# ON THE PRACTICE OF KEEPING AND REARING BAMBOO RATS (RODENTIA, SPALACIDAE, RHIZOMYS) IN VIETNAM

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## 1. INTRODUCTION

So-called bamboo rats are members of the subfamily Rhizomiinae, from the family Spalacidae, a special and not very numerous group of rodents leading a swarming, partly subterranean lifestyle and widely distributed in Indonesia, Malaysia, Thailand, Myanmar, Laos, Vietnam and China. Two genera are represented in Indochina, namely, *Rhizomys* (with three species *R. sinensis* Gray, 1831*, R. pruinosus* Blyth, 1851 and *R. sumatrensis* Raffles*,* 1821) and monotypic *Cannomys* with a single species *C. badius* Hodgson, 1841 [1 - 5]. As for position of actual laws of Vietnam, bamboo rats are legal farming animals and widely breads by local peoples in the country. Due to their considerable large size, only *Rhizomys* are of commercial and, in recent decades, agricultural importance. They are quite large animals (Figure 2), usually weighing up to 1.5 kg (*R. sinensis* and *R. pruinosus*); *R. sumatrensis* reach even over three kg; in nature usually associated with stands of tall bamboo but also with thickets of large grasses, such as *Polypogon sp* and others [6, 7], whose young shoots and roots they usually feed on in nature. The animals live in more or less large family groups on their own by swarming a system of deep (up to 2 m deep), complex multichambered underground burrows, usually located under large clumps. These burrows provide animals by shelter for most of the day and they emerge only at dusk, while they may feed without coming to the surface at all [8].

Although bamboo rats are of some epidemiological importance as hosts and vectors of a wide range of viral infections and mycoses [9 - 13], including those dangerous to humans, historically, these animals are widely used as prey and has been consumed gastronomically almost everywhere in Southeast Asia [3]. Captive breeding has been practiced fairly recently, only several decades ago, and has recently become widespread in both Vietnam [14, 15] and China, where the domestic population has already exceeded 30 million animals [16] and continues to grow. The aim of our work was to investigate the breeding practices of bamboo rats as farm animals in several provinces of Southern and Northern Vietnam, to assess the involvement of natural populations in the captive breeding of these animals and to assess the agricultural potential of these species and potential risks to biodiversity conservation.

## 2. MATERIALS AND METHODS

Two field expeditions in five provinces of Vietnam, two in northern part (Lai Chau and Dien Bien) and three in Southern one (Binh Phuoc, Tay Ninh and Dak Nong), were undertaken to collect material from April-May 2021. We surveyed the following districts: Dien Bien, Tuan Giao, Tua Chua, Muong Cha, Muong Te, Tan Uyen, Than Uyen, Dak R'lap, Dak G'long, Krong No, Bu Dang, Loc Ninh, Chau Thanh and Tan Chau. The practice of bamboo rat breeding in households was quite common in all the study areas. Quite large farms may simply be found in each of

them. The authors visited private farms and interviewed owners about the origin, breeding and husbandry practices, marketing issues and other information related to captive breeding. A total of 6 farms in the Northern provinces and 10 farms in the Southern provinces were visited. The total number of animals was approximately 836 on the northern farms and 1027 on the southern farms.

