Journal of Threatened Taxa

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www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

SMALL WILD CATS SPECIAL ISSUE

ARTICLE

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Wanlop Chutipong, Anucha Kamjing, Worata Klinsawat, Dusit Ngoprasert, Kitipat Phosri, Niti Sukumal, Pongnapa Wongtung & Naruemon Tantipisanuh

12 March 2019 | Vol. 11 | No. 4 | Pages: 13459–13469
DOI: 10.11609/jott.4557.11.4.13459-13469

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Journal of Threatened Taxa | www.threatenedtaxa.org | 12 March 2019 | 11(4): 13459–13469

ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

PLATINUM
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An update on the status of Fishing Cat *Prionailurus viverrinus* Bennett, 1833 (Carnivora: Felidae) in Thailand

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Abstract: Fishing Cat *Prionailurus viverrinus* is threatened throughout its range by habitat loss, persecution, and non-targeted hunting; it is listed as Vulnerable on the IUCN Red List of Threatened Species. Even basic distribution data are still lacking in many parts of its range, particularly in southeastern Asia where most wildlife surveys focus on large charismatic carnivores in protected habitats, typically inland blocks of evergreen or semi-evergreen and deciduous forests. This report aims to update on distribution and status of Fishing Cat in Thailand. Historic (the 1980s) and current (2007–2017) records from Thailand were compiled based on personal communications, local news agencies, social media pages, and publications. The current Thai Fishing Cat distribution seems to be highly fragmented and mostly in coastal wetlands of the Inner Gulf of Thailand and the Thai-Malay Peninsula with one confirmed record from a riverine habitat in central Thailand. No confirmed records came from protected forested areas—perhaps these are marginal habitat for Fishing Cat. Nevertheless, there were no targeted surveys in those areas. Fishing Cat was so far not detected from on-going otters' targeted camera trap surveys along Thailand's Andaman coast. Future surveys should focus on coastal and inland wetlands to expedite the discovery of remaining populations before these are extirpated.

Keywords: Coastal wetland, human-dominated habitat, inland wetland, mangrove forest, persecution, riverine habitat, species distribution, threat assessment.

Abbreviations: DNP - Department of National Park, Wildlife, and Plant Conservation; SRY - Khao Sam Roi Yot National Park; TSL - Thung Salaeng Luang National Park.

DOI: https://doi.org/10.11609/jott.4557.11.4.13459-13469 | **ZooBank:** urn:lsid:zoobank.org:pub:DE815A67-7ED6-4BC8-B804-DCE3F572E5C7

Editor: Angie Appel, Wild Cat Network, Germany. **Date of publication:** 12 March 2019 (online & print)

Manuscript details: #4557 | Received 11 November 2018 | Final received 30 December 2018 | Finally accepted 04 March 2019

Citation: Chutipong, W., A. Kamjing, W. Klinsawat, D. Ngoprasert, K. Phosri, N. Sukumal, P. Wongtung & N. Tantipisanuh (2019). An update on the status of Fishing Cat *Prionailurus viverrinus* Bennett, 1833 (Carnivora: Felidae) in Thailand. *Journal of Threatened Taxa* 11(4): 13459–13469; https://doi.org/10.11609/jott.4557.11.4.13459-13469

Funding: This research was (partially) supported by the Asahi Glass Foundation, National Science and Technology Development Agency [P-15-51209], and King Mongkut's University of Technology Thonburi.

Competing interests: The authors declare no competing interests.

For **Author details** & **Author contribution** see end of this article.

Acknowledgements: We thank Angie Appel for her effort in encouraging, managing, and editing our manuscript. Comments and suggestions made by two reviewers (JW Duckworth and Daniel Willcox) help improving the manuscript significantly. We also thank Shomita Mukherjee for co-editing our manuscript and Vanessa Herranz Muñoz for clarification regarding Fishing Cat from Cambodia. We are grateful to George A. Gale for reading earlier version of our manuscript. In DNA barcoding protocol, we appreciate helpful discussion, financial support and technical assistance from Assoc. Prof. Dr. Worawidh Wajjwalku and Ms. Nongnid Kaolim from Faculty of Veterinary Medicine, Kasetsart University. We are grateful to Parinya Padungthin for pointing out records of Fishing Cat in Thailand.

INTRODUCTION

Fishing Cat *Prionailurus viverrinus* has a wide distribution across southern and southeastern Asia. Most populations, however, appear to have declined significantly due to habitat loss, non-targeted hunting, and retaliatory killing associated with livestock depredation and/or damage to aquaculture (e.g., fish ponds; Mukherjee et al. 2016). Known strongholds are Sri Lanka, Bangladesh, West Bengal in India, and the Terai-Duar belt of the Himalayan foothills in India and Nepal (Mukherjee et al. 2016). In southeastern Asia, recent records dating to 2000–2016 are scarce, and the species occurrence is extremely patchy in Vietnam, Cambodia, Thailand, Myanmar, and Indonesia (Java and perhaps Sumatra) (Mukherjee et al. 2016 and references therein). Fishing Cat is listed as Vulnerable on the IUCN Red List of Threatened Species (Mukherjee et al. 2016).

