

An annotated checklist of the insectivores (Mammalia, Lipotyphla) of Vietnam

Alexei V. Abramov, Dang Ngoc Can, Bui Tuan Hai & Nguyen Truong Son

ABSTRACT. An annotated checklist of 32 extant species from 12 genera of the insectivores (Mammalia, Lipotyphla) of Vietnam is provided. Many recently recorded/described species remain known from the territory of Vietnam only: at least seven species of the white-toothed shrews (*C. annamitensis*, *C. guy*, *C. kegoensis*, *C. phuquocensis*, *C. sapaensis*, *C. sokolovi*, *C. zaitsevi*) and a mole species (*Euroscaptor subanura*).

KEY WORDS: mammals, Soricidae, Talpidae, Erinaceidae, checklist, distribution, systematics, Vietnam.

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Аннотированный список насекомоядных млекопитающих (Mammalia, Lipotyphla) Вьетнама

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РЕЗЮМЕ. Представлен аннотированный список насекомоядных млекопитающих (Mammalia, Lipotyphla) Вьетнама, включающий 32 современных вида из 12 родов. Многие виды известны только с территории Вьетнама — по меньшей мере, 7 видов землероек-белозубок (*C. annamitensis*, *C. guy*, *C. kegoensis*, *C. phuquocensis*, *C. sapaensis*, *C. sokolovi*, *C. zaitsevi*) и 1 вид кротов (*Euroscaptor subanura*).

КЛЮЧЕВЫЕ СЛОВА: млекопитающие, Soricidae, Talpidae, Erinaceidae, чеклист, распространение, систематика, Вьетнам.

Vietnam occupies the key geographic position within Southeast Asia and holds a diverse mammal fauna (Sterling *et al.*, 2006). During the last two decades intensive zoological surveys have resulted in the discovery of new distributional records and description of several new species from Southeast Asia, particularly from Vietnam. According to the latest comprehensive checklist by Dang Ngoc Can *et al.* (2008), the mammal fauna of Vietnam consists of 295 species, including 22 species of insectivorous mammals (Lipotyphla). Many new data on small mammals that have appeared since 2008 indicate that the current knowledge of richness and distribution of Vietnamese lipotyphlan species are still incomplete (Bui Tuan Hai *et al.*, 2013a).

In the present paper, an annotated and updated checklist of the insectivorous mammals (Mammalia, Lipotyphla) of Vietnam, as compared to that of Dang Ngoc Can *et al.* (2008), is provided. New revisions and records of Vietnamese lipotyphlan taxa produced during the last decade justify the compilation of a new species list for the country. We have provided additional references on distribution, taxonomy and other relevant aspects in the “Comments” section provided for each species. The following checklist is relied upon an extensive

literature review and the analysis of available museum specimens from the collections of the Zoological Institute, Russian Academy of Sciences, Saint Petersburg, Russia (ZIN), the Zoological Museum, Moscow State University, Moscow, Russia (ZMMU), and the Institute of Ecology and Biological Resources, Vietnam Academy of Sciences and Technology, Hanoi, Vietnam (IEBR). The high-level taxonomic nomenclature follows Bannikova & Lebedev (2012), who consider Erinaceomorpha, Soricomorpha and Talpomorpha as suborders of the order Lipotyphla (Eulipotyphla sensu Bannikova & Lebedev, 2012).

SUBORDER ERINACEOMORPHA Gregory, 1910

Family ERINACEIDAE G. Fischer, 1814

Subfamily Galericinae Pomel, 1848

Neotetracus sinensis Trouessart, 1909

Type locality. China, Sichuan Province, Ta-tsienshou, elevation 2454 m a.s.l.

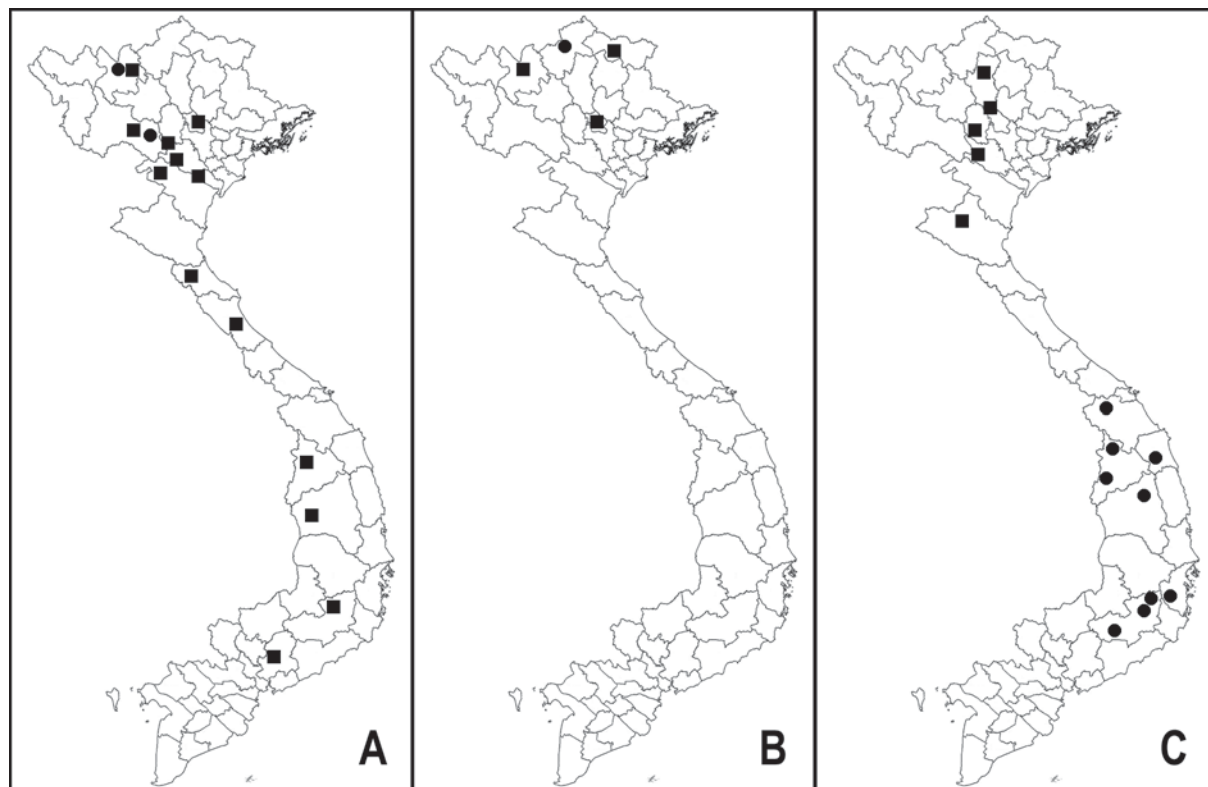


Figure 1. Distribution maps of the Vietnamese insectivores: A — *Neotetracus sinensis* (circles), *Hylomys suillus* (squares); B — *Scaptonyx fuscicaudus* (circles), *Euroscaptor longirostris* (squares); C — *Euroscaptor parvidens* (circles), *Euroscaptor subamura* (squares).

Distribution. Southern China (Sichuan, Yunnan, Guizhou), northern Myanmar and northern Vietnam (Hutterer, 2005; Hoffmann & Lunde, 2008).

Distribution in Vietnam. Northern Vietnam (Fig. 1A), collected from Sa Pa District, Lao Cai Province (Kuznetsov & Rozhnov, 1998; Abramov *et al.*, 2008), and Muong Do Nature Reserve, Son La Province (Nguyen Xuan Dang *et al.*, 2012).

Hylomys suillus Müller, 1840

Type locality. Indonesia, “Java en het andere van Sumatra” (“Mt. Gede, western Java” according to Corbet & Hill, 1992: 24).

