of the Krishna River and associated mangrove habitat. This is perhaps the southernmost record of the species in India.



Local people learn about track and spoor surveys.



GPS recording of the location of a Fishing Cat railroad kill



Questionnaire-based interviews with local people



Involving the local Yanadi tribal community in conservation




We organised education programs in villages to promote knowledge about the fact that the Fishing Cat is protected by law, and hunting individuals is a severe punishable offence. Besides, we distributed awareness posters and brochures. We also installed hoardings in the local vernacular language carrying conservation messages in selected locations. We organised art contests, skits and plays in local schools on themes such as Fishing Cat and mangrove conservation.



Competition for school children on wildlife conservation





Education program to school students for raising awareness on Fishing Cat conservation



Small Wild Cats of India

Art Competition

Calling all Junior Artists!

Did you know that there are 15 different species of wild cats in India out of which 10 species are either small or medium sized cats!

Wild Oasis and Eastern Ghats Wildlife Society

We invite all students (10-16 years of age) to create a poster for a chance to win great prizes and your art work may be displayed on World Wide Web!

Contest Theme: Importance of Small Wild Cats.

Contest open to all children between 10-16 years of age free of cost!

Art modality preferred - Ink, Pencil, Paint and Crayon.

Submission: Artwork may be directly submitted at school or digitised copies emailed to egwsvizag@gmail.com

I Prize – Cash award of 6,000/-Rupees (\$100) + Certificate; II & III Prizes – School Bags+ Certificate. A special cash award of 4,000/-Rupees for the best "Fishing Cat" Artwork.

For more information on contest rules, please follow the link below.
www.eghats.org/save-the-small-wild-cats-art-contest-2

You may kindly contact Ms. Jayshree Hatangadi, Program Coordinator of Eastern Ghats Wildlife Society @ 9441225338 or Murthy Kantimahanti @ 9491804534 for any queries.

Deadline
November 15th

As a result of our continued efforts, two Fishing Cats including one kitten were rescued and handed over to the zoo authorities. While the adult Fishing Cat was released into the wild after rehabilitation, the young Fishing Cat was raised successfully in the zoo and is currently part of the captive animal collection.



This Fishing Cat was rescued and released into the wild after rehabilitation.

Threats

Deforestation, cattle movement, sporadic poaching for meat, bush traps, live wire electric fencing and road kills are some of the observed potential threats to the Fishing Cat in the area. There has been a complete lack of awareness among local communities about the legal protection status of Fishing Cat, its endangerment in the wild and ecosystem services of mangrove forests in general.

First International Fishing Cat Conservation Symposium, November 2015

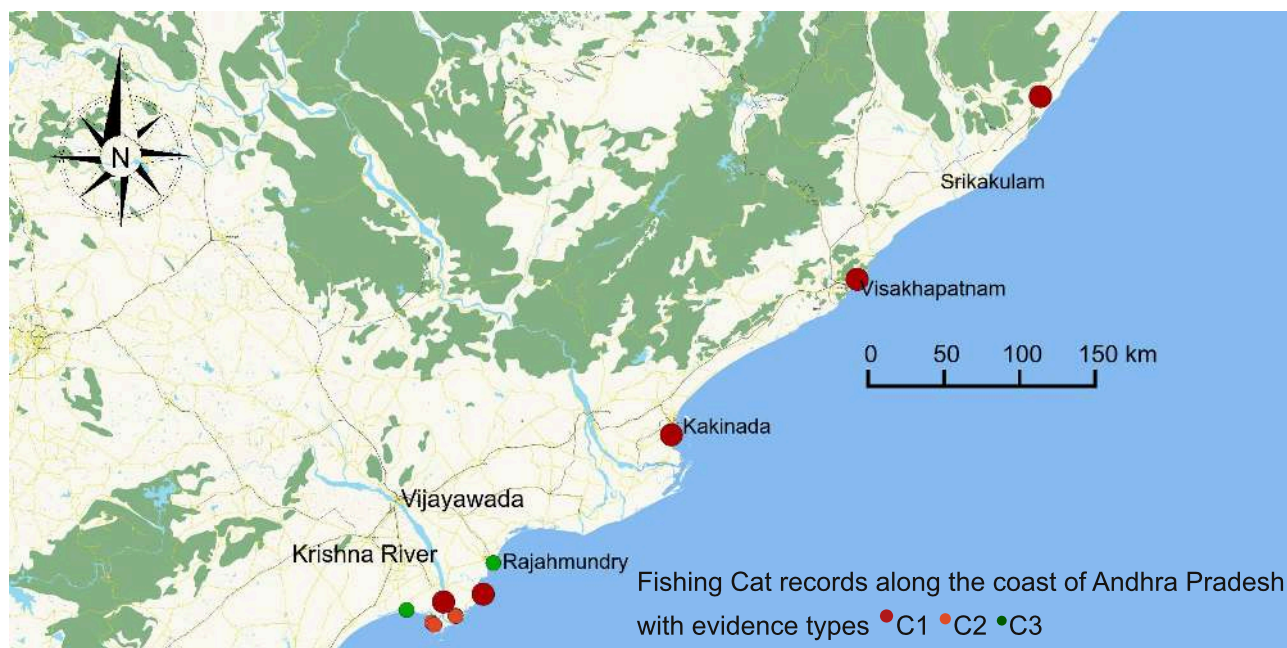


In 2012, we started documenting the occurrence of Fishing Cat in coastal Andhra Pradesh by conducting sign surveys. We gathered further information during structured interviews and via newspaper reports about rescued and dead individuals. In 2014, we also set up camera-traps. We classified all the evidence into three categories:

- Category 1 comprises tangible evidence such as photographic records obtained by camera-traps, our direct sightings of wild Fishing Cats, and newspaper reports accompanied by photographs of wounded, rescued and dead individuals.
- Category 2 comprises information that we obtained from trained personnel and experts about their direct sightings of live or dead individuals, which is accompanied by either photographs or measurements.
- Category 3 includes questionable evidence without any confirmation in the form of photographs or measurements.



