

CONTRIBUTIONS TO THE STUDY OF SMALL NON-VOLANT MAMMAL FAUNA IN  
BU GIA MAP NATIONAL PARK (BINH PHUOC PROVINCE)

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### I. STUDY AREA AND METHODS

The mammalogical investigations were carried out in Bu Gia Map National Park which situated on southeastern part of Dalat Plateau along a border with Cambodia during a series of expedition performed by Joint Vietnam-Russian Tropical Research and Technological Centre. These preliminary studies focused mainly on taxonomical list composition and obtaining the data on biology of most abundant species of small non-volant mammals, which construct a background of fauna of the region. Field surveys were carried out during 15-25.04.2009, 30.10-8.11.2010 and 9-18.01.2011 in southern part of the Nature Reserve. The field camp of expedition was situated in 13 km NE from the settlement Bu Gia Map, on elevation 540 m a.s.l. (12°11'37''N, 107°12'21''E). The main part of investigation carried out within the area situated in 0.5-3.0 km to the north, east and west from field camp on elevations 350-540 m. All types of biotopes which are the typical for the place were investigated (parcels of damaged and non-damaged dipterocarp forest on a slopes of hills, separated curtains of bamboo in the forest and bamboo thickets grooving alongside the forest road and wet biotopes along springs and small rivers beds).

The pitfall traps were used (13cm deep, 9cm in diameter plastic glasses) to catch a shrews along with a cage traps (25×11×11cm) using to catch the rodents. Two different types of cage traps were used, the standard ones equipped by baited trigger hook and another original type where the trigger, reacting when the animal is only steps on it being inside the trap. Different kinds of vegetable baits (carrot, manioc, jackfruit, and apple) used to attract the animals along with some other like foam-rubber impregnated with sunflower oil and/or honey. The cage traps were installed both on a ground surface and on trunks of fallen and lopsided trees and bamboo, lianas and branches at the level from 1 to 8m from the ground. The trapping areas were investigated during 5-10 days. Besides of these areas, a few individual traps were installed in the passage spots, places suitable to cross the rivers or roads and in the places where animals were visually recorded. The animals, its traces and sign of their activity are also recorded during regular diurnal and nocturnal routing registration.

All animals were measured (standard external body measurements) and weighted; age, sex and generative status were also recorded. Some species which were difficult for visual diagnosis were sampled for genetic verification. The generic analyses were carried on in the Southern Division of Joint Vietnam-Russian Tropical Research and Technological Centre, Ho Chi Minh City, Vietnam and allow us to precise taxonomical attribution and relationships for some *Niviventer* and *Rattus* species.

### II. RESULTS

In the following we present some notes on natural history, ecology and systematic of the species found in the Reserve. The nomenclature is follow to Wilson and Reeder [15].

#### Order Scandentia

#### Family Tupaiidae

#### *Dendrogale murina* (Schlegel et Müller, 1845) - Northern Smooth-Tailed Treeshrew

The species was for a first time recorded at November, 2009. Two specimens slew by unstated predator (it may well be domestic dogs) were found near the forest station. Another

adult male was caught in a cage trap on 14.01.2010 near small forest spring in close vicinity to field camp. The trap was set on stalk of bamboo crossing two banks of the spring. Northern smooth-tailed treeshrew is widely distributed species everywhere in Southern Vietnam; nevertheless, it is rather rear and scanty species in most areas except for Nam Cat Tien National Park. The species is also recorded from adjacent Cambodian Province Mondulhiri [11].

**Order Soricomorpha**

**Family Soricidae**

***Crocidura phanluongi* Jenkins, Abramov, Rozhnov et Olsson, 2010 - Phan Luong's White-toothed Shrew**

Two specimens belonging to the newly described species *Crocidura phanluongi* [7] were obtained during our expeditions. Specific attribution and taxonomical status of the species was proved by the mtDNA analysis [6]. According to our data, this new species is distributed widely enough in plains and lowlands forests in Vietnam. We recorded it in Yok Don National Park and Ma Da Vinh Cuu Nature Reserve on elevation of 50-250m a.s.l. The species was found to inhabit up to 480m in Northern-East Cambodia and was found in Bu Gia Map at elevation about 500m a.s.l.

***Crocidura cf. attenuata* Milne-Edwards, 1872 - Asian Gray Shrew**

This species is one of the most abundant South Asian white-toothed shrews is shown to be not so numerous in Bu Gia Map. Only one subadult was trapped on the spring 2009 at the same trapping area as a *Crocidura phanluongi*. It should be noted that species attribution and taxonomical status of the gray shrew from Vietnam formerly regarded as *Crocidura attenuata* [Dang Ngoc Can *et al.*, 2008; 7], still have to be approved. As it was shown by genetic analysis [6] the most part of Vietnam (including the locality of study) are actually inhabited by *C. tanakae*.