Distribution. Throughout Indochina from southern China (Yunnan) and northern Myanmar to Peninsular Malaysia, islands of Borneo, Java, Sumatra and Tioman (Hutterer, 2005).

Distribution in Vietnam. Northern, central and southern Vietnam (Fig. 1A). There are museum specimens (ZIN, IEBR and ZMMU collections) from Son La Province (Ta Xua Nature Reserve, Phu Yen District), Vinh Phuc Province (Tam Dao), Ha Noi Area (Ba Vi National Park), Hoa Binh Province (Kim Boi District), Ha Tinh Province (Vu Quang Nature Reserve), Quang Binh Province (Le Thuy District), Gia Lai Province (An Khe District), Lam Dong Province (Cong Troi

pass), Dong Nai Province (Ma Da Forest, Vinh Cuu Nature Reserve). The species has also been recorded from Lao Cai Province (Bao Ha and Thai Nien), Kon Tum Province (Dak To) (Thomas, 1925, 1927; Osgood, 1932), Thanh Hoa Province (Lang Chanh District) (Dao Van Tien, 1966; Cao Van Sung, 1976) and Ninh Binh Province (Cuc Phuong National Park) (Feiler *et al.*, 2008).

SUBORDER TALPOMORPHA Bugge, 1974

Family TALPIDAE G. Fischer, 1814

Subfamily Talpinae G. Fischer, 1814

Tribe Scaptonychini Van Valen, 1967

Scaptonyx fuscicaudus Milne-Edwards, 1872

Type locality. China, Qinghai Province, “frontière du Kokonoor” (= vicinity of Kukuror, or Qinghai, Lake).

Distribution. Northern Myanmar, central and southern China (Qinghai, Shensi, Sichuan and Yunnan), northern Vietnam (Hutterer, 2005).

Distribution in Vietnam. Northern Vietnam (Fig. 1B), with the only record from the vicinity of Mt. Tay Con Linh II, Ha Giang Province (Lunde *et al.*, 2003).

Comments. The specimen from Mt. Tay Con Linh II represents the only record of *S. fusicaudus* from Vietnam. This specimen is similar to *S. fusicaudus affinis* in having the third lower premolar being only slightly larger than the second one. However, the number of specimens available to us is not enough to adequately assess the taxonomic significance of this similarity (see Lunde *et al.*, 2003).

Tribe **Talpini** G. Fischer, 1814

Euroscaptor longirostris* (Milne-Edwards, 1870)

Type locality. China, Sichuan Province, Moupin (=Baoxing).

Distribution. Southern China (Hutterer, 2005; Hoffmann & Lunde, 2008), northern Vietnam.

Distribution in Vietnam. Northern Vietnam (Fig. 1B). It has been recorded from Sa Pa District, Lao Cai Province (Osgood, 1932; Abramov *et al.*, 2008; Kawada *et al.*, 2009), from the vicinity of Tam Dao Town, Vinh Phuc Province (Kawada *et al.*, 2008; 2009), and from Nguyen Binh District, Cao Bang Province (Kawada *et al.*, 2009).

Comments. The specimens of *E. longirostris* from NW and NE Vietnam are morphologically variable, particularly in their fur density, coloration, tail shape and length (Kawada *et al.*, 2009).

Euroscaptor parvidens (Miller, 1940)

Type locality. Vietnam, Lam Dong Province, agricultural station of Blao, “Délégation de Djnynrh” (=Di Linh), near the upper Dong Nai River, Lam Dong Province, elevation 800 m a.s.l.

Distribution. Southern Yunnan, China (Wang, 2003; Hoffmann & Lunde, 2008) and Vietnam.

Distribution in Vietnam. Southern and central Vietnam (Fig. 1C). The species has been recorded from few localities in Dalat Plateau, southern Vietnam. The type specimen came from Di Linh District, Lam Dong Province (Miller, 1940). Few specimens were collected from Chu Yang Sin National Park, Dak Lak Province (Dang Ngoc Can *et al.*, 2008; Kawada *et al.*, 2009) and the Bi Doup – Nui Ba National Park, Lam Dong Province (Abramov *et al.*, 2010a). There are museum specimens collected from Hon Ba Mt., Khanh Hoa Province (IEBR collection), Bao Lam District and the vicinity of Dalat, Lam Dong Province (IEBR, ZIN and ZMMU collections). Another isolated distribution area exists in central Vietnam. The moles have been found from Ngoc

Linh Mt., Kon Tum Province (Abramov *et al.*, 2007a) and Dong Giang District, Quang Nam Province (Dang Ngoc Can *et al.*, 2008; Kawada *et al.*, 2008, 2009). Recently the species has been recorded from Kon Ka Kinh National Park, Kon Tum Province, Chu Mom Ray National Park, Gia Lai Province, and Ba To, Quang Ngai Province (Dang Ngoc Can *et al.*, 2013, in press; IEBR collection). There are unconfirmed records from Cat Tien National Park, situated in Dong Nai Province southward of Dalat Plateau (Pham Nhat *et al.*, 2001).

Comments. Some authors listed the northern Vietnam in the distribution range of *E. parvidens* (Stroganov, 1948; Pavlinov, 2003; Hutterer, 2005; Chiozza, 2008; Hoffmann & Lunde, 2008). This erroneous opinion was based on the paper by Miller (1940) who had mentioned the record of *E. parvidens* from “Pakho on the frontier of China”. This record is most likely to be attributed to *E. longirostris* or *Mogera latouchei*. Although Wang (2003) mentioned *E. parvidens* as being distributed in Jinping, southern Yunnan, China, the morphological characters of the Chinese specimens need to be examined in detail (Kawada *et al.*, 2009).

Euroscaptor subanura Kawada, Nguyen Truong Son, Dang Ngoc Can, 2012

Type locality. Vietnam, the northwestern slope of Tam Dao Mountain, near Vuoc Ly Village, Hiep Hoa Commune, Son Duong District, Tuyen Quang Province, elevation 250 m a.s.l.

Distribution. Known from Vietnam only.

Distribution in Vietnam. Northern Vietnam (Fig. 1C). It has been found in the northwestern low-elevation slope of Tam Dao Mt., Tuyen Quang Province. This species has also been recorded from Na Hang Nature Reserve, Tuyen Quang Province, and Pu Huong Nature Reserve, Nghe An Province (Kawada *et al.*, 2012). Recently the species has been found in Xuan Son National Park, Phu Tho Province (Shinohara *et al.*, 2013; IEBR and ZIN collections) and Ba Vi National Park, Ba Vi District of Hanoi (Abramov *et al.*, 2013).

Comments. The known distribution of this species is scattered around northern Vietnam. All the localities lie in relatively low mountains surrounded by plain areas. In its type locality (Tam Dao), this species is known from 200 to 300 m a.s.l., while another species *E. longirostris* occurs at a higher elevation (about 1000 m a.s.l.). The higher habitat of moles in Tam Dao area includes farms and townships, but there are no records of *E. subanura* from such habitats. Therefore it is safe to conclude that *E. subanura* is adapted to the lowland forests of northern Vietnam (Kawada *et al.*, 2012).

Mogera latouchei Thomas, 1907

Type locality. China, north-west of Fujien Province, elevation 3500 feet (1067 m) a.s.l.

Distribution. Southern China (Hoffmann & Lunde, 2008), northern Vietnam (Kawada *et al.*, 2009).

* On the basis of morphological data (Motokawa, 2004) and analysis of mitochondrial and nuclear genes (Zemlemerova *et al.*, 2013), the genus *Euroscaptor* was found to be a paraphyletic taxon. Taking into account the phylogenetic position of *Scaptochirus* Milne-Edwards, 1867 within the radiation of *Euroscaptor* Miller, 1940, the former can probably be combined with the second one and retain the generic name *Scaptochirus* as its senior synonym (see Zemlemerova *et al.*, 2013). Further analysis of an extended set of nuclear loci is required to resolve this taxonomic problem.