Fishing Cat road kill in Srikakulam area, northern Andhra Pradesh



The afforestation efforts by local wildlife authorities since 2005 resulted in regeneration of mangroves over large areas as evident from satellite imagery. Worrying is however a recent announcement by the Andhra Pradesh Government to establish a new capital city on the banks of the Krishna River. Large tracts of land and river water will be needed for construction of roads, houses and water supply. Therefore, the restored habitats in the Krishna Delta area will have to be thoroughly surveyed to gather vital data on Fishing Cat ecology. We must keep on involving local people in field surveys and develop recommendations for the long-term conservation of the Fishing Cat on India's east coast.

Acknowledgements

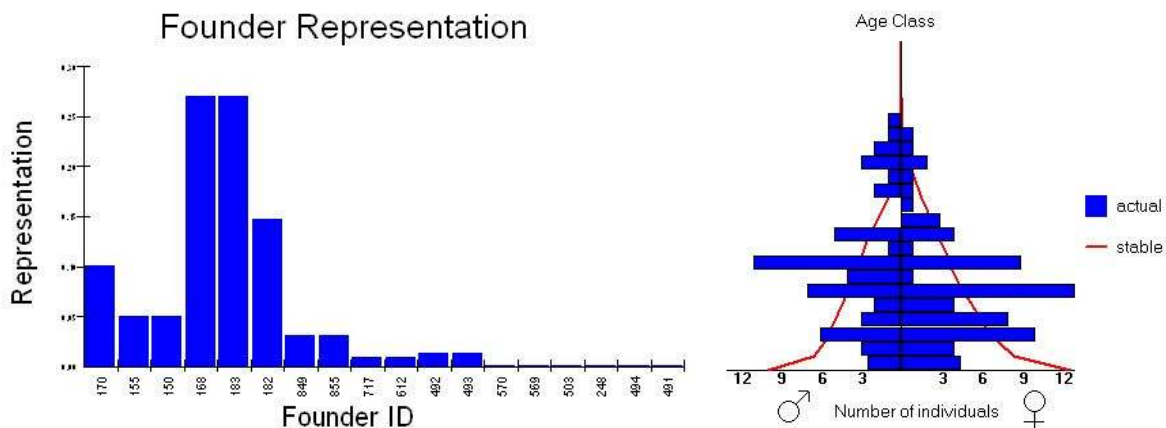
Eastern Ghats Wildlife Society is greatly obliged to Wild Oasis, Small Wild Cat Conservation Foundation and Mohamed bin Zayed Species Conservation Fund for supporting our work. We are also indebted to the state Forest Department for cooperation. We are thankful to the volunteers and field assistants from local communities who have always been very helpful with their involvement.



Captive Fishing Cats in European zoos

Philadelphia Zoological Park received the first captive Fishing Cat in 1894. In Europe, Hannover Zoo received the first Fishing Cat in 1958. The first successful breeding took place at Frankfurt Zoo in 1961.

The first issue of the International Register for Fishing Cat was published by Riverbanks Zoological Park in 1994. There are now 1,177 animals entered in the register, which is maintained by Decin Zoo, Czech Republic. The current living global captive population comprises 257 Fishing Cats in 80 institutions, of which 43 European zoos keep 123 individuals, 19 North American institutions keep 58, 15 Asian institutions keep 71, and three institutions in Oceania keep five individuals.



The founder representation is unequal. Two founders are over-represented, and six founders are under-represented. Ideally, all founders would be equally represented.

The population has a slight female bias, and more breeding is required to maintain a viable population.

There are several factors which affect the well-being and breeding of Fishing Cats: enclosure design and location, diet, health care, finding a suitable mate and when and how mates are introduced to each other. Poor enclosure design can lead to stress and self-inflicted injuries.

Enclosure design

Minimise disturbance by the public by

- restricting viewing to only one side of the exhibit
- providing multiple dens toward the back of the enclosure
- providing vegetation for privacy

Minimise the effects of staff by

- not disturbing the animal in the nest box
- not directly approaching the animal
- not locking the animal in at night or locking it out during the day
- keeping the same daily keeper
- spending quality time with the animal; evenings are best.

Environmental considerations

- Build away from large predators.
- Keep away from exposed areas.
- Avoid dense woodland as poor light affects plant growth within the enclosure.

For animals showing stress, medication such as Zylkene should only be used as a last resort. Zylkene is derived from milk; it has no known side effects and has a calming effect on cats. It has proved to be successful if an animal needs to be restricted following an operation. It has shown not to be effective with hand raised animals (Jane Hopper MA VetMB pers.comm. 2015).



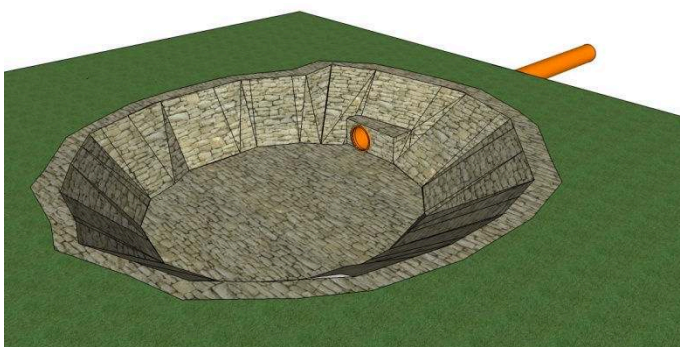
Fishing Cat 'Narayani' catching fish. Photo credit: Neville Buck



Branches extending in to vegetation provide secluded resting areas.



Make use of enclosure height. Cats are more relaxed if they can rest off the ground, which is particularly useful introducing animals.



Fishing Cats regularly defecate in the water. Good drainage is essential.



Nest boxes with a wind baffle give privacy but also provide the female with a safe area, which she can defend easily. This design also allows easy cleaning for the keeper.

