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### SHORT COMMUNICATION

#### REDISCOVERY OF VAN HASSELT'S MOUSE-EARED BAT

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Vuong Tan Tu, Satoru Arai, Fuka Kikuchi, Chu Thi Hang, Tran Anh Tuan, Gábor Csorba & Tamás Görföl

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# REDISCOVERY OF VAN HASSELT'S MOUSE-EARED BAT *MYOTIS HASSELTII* (TEMMINCK, 1840) AND ITS FIRST GENETIC DATA FROM HANOI, NORTHERN VIETNAM

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**Abstract:** This paper presents the rediscovery of Van Hasselt's Mouse-eared Bat *Myotis hasseltii* after nearly 50 years and its genetic data from Hanoi, northern Vietnam. In addition, a snapshot of the impacts of urbanization on the current distribution and conservation status of this native bat species in Hanoi is also provided.

**Keywords:** Bioindicators, Chiroptera, conservation, distribution, habitat, mammals, urbanization.

So far, scientific understanding regarding the potential ecological and environmental impacts of urbanization on native biodiversity in Hanoi and other cities in Vietnam is patchy (Duan & Mamoru 2009; World Bank 2011; Nong et al. 2015). To address this issue, research on bat assemblages along a gradient of urban to suburban, agricultural, semi-natural, and forested

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areas in the Hanoi Capital Region of northern Vietnam has been underway since 2009 (Tu 2009, 2017). Bats, one of the native mammalian groups occurring in urban areas, were chosen because they play many important economic and ecological roles in local ecosystems (Jung & Threlfall 2016) and can be regarded as bioindicators that reflect changes in population status of overall biodiversity under the influence of anthropogenic alteration (Jones et al. 2009).

During such fieldwork on 20 January 2017 at Xom Hau, a suburb of Hanoi (21.136N & 105.860E), an adult male mouse-eared bat (Vespertilionidae: *Myotis*) was captured by a hand-net. The individual was taken as a voucher following the guidelines approved by the American Society of Mammalogists (Sikes et al. 2011) and deposited in the Institute of Ecology and Biological Resources, Hanoi, Vietnam (IEBR), under the registration number VN17-26 for further investigation. The external and craniodental characters of the specimen were examined in detail using reference specimens housed in the IEBR and the Hungarian Natural History Museum (HNHM) and published identification keys (i.e., Bates et al. 1999; Kruskop 2013). In addition, the 5' fragment of the mitochondrial cytochrome c oxidase subunit I gene (COI, 685nt) was also sequenced at the Infectious Disease Surveillance Center, National Institute of Infectious Diseases (IDSC, NIID), Tokyo, Japan, using a primer set, MammMt-5533F(CYCTGTSYTTTTRATTACAGTYAA)/MammMt-7159R (GRGGTTCRAWWCCTYCCTYTCTT) following the protocol presented in Arai et al. (submitted). The new sequence (Genbank accession

number: MK605400) was compared with those of *Myotis* specimens available in the international nucleotide databases (i.e., the Barcode of Life Data Systems (BOLD), GenBank) for corroborating the morphology-based identification. Our analyses confirmed the specimen's identity as Van Hasselt's Mouse-eared Bat *Myotis hasseltii* (Temminck, 1840) (Table 1; Fig. 1; Image 1). This species is sporadically distributed in the Indo-Malayan region, from Sri Lanka, northeastern India, Myanmar, Thailand, Cambodia, and Vietnam southward to peninsular Malaysia, Java, and Borneo (Corbet & Hill 1992; Kruskop 2013).

Prior to our findings, only two instances of occurrence of this species were known in Vietnam. The first record was from three locations within the Hanoi Capital Region, namely Xuan Dinh (21.075N & 105.78E), Yen So (20.97N & 105.867E), and Co Loa (21.113N & 105.873E) during 1966–1971 (Topál 1974; Image 2). The only other documented occurrence of the species in Vietnam is from the southern part of the country, in the provinces of Dong Nai (11.117N & 107.45E), Soc Trang (9.60N & 105.967E), and Ho Chi Minh City (10.583N & 106.883E) in the late 1990s (Francis et al. 2010; Kruskop 2013). Our findings represent the rediscovery of *M. hasseltii* in the Hanoi Capital Region after about half a century and the only record of the species in Vietnam in the last 20 years.