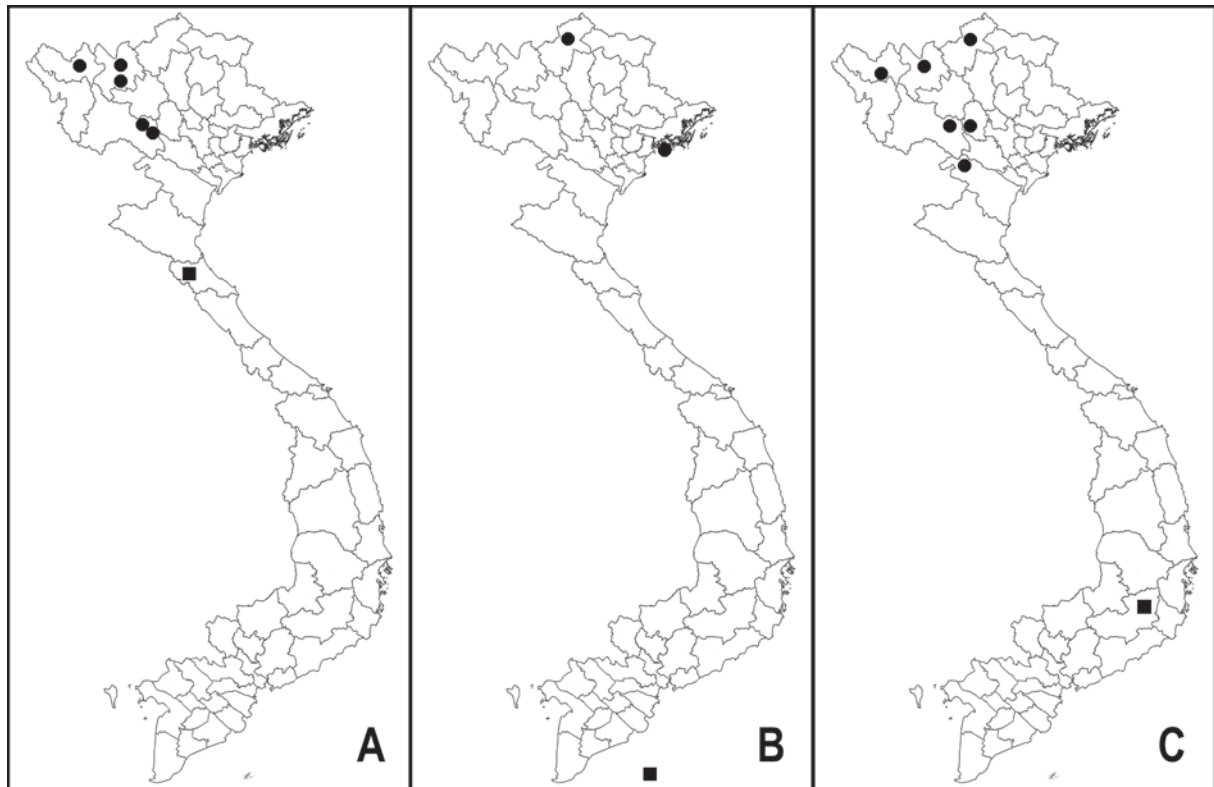


Figure 2. Distribution maps of the Vietnamese insectivores: A — *Mogerla latouchei* (circles), *Crocidura annamitensis* (squares); B — *Crocidura attenuata* (circles), *Crocidura fuliginosa* (squares); C — *Crocidura dracula* (circles); *Crocidura indochinensis* (squares).

Distribution in Vietnam. Northern Vietnam (Fig. 2A). It has been found in few localities of Lao Cai Province: Nam Xay Commune, Van Ban District (Abramov *et al.*, 2009) and near Sa Pa Town (Kawada *et al.*, 2009). Few specimens have been collected from Sin Ho District, Lai Chau Province (IEBR collection); Phu Yen District, Son La Province (ZIN and IEBC collections); Nguyen Binh District, Cao Bang Province (Kawada *et al.*, 2009) and Muong Do Nature Reserve, Son La Province (Nguyen Xuan Dang *et al.*, 2012).

Comments. This species was long considered a subspecies of *M. insularis* from Taiwan, but recently has been accepted as a full species. *M. latouchei* is often found in farmlands that therefore are considered a good habitat for this species (see Kawada *et al.*, 2009).

SUBORDER SORICOMORPHA Gregory, 1910

Family SORICIDAE G. Fischer, 1814

Subfamily Crocidurinae Milne-Edwards, 1872

Crocidura annamitensis Jenkins, Lunde, Moncrieff, 2009

Type locality. Vietnam, Ha Tinh Province, Huong Son District, Huong Son Camp, elevation 920 m a.s.l.

Distribution. Known from Vietnam only.

Distribution in Vietnam. Central Vietnam (Fig. 2A). Known from the type locality in Huong Son District, Ha Tinh Province only (Jenkins *et al.*, 2009).

Crocidura attenuata Milne-Edwards, 1872

Type locality. China, Sichuan Province, Moupin (= Baoxing).

Distribution. India (Assam, Sikkim), Nepal, Bhutan, Myanmar, Thailand, Vietnam, southern China (from eastern Xizang to Hainan and northern to southern Gansu), northern Laos (Hutterer, 2005; Jenkins *et al.*, 2009). The occurrence in Peninsular Malaysia seems to be doubtful (see Hutterer, 2005).

Distribution in Vietnam. The northeastern territory of Vietnam (Fig. 2B), to the north and east of the Red River (see Bannikova *et al.*, 2011). The confirmed records are known from Mt. Tay Con Linh II in Ha Giang Province (Esselstyn & Oliveros, 2010; Bannikova *et al.*, 2011) and Cat Ba Island, Hai Phong Province (Abramov *et al.*, 2012; Abramov & Kruskop, 2012).

Comments. Most authors (Heaney & Timm, 1983; Dang Huy Huynh *et al.*, 1994; Hutterer, 2005; Kuznetsov, 2006; Dang Ngoc Can *et al.*, 2008; Jenkins *et al.*, 2009) suggested a wide geographic distribution for *C. attenuata* in Vietnam. However, the recent study of mitochondrial DNA (Bannikova *et al.*, 2011) restricted

its distribution only to the northernmost part of Vietnam. Elsewhere in the mainland Vietnam it is replaced by *C. tanakae*.

Crocidura dracula Thomas, 1912

Type locality. China, Yunnan Province, “probably near Mong-tze”.

Distribution. Southern China, northern India, Myanmar, northern Vietnam.

Distribution. Northern Vietnam (Fig. 2C). Osgood (1932) listed the specimens from Ngai Tio and Sa Pa, Lao Cai Province, Muong Mo and Lai Chau, Lai Chau Province and Hoi Xuan, Thanh Hoa Province. There is genetically confirmed record from Mt. Tay Con Linh II, Ha Giang Province (as *C. fuliginosa* in Lunde *et al.*, 2003; species identification by Bannikova *et al.*, 2011). Recently the species was recorded from Phu Yen District, Son La Provinces (IEBR and ZIN collections) and Xuan Son National Park, Phu Tho Province (IEBR collection).

Comments. Many papers listed *C. fuliginosa* as being widespread in the mainland Vietnam (Heaney & Timm, 1983; Dang Huy Huynh *et al.*, 1994; Kuznetsov, 2006; Dang Ngoc Can *et al.*, 2008; Jenkins *et al.*, 2009). However, recent comparative studies of mitochondrial DNA (Bannikova *et al.*, 2011; Abramov *et al.*, 2012) did not confirm its occurrence there. Bannikova *et al.* (2011) proposed to re-establish the name *C. dracula* for the large white-toothed shrews from northern Vietnam and southern China.

