Short Note

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A re-discovery of *Coelops frithii* (Chiroptera, Hipposideridae) from its type locality after one and a half century

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Abstract: Here, we report the rediscovery of *Coelops frithii* in the pristine mangrove forest of Sundarbans Forest Reserve in Khulna division of Bangladesh. A dead individual of adult female was collected and identified to species based on morphological features and skull measurements (FA: 41.28 mm, GTL: 17.52 mm, CCL: 15.58 mm). This finding represents the first record from the type locality one and a half century after Blyth (1848) first described the species. *C. frithii* is considered near threaten in the IUCN Red List. The confirmed occurrence through this record calls for future systematic surveys of this species within the Sundarbans.

Keywords: Bangladesh; East Asian tailless leaf-nosed bat; morphology; South Asia; Sundarbans Forest Reserve.

Coelops is a genus of leaf-nosed bats (family Hipposideridae) with only two species recognized, namely the East Asian tailless leaf-nosed bat (*Coelops frithii*) and the Malayan tailless leaf-nosed bat (*Coelops robinsoni*) (Soisook 2019). Considered to be relatively widespread, *C. frithii* has a narrow distribution in South Asia in the Bangladesh Sundarbans and a small part of northeastern India; this species is sporadically distributed in Southeast Asia down to Java Island and has a very restricted range in East in Southern China and Taiwan (Huang et al. 2019b). *C. robinsoni* is only found in the Malayan Peninsula and Borneo (Rahman et al. 2010). These two species are substantially differentiated by the nose structure and body size (head-body 38–50 mm in *C. frithii*, 32–34 mm in *C. robinsoni*) (Soisook 2019). Although *C. frithii* has a wider geographic range, the species was recently updated from Least Concern to Near Threatened in the IUCN Red List of Threatened Species due to an estimated 20–25% decline of its population in the last five years (Bates et al. 2008; Huang et al. 2019b). This dramatic decline is largely attributed to loss and disturbance of their natural forest habitats due to human activities (Huang et al. 2019b; Molur et al. 2002). Most known records and ecological data for *C. frithii* have been gathered from East and South-East Asia, whereas in South Asia, past records have been extremely scarce and completely absent in recent years. These records are limited to Sundarbans of India or Bangladesh (1848) and Darjeeling, West Bengal (1888–1891) and Cherrapunji, Meghalaya (1926) in India (Das 2003; Das et al. 1995; Sinha 1999). The lack of recent sighting urged for the re-assessment of *C. frithii* in South Asian region (IUCN Bangladesh 2015; Saikia et al. 2018).

Coelops frithii is mainly a forest dwelling species inhabiting primary forest, secondary forest and mangrove in tropical to subtropical regions of Asia (Furey et al. 2010; Lee et al. 2007; Molur et al. 2002). The major records were reported from low elevations, between 300 and 900 m in Southeast Asia (Malaysia and Vietnam) and East Asia (Taiwan), though higher elevation records up to 1900 m have also been reported (Huang et al. 2019b). They are often found in small colonies, roosting in caves, tree hollows and sometimes manmade infrastructures (e.g. tunnels, mining caves and disused pillboxes) (Hsu 1997; Molur et al. 2002). The roost size varies according to regions, with an average of 16 individuals per roost in India, and maternity colonies of 100–200 mature individuals in Eastern Asia (Taiwan) (Huang et al. 2019b; Molur et al. 2002). In Southeast Asia, the species has been found to coexist with other cave-dwelling bat species, mainly Hipposideridae and Rhinolophidae (Fang and Cheng 2011; Thong et al. 2012). The species performs slow but highly

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maneuverable flight potentially impacting its ability to disperse and reportedly making captures in the field difficult (Furey et al. 2010).