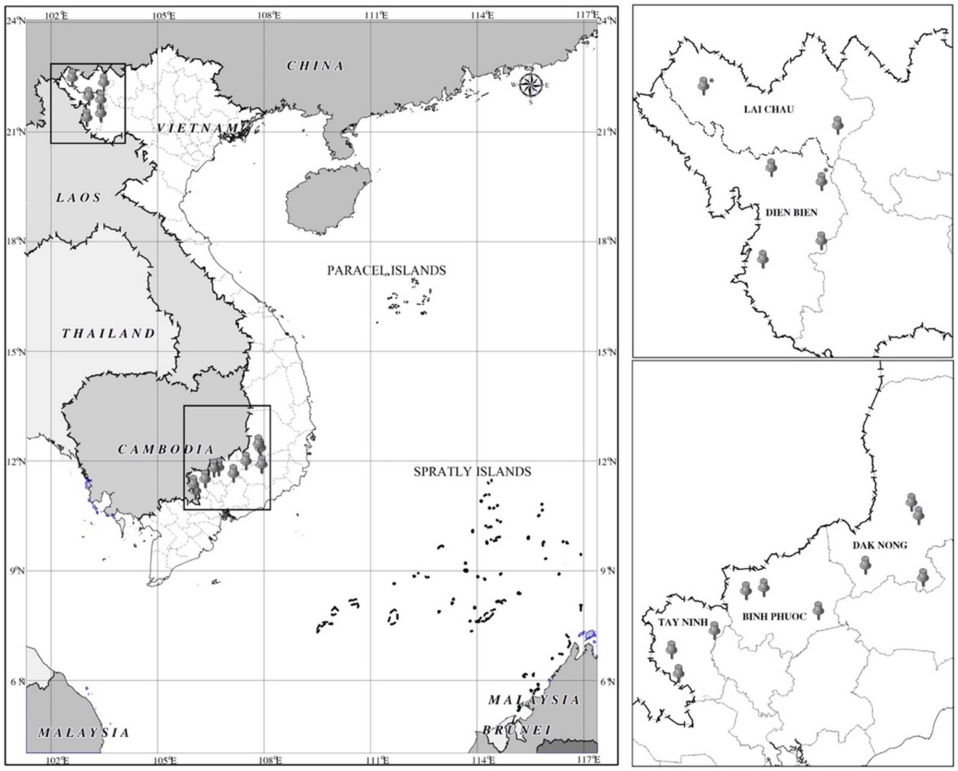


**Figure 1.** Study area, with survey points marked with

**Figure 2.** *R. pruinosus*, typical wild - type colouration, Dien Bien province, (authors' photo)

To summarize the information, the authors developed a questionnaire to be completed by the farm owners, including the following questions:

1. Number of adult males
2. Number of adult females
3. Number of young animals (up to 2 months)
4. Time to start breeding the bamboo rat
5. Origins of breeding stock (founder animals)
6. Using wild-caught animals for breeding
7. Original size of the breeding population
8. The usage additional new animals brought into breeding process later
9. The presence and number of sick animals on the farm
10. Animal deaths and number of fallen animals
11. Total number of litters obtained in the last year
12. Number of calves in a litter
13. Average number of litters received per year
14. Breeding and housing method (paired/single)
15. The breeding book keep (yes/no)
16. Normal age of onset of breeding in pairs
17. Deaths of newborns and youngsters (less than 300 g)
18. Type of feeding and feed used
19. Use of veterinary support on the farm
20. Cost of keeping animals (average per year)
21. Final use of the resulting livestock (for meat or as breeding stock)
22. Approximate level of income received to the farm per year

The data obtained from different households are summarized in Table 1. Below, we will try to summarize the information and draw some conclusions about the maintenance practices of bamboo rats in Vietnam.

The authors also carried out visual inspection and photographing of the animals (some of the individuals), taking wool from the rump or back for further genotyping and comparative phylogenetic analysis of natural and artificially bred populations. However, this material is not discussed in this article; here, we will try to focus our attention on issues of breeding and keeping animals in captivity.

## 3. RESULTS AND DISCUSSION

### 3.1. General observations on animal husbandry

The practice of breeding bamboo rats as farm animals is widespread almost everywhere in Vietnam as well as in China and several other Southeast Asian countries where natural conditions and the availability of inexpensive feed allow the keeping of these animals [8, 11, 14, 15]. Both small and quite large farms with livestock ranging from a dozen to several hundred animals are found in each of the surveyed areas. Not all of the owners were willing to allow us to enter the farms and provide information on animal welfare, but we did manage to survey and interview 16 farm owners and collect a fairly representative sample.