Health care

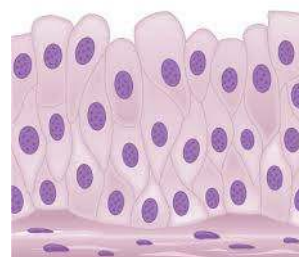
There are no specific parasite problems in Europe. For internal parasites, it is best to perform bi-annual faecal checks and treat only those animals showing a positive result. To minimise resistance, it is good practice to use rotating families of wormer.

External parasites is not a widespread problem in Europe. Mites are easily treated with Ivermectin 0.2 mg/kg, or oral medication using Spinosad (Jane Hopper MA VetMB pers.comm. 2015).

Fishing Cats can be affected by diseases associated with domestic cats. It is recommended that all European zoos inoculate using a killed vaccine whenever possible.

In 2004, transitional cell carcinoma (TCC), bladder cancer, was reported for the first time in Fishing Cats (Sutherland-Smith et al. 2004). Clinical signs include blood in urine and straining to urinate. Obstruction in the urinary tract leads to renal failure. Development of secondary malignant growths can be seen in the lungs, gastro-intestinal tract and bones. Diagnosis relies on imaging x-rays or ultrasound. Any older Fishing Cat showing clinical signs is suggestive of TCC that can be caused by repeated exposure to carcinogens in the urine.

There is no cure for bladder cancer, but treatment with Meloxicam, 0.05 mg/kg body weight, alleviates the clinical signs and makes the cat more comfortable. Continuous use of Metacam can advance the onset of renal failure (Jane Hopper MA VetMB pers.comm. 2015).



In TCC, the bladder is lined by transitional cell epithelium.



In Europe, TCC was found in nine Fishing Cats that died after 5 years of age between 1999 and 2015. In USA, 34 cases were identified from 1995 to 2012 at 16 institutions and seen in over 35% of Fishing Cat deaths older than 5 years. There were also two cases in Australia and one in Thailand. Statistically, the prevalence of TCC is low in Europe when compared to USA.

Diet

Diet surveys in 30 European and 24 USA zoos revealed that on average 20% fish is fed to Fishing Cats, including the saltwater fish capelin, herring and sprats, and the freshwater fish trout, smelt and roach. European zoos were more likely to feed whole prey as the remainder of the diet, such as rabbits, rats and chicks, rather than beef or horse meat.

Following research by the Species Survival Plan, the European Endangered Species Programme for Fishing Cat has recommended that all Fishing Cats be transitioned to a diet of at least 75% fish. This should include a minimum of three fish species with at least one of these being a marine species. The remaining 25% can be commercial feline diets, whole prey or commercial raw diets. Proper supplementation is required to prevent vitamin E and thiamine deficiencies. Due to the high fatty acid content of fish, oxidation of fatty acids occurs rapidly and destroys the Vitamin E. Enzymes such as thiaminase are very active in frozen fish which quickly destroy thiamin.

Introductions

Mate selection is important. Holders must consider genetics but compatibility is just as important. Cats are like people – they sometimes just don't like each other.

Often people introduce cats when the female is in season. This is the worst possible time for a first introduction. The male will be intent on mating with the female, and she will usually do her best to avoid the male. Nature has developed a courtship for a reason. Good practices for introductions include:

- Give the female access to the male's enclosure while he is shut away, so that she can find the safe areas.
- Do not give the male access to the female's enclosure until the time they are to be introduced.
- Feed before introductions and clear away any food remains.
- Introduce cats to each other in the evening.
- Do not disturb the female in her den. Give her an area where she feels safe. She is more likely to raise her young if she knows that she will not be disturbed.



Fishing Cat kitten, 38 days old. Photo credit: Neville Buck



Fishing Cat 'Loei' feeding on a python. Photo credit: Neville Buck

Birth seasonality shows a significant difference between zoos in Europe and zoos in the species's home range. Births in zoos are not only affected by climatic conditions but also by keeper judgement as to when animals should be mixed. Litter size ranges from one to five kittens, with three kittens seen in 36% of births. Out of 270 litters the mean litter size is 2.3.

The youngest female at first reproduction was 14.5 months old, and the oldest female was 16 years, 3 months and 28 days old. The youngest sire at first reproduction was one year and 14 days old, and the oldest sire was 14 years old.

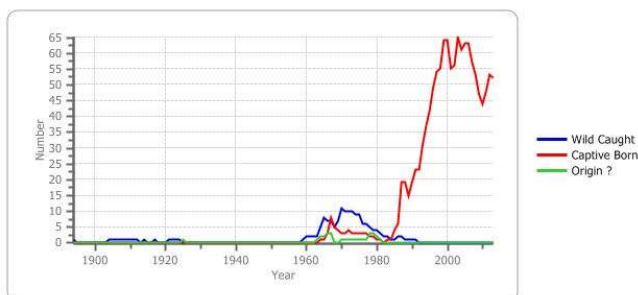


Linda CASTANEDA

Fishing Cat Species Survival Plan in North America

The Fishing Cat Species Survival Plan (SSP) manages the population of captive Fishing Cats in North America. Currently, the American zoo population is 57 Fishing Cats total, 29 males and 28 females. We need a population closer to 100 animals to be viable long-term so we need to produce 6-9 offspring per year and import 1.1 founders every three years to become viable long-term.

There are currently no wild-caught animals in the population. While we do not want wild cats to be brought into captivity, we are in need of founders which are most likely to be found in captive populations in Asia. This would be a good outlet for Fishing Cats that maybe cannot be re-introduced into the wild, or offspring of captive Fishing Cats in zoos across Asia.



Population dynamics of the North American captive Fishing Cat population

Education efforts

Since 2014 we have started new education efforts. We started a Facebook page for the Fishing Cat SSP and now have over 600 likes (update as of March 2016: over 900 likes). Our address is www.facebook.com/FishingCatSSP, and our intent is to share news about captive Fishing Cats and also conservation effort updates. We encourage everyone to send in updates, pictures and videos that we can share on the Facebook page. The page “follows” other Fishing Cat projects so that we can share news when posted. Any updates or information to be posted can be sent to me.