Thailand may be one of the important strongholds for Fishing Cat and a regional priority range country for its conservation—it has few degraded habitats, at least those that are potentially suitable for Fishing Cat, e.g., in coastal mangroves, within large protected areas with a high protection level and law enforcement measures, and populations of ecologically similar species like otters. Nevertheless, between 1996 and 2011, there were only a few targeted surveys for Fishing Cat that yielded confirmed records and these were mainly in and around Khao Sam Roi Yot (SRY) and Thale Noi Non-hunting Area (Cutter & Cutter 2009; Tantipisanuh et al. 2014; Fig. 1). Results of radio telemetry research on 23 radio-collared Fishing Cats in an area of approximately 35km^2 suggested that SRY was a stronghold for the Fishing Cat in Thailand (Cutter & Cutter 2009; Cutter 2015; Patumrattanathan 2015). In the same area, however, negative interaction with people on livestock-raiding led to retribution killings of at least five out of 16 Fishing Cats monitored during this study (Cutter 2015).

In a review of the status of small cats in Thailand (Tantipisanuh et al. 2014), Fishing Cat rarely occurred in protected areas with no significant wetland habitats where most of camera trap surveys were conducted, although none of these surveys had specifically targeted Fishing Cat, except that of Cutter & Cutter (2009). Wetland habitats such as mangrove and peat swamp which were largely under-surveyed may still hold some remaining Fishing Cat populations and other threatened small carnivores and therefore require immediate attention for surveys (Chutipong et al. 2014). These wetlands were heavily used for aquaculture in the past several decades but in many parts are still little degraded, particularly along the west coast of southern Thailand. Given such a paucity of surveys in suitable habitats, Thailand might hold a large Fishing Cat population or, equally, the species might be close to extinction (Appel & Duckworth 2016). This very wide range of possibilities clearly indicates that there is an urgent need for a conservation status assessment in the country.

This article compiles evidence of Fishing Cat occurrence that was not included in the previous review by Tantipisanuh et al. (2014). Some records in this article date to before 2014, but these records are not exhaustive as attempts were not made to review all historic records, e.g., examining specimens in museums. This remains a priority because it has the possibility to indicate a longer-term change in range. Results from a camera trap survey in a coastal mangrove site where wetland-associated species such as otters, Lutrinae, were targeted are also summarized. This present article provides an update on Fishing Cat distribution in Thailand and therefore helps to identify areas for further surveys and conservation efforts in the country. It is also in line with one of the objectives of the Fishing Cat conservation strategy that aims to close information gaps on Fishing Cat distribution and status in range countries (Appel & Duckworth 2016).

METHODS

We compiled Fishing Cat evidence from various sources—personal communications, newspaper articles, social media pages, and publications. We attempted to verify each report by (1) circulating images among experts for confirmation of species identification when images were available, or (2) visiting and taking images and recording narration from owners of the stuffed mounted specimens, reports, and then circulating images for confirmation. Records date from the late 1980s to the late 2010s. Some records are from the same review period in Tantipisanuh et al. (2014) but were overlooked at the time and therefore not included in it.

RESULTS AND DISCUSSION

Records came from Muang District of Phitsanulok Province in north-central Thailand, Bangkhuntian District of Bangkok Province, Muang District of Samut Sakorn Province, Laem Phak Bia Subdistrict in Ban Laem District of Phetchaburi Province located in the Inner Gulf, and Singhanakorn District of Songkhla Province,

Muang District and Mai Kaen District of Pattani Province in peninsular Thailand (Fig. 1). Ongoing surveys in mangrove habitats in Ranong, Phang-nga, and Krabi provinces along Thailand's western coast so far failed to detect any evidence of Fishing Cat.

A. Upper Central Thailand

A.1. Sa Khlo Village, Hua Raw Subdistrict, Muang District, Phitsanulok Province

On 24 December 2012, a local news agency reported a male Fishing Cat captured by a group of people at Sa Khlo Village (Anonymous 2012; Fig. 1). The report, however, did not elaborate details on the type of habitat and the animal's capture. It further documented that the cat was reported to a local politician who appeared to recognize the animal as a Fishing Cat. He then asked to keep the animal instead of releasing it to the wild, in fear of the cat being killed and eaten by locals. He convinced the locals that he would report to the authorities, the Department of National Park, Wildlife, and Plant Conservation (DNP), for permission to keep the animal in captivity. There was no further information to validate if the cat was a resident caught in the mentioned area and not an escaped pet. The set of images published with this newspaper article was circulated among six experienced field conservationists/ researchers, and all agreed that the animal was a Fishing Cat, based on its features: small ears in relation to head, short tail in relation to the body, and protruding claws of the front paws. Examination of the habitat (using Google Earth, 16 October 2017; Table 1) where the cat was claimed to be caught, included a small low-lying river, named Sa Khlo, which runs through paddy fields and has a 3–5 m wide scrubby strip dotted with clumps of bamboo situated along both sides. Small and scattered human settlements are situated on both sides of the river in this relatively flat area. Satellite image of the riverine habitat along the Sa Khlo River matches no other habitat where Fishing Cat populations were found in low-lying riverbeds but perhaps similar to those in Pakistan (see Roberts 1977 cited by Appel 2016).