**Table 1.** Summary data on keeping and breeding of bamboo rats in different households

| № | Farms province | Number of adult males | Number of adult females | Number of young | Year of breeding | Source of primary stock (province) | Use of animals from nature (yes/no) | Number of primary stock | Blood supply (yes/no) | Number of sick animals (per year) | Number of animals died (last year) | Number of litters (for the last year) | Number of calves in the litter | Number of births per year | Sale price for meat (thousand VND/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Binh Phuoc | 5 | 10 | - | 2017 | Nghe An | N | 10 | N | 0 | - | 10 | 2 | 3 | - |
| 2 | Binh Phuoc | 10 | 30 | 40 | 2011 | Dak Nong | N | 30 | Y | 0 | 2 | 30 | 2-3 | 3 | 700-800 |
| 3 | Binh Phuoc | 30 | 30 | 50 | 2014 | Dak Nong | N | 40 | N | 0 | 3 | 25 | 2 | 3 | 700 |
| 4 | Tay Ninh | 3 | 10 | - | 2020 | Long An | N | 20 | N | 7 | 7 | - | - | - | - |
| 5 | Tay Ninh | 3 | 7 | 1 | 2019 | - | Y | 5 | Y | 2 | 2 | 7 | 2 | 3 | 800 |
| 6 | Tay Ninh | 20 | 40 | 60 | 2019 | Dak Lak | N | - | - | 0 | 0 | - | - | - | - |
| 7 | Dak Nong | 180 | 200 | 40 | 2011 | - | Y | 30 | Y | 0 | 0 | 50 | 2 | 3 | 500 |
| 8 | Dak Nong | 23 | 41 | 38 | 2020 | Thanh Hoa | N | 60 | N | 9 | 9 | 41 | 2 | 3 | - |
| 9 | Dak Nong | 20 | 60 | 40 | 2017 | Dak Lak | Y | 30 | N | 0 | 0 | 40 | 2 | 3 | 600 |
| 10 | Dak Nong | 1 | 6 | 29 | 2019 | Dak Nong | Y | 20 | Y | 50 | 50 | - | 2 | 3 | 600 |
| 11 | Dien Bien | 18 | 50 | 52 | 2020 | Son La | Y | 20 | Y | 10 | 10 | 15 | 2 | 3 | - |
| 12 | Dien Bien | 5 | 15 | 10 | 2020 | - | Y | 20 | Y | 10 | 10 | 5 | 2 | 3 | - |
| 13 | Dien Bien | 20 | 50 | 80 | 2019 | Yen Bai | N | 65 | - | 20 | 10 | 40 | 2 | - | - |
| 14 | Lai Chau | 120 | 180 | 200 | 2019 | Ha Giang | N | 30 | Y | 5 | 4 | 80 | 2 | 3 | 800 |
| 15 | Lai Chau | 2 | 4 | 0 | 2020 | Tuyen Quang | N | 20 | N | 15 | 14 | - | 2 | - | - |
| 16 | Lai Chau | 8 | 10 | 12 | 2020 | Hoa Binh | N | 50 | N | 32 | 32 | 5 | 2 | 3 | - |

| Breeding price in couples | Revenue million per year | Cost of breeding thousand a year | Veterinary examination | Keeping in couples / not in couples | Permanent couples | Not permanent couples | Age at mating (months) | Number of dead of young animals (below 300 g in the last year) | Feed used | Colored individuals in litters |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.5- 3.5 | 30 | - | N | Y | Y | Y | 9 | 0 | Bamboo, Sugarcane, Corn | Y |
| 1.5 | 50 | 150 | N | Y | N | Y | - | 2 | Bamboo, Sugarcane, Corn, Bran | Y |
| 1.5 | 100 | 200 | N | Y | Y | - | 9 | 4 | Bamboo, Sugarcane, Corn, Cane | Y |
| 1.5 | - | - | N | - | - | - | - | 0 | Bamboo, Sugarcane, Corn, Cane | Y |
| 1.5 | - | - | N | Y | Y | N | - | 0 | Bamboo, Sugarcane, Corn | Y |
| 1.5 | 10 | - | N | - | - | - | - | 0 | Bamboo, Corn | Y |
| 1.4 | - | - | N | Y | Y | Y | 9 | 1 | Bamboo, Corn | Y |
| - | - | - | N | Y | Y | N | 9 | 0 | Bamboo, Corn | Y |
| 1.2 | 120 | - | N | Y | Y | N | - |  | Bamboo, Sugarcane, Corn | Y |
| 1.0 | - | - | N | Y | N | Y | - | 0 | Bamboo, Sugarcane, Corn | Y |
| 0.8 | 30 | 120 | N | Y | Y | Y | 9 | 3 | Rice and Bamboo powder | Y |
| - | - | - | N | Y | Y | Y | - | 2 | Bamboo, Corn | Y |
|  |  |  | N | Y | Y | Y | - | 0 | Bamboo, Corn | Y |
| 1.3 | - | - | N | Y | Y | Y | - | 0 | Bamboo, Corn | Y |
| - | - | - | N | - | - | - | - | - | Bamboo, Corn | Y |
| - | - | - | N | Y | Y | N | - | 0 | Bamboo, Corn | Y |