Crocidura fuliginosa (Blyth, 1855)

Type locality. Myanmar, Schwegyin, near Pegu (= Bago).

Distribution. Malay Peninsula and adjacent islands, Myanmar, Vietnam.

Distribution in Vietnam. Southern Vietnam (Fig. 2B). The species' occurrence has only been confirmed for Con Son and Bai Canh islands of Con Dao Archipelago, Ba Ria - Vung Tau Province (Van Peenen *et al.*, 1970; Abramov *et al.*, 2012).

Comments. The occurrence of *C. fuliginosa* in the mainland Vietnam is still questionable (see Abramov *et al.*, 2012). Jenkins *et al.* (2009) provided two records based on survey reports rather than on museum voucher specimens. One of them (Le Trong Trai *et al.*, 1999), reporting *C. fuliginosa* from Ngoc Linh Mt. in Kon Tum Province, was based on a visual observation only. Another location mentioned was Nui Bi Doup, Lam Dong Province (Jenkins *et al.*, 2009). None of these locations are confirmed by voucher specimens (see Abramov *et al.*, 2012).

Crocidura fuliginosa was described from central Myanmar (Blyth, 1855), so biogeographically it is unclear whether this name can be applied to the Vietnamese taxon. The DNA-confirmed records of Vietnamese haplogroup are known from Cameron Highland, Peninsular Malaysia (see Bannikova *et al.*, 2011).

Crocidura guy Jenkins, Lunde, Moncrieff, 2009

Type locality. Vietnam, Tuyen Quang Province, Na Hang Nature Reserve, Tat Ke Sector, elevation 300–800 m a.s.l.

Distribution. Known from Vietnam only.

Distribution. Northern Vietnam (Fig. 3A). Known from the type locality in Tuyen Quang Province only (Jenkins *et al.*, 2009).

Crocidura indochinensis Robinson, Kloss, 1922

Type locality. Vietnam, Lam Dong Province, Dalat, Langbian Plateau, elevation 5000 feet (1524 m) a.s.l.

Distribution. Myanmar, northern Thailand, southern China (Yunnan, Fujian, Sichuan), Vietnam (Hutterer, 2005; Hoffmann & Lunde, 2008). The exact distributional limits remain unknown. According to Jenkins *et al.* (2009), this species seems to have a disjunct range, being found in China (Yunnan), Myanmar (Kachin) and Vietnam.

Distribution in Vietnam. Southern Vietnam (Fig. 2C). It has been found in a couple of localities in Dalat Plateau, Lam Dong Province: near Dalat (Robinson & Kloss, 1922; Jenkins *et al.*, 2013) and 5 km NE of Long Lanh Village, Bi Doup – Nui Ba National Park (Abramov *et al.*, 2010a).

Comments. Bannikova *et al.* (2011) did not find any members of the *C. indochinensis* haplogroup in northern Vietnam and southern China. Specimens from Sa Pa District, Lao Cai Province, previously referred to as *C. indochinensis* (Jenkins *et al.*, 2009), have been recently re-identified as *C. sapaensis* (see Jenkins *et al.*, 2013).

Crocidura kegoensis Lunde, Musser, Ziegler, 2004

Type locality. Vietnam, Ha Tinh Province, “Ky Anh – Ke Go” (= “Ke Go” or “Ho Ke Go”) Nature Reserve, elevation about 200 m a.s.l.

Distribution. Known from Vietnam only.

Distribution in Vietnam. Central Vietnam (Fig. 3A). Known from the type locality in Ha Tinh Province only (Lunde *et al.*, 2004; Jenkins *et al.*, 2009).

Crocidura phanluongi Jenkins, Abramov, Rozhnov, Olsson, 2010

Type locality. Vietnam, Dak Lak Province, northern portion of Yok Don National Park, elevation 250 m a.s.l.

Distribution. Southern Vietnam, northeastern Cambodia.

Distribution in Vietnam. Southern Vietnam (Fig. 3B). It has been found in Yok Don National Park in Dak Lak Province; Ma Da Forest, Vinh Cuu Nature Reserve in Dong Nai Province; Binh Chau – Phuoc Buu Nature Reserve in Ba Ria – Vung Tau Province (Jenkins *et al.*, 2010); Bu Gia Map Nature Reserve in Binh Phuoc Province (Abramov *et al.*, 2011; Bannikova *et al.*, 2011),

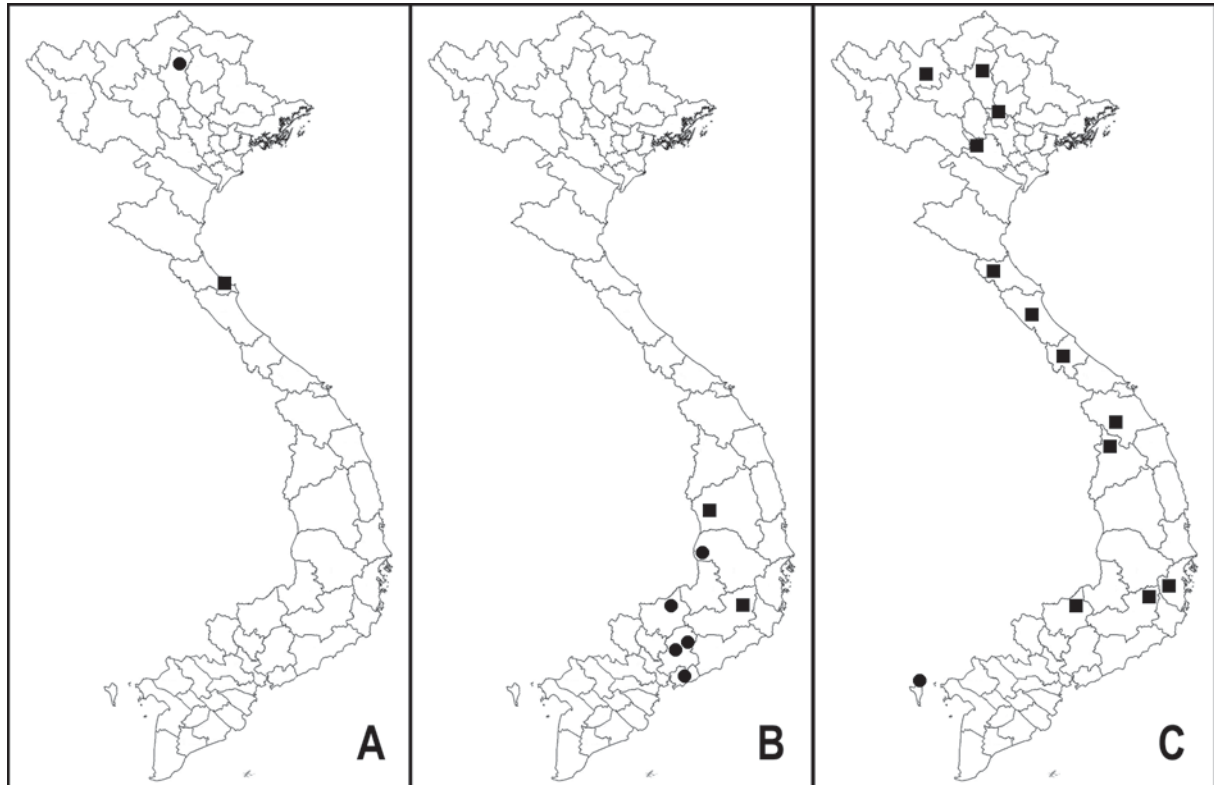


Figure 3. Distribution maps of the Vietnamese insectivores: A — *Crocidura guy* (circles), *Crocidura kegoensis* (squares); B — *Crocidura phanluongi* (circles), *Crocidura rapax* (squares); C — *Crocidura phuquocensis* (circles), *Crocidura tanakae* (squares).

and Cat Tien National Park in Dong Nai Province (ZIN collection, ZMMU collection).