The Fishing Cat Fund

We also started the Fishing Cat Fund. While learning about Fishing Cat research it appears that most people are not aware what a Fishing Cat is, let alone how they can help the wild populations. We work with the Cincinnati Zoo American Association of Zoo Keeper (AAZK) chapter, so donations to the Fund are tax deductible. The AAZK chapter helps us organize and publicize fundraisers. The website is www.fishingcatfund.org



The Fishing Cat Fund logo

The Fishing Cat Fund works collaboratively with non-profits to increase Fishing Cat range and populations through global education and conservation. We strive to:

1. Create accessible educational tools to support Fishing Cat awareness and conservation goals.
2. Provide strategies for public support of Fishing Cat conservation.
3. Financially support *in situ* Fishing Cat conservation projects.



We are working to raise funds for Fishing Cat and have sold t-shirts with the Fishing Cat Fund logo. Much like other organizations have fundraisers, we are trying to make a fundraiser specifically for Fishing Cat. Our goal is to make a fundraiser that other zoo keepers around the USA can do at their zoo to raise awareness and funding for Fishing Cat. We had our first “DRINK LIKE A FISHing Cat” in Cincinnati, Ohio in April 2015, and we are hoping to have another in 2016, making it bigger and better. (Update March 2016: the second DRINK LIKE A FISHing Cat is set for June 2017 in Cincinnati, Ohio, and another zoo is already planning to hold the event as well). The Fishing Cat Fund helped to support the symposium costs. Our goal for 2017 is to help support the creation and distribution of educational material about the Fishing Cat in the USA and in range countries in Southern Asia.



A recovery plan for otters in Southeast Asia

There are four species of Otter in Asia. These are:

<p><i>Lutra sumatrana</i> Hairy-nosed Otter</p>  	<p><i>Aonyx cinereus</i> Small-clawed Otter</p>  
<p><i>Lutra sumatrana</i> Hairy-nosed Otter CITES Appendix II IUCN: EN</p> <p>Head and body length: 50 - 80cm Tail length: 37 - 50cm</p> <ul style="list-style-type: none"> - Upperparts including side of neck dark brown - Irregular patches on chin and throat - Tail round in cross section - Tip of nose covered in hair <p>Distribution: Cambodia, Malaysia, Thailand, Vietnam, Indonesia, Brunei</p>  	<p>Distinguishing Features: <i>Aonyx cinereus</i> Asian Small-clawed Otter CITES Appendix II IUCN: VU</p> <p>Head and body length: 36 - 55cm, Tail length: 25 - 35cm</p> <ul style="list-style-type: none"> - Small - Dark brown to greyish-brown - Throat and side of neck pale - Claws very small, do not extend beyond the toe pads <p>Distribution: Asia - in Southeast Asia: Brunei Darussalam; Cambodia; Indonesia; Lao PDR; Malaysia; Myanmar; Philippines; Singapore; Thailand; Viet Nam</p>  <p><small>Credit: Gerald S. GUTBETT/WWF-Canon</small></p>
<p><i>Lutrogale perspicillata</i> Smooth-coated Otter</p>   <p><i>Lutra perspicillata</i> Smooth-coated Otter CITES Appendix II IUCN: VU</p> <p>Head and body length: 65 - 75cm Tail length: 40 - 45cm</p> <ul style="list-style-type: none"> - Fur smooth and shiny - Throat and side of neck pale - Straight edge between fur on face and bare nose - Tail slightly flattened in cross section. <p>Distribution: Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; India; Indonesia; Iraq; Lao PDR; Malaysia; Myanmar; Nepal; Pakistan; Thailand; Viet Nam</p>  <p><small>Credit: Claire Beasat</small></p>	<p><i>Lutra lutra</i> Eurasian Otter</p>   <p><i>Lutra lutra</i> Eurasian Otter CITES Appendix I IUCN: NT</p> <p>Head and body length: 55 - 72cm Tail length: 37.5 - 48cm</p> <ul style="list-style-type: none"> - "W"-shaped edge between fur on face and bare nose - Short fur with long paler hairs giving greyish effect - Tip of tail round in cross section <p>Distribution: Europe and Asia. In Southeast Asia: Indonesia; Lao PDR; Myanmar; Thailand; Viet Nam</p>  <p><small>Credit: Sanchez & Lopez/WWF-Canon</small></p>

Otter Specialist Group priorities in Southeast Asia

Curbing the illegal trade in otters: all Southeast Asian otter species are now experiencing precipitous population declines. There continues to be a trade in otters, both as pets and as well as their furs, in Asia. Pelt and body parts might perhaps primarily be exported to China for the fur and medicine markets. The four tropical Asian otter species receive little protection although legally protected throughout their range. Otter species and their habitat remain poorly studied.

Our action plan includes three major initiatives:



Phase I. Reinforcement of the OSG's effectiveness in Southeast Asia by teaming up with well-established conservation bodies. Goals:

- 1) Increase local awareness of the importance of Otters in healthy wetlands.
- 2) Train new generation of otter researchers so they can develop and implement effective conservation programs.
- 3) Collaborate with TRAFFIC-Southeast Asia to work closely with local government agencies to encourage better law enforcement, train wildlife officers in identifying otter pelts and body parts, and monitor local animal markets.

Phase I has been successful and is ongoing.

Phase II. Establish working relationships with NGOs and working groups in Southeast Asia. Most of these groups are already conducting local awareness programs on other threatened species but have not incorporated Otters into their conservation programs.

Phase III. By the end of 2015, we will have drafted a detailed Conservation and Education Strategy and developed budgets for each country with realistic deliverables and time tables. Phase III will focus on funding and assisting in the Otter recovery projects in these countries through local partners and project leaders.

Phase II is ongoing, which is where we seek your support and help.

Fishing Cats and the four otter species share a great proportion of the same habitat type. And the threats to these habitats include: human settlement, draining for agriculture, pollution, excessive hunting, deforestation and extensive commercial fishing. The clearance of coastal mangroves and the depletion of fish stocks from over-fishing is prevalent and is likely to be a significant threat to these species.