Sundarbans is the largest mangrove Reserve forest in the World with an area of 10,000 km^2, 60% of which is located in south-west Bangladesh and the remainder in the West Bengal state of India (Aziz et al. 2016). It is also the largest delta mangrove forest dominated by *Excoecaria agallocha* and *Heritiera fomes*. In 1996, the Bangladesh Forest department established three protected areas within Sundarbans where the majority of conservation efforts targeted on the Bengal tiger (*Panthera tigris*) (Aziz et al. 2016). By the way, there is a substantial deficit in studies of small mammals, especially bats which are known through brief reports of roosting sites of *Pteropus giganteus* (= *P. medius*, Soisook 2019) in the peripheral area of Sundarbans (Khan 2001), and more recently, the discovery of *Rhinolophus luctus* and *Megaderma spasma* in an abandoned old temple (Khan pers 2019).

In February 2019, the wildlife research group of Jahangirnagar University conducted a preliminary survey in the eastern part of Sundarbans (East sanctuary) to assess the status of terrestrial mammals. During this survey, a single dead bat was found on the ground in early morning very close to one of the camera traps (21° 51′ 238″ N, 89° 46′ 907″ E, 6 m a.s.l.). Considering the specimen's injuries, we assumed that it was attacked by a nocturnal predator, probably an owl. The dead bat was immediately collected in a Ziplock bag to be examined at the laboratory in department of Zoology, Jahangirnagar University (WLMA0031).

The first inspection of the bat specimen revealed that the body parts were mostly intact, while the mouthparts and nose-leaves, interfemoral membrane and shoulder joint of the right arm were badly injured (Figure 2a). Morphometric measurements were taken with a dial caliper (accuracy of 0.01 mm), including cranial measurements to facilitate species identification (Table 1) (Bates and Harrison 1997). The specimen had rounded ears but no supporting ridges, two of the key characteristics of *Coelops* (Figure 2a) (Francis 2008). The large antitragus lobe is also typical of this genus among Hipposiderid bats (Kruskop 2013). The phalange of the thumb was found to be properly embedded with a well-developed protapagium and dactylopaguim.

Overall, the specimen was small, the third metacarpal was smaller than the fourth and fifth metacarpals (Table 1). The braincase was characteristically bulbous, and narrower

Table 1: Comparative measurements of *Coelops frithii* and *C. robinsoni* in South and Southeast Asia according to Srinivasulu et al. (2010), Sarak et al. (2013) and Rahman et al. (2010).

Attributes (mm)	*C. frithii*, Bangladesh (WLMA0031)	*C. frithii*, India (Srinivasulu et al. 2010)	*C. frithii*, Cambodia (Sarak et al. 2013)	*C. robinsoni*, Malaysia (Rahman et al. 2010)
HB	41.02	43.5 (38–50)	34.7–35.5	35.63
FA	41.28	40.73 (37.8–42)	38.8–38.8	35.88
3mt	32.06	30.2 (29–31.2)	na	21.81
1ph3mt	8.32	7.4 (7.1–7.7)	na	6.79
2ph3mt	23.22	23.7 (20.9–26.4)	na	18.33
4mt	33.6	32.3 (31.2–33.3)	na	24.84
1ph4mt	10.64	9.4 (8.7–9.8)	na	7.72
2ph4mt	11.24	10.5 (8.3–13.2)	na	8.96
5mt	35.55	34.8 (33.9–35.3)	na	29.28
TIB	18.19	17.4 (16.5–18.5)	15.4–15.7	13.76
HF	8.58	6.9(5.3–9)	13.5–13.9	5.25
E	14.7	13.1 (11.5–15)	7.5–7.7	13.36
GTL	17.52	16.8 (16.6–17)	16.22–16.64	13.90
CCL	15.58	14.5(14.3–14.8)	14.06–14.37	na
BB	8.02	7.8(7.7–7.8)	na	na
ZB	7.64	7.4 (7.2–7.5)	6.67–6.78	5.73
C-M^3 (U)	6.2	5.9(5.8–6)	5.87–5.94	5.04
C-M_3 (L)	6.56	6.3(6–6.5)	6.09–6.17	na
ML	10.6	10 (9.8–10.2)	9.42–9.76	na

HB, head-body length; FA, forearm length; 3mt, third metacarpal; 1ph3mt, first phalanx of third metacarpal; 2ph3mt, second phalanx of third metacarpal; 4mt, fourth metacarpal; 1ph4mt, first phalanx of fourth metacarpal; 2ph4mt, second phalanx of fourth metacarpal; 5mt, fifth metacarpal; 1ph5mt, first phalanx of fifth metacarpal; 2ph5mt, second phalanx of fifth metacarpal; TIB, tibia length; HF, hind foot length; E, ear length; GTL, greatest length of the skull; CCL, condylo-canine length; BB, braincase breadth; ZB, zygomatic breadth; C-M^3 (U), maxillary tooth row; C-M_3 (L), mandibular tooth row and ML, mandible length; na, not available.