Previous studies indicate that the Van Hasselt's Mouse-eared Bat roosts in crevices in buildings and feeds on insects flying above water or possibly even small fishes. Such ecological traits suggest that it can adapt to anthropogenic habitats and relies on the

**Table 1. External and cranial measurements (in mm) of *Myotis hasseltii* and its most similar sister species *M. horsfieldii* collected in Vietnam.**

Characters	<i>M. hasseltii</i>			<i>M. horsfieldii</i>	
	Bates et al. 1999 (min–max)	Past surveys during 1966–1971 (Topál 1974) (mean ± SD) (n)	This study	Bates et al. 1999 (min–max)	
Sex		Female	Male	Male	
Forearm length (FA)	38.8–39.1	-	38.81 (1)	37.8	34.3–36.8
Tail length (T)	36.6–40.9	-	15.87 (1)	41.6	33–38.9
Ear length (E)	15.6–15.7	-	-	16.5	12.2–15.8
Tibia length (Tib)	17.2–17.9	-	16.62 (1)	16.8	15.1–17.1
Foot length (HF)	10.8–10.9	-	9.5 (1)	11.1	8.1–9.9
Greatest length of skull (GLS)	16.0–16.3	16.07 ± 0.20 (4)	16.11 ± 0.16 (8)	16.09	14.7–15.7
Codylo-canine length (CCL)	13.8–14.0	13.98 ± 0.17 (4)	14.01 ± 0.10 (8)	13.97	12.9–13.5
Posterior palatal width (M <sup>3</sup> M <sup>3</sup> )	6.1–6.2	6.23 ± 0.11 (4)	6.24 ± 0.08 (8)	6.06	5.8–6.1
Breadth of braincase (BB)	7.7–7.7	8.03 ± 0.08 (4)	7.97 ± 0.08 (8)	7.87	6.9–7.5
Maxillary tooththrow length (CM <sup>3</sup> )	5.7– 5.8	5.81 ± 0.07 (4)	5.85 ± 0.07 (8)	5.54	5.4–5.8
Mandible length (ML)	11.3–11.6	11.22 ± 0.20 (4)	11.30 ± 0.16 (8)	11.2	10.5–11.2
Mandibular tooththrow length (CM <sub>3</sub> )	6.2–6.3	6.18 ± 0.10 (4)	6.22 ± 0.06 (8)	6.03	5.9–6.3



Image 1. Portrait (not to scale) and different views of skull (scale = 10mm) of the newly collected specimen of *Myotis hasseltii* from Vietnam (VN17-26).