Comments. The specimen from Binh Chau – Phuoc Buu Nature Reserve in Ba Ria – Vung Tau Province, referred to by Jenkins *et al.* (2010) as *C. phanluongi*, may represent a distinct species (see Bannikova *et al.*, 2011).

Crocidura phuquocensis Abramov, Jenkins, Rozhnov, Kalinin, 2008

Type locality. Vietnam, Kien Giang Province, northern part of Phu Quoc Island, c. 5 km west of Bai Thom Village, elevation 30 m a.s.l.

Distribution. Known from Vietnam only.

Distribution in Vietnam. Southern Vietnam (Fig. 3C). Known only from the type locality in Phu Quoc Island (Abramov *et al.*, 2008, 2012).

Crocidura rapax G. Allen, 1923

Type locality. China, south of Yunnan Province, Mekong River, Ying-pan-kai, elevation 9000 feet (2745 m) a.s.l.

Distribution. Reported from northeastern India, northern Myanmar, throughout southern China (Sichuan, Yunnan), with isolated records from Vietnam, Taiwan and offshore islands (Jenkins *et al.*, 2009).

Distribution in Vietnam. Central and southern Vietnam (Fig. 3B). Jenkins *et al.* (2009) reported on three museum specimens (kept in the National Museum of Natural History, Smithsonian Institution, Washington, USA) from An Khe, Gia Lai Province and Lang Bian Mt., Lam Dong Province.

Comments. The aforementioned specimens were earlier considered to belong to *C. indochinensis* (Heaney & Timm, 1983).

Crocidura sapaensis Jenkins, Abramov, Bannikova, Rozhnov, 2013

Type locality. Vietnam, Lao Cai Province, Sa Pa District, c. 6 km west of Sa Pa Town, vicinity of Tram Ton Station of Hoang Lien National Park, north slope of Fan Si Pan Mt. area, elevation 1930–2200 m a.s.l.

Distribution. Known from Vietnam only.

Distribution in Vietnam. Northern Vietnam (Fig. 4B). Based on the cytochrome *b* analysis and morphology of the third lower molars *m*₃, the confirmed specimens of *C. sapaensis* have been recorded from Lao Cai Province, Sa Pa District. Based on morphology, specimens from the northern part of Lao Cai Province, Ngai Tio (elevation 1450 m) and from the vicinity of Cat Cat Village near Sa Pa Town (elevation 1400–1450 m) in relatively close geographical proximity seem to also belong to the same species (Jenkins *et al.*, 2013).

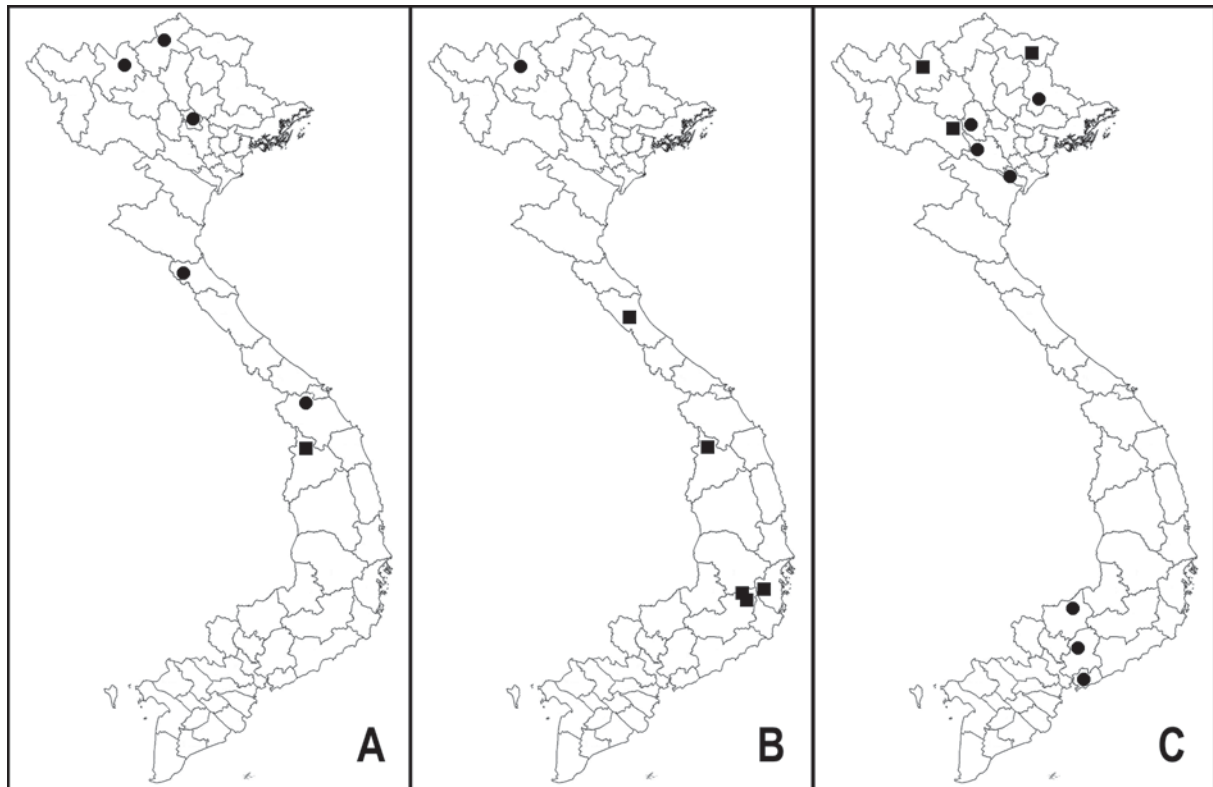


Figure 4. Distribution maps of the Vietnamese insectivores: A — *Crocidura wuchihensis* (circles), *Crocidura sokolovi* (squares); B — *Crocidura sapaensis* (circles), *Crocidura zaitsevi* (squares); C — *Suncus etruscus* (circles), *Anourosorex squamipes* (squares).

Crocidura sokolovi Jenkins, Abramov, Rozhnov, Makarova, 2007

Type locality. Vietnam, Kon Tum Province, west slope of Ngoc Linh Mountain, elevation 2400 m a.s.l.

Distribution. Known from Vietnam only.

Distribution in Vietnam. Central Vietnam (Fig. 4A). Known from the type locality only: at the high elevations of Ngoc Linh Mt., Kon Tum Province (Jenkins *et al.*, 2007; Rozhnov & Abramov, 2009; Bannikova *et al.*, 2011).

Crocidura tanakae Kuroda, 1938

Type locality. China, central Taiwan, Taichusiu, Horigai, Shohosha.

Distribution. Central Laos (Khammouane), China (Hunan), Taiwan, Vietnam (Esselstyn *et al.*, 2009; Esselstyn & Oliveros, 2010; Bannikova *et al.*, 2011).

Distribution in Vietnam. A widespread and common species known throughout Vietnam (Fig. 3C). While *C. attenuata* in Vietnam appears to occur only to the east of Song Hong (the Red River), in NE Vietnam (Bannikova *et al.*, 2011; Abramov *et al.*, 2012), *C. tanakae* does not appear to be so restricted and has been recorded on both sides of the river in northern Vietnam and also in central and southern Vietnam (Es-

selstyn & Oliveros, 2010; Bannikova *et al.*, 2011; Jenkins *et al.*, 2013). The genetically confirmed records have been known from Vinh Phuc Province (Tam Dao), Tuyen Quang Province, Ha Tinh Province and Quang Nam Province (Esselstyn & Oliveros, 2010); Lao Cai Province (Van Ban District), Quang Binh Province (Phong Nha – Ke Bang National Park), Quang Tri Province (Huong Hoa Nature Reserve), Kon Tum Province (Ngoc Linh Mt.), Lam Dong Province (Bi Doup Mt., Hon Giao Mt.), Khanh Hoa Province (Hon Ba Mt.), Binh Phuoc Province (Bu Gia Map Nature Reserve) (Bannikova *et al.*, 2011). The species has recently been found in Ba Vi National Park, Ba Vi District of Hanoi (Abramov *et al.*, 2013).