***Crocidura indochinensis* Robinson et Kloss, 1922 - Indochinese Shrew**

Only two specimens were obtained on spring 2009. Adult male was trapped in floodplain forest along Dak A River (350m a.s.l.), and adult female was trapped in the dry stream valley (540m a.s.l.). We recorded this species in north-eastern part of Dalat Plateau in Bi Dup - Nui Ba National Park also; where it was trapped on appreciably higher elevations, up to 1400m [3].

***Suncus etruscus* Savi, 1822 - Etruscan Shrew**

This is very widely distributed species stretching their area from Western Europe to Southern Asia. Their distribution in Southeastern Asia is still very scantily investigated. Until recently, the species was known from three localities in Vietnam [2]. One specimen was collected in 1994 in Vinh Cuu Nature Reserve (= Ma Da Forest) [Kuznetsov, 2006], lately *Suncus etruscus* was recorded from Northern Vietnam, Cuc Phuong National Park [Feiler, Nadler, 1997] and Huu Lien Nature Reserve [9]. Two specimens of *S. etruscus* were trapped at November 2009 and January 2010 in pitfall traps on a hill slope descending to Dak A River.

**Order Erinaceomorpha**

**Family Erinaceidae**

***Hylomys suillus* Muller, 1840 - Short-tailed Gymnure**

Two specimens of short-tailed gymnure were obtained at autumn 2009. One of them was catch in kennel along the road close to forest station, with one another was found to be slew by unstated predator, most probable by domestic dogs.

**Order Rodentia**

**Family Muridae**

***Mus pahari* Thomas, 1916 - Indochinese Shrewlike Mouse**

Vietnam is known to inhabit by four *Mus* species [9, Dang Ngoc Can *et al.*, 2008]. Most of the species inhabit open habitats or are synanthropic (like domestic mouse *Mus musculus*).

Indochinese shrewlike mouse is the only species which actually inhabits forests. This species is widely distributed in Vietnam, however it rarely can be trapped and only a few specimens are listed in scientific collections. A single specimen was collected in a cage trap in forest at 400m a.s.l.

***Mus caroli* Bonhote, 1902 - Ryukyu Mouse**

This species is very abundant everywhere in Vietnam; it can be found at any parts of the country but preferably distributed in agricultural areas [9, Dang Ngoc Can *et al.*, 2008]. Adult male was trapped in forest at 400m a.s.l. Trap was set on 1.5m on tree trunk constructed a natural bridge over the forest trail.

***Chiropodomys gliroides* (Blyth, 1856) - Indomalayan Pencil-tailed Tree Mouse**

The species is known to be distributed widely enough in Vietnam but being recorded by only few specimens from everywhere. Two adult animals were trapped at spring 2009 by cage traps set on bamboo stems constructed a natural bridge over a road on about 5m above ground surface. Two more specimens were trapped at the same place at November, 2009. Another seven animals were caught in different habitats (forest on slopes along Dak A River, bamboo curtains, bamboo thicket aside to the forest road).

The biology of this species is poorly known. It was indicated for Chinese populations (Smith, Lunde, 2008) that breeding season is not strongly pronounced in the species. The fact that our January sample from Bu Gia Map contained a considerable part of subadult animals (57%) provides evidence in favor of winter breeding in the species in Southern Vietnam. We failed to find any signs of breeding activity in two adults obtained in Bu Gia Map in April, 2009.

***Maxomys surifer* (Miller, 1900) - Indomalayan Red Spiny Rat**

It is one of background-forming species of rodents in plain forests in Vietnam. But in Bu Gia Map the species is much less abundant than in major part of adjacent regions, only seven animals were trapped on a ground surface during our expeditions. This species is less numerous than *Rattus andamanensis* in most kinds of habitats, what is not typical for forests rodents community of Southern Vietnam.

***Rattus andamanensis* Blyth, 1860 - Indochinese Forest Rat**

That is most abundant species in the studied area. We obtained 13 specimens (13 adult males and 2 females). All these animals were caught by traps set on branches and sloping tree trunks served as natural bridges over different kinds of ravines, forest springs, or other kinds of cross-country terrains. Based on both detailed investigations of cranial characters and mtDNA data we can attribute the rats to *Rattus andamanensis* follows the point of view of Musser and Carleton (2005) who combine *Rattus remotus* and *Rattus koratensis* from Vietnam together with *R. andamanensis* from Thailand. Being slightly different in general appearance and coloration, all these taxa are proved to be genetically identical (Balakirev, Rozhnov, 2011, in press).

***Leopoldamys sabanus* (Thomas, 1887) - Giant Indomalayan Tree Rat**

One of the largest forest rats species in Vietnam. A single animal was trapped at autumn 2009.