A literature search (published in English) traced no records of Fishing Cat in the nearby Thung Salaeng Luang National Park (TSL; 1,262km^2), located about 20km farther east. TSL is part of the Phu Miang-Phu Thong Conservation Corridor (9,944km^2), which also includes Khao Kho National Park and Wang Pong-Chon Daen Non-hunting Area (Tordoff et al. 2012). According to the GIS database of the Land Development Department 2018 (LDD 2018), TSL consists mainly of evergreen forest (59%) with patches of limestone caves and associated subterranean streams in the Chao Phraya basin and Nan River sub-catchment, and 29% mixed deciduous forest. This habitat is unlikely to harbour Fishing Cats. Since there were no targeted surveys for Fishing Cat anywhere near or in the park, the absence of Fishing Cat there remains uncertain. The park, however, may be of low priority for a Fishing Cat targeted survey due to a lack of significant wetlands.

This inland record in Sa Khlo Village would be a really significant one if it is genuinely of a wild animal since it is almost 400km from the coast where most suitable habitats lie. It would also indicate that Fishing Cat once occurred far away from coastal wetlands. One inland record of 'Fishing Cat' is known from northwestern Thailand, in Tak Province (Duckworth et al. 2010) and another one, a camera trap record from Kulen Promtep Wildlife Sanctuary in northern Cambodia (Rainey & Kong 2010). In the Indian subcontinent, there are many more inland records, e.g., from Terai Arc landscape, Chitwan and Badia NPs, Nepal (Dahal & Dahal 2011; Yadav et al. 2018), India (e.g., Palei et al. 2018), and Sri Lanka (Thudugala 2016). Duckworth et al. (2010) did not, however, examine the specimen from northwestern Thailand, and thus they could not be sure whether the specimen was correctly identified and of certain origin (J.W. Duckworth in litt. 1 July 2017). Due to the intense use of inland wetlands in southeastern Asia, this type of habitat is now much reduced (Davidson 2014). As Fishing Cat is highly adaptable and can persist in degraded habitats (e.g., SRY: Cutter 2015; Pathumratanatarn 2015), all sizes and conditions of inland wetlands need to be identified and surveyed.

B. Inner Gulf of Thailand

B.1. Bangkhuntian District, Bangkok Province

On 10 July 2014, W. Chutipong and D. Ngoprasert interviewed a local school teacher, a former hunter, regarding the historic occurrence of Fishing Cat in Bangkhuntian, a suburb of Bangkok. The person said that he had stuffed 14 Fishing Cats, which were killed by either him or his sibling or sourced from locals in and around his community. He also mentioned that Fishing Cat was opportunistically hunted for meat or as retribution for killing livestock. We traced one stuffed mount stored at a local museum held by the Klong Pittayalongkorn School where he is currently working (Figs. 1; Image 1). This specimen, dated to the late 1980s, was obtained from a local villager who trapped the cat accidentally with a fish trap (Kriangsak Rukngam pers. comm. 10 July 2014).