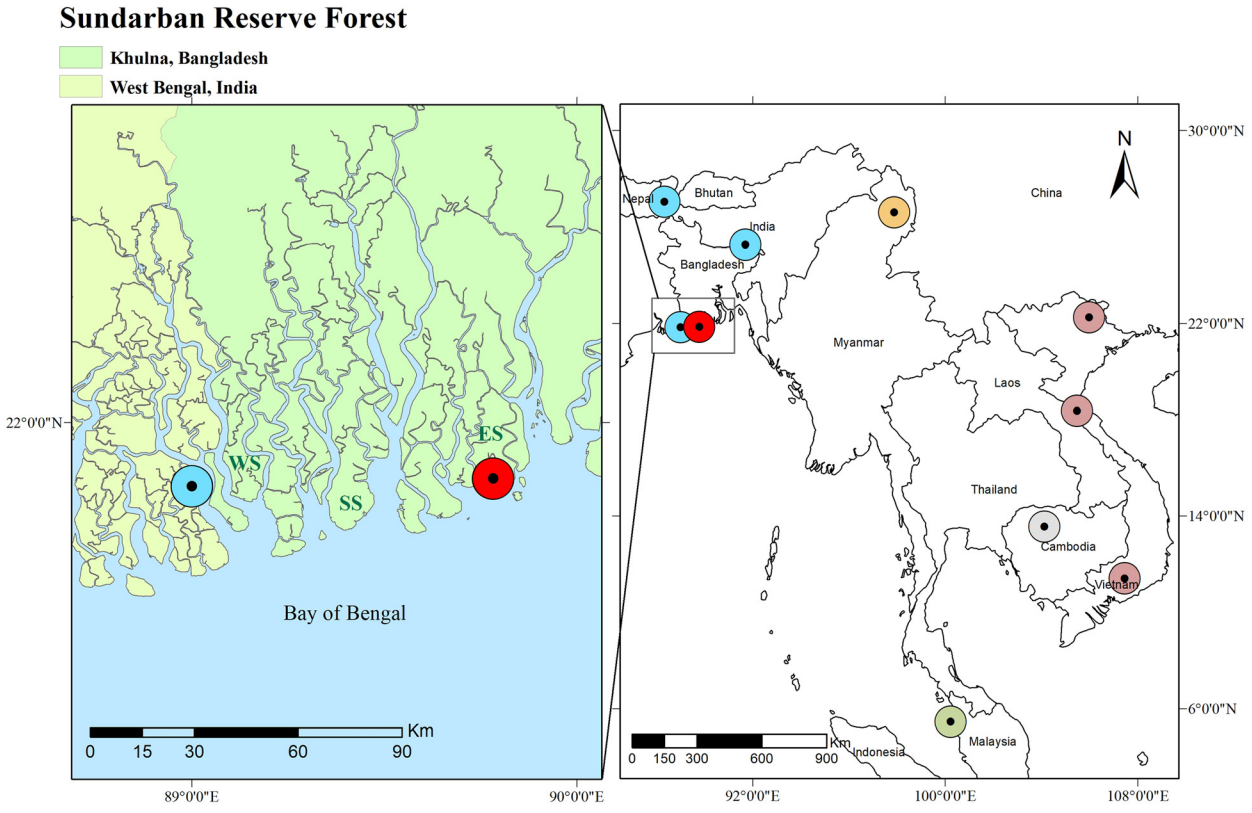

Figure 1: (Left) Red circle indicates the present location of the new sighting of *Coelops frithii* in East wildlife sanctuary of Sundarbans, Bangladesh and blue circle the past location from West Bengal part of Sundarbans, India. (Right) Local country records from South and Southeast Asia (Furey et al. 2010; Huang et al. 2019a; Kruskop 2013; Molur et al. 2002; Sarak et al. 2013). The box was the original habitat for *C. frithii* from Sundarbans in South Asia.

than the zygomatic breadth. In the absence of nose-leaves, which were severely damaged, measurements including cranial measurements (greatest length of the skull, zygomatic breadth, upper maxillary tooth row) identified the specimen as *C. frithii* (Table 1).