We want to engage the active cooperation of people working in riverine communities: local biologists, conservationists and government officials in the region. And share information on:

- Otter presence, both direct and indirect observation
- Habitat type, if otters are present
- Information about illegal trade
- Poaching activities

And of course we will reciprocate.



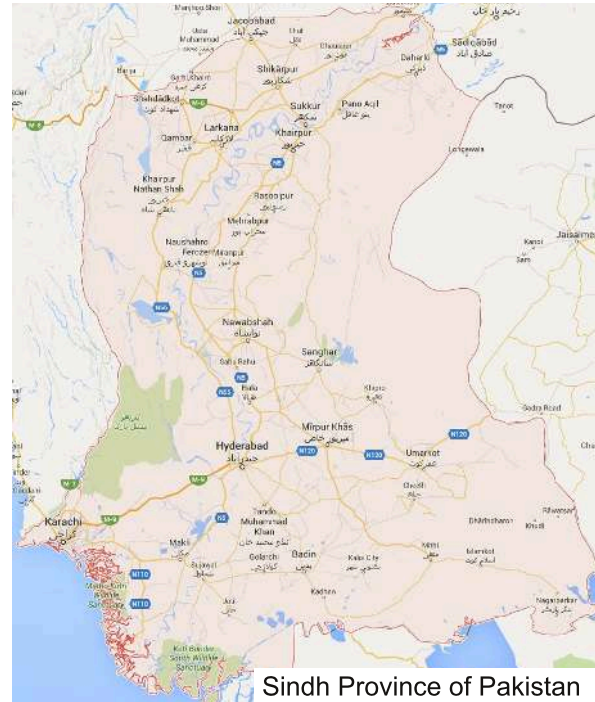
Fishing Cat and otters in Pakistan

Katrina Fernandez suggested that Fishing Cat and otters share a great proportion of the same habitat type. Therefore, I looked into historical distribution of Fishing Cat in Pakistan and recent records of Smooth-coated Otter *Lutrogale perspicillata* in the Indus River basin.

Roberts (1977) collated Fishing Cat records in Pakistan where several specimens were captured or killed between the late 1960s and the early 1970s. Most of these records came from southern Sindh, which Roberts considered the only stronghold in Pakistan. The Fishing Cat lived in

- riverine and swamp areas with permanent water in conjunction with extensive reed beds and tall grasses;
- coastal areas with mangroves and tamarisk bushes.

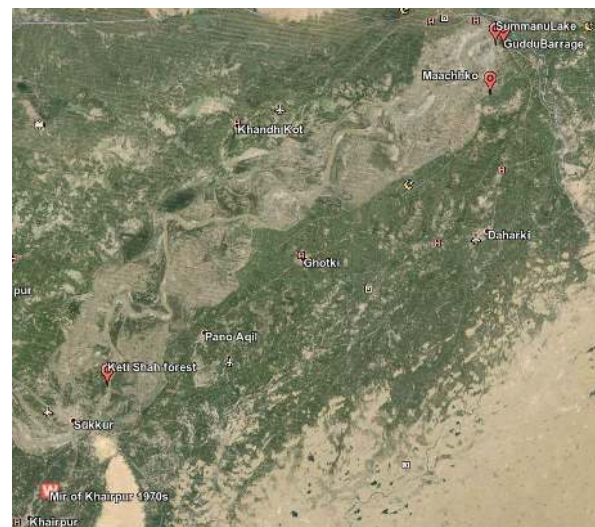
In 2010, a Pakistani team published contemporary records of Smooth-coated Otter collected from October 2008 to September 2010 (Khan et al. 2010). The authors travelled around 5,000 km, covered 36 different sites in 12 districts of the Sindh Province. During their surveys they sighted otters, observed tracks, holts, spraints and feeding remains. They also interviewed local people about otters using a pre-tested questionnaire.



Indus riverine forests

Riverine forests in the Indus basin cover about 2,400 km² and entirely depend on inundation waters received during the monsoon season; they are important habitats for mammals, reptiles and birds (WWF 2008a). In northern Sindh Province, two barrages across the Indus River divert water for irrigation: the Sukkur and Guddu barrages constructed in 1932 and 1962 respectively (Gowdy and Salman 2011).

Roberts (1977) knew of Fishing Cat in the Mir of Khaipur, a riverine forest south of Sukkur. He also reported Smooth-coated Otter to be common particularly around Sukkur. Khan et al. (2010) found otter tracks and trails in the Keti Shah forest, a reserved forest north of Sukkur, a “distant place with no human activities”.



Smooth-coated Otters and Fishing Cats recorded in Indus riverine forests, northern Sindh Province.

Nara Wetlands and Chotiari Reservoir

The Nara Canal originates at the Sukkur Barrage and provides a perennial water source to agriculturally used land. The Nara Wetlands extend to 4–5 km on either side of the canal and comprise about 225 small, medium and large marshes, pools and lakes, which are surrounded by sand dunes; this area along the canal covers more than 1,000 km² (WWF 2011). The canal feeds the Chotiari Reservoir located on the western flank of the Thar Desert, about 180 km² in size and flooding an area of about 160 km² (WWF 2008b).



Roberts (1977) reported Fishing Cat surviving precariously near the Chotiari Reservoir and in swamps in the eastern Nara Canal. A WWF-Pakistan survey team attributed footprints found around the reservoir to Fishing Cat, and local people corroborated the cat's presence in interviews (WWF 2008b). In the Nara Wetlands farther north, a different WWF-Pakistan survey team also attributed footprints found to Fishing Cat in 2010, but local people did not report any sighting (WWF 2011). Khan et al. (2010) sighted Smooth-coated Otter near the Chotiari dam and in the Nara Canal. Near a power station farther upstream, they also found otter holts, tracks and trails.

Haleji and Keenjhar lakes

Both lakes are freshwater lakes located east of Karachi in stony desert (Sanpera et al. 2002, WWF 2008c). Haleji Lake covers 10.5 km², is surrounded by marshes and brackish seepage lagoons and considered an important breeding and wintering area for waterfowl (Sanpera et al. 2002). Keenjhar Lake is a semi-natural lake that was declared a Wildlife Sanctuary in 1977. It covers an area of 145 km² and is fed by a canal from the Indus and several seasonal streams (WWF 2008c).