Comments. An analysis of cytochrome oxidase *c* subunit I (COI) demonstrated the occurrence of two clearly defined haplogroups of *C. tanakae* within Vietnam: one (*C. tanakae* A) that occurs in central and southern Vietnam (Huong Hoa, Phong Nha – Ke Bang, Ngoc Linh, Hon Ba, Bi Doup) and another (*C. tanakae* B) that is restricted to the northern part of the country in Hoang Lien Mountains (Bannikova *et al.*, 2011).

Crocidura wuchihensis Shaw, Wang, Lu, Chang, 1966

Type locality. China, Hainan Island, Shui-Man, western slope of Wuchih Mountain.

Distribution. China (Hainan Island, western Yunnan), northern Laos, northern Vietnam (Jenkins *et al.*, 2009).

Distribution in Vietnam. Northern and central Vietnam (Fig. 4A). The populations of *C. wuchihensis* identified on the basis of cytochrome *b* have been found in Mt. Tay Con Linh II, Ha Giang Province (Ohdachi *et al.*, 2006; Esselstyn & Oliveros, 2010) and from Tam Dao, Vinh Phuc Province (Bannikova *et al.*, 2011; ZIN collection). Based on morphology, the populations that seem to belong to this species also occur in Huong Son, Ha Tinh Province (Lunde *et al.*, 2004; Jenkins *et al.*, 2009), Ba Na, Quang Nam Province (Jenkins *et al.*, 2009) and Pa Kha and Thai Nien, both in Lao Cai Province (Jenkins *et al.*, 2013).

Comments. Bannikova *et al.* (2011) suggested that the distribution of *C. wuchihensis* was restricted in Vietnamese territories east and north of the Red River. The population of *C. wuchihensis* recorded from the Annamites (Ha Tinh and Quang Nam provinces) has not been included in any of the previous molecular studies. Based on the multivariate cranial analysis, Jenkins *et al.* (2009) showed that two groups of *C. wuchihensis* (from northern and central Vietnam) were moderately well separated from each other. Lacking further evidence from molecular studies, it is impossible to see whether the population from the southern Annamites was correctly assigned to *C. wuchihensis*, or could it belong to *C. sapaensis* or indeed even represent a further undescribed species (see Jenkins *et al.*, 2013).

Crociodura zaitsevi Jenkins, Abramov, Rozhnov, Makarova, 2007

Type locality. Vietnam, Kon Tum Province, west slope of Ngoc Linh Mountain, elevation 2300 m a.s.l.

Distribution. Known from Vietnam only.

Distribution in Vietnam. Central and southern Vietnam (Fig. 4B). In central Vietnam, it has been found in a wide elevation range of Ngoc Linh Mt., Kon Tum Province (Jenkins *et al.*, 2007; Rozhnov & Abramov, 2009) and in Phong Nha – Ke Bang National Park, Quang Binh Province (Bannikova *et al.*, 2011); also recorded in three localities in southern Vietnam: Bi Doup – Nui Ba National Park, Lam Dong Province, Hon Ba Mt., Khanh Hoa Province (Bannikova *et al.*, 2011), and Chu Yang Sin National Park, Dak Lak Province (ZIN collection).

Comments. The intraspecific differentiation of *C. zaitsevi* is relatively high. Bannikova *et al.* (2011) found two haplogroups (*p*-dist = 2.3%, *cyt b* and 1.5%, COI) within *C. zaitsevi*, which correspond to central and southern Vietnam localities accordingly: the haplogroup A containing specimens from the type locality (Ngoi Linh) and the haplogroup B found in southern Vietnam (Hon Ba and Bi Doup). The haplogroup from the Phong Nha – Ke Bang in central Vietnam is associated with the haplogroup A; however, it is distinct (*p*-dist = 1.3%, COI) and may represent a separate subgroup.

Suncus etruscus (Savi, 1822)

Type locality. Italy, Pisa.

Distribution. Widely distributed across Eurasia (Hutterer, 2005).

Distribution in Vietnam. Sporadically distributed in Vietnam (Fig. 4C), known from four localities in northern part of country: Cuc Phuong National Park, Ninh Binh Province (Feiler & Nadler, 1997); Huu Lien Nature Reserve, Lang Son Province (Lunde *et al.*, 2007; ZIN collection); Ba Vi National Park, Ba Vi District of Hanoi (Abramov *et al.*, 2013); and Xuan Son National Park, Phu Tho Province (ZIN collection). There are also three localities in southern Vietnam: Ma Da Forest, Vinh Cuu Nature Reserve, Dong Nai Province (Kuznetsov, 2006), Bu Gia Map Nature Reserve, Binh Phuoc Province (Abramov *et al.*, 2009, 2011), and Dinh Mt., Tan Thanh District, Ba Ria – Vung Tau Province (IEBR collection).

Suncus murinus (Linnaeus, 1766)

Type locality. Indonesia, Java.

Distribution. Widespread throughout the Indomalayan Region, and has been widely introduced in the Philippines, parts of Africa, coastal Arabia, islands in the Indian Ocean and many other regions (Hutterer & Tranier, 1990; Hutterer, 2005).

Distribution in Vietnam. A widespread, synanthropic species known throughout Vietnam, usually found near human settlements.

Subfamily Soricinae G. Fischer, 1814

Tribe **Anourosoricini** Anderson, 1879

Anourosorex squamipes Milne-Edwards, 1872

Type locality. China, Sichuan Province, probably Moupin (= Baoxing).

Distribution. Southern China (Shaanxi, Hubei, Sichuan and Yunnan); northern and western Myanmar, eastern India (Mizoram), northern Vietnam, Thailand (Corbet & Hill, 1992; Hutterer, 2005)

Distribution in Vietnam. Northern Vietnam (Fig. 4C). It has been collected from a few localities on northern and northwestern slopes of Fan Si Pan Mt., Lao Cai Province (Osgood, 1932; Kuznetsov & Rozhnov, 1998; Abramov *et al.*, 2008, 2010). Dang Ngoc Can *et al.* (2008) recorded the species for the Pia Oac locality in Cao Bang Province (IEBR collection). Recently the species has been recorded in Muong Do Nature Reserve, Son La Province (Nguyen Xuan Dang *et al.*, 2012).

Tribe **Blarinellini** Reumer, 1998

Blarinella griselda Thomas, 1912

Type locality. China, Gansu Province, 42 miles (68 km) southeast of Taochou, elevation 10 000 feet (3048 m) a.s.l.