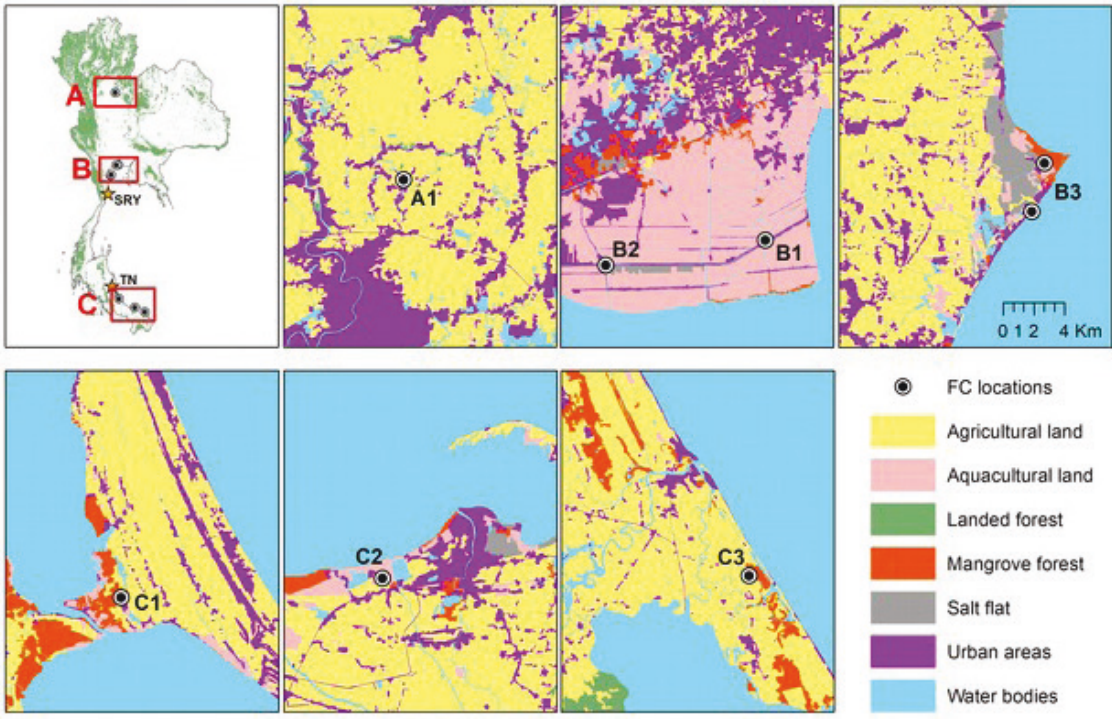

Figure 1. Locations of traced Fishing Cat records. Letters and numbers represent records described in the text and in Table 1. All coordinates are approximate locations based on available information from each record unless otherwise stated.

Table 1. Summary of Fishing Cat and Leopard Cat records in Thailand from the late 1980s to 2016. All coordinates are approximated locations based on available information unless otherwise stated.

Locality	Coordinates	Evidence	Source	Date of image taken	Remarks
A. Upper Central Thailand					
A.1. Sa Khlo, Muang, Phitsanulok	16.883°N, 100.283°E	Images	Local news (Anonymous 2012)	[not indicated]	
B. Inner Gulf of Thailand					
B.1. Bangkhuntian, Bangkok	13.517°N, 100.417°E	Image of stuffed mount specimen	Interviewed the hunter	10 July 2014	The animal was stuffed in the early 1980s and kept at Pittayalongkorn Pittayakhom School; Image 1.
B.2. Phantai Norasing, Khok Kham, Samut Sakorn	13.500°N, 100.317°E	Image of stuffed mount specimen	Wanlop Chutipong, Dusit Ngoprasert	10 July 2014	A road-kill female Fishing Cat found on a road near a school on 14 December 2013 at 5.30h; Image 2.
B.2. Phantai Norasing, Khok Kham, Samut Sakorn	13.483°N, 100.317°E	Image of a cat in a breeding centre	Kitipat Phosri	28 May 2016	It is uncertain whether the photographed cat is from SRY/ Phantai, but it is certain that some Fishing Cats were trapped in Phantai and taken to the breeding centre; Image 3.
B.3. Laem Pak Bia, Ban Laem, Phetchaburi	13.017°N, 100.067°E	Skull	Jonathan Murray (deceased)	2010	Coordinates were taken at the restaurant where the skull of a Leopard Cat was retrieved; Image 4.
B.3. Laem Pak Bia, Ban Laem, Phetchaburi	13.033°N, 100.083°E	Image of a dead animal posted online	Internet search for Fishing Cat	March 2011	Image 5; the URL is no longer available.
C. Peninsular Thailand					
C.1. Singhanakorn, Songkhla	07.250°N, 100.467°E (Pa Khat), 07.250°N, 100.433°E (Pak Ro)	Report with images and VDO link.	Suppakorn Patumrattanathan	2013–2015	https://www.youtube.com/watch?v=aBj7_R-GuxA (YouTube video) The VDO shows the release of a female Fishing Cat as part of the study mentioned in the report (Ramsuti 2014).
C.2. Bangplamor, Pattani	06.850°N, 101.200°E	Image of live-captured animal	Wanchamai Karnthanut	2007	Reported in Buatip et al. 2013; Image 6.
C.3. Mai Kaen, Pattani	06.633°N, 101.667°E	Image of caged animal	Niti Sukumal	2014	The wild-caught Fishing Cat from Mai Kaen District, Pattani Province, was kept as a pet; Image 7.