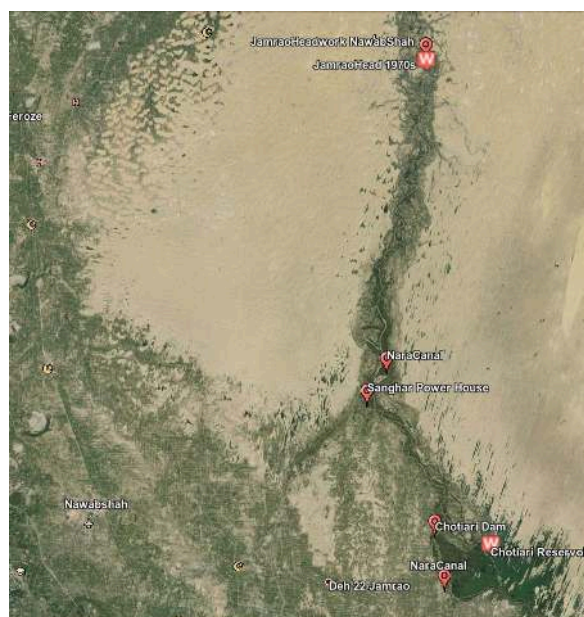
In the early 1970s, animal exporters captured Fishing Cat specimens near Haleji and Keenjhar lakes and on the east bank of the Indus (Roberts 1977). A WWF-Pakistan survey team attributed footprints found around Keenjhar Lake to Fishing Cat, and local people reported sightings (WWF 2008c). Khan et al. (2010) found tracks and trails of Smooth-coated Otter near Haleji Lake and sighted one at Keenjhar Lake.

Indus Delta

The Indus Delta extends to about 6,000 km² (Chaudhry 2010). In the late 1980s, deltaic mangroves covered an area of about 1,600 km²; by 2002, they had decreased to about 800 km². This loss is attributed to several causes: fresh water declined following construction of three dams upriver and diversion of water for irrigating crops; salinity increased with rising sea level; local people over-harvested them; polluted sewage water flowed in from Karachi (Gowdy and Salman 2011).



Three wildlife sanctuaries were established in the Indus Delta in 1977:

- Marho Kotri with a total area of about 310 km² (IUCN and UNEP–WCMC 2015)
- Keti Bunder North with a total area of about 89.5 km² (WWF 2008d)
- Keti Bunder South with a total area of 230 km² (WWF 2008d)



Smooth-coated Otters  and Fishing Cats  recorded near the Chotiari Reservoir and along the Nara Canal.



Smooth-coated Otters  and Fishing Cats  recorded near Haleji and Keenjhar lakes.





Keti Bunder hosts 42 village settlements. Some ethnic groups, who used to subsist on agriculture and livestock raising, turned to fishing since the land degraded. In consequence, fish and shrimp stocks have decreased drastically since the 1980s. Recent surveys in these areas focused on the status of the mangroves (Khan and Aziz 2001, Farooqui 2014), determining fish species and the level of toxic and essential trace elements contained in fish and prawns (Tabinda et al. 2010).

It is possible that Fishing Cat persist in the deltaic mangrove forests; according to local people the cat is present, but a WWF-Pakistan survey team did not find any signs (WWF 2008d).



Fishing Cat in Zabol Zoo, 2014. Photograph by Dr. Memarian, head veterinarian of Tehran Zoo.

Recent records

Two incidents suggest that the Fishing Cat survived in Pakistan.

In spring 2014, I received a photograph of a “weird” cat kept in a small zoo in Iran. The cat had been confiscated and taken to Zabol Zoo where staff were not able to identify it. Zabol is a small town about 900 km north-west of Karachi close to the border with Afghanistan. It is plausible that this Fishing Cat had been captured in the Indus basin.

On 18 October 2015, a Pakistani newspaper reported about a raid at the Empress Market in Karachi where wildlife department officials seized a Fishing Cat and handed it over to the Karachi Zoo (Bhatti 2015).

Shortly after the symposium, Islam et al. (2015) reported to have photographed Fishing Cat and Smooth-coated Otter during a camera-trapping survey at the Chotiari Reservoir.

Next steps

Extensive wetlands in the Indus basin and delta constitute suitable habitat for Fishing Cat, despite intensive use of natural resources. To clarify distribution and current status of Fishing Cat in Pakistan targeted surveys will have to be conducted in wetlands throughout Sindh Province, both inside and outside protected areas. Areas with a high priority for field surveys include those from where historical records are known, but should not be limited to

- the riverine forests around the Sukkur Barrage,
- downstream the Nara Canal to Chotiari Reservoir,
- the wetlands surrounding Haleji and Keenjhar lakes
- and the deltaic mangrove forests.

Searching the Pakistan Wetlands Inventory may yield more wetland sites that warrant surveys targeting Fishing Cat. Local stakeholders need to be identified to cooperate in promoting Fishing Cat and wetland conservation.



Strategic Planning

Strategic Planning differs from the routine or regular (annual) planning in quite a few aspects. Whereas regular or routine planning is continuation of the past activities, albeit with some incremental changes. Strategic Planning is a break with the past. As such, Strategic Planning is done for a period much longer than one year, which is typical of routine planning. Depending on the context and the pace of change in the external environment, a Strategic Plan could go for three, five, ten or even 20 years. There are no hard and fast rules regarding the duration of a Strategic Plan. Strategic Planning is a response of an organisation or institution to the changes in its **external environment** whereas routine planning assumes no significant changes in the external environment.

Strategic Analysis Model

The external environment of an organisation or institution can be considered to have two layers: the outermost layer comprising of **FACTORS** that affect the existence, growth and development of the organisation or institute such as

- (i) economy and demography,
- (ii) legal and political systems,
- (iii) technology and physical infrastructure, and
- (iv) social and cultural settings;

the innermost layer comprising of **ACTORS** that affect the existence, growth and development of the organisation or institute such as

- (i) regulators/controllers,
- (ii) donors/funders/supporters,
- (iii) competitors/collaborators, and
- (vi) intermediaries/implementers.