***Note:*** *Y-yes; N-no.*

Among about of 1800 animals, we were able to investigate on farms, only two out of four species of bamboo rats distributed in the region were found, namely, *R. pruinosus* and *R. sumatrensis*. The latter has been found only in the Northern provinces. We did not find any individuals that could be morphologically diagnosed as *R. sinensis*, a species considered widespread in Northern Indochina in households, either in the south or in the north of the country. *R. sinensis* distributed through almost all provinces of Northern Vietnam as well as in parts of Northern Myanmar, close to border of China [4]. It is, thus, assumed to be broadly sympatric with *R. pruinosus* in Northern Vietnam. According to Chinese [6, 8, 17], the sympatry zone extends considerably wider and covers almost entirely the Chinese provinces of Yunnan, Guangxi, Guizhou, Guangdong, Fujian and Southern Hunan and Jiangxi. It is noted that in the sympatric zone, *R. sinensis* is predominantly found above 1000 m a.s.l., while *R. pruinosus* is usually found below 1000 m a.s.l. [3, 6]. The reason why such selectivity in the space use exist between two ecologically similar sympatric species is not entirely clear. While the total population of *R. pruinosus* represents over 95% of the animals surveyed, cases of *R. sumatrensis* have been recorded but are very rare; it has only been kept on two farms in very small numbers or only single individuals registered, which has prevented from any significant statistics being obtained for this species. Therefore, the data presented below relate mainly to *R. pruinosus.*

We found variation in the colouration of the fur of the animals. In addition to the 'wild type', which may explain as dark gray grizzled pattern common for most animals, both for the North and South populations, there were variants of more or less light colors, brown and even red-yellow patterns, but the proportion of such individuals never exceeded 20%. Some individuals with visually differing colouration were recorded even within one brood, suggesting a split due to genes of colouration interactions. In two localities (22°29'7.104"N - 102°37'7.902"E and 21°58'13.92"N - 103°4'50.746"E, points marked with * in Figure 1), partial (large white spots) or complete albino areas were observed on animals' pelts.

Although the climate differs greatly between the Northern (Dien Bien and Lai Chau) and Southern (Binh Phuoc, Tay Ninh and Dak Nong) provinces, the mode animals are kept is quite universal. They are usually kept in open cages made of bricks or tiles approximately half a metre high and 0.25 - 0.8 $m^2$. One cage usually contains either an adult male or a pair of females (usually from the same litter), a female with litter, or a group of 3-6 young animals separated from their mothers, depending on their age. The area required per adult (over 1 kg in weight) animal is usually 0.2 - 0.25 $m^2$. The floor of the cages is usually earthen or concrete, usually without bedding. In the Northern provinces, bedding is sometimes used only during the winter period when temperatures fall below +10°C and the animals actually suffer in cold temperatures. Rice straw and/or sugar cane leaf litter is also frequently used for nesting, and a small open wooden or plastic box of about 30 cm x 30 cm is placed in the cage for nest. In rare cases, when animals are keeping in large groups (up to two dozen adults) in very large cages (up to 10 $m^2$), old car tires can be used

as individual shelters for animals, which animals readily use. The cages are placed under a roof in a wind-protected, unlit room. If there are large windows, cages should additionally be covered with a thick curtain, which creates semidarkness or complete darkness favored for these mammals. Owners estimate that bright light frightens and makes the animals nervous, but they feel calmer without it, limiting excessive light. Cages are also carefully guarded against draughts and dampness, as animals easily catch cold in damp conditions. In Southern provinces, during very hot weather (temperature over 40°C), animals also feel badly from overheating up to heat stroke. In such case, room must be provided by active ventilation and a special cover should be constructed over the building to prevent the roof from being heated by direct sun lights. The room should be as quiet as possible and no other pets or people allowed inside, as animals, especially pregnant and lactating females, are rather timid. Animals quickly become accustomed to their owners and respond calmly and good-naturedly.