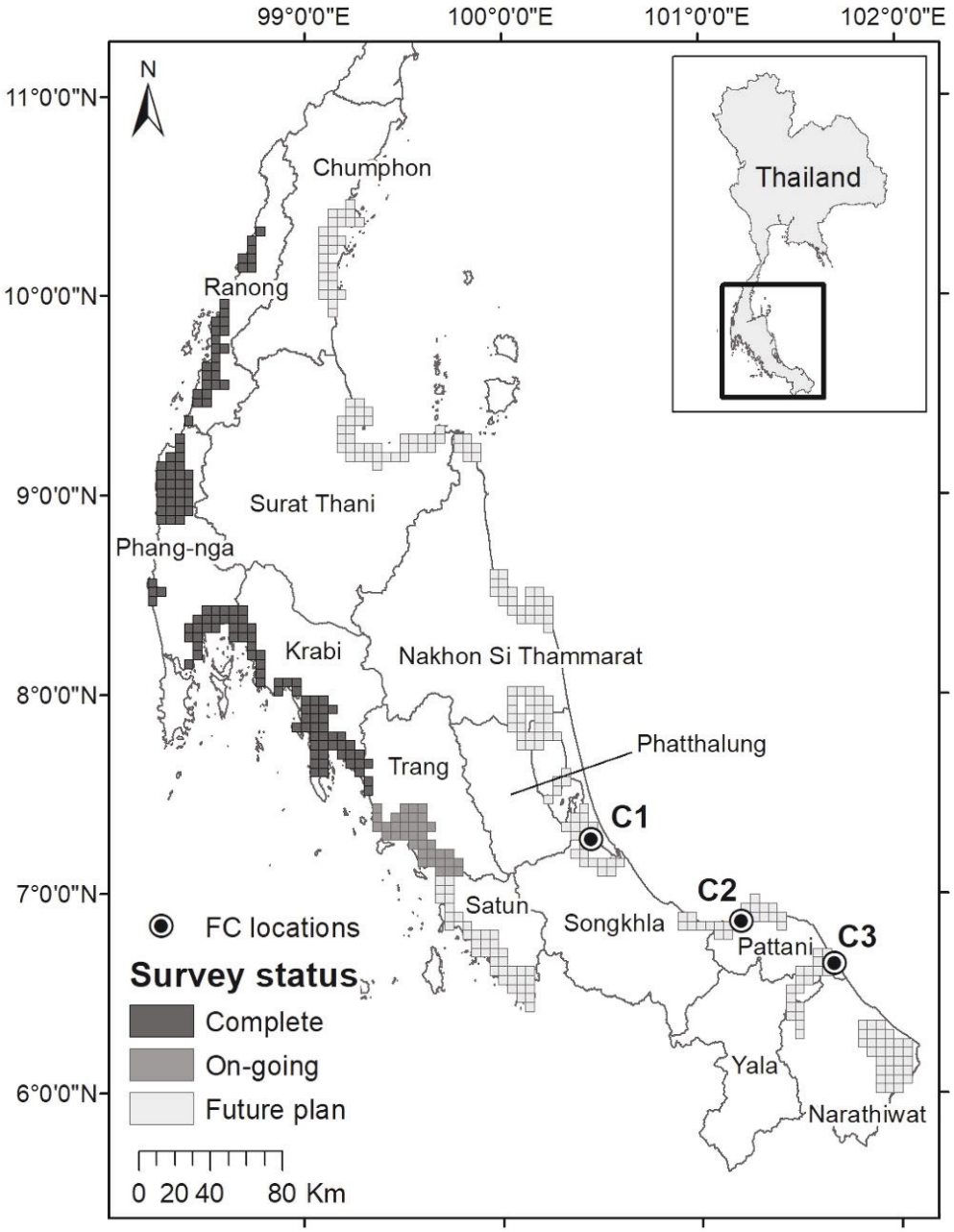

Figure 2. Survey grids used for completed, on-going, and planned otter occupancy surveys in southern Thailand. Approximated locations of records (C.1.–C.3.), as reported in the main text, are shown.

B.2. Phantai Norasing, Khok Kham Subdistrict, Muang District, Samut Sakorn Province

In December 2013, during an occupancy survey for Smooth-coated Otter *Lutrogale perspicillata* and Asian Small-clawed Otter *Aonyx cinereus* in the Inner Gulf of Thailand, A. Kamjing heard of a road-killed Fishing Cat at Phantai Norasing from local landowners when he surveyed their ponds for otter signs. In July 2014, W. Chutipong and D. Ngoprasert examined a stuffed mount of a female road-killed Fishing Cat reported by A. Kamjing (Figs. 1; Image 2) at the Marine and Coastal Resource Conservation Center located close to where the animal was found. The road-killed cat was found dead on a road close to a patch of mangrove forest next to a school by W. Chantong who then reported it to the mangrove conservation centre nearby. The reporter was convinced that the cat was of wild origin since no Fishing Cat was kept as a pet in the area that he was aware of.

In 2012, S. Patumrattanathan, a researcher from DNP, live-trapped four adult Fishing Cats, comprising one male

Image 1. A stuffed mount specimen of a Fishing Cat dated back to the 1980s from Bangkhuntian District, Bangkok: a - top view; b - lateral view. © W. Chutipong, 10 July 2014.

and three females close to Phantai Norasing, Khok Kham Subdistrict, Muang District, Samut Sakorn Province. This trapping was part of a three-year project with the aim to increase the genetic diversity of Fishing Cat in Thailand by breeding Fishing Cats from SRY and Phantai Norasing and then releasing the captive-bred individuals at Bueng Boraphet, a wetland of international importance in Nakhon Sawan Province (Suppakorn Patumrattanathan pers. comm. 13 August 2018). All four trapped Fishing Cats from Phantai and the unknown number from SRY were relocated to Khao Prathab Chang Wildlife Breeding Center in Pak Chong Subdistrict, Chom Bueng District, Ratchaburi Province, and gave birth to two kittens. The project, however, was suspended in 2013 before the cats were released. Now only 1–2 pairs of these Fishing Cats remain at the breeding centre. Kitipat Phosri visited the centre in early 2018 and saw the animals (Image 3). No precise information was available about which individuals were caught in SRY and Phantai Norasing. Since S. Patumrattanathan studied Fishing Cats in SRY and Singhanakorn District, Songkhla Province (see C1 in Fig. 1) using radio telemetry and in captivity for 6–7 years (Patumrattanathan 2015; Pathumratanathan et al. 2015), we are confident that he indeed captured Fishing Cats in this area.