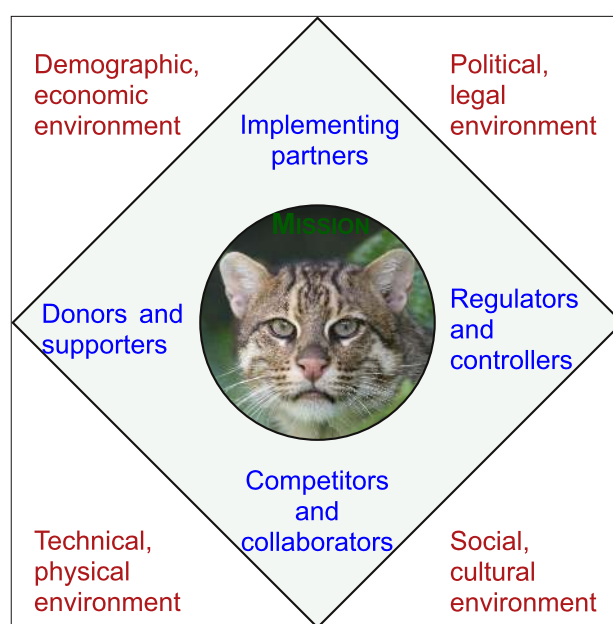


Photo credit: Neville Buck

Large organisations or institutions with abundant resources can at best influence to some limited extent the external environment but cannot control them. The external environment are a source of Opportunities and Threats to the organization or institution.

Therefore the starting point for a strategic planning is identification of key changes in the external environment: **FACTORS** and **ACTORS** affecting the very existence, survival, growth and development of the organization or institution. The next step is an analysis of the organisation or institution's internal environment. Different models can be used to depict the internal environment of an organisation or institution. One simple model is 4S model: Strategy, Structure, System and Staff, skills, styles, shared values included. In contrast to the external environment, the internal environment is very much within the control of the organisation or institution. Analysis of the internal environment reveal the Strengths and Weaknesses of the organisation or institution. Once the external and internal environment is analysed, the questions for strategic planning are:

- Which opportunities offered by the external environment do we pick up? What do we need to have in place, in terms of Strategy, Structure, System and Staff, to be able to pick up the opportunities? What do we need to do to ensure that we grab the opportunities successfully?
- Which threats originating in the external environment do we need to respond to? What do we need to have in place, in terms of Strategy, Structure, System and Staff, to be able to effectively counter the threats arising from the external environment, I.e. factors and actors? What do we need to do to ensure that the threats do not affect the organisation seriously?



Once the answers to the key questions worked out, the final step is to decide “who does what and by when.” This thus completes the strategic plan based on the strategic analysis model.

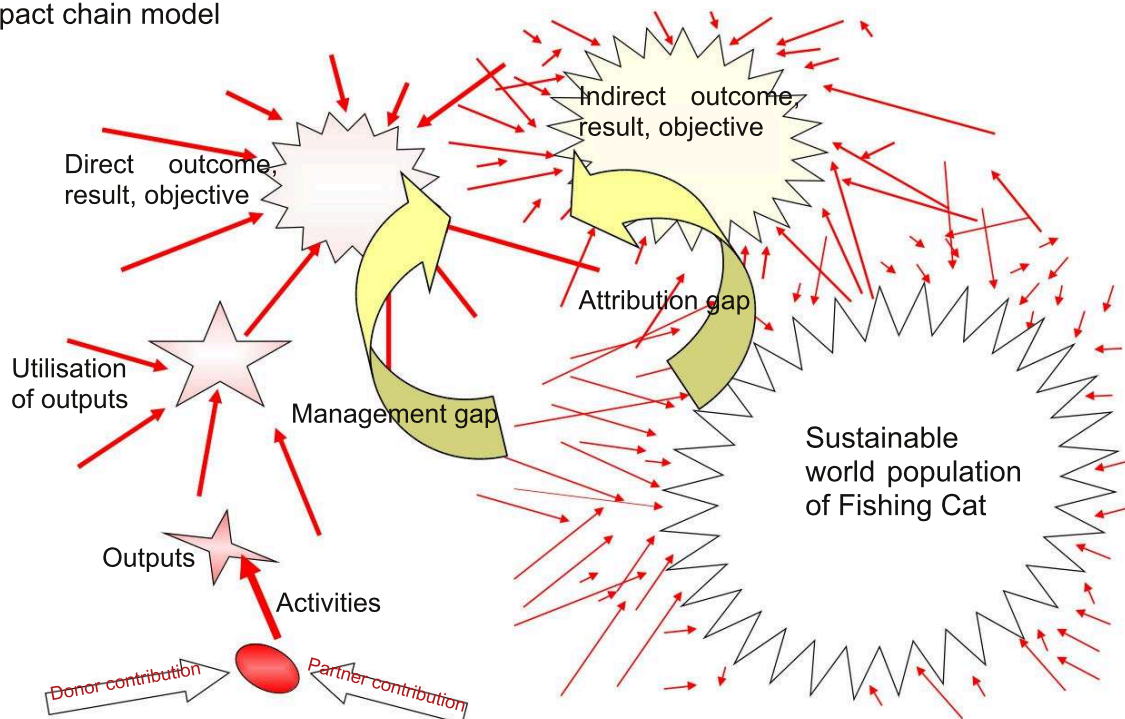
Sometimes, strategic planning is carried out without so much focusing on the external analysis but mainly focusing on visualizing the final destination and the road map:

- What is the ideal state of affairs, the vision that we want to see say in 20 or 50 years’ time? What outcomes – desired states – do we need to bring about in say three to five years’ time to ensure that we are effectively moving towards achieving the vision?
- What major activities do we need to implement in order to successfully achieve the outcomes? Who does what or who contributes what to ensure smooth implementation of the activities?

Impact Chain Model

Whichever strategic planning approaches or models are followed, **Impact Chain Model** will be a very useful tool in defining the desired destination of an organisation or institution as well as the road map to reach the desired destination with clear achievement milestones.