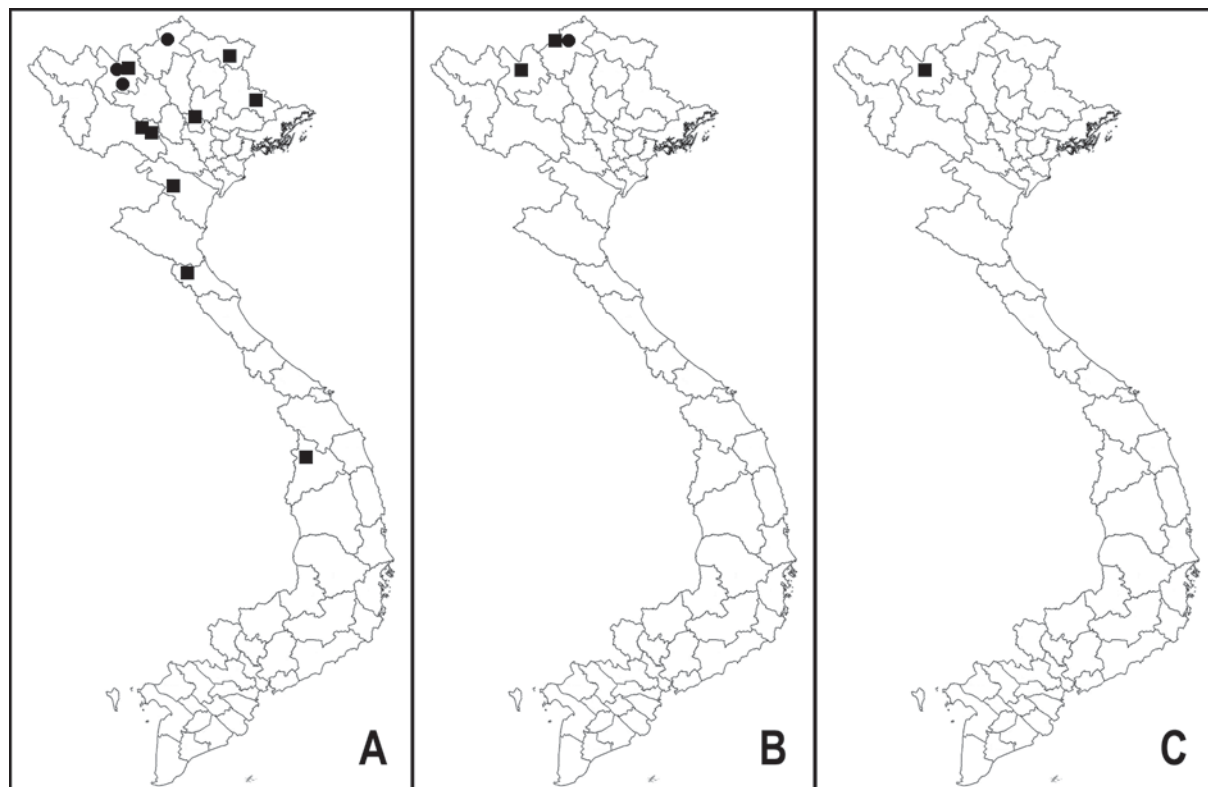


Figure 5. Distribution maps of the Vietnamese insectivores: A — *Blarinella griselda* (circles), *Chimarrogale himalayica* (squares); B — *Chodsigoa caovansunga* (circles), *Chodsigoa parca* (squares); C — *Episoriculus baileyi*, *Episoriculus caudatus*, *Episoriculus macrurus*, all three species are known from the single locality only (marked by square).

Distribution. China (Gansu, Yunnan and Hubei), northern Vietnam (Hutterer, 2005; Hoffmann & Lunde, 2008; see also Chen *et al.*, 2012).

Distribution in Vietnam. Northern Vietnam (Fig. 5A). The species was first recorded from Mt. Tay Con Linh II, Ha Giang Province (Lunde *et al.*, 2003). Also it has been found in two localities in Lao Cai Province – Van Ban District, Nam Xay Commune and Sa Pa District, near Tram Ton Station (Abramov *et al.*, 2007b).

Tribe **Nectogalini** Anderson, 1879

Chimarrogale himalayica (Gray, 1842)

Type locality. India, NE Punjab, Chamba (see Corbet & Hill, 1992: 34).

Distribution. Southeast Asia from Kashmir to Indochina, central and southern China, Taiwan (Hutterer, 2005; Hoffmann & Lunde, 2008; Lin & Motokawa, 2010).

Distribution in Vietnam. Only a few records from central and northern Vietnam (Fig. 5A). Osgood (1932) mentioned one specimen from Sa Pa, Lao Cai Province. From Dak To, Kon Tum Province, Thomas (1927) described a distinct species *Chimarrogale varennei* which was synonymized with *C. himalayica* (Corbet & Hill, 1992; Hutterer, 2005). Three specimens were collected from Huong Son District, Ha Tinh Province

(Lunde & Musser, 2002). Dang Ngoc Can *et al.* (2008) also listed the Pia Oac locality in Cao Bang Province, Tam Dao National Park in Vinh Phuc Province and Mau Son Mt. in Lang Son Province. Recently the species has been recorded in Muong Do Nature Reserve, Son La Province (Nguyen Xuan Dang *et al.*, 2012), Ta Xua Nature Reserve, Son La Province (ZIN collection) and Xuan Lien Nature Reserve, Thanh Hoa Province (Bui Tuan Hai *et al.*, 2013b).

Comments. Dang Huy Huynh *et al.* (1994, 2007) referred to *varennei* as a synonym of *Chimarrogale platycephala* and listed the latter species in the fauna of Vietnam. Based on the cytochrome *b* analysis (Yuan *et al.*, 2013), *C. himalayica* was clearly shown to be as a paraphyletic taxon. Yuan *et al.* (2013) suggested that three subspecies of *C. himalayica* should be reconsidered as distinct species. They treated the populations from Vietnam and southern China as *Chimarrogale varennei*. Therefore, additional morphological and molecular analyses are needed to test the taxonomic status of these mitochondrial lineages.

Chodsigoa caovansunga Lunde, Musser, Nguyen Truong Son, 2003

Type locality. Vietnam, Ha Giang Province, Vi Xuyen District, Cao Bo Commune, Mt. Tay Con Linh II, elevation 1500 m a.s.l.

Distribution. Northern Vietnam (Lunde *et al.*, 2003) and southern China, Yunnan (He *et al.*, 2012).

Distribution in Vietnam. Northern Vietnam (Fig. 5B). The species has been known from the type locality in Ha Giang Province only (Lunde *et al.*, 2003; IEBR collection).

Chodsigoa parca G. Allen, 1923

Type locality. China, western Yunnan, Ho-mu-shu Pass, elevation 8000 feet (2438 m) a.s.l.

Distribution. Southwestern China, northern Myanmar, Thailand and Vietnam (Hutterer, 2005).

Distribution in Vietnam. Northern Vietnam (Fig. 5B). The species has been known from two localities only: Sa Pa District, Lao Cai Province (Osgood, 1932; IEBR and ZIN collections) and Mt. Tay Con Linh II, Ha Giang Province (Lunde *et al.*, 2003).

Comments. The specimen from Sa Pa was described as a distinct species *Chodsigoa lowei* (Osgood, 1932). Now this name is considered subspecies and assigned to *C. parca* (Hoffmann, 1986; Hutterer, 2005).

Episoriculus baileyi (Thomas, 1914)

Type locality. India, Arunachal Pradesh, Mishmi Hills, Tsu River, elevation 7500 feet (2286 m) a.s.l.

Distribution. India (Sikkim, Assam), southern China (Sichuan, Yunnan, Xizang), northern Myanmar, northern Vietnam (Hutterer, 2005; Hoffmann & Lunde, 2008; Motokawa & Lin, 2005; see comments below).

Distribution in Vietnam. Northern Vietnam (Fig. 5C). The species has been known from the vicinity of Fan Si Pan Mt., Sa Pa District, Lao Cai Province only (Osgood, 1932; Kuznetsov & Rozhnov, 1998; ZMMU collection).

Comments. Many authors have placed *baileyi* in *E. leucops* as a subspecies or even a synonym (Hoffmann, 1986; Corbet & Hill, 1992; Motokawa, 2003; Hutterer, 2005; Hoffmann & Lunde, 2008; Dang Ngoc Can *et al.*, 2008). However, Motokawa & Lin (2005) revised a species composition of *Soriculus sensu lato* on the basis of external and cranial morphological characteristics and proved *Episoriculus baileyi* to be a valid species. According to Motokawa & Lin (2005), the distribution range of *E. leucops* is restricted to Nepal, whereas that of *E. baileyi* lies in northeastern India, China, northern Myanmar and northern Vietnam.