B.3. Laem Phak Bia Subdistrict, Ban Laem District, Phetchaburi Province

Two records came from Laem Phak Bia in Ban Laem District of Phetchaburi Province, located in south-central Thailand. The first record was reported by the late Jonathan Murray who obtained at least one skull of a Fishing Cat (Figs. 1; Image 4, but see discussion below) from a restaurant close to Laem Phak Bia in 2010. He questioned the owner to confirm the origin of the skull. The cause of death of this specimen was not reported. Based on DNA analysis of its nasal bone fragments, however, we confirmed that the skull was of a Leopard Cat *Prionailurus bengalensis.* The analysis was done using multilocus DNA barcoding (the combined sequences of partial mtDNA Cytochrome b, 16S, ND5 gene, Control Region, and four Y-chromosome introns including SMCY3, SMCY7, DBY7, and UTY11; Luo et al. 2014), coupled with reference databases of genetic diversity of Fishing Cat and Leopard Cat in Thailand (Klinsawat et al. unpublished data) and other range countries (Luo et al. 2014; Patel et al. 2017). With this example, we strongly recommend that when recovering animal parts without accompanying images of the entire body, one should conduct DNA analysis to verify species identification.

Another record from this area appeared in March 2011. An image of a dead Fishing Cat was posted on the internet (Image 5) by a person who observed the carcass, apparently shot by a worker from a nearby construction site. The cat was shot by a modified slingshot used for fishing. The reporter, however, mistook the animal as a Black Leopard *Panthera pardus*. A description of the post (in Thai) indicated that the cat was shot when the poacher was searching for wild game for a special feast. It was also mentioned that wild game hunting was a common practice among the group of people

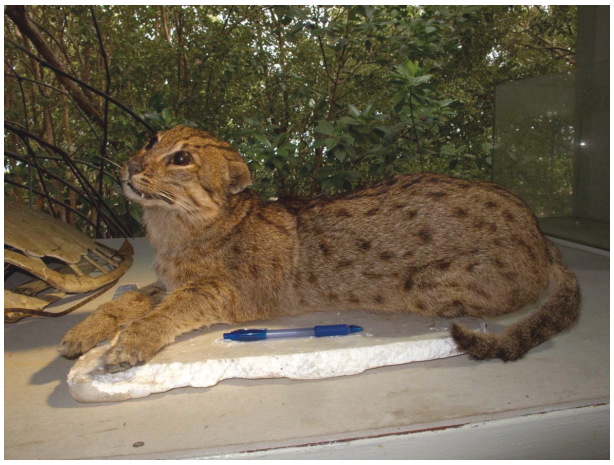

Image 2. A stuffed mount specimen of a road-killed female Fishing Cat from Samut Sakorn Province. © W. Chutipong, 10 July 2014.

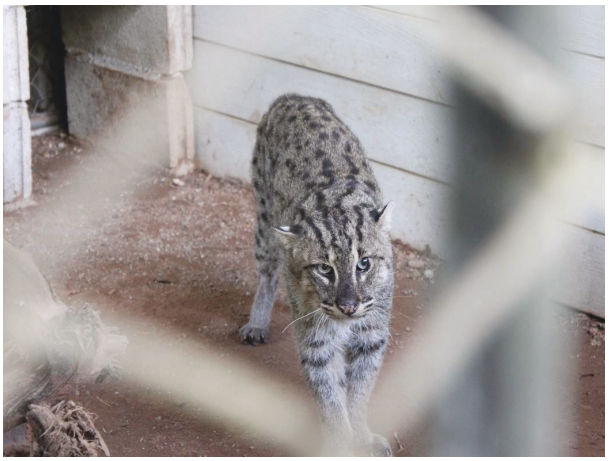

Image 3. A wild-caught Fishing Cat, presumably from either Sam Roi Yot National Park or Phantai, Khok Kham, kept at Khao Prathab Chang Wildlife Breeding Center. © K. Phosri, 28 May 2016.

mentioned in the post. This latter evidence suggested the continued presence of the Fishing Cat in Laem Phak Bia area (at least up to March 2011). On the other hand, threats such as illegal opportunistic hunting were also documented.

C. Peninsular Thailand

C.1. Pa Khat and Pak Ro subdistricts, Singhanakhon District, Songkhla Province

Pathumratanathan et al. (2015) conducted an ecologic study of Fishing Cat in three subdistricts of Singhanakhon District, Songkhla Province, covering an area of approximately 42km^2, between 2013 and 2015 (Fig. 1). Ten Fishing Cats were captured, comprising seven males and three females, in the two subdistricts Pa Khat and Pak Ro. Five males and one female were fitted with VHF radio transmitters. Habitats in these subdistricts consist mainly of paddy fields (52%), degraded peat swamp and mangrove (24%), agriculture areas including shrimp farms (10%) and oil palm plantations (8%), and settlements (6%) (Pathumratanathan et al. 2015). The authors mentioned active hunting of Fishing Cat for meat and persecution due to perceived loss of aquaculture stock such as fish and shrimps, and highly valued fighting roosters that are specially selected and raised for cockfight or gamecocks. The authors, however, do not quantify the intensity of such killings and hunting pressures.