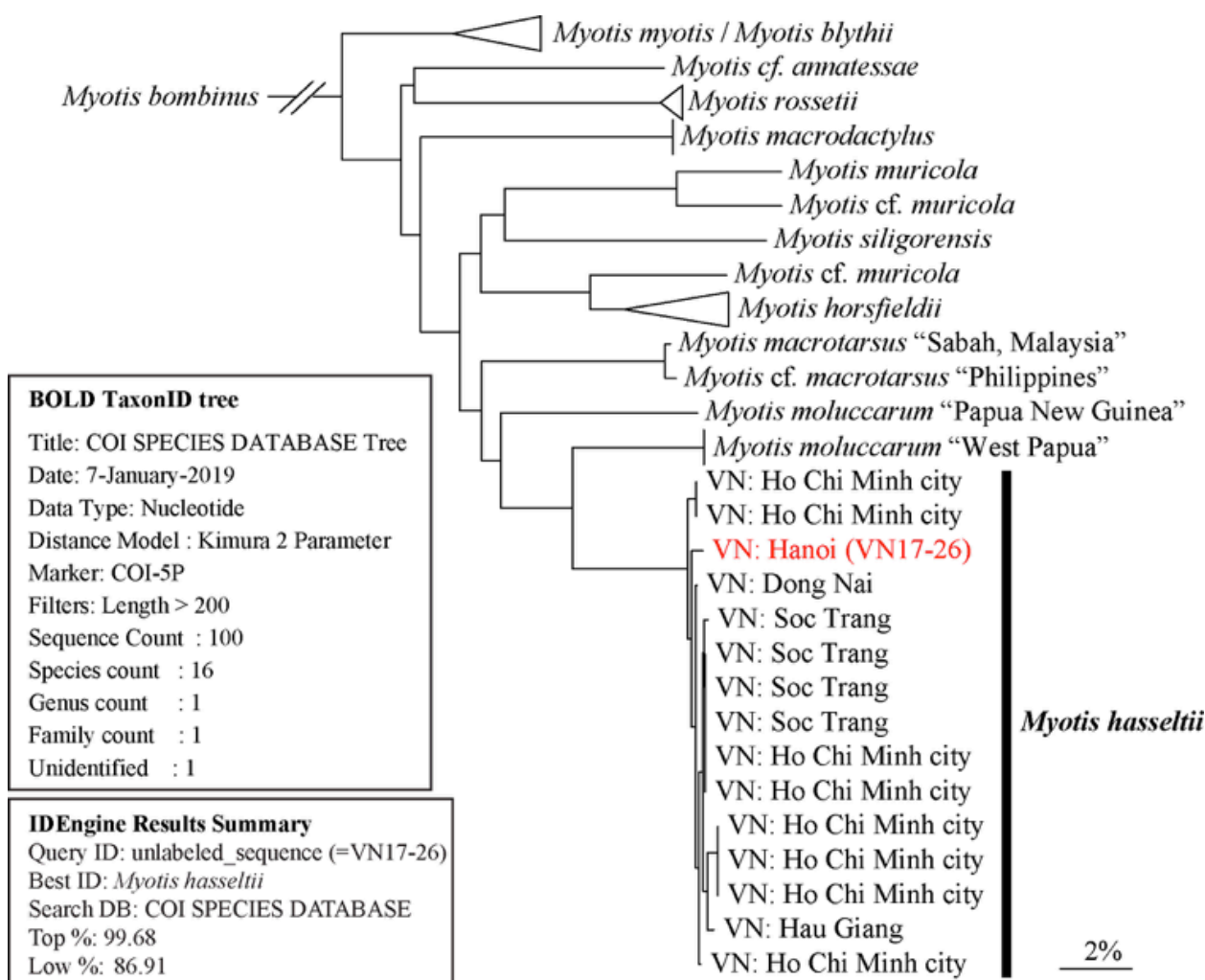
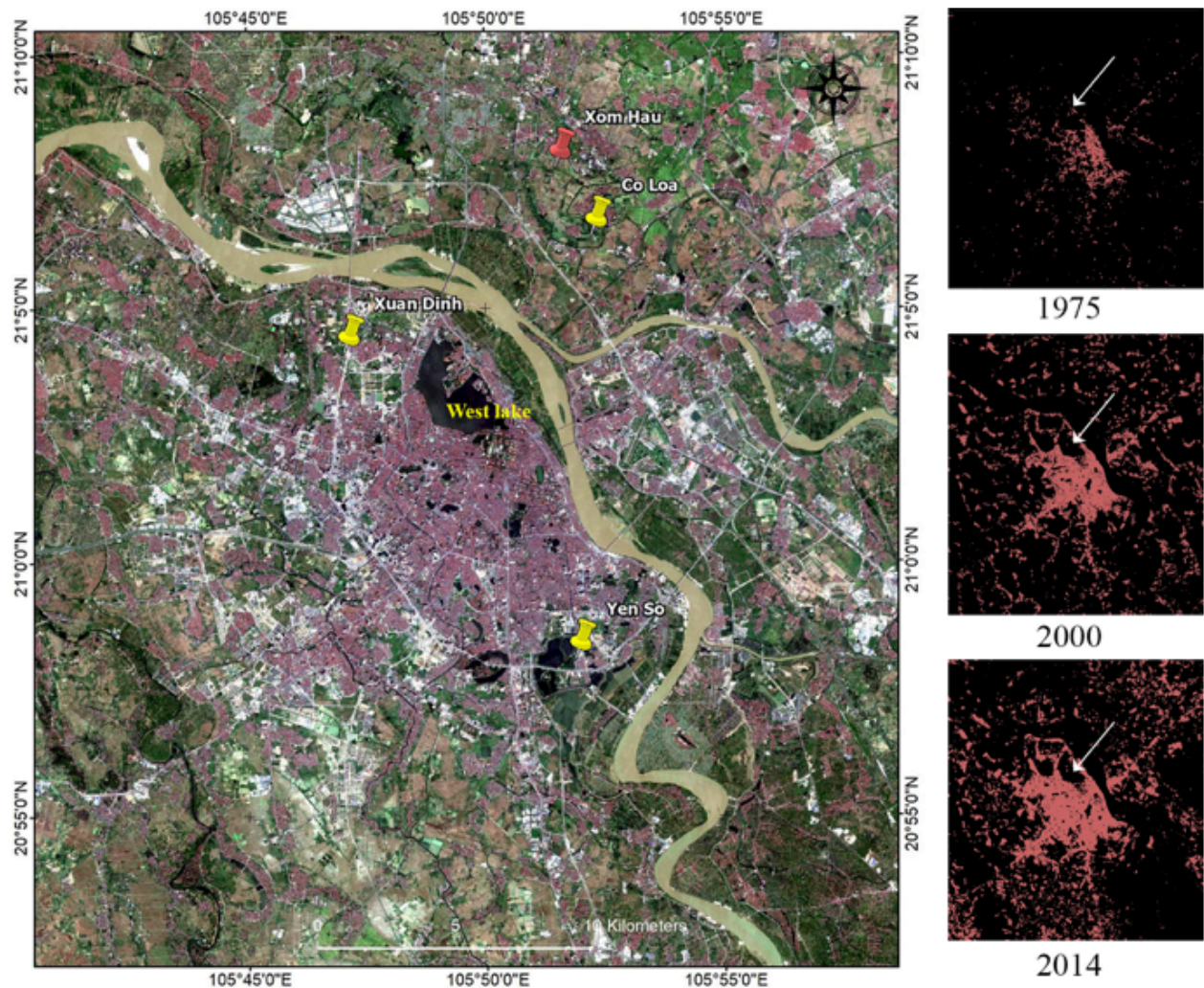