Episoriculus caudatus (Horsfield, 1851)

Type locality. India, “Sikim and Darjeling”. Ellerman & Morrison-Scott (1951: 59) restricted it to the type locality to “Darjeeling”.

Distribution. Northern India (Sikkim, Uttarakhand and West Bengal) and Nepal (Molur *et al.*, 2005), central and southern China (Xizang, Sichuan, Gansu and southwestern Yunnan), northern Myanmar (Hoffmann & Lunde, 2008), northern Vietnam.

Distribution in Vietnam. Northern Vietnam (Fig. 5C). The species has been known from Sa Pa District, Lao Cai Province only (Dang Ngoc Can *et al.*, 2008; ZIN collection).

Comments. The species is morphologically close to *Episoriculus macrurus* but its tail is shorter (Hoffmann, 1986). According to the same author (Op. cit.: 467–468), “it occurs from Kashmir eastward to western and southern China, and northern Burma, but not, apparently, Vietnam”. Many previous authors listed *E. caudatus* in the fauna of Vietnam on the basis of the erroneous synonymization of *baileyi* and *caudatus* (Ellerman & Morrison-Scott, 1951; Dang Huy Huynh *et al.*, 1994, 2007; Kuznetsov, 2006). The specimen ZIN 99787 from Sa Pa District seems to be the only known museum specimen of *E. caudatus* from Vietnam.

Episoriculus macrurus (Blanford, 1888)

Type locality. India, Darjeeling.

Distribution. Central Nepal to Sikkim, India, western and southern China (Yunnan, Sichuan), northern Myanmar and northern Vietnam (Corbet & Hill, 1992; Hutterer, 2005; Hoffmann & Lunde, 2008).

Distribution in Vietnam. Northern Vietnam (Fig. 5C). The species has been known from Sa Pa District, Lao Cai Province only (Osgood, 1932; see also Kuznetsov, 2006).

Comments. The species has been reported from Vietnam (Corbet & Hill, 1992; Hutterer, 2005; Kuznetsov, 2006; Hoffmann & Lunde, 2008) on the basis of the single specimen (No.39030, Field Museum, Chicago, USA) from “Mount Fan Si Pan (alt. 10 000 feet), near Chapa” studied by Osgood (1932). Osgood (1932: 250) placed *macrurus* as a synonym of *leucops* and this opinion has been followed by the subsequent authors (see Hoffmann, 1986).

Conclusions

The fauna of insectivorous mammals of Vietnam is very rich and includes 32 species from 12 genera and three families. Many species still remain known from the territory of Vietnam only: at least, seven species of the white-toothed shrews (*Crocidura annamitensis*, *C. guy*, *C. kegoensis*, *C. phuquocensis*, *C. sapaensis*, *C. sokolovi*, *C. zaitsevi*) and a mole species (*Euroscaptor subanura*). The distributional range of *Crocidura indochinensis*, which was considered a widespread species in SE Asia, seems to be restricted to southern Vietnam only. The red-toothed shrew *Chodsigoa caovansunga* described as an endemic species of Vietnam has recently been found in a single locality of southern China (He *et al.*, 2012). Some species (*Crocidura rapax*, *Episoriculus macrurus*) remain poorly-known and their occurrence in Vietnam is still questionable.

The values for species richness and endemism given here will necessarily change, as soon as new species are discovered both in the wild and in museum collections

Table. Species composition of the insectivorous mammals of Vietnam according to recent checklists.

Family	Dang Huy Huynh <i>et al.</i> , 1994	Kuznetsov, 2006	Dang Ngoc Can <i>et al.</i> , 2008	This study
Erinaceidae	<i>Hylomys suillus</i>	<i>Hylomys suillus</i>	<i>Hylomys suillus</i>	<i>Hylomys suillus</i>
	<i>Neotetracus sinensis</i>	<i>Hylomys sinensis</i>	<i>Neotetracus sinensis</i>	<i>Neotetracus sinensis</i>
Talpidae			<i>Scaptonyx fuscicaudus</i>	<i>Scaptonyx fuscicaudus</i>
	<i>Parascaptor klossi</i> <i>Parascaptor leucura</i>	<i>Talpa longirostris</i> <i>Talpa micrura</i>	<i>Euroscaptor longirostris</i> <i>Euroscaptor parvidens</i>	<i>Euroscaptor longirostris</i> <i>Euroscaptor parvidens</i> <i>Euroscaptor subanura</i>
			<i>Mogera latouchei</i>	<i>Mogera latouchei</i>
Soricidae	<i>Crocidura attenuata</i> <i>Crocidura dracula</i> <i>Crocidura horsfieldi</i>	<i>Crocidura attenuata</i> <i>Crocidura fuliginosa</i> <i>Crocidura horsfieldi</i>	<i>Crocidura attenuata</i> <i>Crocidura fuliginosa</i> <i>Crocidura indochinensis</i> <i>Crocidura kegoensis</i> <i>Crocidura sokolovi</i> <i>Crocidura wuchihensis</i> <i>Crocidura zaitsevi</i>	<i>Crocidura annamitensis</i> <i>Crocidura attenuata</i> <i>Crocidura dracula</i> <i>Crocidura fuliginosa</i> <i>Crocidura guy</i> <i>Crocidura indochinensis</i> <i>Crocidura kegoensis</i> <i>Crocidura phanluongi</i> <i>Crocidura phuquocensis</i> <i>Crocidura rapax</i> <i>Crocidura sapaensis</i> <i>Crocidura sokolovi</i> <i>Crocidura tanakae</i> <i>Crocidura wuchihensis</i> <i>Crocidura zaitsevi</i>
	<i>Suncus murinus</i>	<i>Suncus etruscus</i> <i>Suncus murinus</i>	<i>Suncus etruscus</i> <i>Suncus murinus</i>	<i>Suncus etruscus</i> <i>Suncus murinus</i>
	<i>Anourosorex squamipes</i>	<i>Anourosorex squamipes</i>	<i>Anourosorex squamipes</i>	<i>Anourosorex squamipes</i>
			<i>Blarinella griselda</i>	<i>Blarinella griselda</i>
	<i>Chimarrogale himalayica</i> <i>Chimarrogale platycephala</i>	<i>Chimarrogale himalayica</i>	<i>Chimarrogale himalayica</i>	<i>Chimarrogale himalayica</i>
			<i>Chodsigoa caovansunga</i> <i>Chodsigoa parca</i>	<i>Chodsigoa caovansunga</i> <i>Chodsigoa parca</i>
	<i>Soriculus caudatus</i> <i>Soriculus leucops</i> <i>Soriculus lowei</i>	<i>Soriculus caudatus</i> <i>Soriculus leucops</i> <i>Soriculus macrurus</i> <i>Soriculus parca</i>	<i>Soriculus caudatus</i> <i>Soriculus leucops</i>	
			<i>Episoriculus baileyi</i> <i>Episoriculus caudatus</i> <i>Episoriculus macrurus</i>	

and the ranges of known species are clarified (Sterling *et al.*, 2006). New findings and taxonomic studies of insectivorous mammals have changed the species composition of Vietnam fauna significantly (see Table).

The detailed geographical distribution, ecology, and natural history of the majority of insectivorous mammals of Vietnam are still poorly studied. Morphological characters and genetic variation in the populations of the widespread species such as *Suncus etruscus*,

Crocidura tanakae, *Crocidura phanluongi*, *Euroscaptor parvidens* and some others need to be examined in detail. Undoubtedly, the number of lipotyphlan species in Vietnam and Southeast Asia will increase, should targeted insectivorous mammals surveys are undertaken there.

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