***Niviventer cf. fulvescens* (Gray, 1847) - Indomalayan White-bellied Rat**

This is most numerous species inhabit southern part of Dalat Plateau (Langbian Mt.); it can be found in every types of habitats [4]. This species was not recorded during the first expedition at April, 2009; however, three specimens were caught in autumn 2009 and another four at January, 2010. All animals were trapped by cage traps set on tree branches, fallen trees or bamboo stems elevated on 2-4m above ground level. This species was recorded at the most biotopes studied. Based on genetic data, we can assume that the morph is actually belong to different cryptic species which should be attributed to scientific name *Niviventer huang*, the

species which is closely relative but not identical to *Niviventer fulvescens* inhabits northern parts of Vietnam [5].

***Niviventer cf. tenaster* (Thomas, 1916) - Indochinese Mountain White-bellied Rat**

Two animals, which were preliminary attributed to *Niviventer tenaster* were caught on natural bridges over forest spring near expedition camp at January, 2010. These are fairly large rats (head and body length 150-157mm, length of tail 190-200mm), appreciably larger than above mentioned *Niviventer cf. fulvescens*.

***Hapalomys delacouri* Thomas, 1927 - Lesser Marmoset Rat**

The species is known to inhabit Southern China, Northern Laos and some localities in Northern and Central Vietnam (Dang Huy Huynh *et al.*, 1994; Musser, Carleton, 2005; Dang Ngoc Can *et al.*, 2008), but that is very rare species in scientific collections. One adult male was caught at April, 2009 in cage trap set on bamboo stem forming a natural bridge over the forest road. It was the first finding of this species in Southern Vietnam. At November 2009 and January 2010 we could obtain few other specimens. All animals were caught exclusively at thick trunk bamboo thicket growing along forest road by traps set on 5-7m over the ground surface.

Ecology of lesser marmoset rat is still having been completely unknown (see Lunde, Aplin, 2008 for details). It is considered to be mainly arboreal species presumably associated with a bamboo forests growing at altitudinal belt on about 1200-1500m a.s.l. (Lunde, Nguyen Truong Son, 2001; Francis, 2008; Smith, Lunde, 2008). Thus, the population inhabits Bu Gia Map is apparently strongly associated with bamboo thicket but distributed in appreciably lower elevation, on about 540m. Both two female being caught at January, 2010 were pregnant (at early stage) bearing four and five embryos. Keeping in mind the fact that one of male caught at January was also obviously subadult (head and body length was only 90% from average for adults), it may suppose that breeding season last over all winter season at least.

**Family Spalacidae**

***Rhizomys sumatrensis* (Raffles, 1821) - Indomalayan Bamboo Rat**

This bamboo rat is distributed in Central and Southern Vietnam, and inhabits the areas on elevation from 1200m a.s.l. and above (Lunde, Nguyen Truong Son, 2001). We recorded the species in Northern-East part of Dalat Plateau in altitudinal belt 1600-1700m [3]. In Bu Gia Map, holes, the traces of borrowing activity and animals as such were visually spotted in bamboo thicket close to our camp on elevation no more than 540m.

**Family Sciuridae**

***Menetes berdmorei* Blyth, 1849 - Indochinese Stripped Ground Squirrel**

This species is widely distributed all over in Vietnam. Indochinese stripped ground squirrels are mainly terrestrial and inhabit all types of forest. At 22.IV.2009 at the vicinity of our camp we found a drey of the species with three blind and necked younglings. The drey was established on a ground under sheet of slate aside from abandoned forest guard house. Nest as such what being inside, has a look as close ball made out dry grass and bamboo leaves on about 50cm in diameter.

***Callosciurus erythraeus* (Pallas, 1779) - Pallas's Squirrel**

It is widely distributed and abundant species in Vietnam. One animal used as a voucher specimen was caught 11.01.2010 in fallen bamboo thicket on a bank of small forest spring close to field camp. The red-bellied squirrels (*Callosciurus erythraeus flavimanus*) which are known to inhabit Southern Vietnam are sometimes regarded as a distinct species *C. flavimanus* but here we follows to generally accepted taxonomical conception (Thorington, Hoffmann, 2005; Kuznetsov, 2006; Dang Ngoc Can *et al.*, 2008) and treat it as a morph.

***Ratufa bicolor* (Sparrman, 1778) - Black Giant Squirrel**

This is one of most common species in the studied area. Black giant squirrel (it may well be the same individual or pair) was repeatedly recorded in trees canopy near our field camp. The others, most probably different animals, were observed or can be heard sometimes a pretty far away of the forest station.