Figure 1. Taxon ID tree created by BOLD Identification Engine (Ratnasingham & Hebert 2007) indicating the identity (<1%) between the newly collected specimen (IEBR.VN17-26) and barcode records of *Myotis hasseltii*.





**Image 2.** Hanoi with the earlier (yellow) and present (red) collecting locations of *Myotis hasseltii* (left) and the steps of urban expansion from 1975, 2000, and 2014 (right) (Landsat satellite images derived from the U.S. Geological Survey EarthExplorer). Arrows indicate the location of the West Lake.

availability of local water bodies for foraging (Bates & Harrison 1997; Kruskop 2013; Wellappulli-Arachchi et al. 2014). Our specimen was captured while it was foraging over a water body located in a peri-urban area, thus indicating a similar habitat preference. This small pond is surrounded by paddy fields, orchards, and a low density of buildings and is currently used as a family's fish farm (Image 3). Since 2009, over 2,200 bats have been captured and identified during our monitoring surveys to assess the temporal variation in activity patterns of bat assemblages along the urbanization gradient in the Hanoi Capital Region (most of those were released to the wild after examination). This was the first time that *M. hasseltii* was captured and the low capture rate of this species suggests that it is an uncommon species in present-day Hanoi. It should



**Image 3.** Habitat of the collection site of *M. hasseltii* in Xom Hau, Hanoi, Vietnam.

be noted that during the last few decades, Hanoi has experienced a rapid urban sprawl associated with fast economic growth and population boom. As a result, a large portion of the peri-urban areas of Hanoi that cover two of the three previous collecting sites of *M. hasseltii*, namely Xuan Dinh and Yen So (Topál 1974), have already been converted into core urban areas with a decrease in natural habitats and water surfaces. The other former site, Co Loa, and the present collection locality, Xom Hau, have retained a considerable part of their natural habitats (Duan & Mamoru 2009; Nong et al. 2015; Images 2 & 3). Although additional surveys are needed, current evidence suggests that the loss or reduction of suitable habitats (i.e., natural vegetation and water bodies) as the result of anthropogenic pressure might play a significant role in the potential local extinction of *M. hasseltii* in the former collecting sites that have now become urbanized. Since these places are still undergoing unplanned expansion (Duan & Mamoru 2009; Nong et al. 2015), it is predictable that the native biodiversity of Hanoi will continue to decline. Assessments of the influences of human-induced habitat changes on urban biodiversity in tropical and subtropical areas, including impacts on bats, are urgently needed to support long-term biodiversity conservation efforts in human-dominated landscapes.

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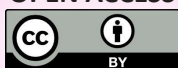
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