C.2. Bangplamor Village, Rusamilae Subdistrict, Muang District, Pattani Province

In late 2013, evidence of Fishing Cat was uncovered in Pattani Province (Fig. 1), where Buatip et al. (2013) conducted research on predation of Little Egret *Egretta garzetta* nests and mentioned Fishing Cat as a possible nest predator. A follow-up revealed a confirmed record of Fishing Cat occurrence in the area (Image 6). "[In 2007] this cat was trapped in a patchy mangrove around the village named Bangplamor of Muang District, Pattani Province. It is about 15 minutes' drive and close to the [Prince Songkhla] University's [Pattani] campus where the locals earn their living on small scale fishery," said W. Karntanut, one of the article's author. W. Karntanut also reported that two cats were trapped at the same time but one died shortly after. The remaining cat was released after being photographed since it did not take any of the provided food. Further correspondence revealed that Fishing Cats thrived, at least at the time of the report in late 2013, in coastal mangrove habitat close to the campus and local communities. There were also reports of persecution due to loss of livestock. Sometimes, however, "trouble-making" Fishing Cats were trapped and kept as pets instead of being persecuted (Wanchamai Karntanut in litt. 1 October 2013). This record appears to be the southernmost confirmed record in mainland southeastern Asia (Angie Appel in litt. 22 December 2013).

C.3. Mai Kaen Village, Mai Kaen Subdistrict, Mai Kaen District, Pattani Province

Another report of Fishing Cat from Pattani Province came from Mai Kaen District in 2014 (Fig. 1). This cat (Image 7) was caught in mangrove forest close to Saiburi River, but no precise date and location were reported. The person who caught the cat lived there for more than 60 years. He and N. Sukumal, who was born in this area, reported that Fishing Cat was not commonly encountered in the past 20 years, but it was present in

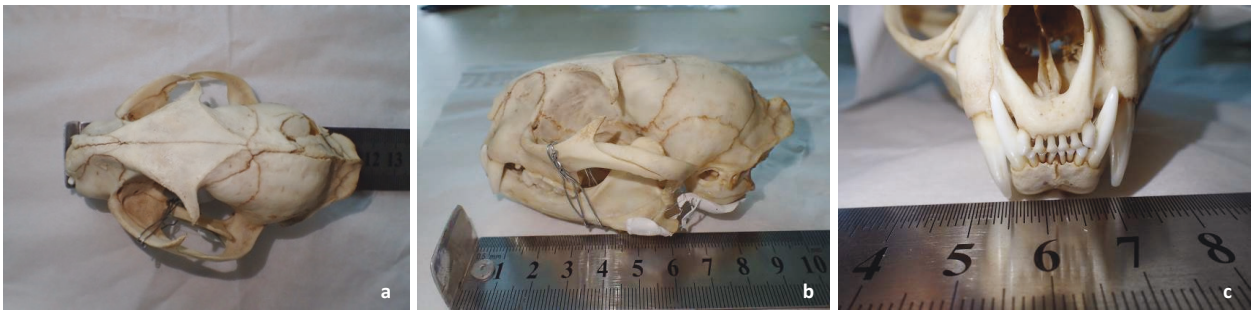

Image 4. A skull of Leopard Cat retrieved from a restaurant near Laem Phak Bia by the late Jonathan Murray in 2010: a - top view; b - lateral view; c - front view. © A.J. Pierce, 2018.

Image 5. A poached Fishing Cat from Laem Phak Bia area. Image posted on the internet in March 2011 by a worker from a nearby construction site.

Image 6. A wild-caught Fishing Cat in captivity in Pattani Province. © W. Karntanut, 5 May 2007.

the area of mangrove forest along Saiburi River and the canals that connect to the main Saiburi River. In the past two decades, Fishing Cats opportunistically entered the areas in this district to prey on poultry (Niti Sukumal personal observation). Some cats were caught and kept as pets, and some were killed (Niti Sukumal personal observation). Fishing Cat is rare in the area at present, although villagers reported in 2016 that two kittens were found in the forested area dominated by *Melaleuca cajuputi*. This report, however, should be treated with caution as species identification could not be validated; the animals were already sold by the time we visited the area in 2016.

C.4. Southwestern coast, Ranong, Phang-nga, and Krabi provinces

Camera trap surveys targeting Smooth-coated Otter and Small-clawed Otter in coastal mangroves in southwestern Thailand have been running since August 2016 (Fig. 2; Tantipisanuh et al. 2018). Grid cells of 5km×5km for camera trapping were initially selected on a basis of a minimum area of mangrove (10%) where Asian Small-clawed Otters were found during a preliminary survey. In each grid cell, we set 3–6 camera trap stations at locations where we found evidence of otter presence like spraints and footprints. Some cameras were also deployed in sites without evidence of otters but which exhibit similar characteristics as habitat used by otters, e.g., the presence of mounds that are well above the highest tide. To avoid inundation, cameras were set 1–3 m above ground but still aimed at the focal areas on the ground, which was large enough to capture large otter groups (Image 8). Cameras were kept at locations for approximately 20 days. Fish oil was used as a lure to attract the focal species to the focal area of cameras, i.e., approximately 3m in front of the camera traps. Fish oil lure appears to attract Fishing Cats to camera traps as observed in a concurrent survey of Fishing Cat in SRY (Kitipat Phosri & Dusit Ngoprasert personal observations).