### 3.2. Keeping and feeding practices

It should be specially noted that unlike bamboo rats captured in the wild, which are always very aggressive and even dangerous, they have very powerful jaws and sharp teeth and can inflict severe bites. However, if treated well and not frightened, the animals are easily tame in captivity, even those who born in the wild. As the author's own experience (BAE) has shown, captive - born animals are not aggressive from the very beginning and behave like pets, cats, nutria or rabbits. They may be petted, handled, interact well with humans and even learn some training. Thus, the simplicity and practicability of the treatment depends in the first place on the practice of the owner; if not to frighten or make the animals angry, their treatment is not a problem and completely non danger. The authors are aware of cases of keeping bamboo rats as pets in Vietnam for purely aesthetic purposes.

In the Northern provinces, all farms without any exception use bamboo shoots and maize (usually in the form of unthreshed cobs), the most common fodder crops in the region, for animal feed. Dry and rigid cob stalks and sometimes stumps of single-timbered bamboo stalks are also used as material for animals to sharpen their rapidly growing teeth. Such materials should always be present in the diet. In the Southern provinces, seven out of ten farms in addition to bamboo and maize also use sugarcane (stalks), and in two cases, also use grass and pelleted bran. It must be stated that according to the observations of the author (BAE), who kept a pair of animals for about two years and carried out a special study of dietary preferences of *Rhizomys pruinosus*, the mention of using grass as food looks doubtful. According to our practice, the animals defiantly ignore any green leafy and juicy plant parts (lettuce, cabbage, turnip, radish and carrot tops, watermelon and citrus peels, soybean shoots), preferring root crops, rigid stems, sometimes corn and hard fruits like pumpkin, unripe pear or guava. According to our practice, sugarcane and boiled corn cobs are the favorite foods of these rodents.

On all farms, the amount of feed provided to animals is usually not strictly rationed, and only the amount of uneaten leftovers is usually monitored. Due to the nature of the feed, its general dryness and lack of susceptibility to rapid rotting, regular removal of feed residues from cages is usually not necessary. Water in liquid form is usually not given to the animals; as confirmed by many days of camera observations made by the authors, bamboo rats drink reluctantly, obtaining the necessary water biochemically from the feed. During two years of observations and hundreds of hours of continuous video studies (both day and night), the author (BAE) did not observe animals drinking water that was provided to them freely. Supplementing additional succulent fruits and/or root vegetables (apples, plums, carrots, radishes, etc., which were fairly easily eaten) to the diet resulted in only dilution of stools. Thus, bamboo rats seem to have no need for liquid water at all when kept. According to interviews, a bowl of water is sometimes put by some owners to pregnant females before they give birth, but there is no evidence that water is actually used by the animals, even in such a kind special condition.

At all farms, animal droppings are removed from the cage as they accumulate. The normal consistency of bamboo rat faeces are fairly solid and semidry elongated lumps similar in shape and size to peanuts (1.5 - 2.0 x 0.5 - 0.6 cm), the color of the lumps depends on the type of feed eaten (usually creamy or grayish - yellowish, with carrot feeding it may be orange). It usually does not flake, does not adhere to the floor of the cage or the coat of the animal, has a moderate and not too unpleasant smell, and can be easily removed with a dustpan and broom. For all the obvious potential usefulness of bamboo rat dung as a fertilizer, only two farms in the south of the country have treat it to be of particular use. In one case, it is utilized in the vegetable garden; in the other case, it is used as the equivalent of granular fertilizer for growing orchids. In the latter case, the great potential of this natural product for floriculture applications should be specifically noted. The natural, organic, complex nature of the fertilizer and its natural granularity are easy to dose and ideal for use as an organic fertilizer in floriculture. This potential is still far from being estimated and exploited, yet many farms produce up to tens of kilograms of this valuable fertilizer every day, which can and should find commercial and economic application.

### 3.3. Breeding practice

According to our data, all six farms in the North and half (five out of ten) in the South started breeding bamboo rats only 2-3 years ago, which means that most of the captive populations are very young, not exceeding 3-4 generations reliably. Only two farms in Binh Phuoc province have been breeding bamboo rats for 7 or even 10 years. According to interviews and observations we made, bamboo rats have become fashionable in Vietnam in recent years, and new farms appear frequently, but for the reasons mentioned below, they usually do not last more than 3 years. Bamboo rat farming is easy to start due to it is easy to obtain a starting stock of founders. Farm organization requires a license, which is also fairly easy to obtain in almost any area of the country. Fifteen of the 16 farms we visited have such a license and are running