Impact chain model



At the bottom of the **Impact Chain Model** are the preconditions – commitment of resources from the donors or the organisation/institution: financial, human, technical, and infrastructural that are necessary to enable the organisation/institution to implement **ACTIVITIES** aimed at delivering **OUTPUTS** or goods/services of desired quality, in required quantity and within given time. **UTILIZATION** of these outputs by the targeted beneficiaries will result in **DIRECT OUTCOMES**, intended benefits or changes in the conditions or behaviours of the beneficiaries, which again can lead to more **INDIRECT OUTCOMES** and so on. It is up to the organisation to decide where it wants to reach within a given period of time. Along the impact chain model, one needs to check whether the resources are sufficient to implement the activities, whether the activities are appropriate to produce the outputs, whether the outputs are likely to be utilized by the beneficiaries and whether the utilization of the outputs will result in achievement of the direct outcomes. It is also necessary to identify and properly address external factors that might affect the achievements along the impact chain model. If there are blockages at any point in the chain, then the progress stops right there. Although there are no hard and fast rules as to where to start on the model, most practitioners prefer is to define the direct outcome first with timeline and then to derive outputs, activities and resources backwards, and figure out the indirect outcome.



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Field visit to the Bandarjola islands



Ruddy Shelducks *Tadorna ferruginea*



Photo credits 1, 7: Angie Appel; 2: Ashan Thudugala; 3–6: Neville Buck; 8: Thaung Ret



Hanuman Langur *Semnopithecus hector*



Gharial *Gavialis gangeticus*

Photo credits 1, 3–6: Angie Appel; 2: Neville Buck



Press release

2 December 2015

First ever Conservation Strategy for the Fishing Cat

International conservationists gathered in Nepal to develop a Conservation Strategy Plan for the Fishing Cat – the first such plan for an Asian small wild cat.

In November 2015, the First International Fishing Cat Conservation Symposium was hosted in association with the NGOs Himalayan Nature and Small Mammals Conservation and Research Foundation. Participants included representatives from Fishing Cat range countries like Nepal, India, Sri Lanka, Cambodia and Bangladesh, as well as conservationists from USA, UK, Spain and Germany.

The endangered Fishing Cat *Prionailurus viverrinus* is at home near water bodies. This unique cat is known to science since the early 19th century. However, its recent discovery in mangroves along the east coast of India and in Cambodia reveals that still little is known about its distribution and ecological needs. In Asia, wetlands are rapidly devastated, which results in declining Fishing Cat populations in all range countries. Furthermore, they are threatened by killings in retaliation, poaching and traffic. Their status in Pakistan, Myanmar, Thailand, Vietnam and Java is largely unknown. They may have declined dramatically over the last decades.

“This dire perspective across their range motivated us to form the Fishing Cat Working Group in 2011. Our symposium was a huge success. We are the first Working Group who developed a conservation strategy for an Asian small wild cat. Fishing Cats need more targeted conservation efforts to ensure their continued survival in the wild. Our vision is that wild Fishing Cat populations become viable again across their native range, are valued globally and live in harmony with humankind.” said Angie Appel, co-founder and coordinator of the Fishing Cat Working Group.

“In India, they are included in Schedule I of the Wildlife Protection Act, 1972, along with the tiger, and thus deserve protection measures of the highest accord. Nevertheless, their most important habitats are destroyed by the filling up of wetlands for airports, residential areas and highways due to policy contradictions.” said Tiasa Adhya. She has been engaged in conserving Fishing Cats in West Bengal. Because of her successful efforts she was recently nominated for the Future for Nature award. Giridhar Malla from the Wildlife Institute of India added “A viable population of Fishing Cats was recently recorded in mangroves of Andhra Pradesh. However, oil refineries and expansion of road network pose a huge threat to this population.”

“In Nepal, Fishing Cats have been recorded in protected areas and recently also in human dominated landscapes in the Terai. However, we still don’t know all the specific sites where Fishing Cats are present. Furthermore, they are not listed as a priority protected species in the country.” said Sagar Dahal of the Small Mammals Conservation and Research Foundation.

“Ecological studies on Fishing Cats are scarce even though they live throughout coastal wetlands and hill forests of Sri Lanka.” said Anya Ratnayaka. She radio-collared the first Fishing Cat in suburban Colombo to understand their ecological adaptations to novel urban habitats. “In Sri Lanka, more than 50 individuals died in road accidents during the past two years.” added Ashan Thudugala. In response he installed road signs in the country’s central hills to minimize road accidents involving Fishing Cats.

“In Cambodia, Fishing Cats are poorly studied. Our recent discovery of a Fishing Cat population in mangroves is spectacular. This is not only the first record since 2003, but also in a previously undocumented site.” said Ret Thaug of the Centre for Biodiversity Conservation (CBC) of the Royal University of Phnom Penh. “We are very excited about this discovery because it gives us new hope for the recovery of Fishing Cats in Southeast Asia.” said Vanessa Herranz Muñoz who collaborates with CBC.



“Conservationists in Fishing Cat range countries need to be better linked with the international zoological community for exchange of knowledge. We can increase awareness about the plight of Fishing Cats in the wild and support conservation efforts through fund raising activities.” said Neville Buck of the Aspinall Foundation, UK.

The objectives of the first Conservation Strategy Plan revolve around three major themes, namely ecological, socio-cultural and policy issues. Participants pledged to implement planned activities within the next five years. They will collaborate in developing manuals for policy makers and researchers as well as comprehensive habitat and distribution maps. They will continue to work with local communities and address Fishing Cat conservation needs through advocacy networks. Information material will be created to raise awareness amongst global stakeholders, both young and old.

The symposium was supported by the Mohamed bin Zayed Species Conservation Fund, the Cincinnati Zoo & Botanical Garden, the Fishing Cat Fund and the Department of National Parks and Wildlife Conservation, Nepal. It was held at Park River View Resort in Nawalparasi close to Chitwan National Park.

Fishing Cat



Working Group