Eighteen months of surveys in Ranong, Phang-nga, and Krabi provinces covered an area of approximately 2,825km^2 and totalled 11,563 camera trap days across

Image 7. A wild-caught Fishing Cat in captivity in Mai Kaen District, Pattani Province. © N. Sukumal, 2014.

Fishing Cats were recorded in coastal mangroves in other range countries, e.g., the deltaic mangrove forest of Coringa WS in Andhra Pradesh (Mukherjee et al. 2012) and Odisha, both in eastern India (Palei et al. 2018), mangrove forests of southern Cambodia (Thaung et al. 2017), and Ayeyarwady Delta of Myanmar (Naing Lin & Than Zaw, WCS Myanmar Program, in litt. 11 May 2018). Fishing Cat, however, was not detected during surveys conducted along coastal Kerala in southwestern India (Janardhanan et al. 2014). Currently, it is unclear whether Fishing Cat occurs in this part of Thailand and was simply missed in the current surveys or whether it is not present there at all. Despite the non-detection, the entire southwestern coastal wetlands are still priority sites, as they provide potentially suitable habitat, and need targeted surveys for Fishing Cat.

558 camera trap stations. Smooth-coated Otter and Asian Small-clawed Otter were detected in 165 of 558 camera trap stations (30%) and in 71 stations (13%), respectively. Meanwhile, Leopard Cat (0.7%), Large-spotted Civet *Viverra megaspila* (0.2%), Greater Hog Badger *Arctonyx collaris* (0.2%), Small Asian Mongoose *Herpestes javanicus* (0.3%), and Common Palm Civet *Paradoxurus hermaphroditus* (27%) were also recorded, but not a single Fishing Cat (Tantipisanuh et al. unpublished data). Assuming that other small carnivore species that are present were readily detected during the surveys, Fishing Cat either occurs at a very low abundance or does not occur at all in the surveyed area. It is possible that Fishing Cat has very specific habitat requirements, which our otter targeted survey failed to cover.

MANAGEMENT IMPLICATIONS AND CONCLUSIONS

These new localities show that Fishing Cat is more widely distributed along Thailand's coastal wetlands than previously reported—eight records traced were from outside protected areas. The single confirmed record (accepting that the cat's origin is not known) traced from inland and its surrounding habitat, appears to match known inland records from elsewhere in Fishing Cat range. Combined with the previous confirmed records in Tantipisanuh et al. (2014), this evidence strongly suggests that Fishing Cat populations largely occur outside Thailand's protected area system. These results highlight the need to conduct targeted surveys for Fishing Cat in both coastal zones and inland areas with suitable habitat outside protected areas in human-

Image 8. Camera trap images of family groups from Phang-nga Province in 2017: a - Smooth-coated Otter from Kuraburi; b - Asian Small-clawed Otter from Takuapa. © Tantipisanuh et al. 2018.

dominated landscapes, to provide reliable information on the national conservation status and distribution of the species. Due to the difficulty in distinguishing between Fishing Cat and the co-occurring Leopard Cat, particularly in the case of juveniles, species identification should be validated either with photographic evidence and/or DNA analysis of fecal and hair samples or other biologic samples that can yield enough DNA material using the combined mtDNA, Y-linked, and autosomal variants for species identification and detection of hybridization signals. A compilation and identification validation of all purported historic records of Fishing Cat from Thailand, notably including museum specimens, is very important for the cues this might give as to where Fishing Cat occurred and thus suggest sites to look for today. Large-scale habitat protection for Fishing Cat may not be possible in Thailand's fragmented and degraded wetlands; many of these are dominated by people, used as agricultural land and for aquaculture. The next steps in conservation planning for this species are to confirm if the remaining populations are viable and then identify potential source sites, alongside potential threatening factors, and dispersal corridors. Establishment of corridors will help to ensure that the populations remain genetically connected. Restoration, or at least some maintenance of natural habitat, will help to achieve this, as was suggested for Smooth-coated Otter in the Inner Gulf of Thailand (Kamjing et al. 2017), a species which faces similar threats and occupies similar habitats as Fishing Cat. Mitigation and resolutions of human-Fishing Cat negative interactions in areas of high conservation importance, combined with community awareness-raising to understand perceptions, and establishment and promotion of positive attitudes amongst local people and stakeholders towards Fishing Cat persistence, will be crucial in these human-dominated landscapes.

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Author contribution: All authors contributed equally to the conception, design, data collection, writing, and revising the manuscript.

Journal of Threatened Taxa

www.threatenedtaxa.org

PLATINUM OPEN ACCESS

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

March 2019 | Vol. 11 | No. 4 | Pages: 13419–13510
Date of Publication: 12 March 2019 (Online & Print)
DOI: 10.11609/jott.2019.11.4.13419-13510

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