their business quite officially. The purpose of the license is to confirm that the animals kept on the farm and sold on the market are of cultural origin and not illegally caught in the wild. The introduction of the licensing of this type of agricultural activity is linked to nature conservation and the tightening of environmental legislation to protect rare species. Although bamboo rats (none of the species found here) are currently recognized as a rare or endangered species in Vietnam, species of the genus *Rhizomys* historically and currently underwent heavy pressure as hunting prey almost everywhere in Indochina. Officially, hunting them in the wild in Vietnam is now banned. Nevertheless, according to questionnaire data for 2 of 6 farms in Northern provinces and 4 of 10 farms in the south of the country, at least part of the primary population of founder animals comes directly from natural populations (Table 1). Moreover, this applies to some of the newly established farms as well as to farms with a long track record. According to owners' accounts, the number of these mammals is not high everywhere; few owners are deliberately trying to increase their number, as they are not easy to handle (due to their wildness and aggressiveness), they are smaller than domestic ones, grow not so well and, as a rule, are less fertile in the first generation. However, wild animals are sometimes used as stock at least in Tay Ninh, Dak Nong and Dien Bien provinces. This practice should be recognized as potentially dangerous in terms of protection and conservation of natural biodiversity, as it leads to artificial hybridization of geographically distant populations. The introduction into farms of hybrid individuals who occasionally escape from captivity and are usually able to live and breed normally in the wild, carries significant risks of diluting the natural genetic background of natural populations through accidental introduction. This risk is further complicated by the fact that captive breeding stock is widely exchanged in Vietnam and sold for breeding in other, often remote, provinces. Therefore, among the farms we surveyed, only 2 out of 16 breeding stocks were originally obtained in the same province; in another two cases, the origin of the founders was not quite clear, but in 12 out of 16 farms (75%), the owners reliably obtained animals from other provinces, among which in addition to those we surveyed also mentioned Nghe An, Thanh Hoa, Dak Lak, Hoa Binh, Son La, Yen Bai and Ha Giang. With such a wide exchange, one would expect that the current population of *R. pruinosus* held in captivity in Vietnam may represent a single genetic pool of hybrid origin individuals who could potentially and probably actually reintroduce into natural populations. How far this process has progressed may be shown by genetic analysis, which the authors intend to carry out soon on the basis of the material they have collected.

In breeding practice, the starting population of founders for different farms ranged from 5 to 65 individuals (4 - 60 pairs). Usually, the number of males taken for breeding is a multiple of the number of females, with 4 to 10 females per male on different farms. However, as breeding progresses, the sexes distribution on farms evens out, and after a couple of years, there are no more than three females per male (Table 1) may be observed. This is caused by the convenience of pairing because female bamboo rats are very choosy in mate selection, and for successful breeding, it is convenient to keep

several "candidate husbands" on the farm to choose from. Once a female has made her choice and mated, the animals are almost always kept as a pair until the offspring are born. In 11 out of the 16 farms surveyed, a more or less systematic pedigree bookkeeping is in place so that the origin and kinship of the animals can usually be traced back to at least the third generation. Such an approach could be considered quite promising, but the overall fecundity of captive animals is low and everywhere is approximately 2 calves per litter. Although we have seen broods of 3 or even 4 calves in captivity, large broods are very rare. Interestingly, broods of 3 pups are not very rare in the wild in *Rhizomys pruinosus* [3, 5]. What this reduction in litter size in captive management is not entirely clear, possibly because the total number of litters per year in 12 of the 16 farms where relevant data were obtained is 3 per year. In the wild, individuals usually do not produce more than two litters [3], our own unpublished observations), so it is possible that the increased number of births in females is physiologically compensated by the decreased litter size.

The survival rate of young stock is generally very high everywhere, with the proportion of sucker death per year per farm being very low and usually not exceeding 3-5%. In general, mortality from infectious diseases in bamboo rats is quite low and, with one exception, nowhere exceeds a dozen individuals per farm per year, often even less, and is substantially lower in the Southern provinces than in the Northern ones (Table 1). This seems to be mainly due to the climate, as animals in the north are noticeably more likely catch cold and sometimes express symptoms of respiratory infections (sneezing, nasal discharge, mucous membrane inflammation), from which, however, they usually successfully recover. The only case we documented in Dak Nong province, when approximately fifty animals (more than 90% of the flock) died in less than one year, it was clearly happened due to any epidemy of an unspecified nature. In general, it should be noted that the veterinary medicine of this species is still undeveloped, and farms in Vietnam are still out of veterinary monitoring; not a single farm has stated that they routinely perform veterinary checkups on the animals. Given the rapid development of this particular branch of livestock breeding in the country, the development of veterinary care for this species of animals should be given the closest attention.