In general, studies on bats are very scarce in Bangladesh, and most consist of checklists briefly mentioning the presence of *C. frithii* in Sundarbans (Khan 2001; Srinivasulu and Srinivasulu 2005). As a result, IUCN Bangladesh (2015) assessed *C. frithii* to be data deficient with a doubtful occurrence in the area. In a review of the fauna of Meghalaya, India, Das et al. (1995) mentioned that a type specimen of *C. frithii* had been collected from Sundarbans, ca. 82 km away from our record (Figure 1), probably the Bangladesh part thereof, by the natural history collector Mr. Robert. W.G. Frith in the 19th century (Beolens et al. 2009). The species was deposited in 1848 into the collection of the museum of the Asiatic Society of Bengal by Edward Blyth. Furthermore, the last published record of *C. frithii* in the Indian subcontinent was reported by Hinton and Lindsay in 1926 from Meghalaya, India, 425 km from our record (Das et al. 1995). Thus, the newly discovered bat specimen identified as *C. frithii* within this study is the first to be reported after 170 years in its original habitat of Sundarbans, Bangladesh, and also the first new record in the last century for South Asia.

In conclusion, although only a dead and damaged specimen has been collected, we believe that the undisturbed mangrove habitat of Sundarbans can support *C. frithii*. Indeed, the abundance of dead trunks and tree hollows could serve as suitable roosting sites for this species (Francis 2008). No signs of deforestation have been reported; however, since the site is located near the Bay of Bengal, it is affected by seasonal cyclones. This study, providing the first benchmark for this species after 170 years within this pristine mangrove forest habitat, future studies should focus on evaluating the population of *C. frithii* in Sundarbans through systematic surveys, which may reveal more information about its long-term adaptation in this primary intertidal forest.

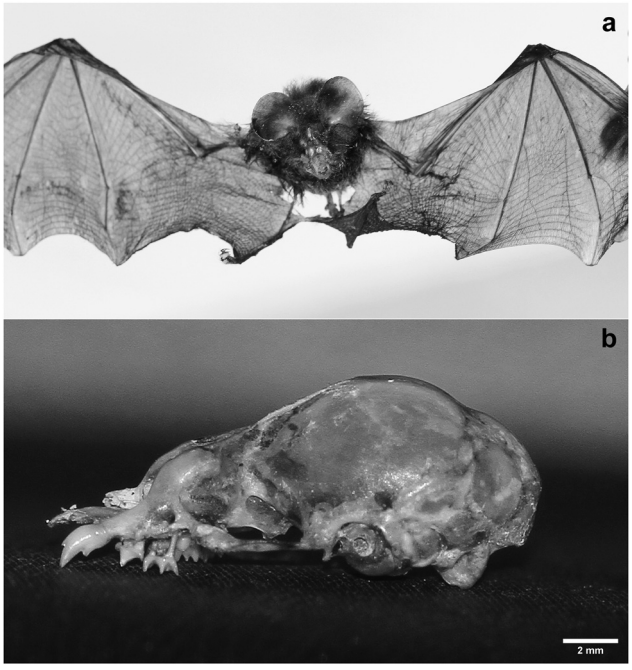

Figure 2: Dead specimen of *Coelops frithii* (WLMA 0031) collected from Sundarbans Forest Reserve, Bangladesh: (a) rounded ears without supporting ridges (b) bulbous skull showing the extended canine with distinct secondary cusp.

Research ethics: This study was done with the permission from Bangladesh Forest Department (22.01.0000.101. 23.2018.4094). The voucher specimen is deposited at department of Zoology, Jahangirnagar University as a catalogue number WLMA0031.

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