**III. CONCLUSIONS**

The Bu Gia Map National Park is undoubtedly of interest for zoogeography and comparative ecology of small mammals' communities. Difficult terrains structure and great variability of natural conditions (sites of primary rainforest are altering with areas of derivative vegetation such as bamboo thicker and palm forests) are resulting in existence of a diverse fauna in the region. During our expeditions, a great variety of different natural biotopes were investigated, with a special emphasis to old bamboo vegetation associations. Considerable materials on distribution and breeding ecology for some bamboo-associated species were obtained. In general, 19 species of small mammal were recorded, including rodents, insectivorous and tree-shrews.

The strong seasonality of climate in Southern Vietnam is greatly affected to results of ecological surveys here. Thus, the species composition of small non-volant mammals recorded at January 2010 was appreciably different to results obtained in spring and autumn of 2009. Specifically, shrews was completely lacking at January which may be caused by very dry season at the moment. Some other species (*Mus caroli*, *Rattus* cf. *losea*, *Niviventer* cf. *tenaster*), which were recorded in the Nature Reserve only in 2010, but not in previous surveys carried in 2009 and vice versa, Indomalayan red spiny rats *Maxomys surifer* and shrews *Crocidura* spp. were not recorded in 2010 even at exactly those places where it was caught in 2009. So, a number of expeditions in different seasons have to be organized to obtain a comprehensive view on species composition and ecology.

The fauna of mammals in Bu Gia Map is proved to be rather special for the region. The dominant species of rats is *Rattus andamanensis* here. The situation is pretty uncommon for plain forest of Southeast Asia; where representatives of different genera of rats (*Maxomys* spp., *Niviventer* spp., *Leopoldamys* spp.) are most often predominate, whereas the different *Rattus* species are generally associated with anthropogenic areas and open, grassland biotopes (Shchipanov *et al.*, 1996). We only can indicate two other places in Vietnam where representatives of *Rattus* are predominant in small mammals' fauna. The first place is dipterocarp and mixed forests in northern part of Phu Quoc Island (Abramov *et al.*, 2007) and the second one is mixed forests in Con Son Island. The other peculiar trait of fauna composition in the Nature Reserve is considerable shift in altitudinal distribution for some species. To say that in another words, some species of small mammals such as *Hapalomys delacouri*, *Rhizomys sumatrensis*, *Niviventer tenaster*, which considered to be mountain species and recorded on altitudinal belt 1000-1200 m and more (Lunde, Nguyen Truong Son, 2001; Francis, 2008; Smith, Lunde, 2008), are actually inhabit appreciably lower zone (400-500m a.s.l.) in Bu Gia Map. At the same time, some of the typical plain forest and lowlands species such as *Crocidura phanluongi*, *Dendrogale murina* are also can be found here.

The results of our survey presented here can be only regarded as preliminary. It is obvious that impossible to present full list of small mammal's fauna during only three short expeditions. Hilly relief of the area of study makes it rather difficult for researchers to move athwart to the main mountain ridges and valleys what results in the fact that many parts of the Nature Reserve are hardly accessible for regular surveys. As for now, only background-forming species which form a structure of local mammals fauna are may be considered to be well recorded along with some others species characterizing by low population density and sporadic distribution.

Subsequent surveys, to be conducted in different seasons and/or by using different trapping techniques, are needed to obtain full and irrefragable data on the natural variability of fauna of the Nature Reserve and its relations with local faunas of other regions of Southeast Asia.

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## NHỮNG ĐÓNG GÓP CHO NGHIÊN CỨU CÁC LOÀI THÚ NHỎ KHÔNG BAY Ở VƯỜN QUỐC GIA BÙ GIA MẬP (TỈNH BÌNH PHƯỚC, VIỆT NAM)

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### TÓM TẮT

Báo cáo trình bày những kết quả nghiên cứu dã ngoại đầu tiên về các loài thú nhỏ tại Vườn Quốc gia (VQG) Bù Gia Mập. Hệ động vật ở đây phong phú và đa dạng, mang cả đặc điểm của vùng đồng bằng và vùng núi đồi phía Nam Việt Nam. Tại VQG Bù Gia Mập, kết quả nghiên cứu thực địa đã ghi nhận có 19 loài thú nhỏ, 1 loài dơi, 5 loài ăn côn trùng và 13 loài gặm nhấm (chuột, dúi, sóc). Báo cáo này trình bày ngắn gọn những dẫn chứng về sự phân bố, sinh thái và phân loại học của chúng. Đáng chú ý nhất là các loài sống cùng với tre nứa, đó là những loài chuột như *Chiropodomys gliroides* và *Hapalomys delacouri*, thông thường ít gặp nên ít được nghiên cứu. Số lượng của chúng tại VQG Bù Gia Mập khá nhiều, đây có thể là điều kiện thuận lợi để nghiên cứu riêng về các loài này.