### 3.4. Socioeconomics of bamboo rat breeding

As noted above, the breeding of bamboo rats in households has become very popular in recent years in Vietnam and neighboring countries [16, 18]. This is mainly due to the potential high profitability of this livestock industry, which attracts people (especially in the country) in search of additional and sometimes even main income. Our surveys show that a farm, even a relatively small one, has a direct annual income of 30 - 50 million VND, up to 100 - 120 million VND for large ones (Table 1). These are very substantial sums, exceeding the average income of peasant farms in most provinces of Vietnam. This point, together with the fact that the animals are not demand too many labor, consumables and special conditions for care, has made the breeding of this species an important socioeconomic factor in

increasing the people income in the country. Bamboo rat meat is considered a delicacy and has traditionally been in high value in restaurants in Vietnam and neighboring countries. Its price is currently 500 000 - 800 000 VND/kg, depending on the region. However, a survey showed that most farms are affected by marketing problems and some cultural peculiarities related to the consumption of bamboo rat meat in Vietnam. For example, in many areas, the indicated prices are too high for the local population, which considerably limits local demand. In addition, in some regions and among some ethnic groups in Vietnam, consumption bamboo rat meat is prohibited during certain seasons due to religious and cultural traditions, depending on days of the week or phases of the lunar cycle. On the other hand, among the Kinh people (ethnic majority) cultural tradition say that the exactly meat of wild animals is particularly valuable (despite their smaller size and overall fatness). As a result, illegally provided wild animals meat is up to twice as expensive (sometimes more than one million VND per kilo), species in the wild are subjected to overhunting pressure, and farm products may not be sold. All mentioned above can (and in some cases really does) make farming for gastronomical meat economically not effective. This is the reason for the short duration of bamboo rat farming practices on most farms that we have found. Due to fashion, many farms are founded, but most of them come to bankruptcy or cease operations within three to four years due to economic inefficiency. Only the breeding farms are in a special position, among which the most profitable ones are found. The fashion for breeding bamboo rats generates a great demand and good prices for breeding stock. The prices of breeding animals range from 800 000 VND to over 3 million VND, usually approximately 1.5 million, depending on the region (Table 1). The animals are usually sold in pairs. In the situation of current fashion, this breeding focused approach brings even more profit than direct farming for meat. Some farms even deliberately focused to this economic model, not slaughtering animals at all but only matching and selling breeding pairs.

## 4. CONCLUSION

In summary, the research we have carried out highlights the domestication and agricultural use as well as the sustainable management and protection of small mammal biodiversity in Vietnam. The data presented here are certainly only preliminary and are served to attract attention for further research into the practice of breeding bamboo rats as farm animals in an economic, social, veterinary and conservation context.

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## SUMMARY

Bamboo rats are members of the subfamily Rhizomiinae, of the family Spalacidae. These animals are widely distributed in Indonesia, Malaysia, Thailand, Myanmar, Laos, Vietnam and China. Due to their larger size compared to other rodents, in recent years they have been bred in captivity and have brought a certain economic value. With the survey results of 16 bamboo rat farms in 2 Northern provinces and 3 Southern ones, a preliminary overview of the current situation with bamboo rats production in Vietnam presented. More than 1000 individuals were surveyed and only two species of bamboo rats have been found in captivity, exactly *R. pruinosus* and *R. sumatrensis*. *R. sinensis* was not recorded, although this species quite common in the north. Bamboo rats are usually kept in cages made of ceramic bricks about 50 cm high and 0.25 - 0.8 m wide. Each cage usually contains 1 adult male or 1 female, sometimes both male and female are seen in the case with juveniles in the same flock. The survival rate of young bamboo rats is very high, only 3-5% of the total herd dies before reaching the weight of 300g. The source of food depends on the locality, but the main food is bamboo, sugarcane, cane or bran. The average annual income may vary from 30-50 for small farms to 100-120 million VND for large farms.

***Keywords:*** *Bamboo rats, Rhizomiinae, R. pruinosus, R. sumatrensis, Bamboo rat keeping, dúi, chăn nuôi dúi.*

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