

## 1. Trapping rodents

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### 1.1. Trapping techniques

Different methods have been used for generations for catching rodents showing the great ingenuity of rural populations and their knowledge of animal behavior. Traditional techniques are quite similar in different countries. Recently the commercialization of trapping devices tends to generalize the use of a few techniques to the detriment of ancestral practices.

A variety of traps have been created to catch rodents. The most common are:

- **Live-traps:** cage-traps (usually locally made, but also commercialized ones such as Ugglan traps), box-traps (like Sherman, Tomahawk, Longworth) and pitfall traps.
- **Kill-traps:** snap traps, snares.

These different traps vary in size and may consequently be intended to trap different sized animals. The smallest rodents and insectivores, such as *Mus* sp. and *Crocidura* sp., may escape from the cage-traps (depending on the size of the mesh fence). Box-traps have the advantage of protecting captured animals against rain and other animals, but they may repel some species.

Locally-made traps, usually cage-traps, may be chosen because of their low cost (compared with commercial ones) and because of their availability in remote areas. Some live-traps can fold flat to be easily carried and stored. Others allow multiple captures (Fig. 3). Fences are sometime used to drive the animals into the trap and help to increase the trapping success.

Live-trapping is required when animals must be released (demographic studies) and when specific tissue samplings or blood are required (medical studies). Also, kill-traps may damage animals and prevent certain analyses. For instance, snap traps usually destroy skulls and prevent any measurements for morphometrics.

Kill-traps are more effective in catching many species. They have the advantage of being cheap and small. They are often chosen by hunters who use large numbers of traps every night. There is a large variety of traps made by local people, using bamboo, wood and motorcycle tubes (Fig. 2 and 4). The trapping must be conducted cautiously. One should wear protective equipment (mask and gloves) to avoid contamination with blood or excretions from the animal. When required, animals should be killed rapidly after their catch.



Figure 2: Hunter with traditional trap in Phrae, Thailand (Photo: Herbreteau V.)



Figure 3: A multiple-capture cage-trap in Cambodia (Photo: Herbreteau V.)



Figure 4: Preparation of collars mounted on a wooden stick, in Kalasin province, Thailand (Photo: Herbreteau V.)

The traps should be placed so that the captured animals are protected from changing weather conditions and predators. Adding a shelter made with vegetation on the trap can help protecting captured animals.

The choice of baits to attract rodents into the trap usually generates great debates among scientists and local people. Different baits can be used in a single trap to be more appealing. Each hunter may recommend their own recipe but differences in trapping success are not so obvious. Nevertheless some bait is advantageous in that it is long lasting and easily cleaned. Bait attracting ants should be avoided.

There are other techniques for catching rodents yet some of them are more or less recommended. Digging burrows can be a solution when the species is rarely caught using traps. However animals may escape or they can bite easily. Glue traps and foothold traps are not recommended since they can hurt animals and because they can capture non-target species.

### Recommendations:

- *When handling traps, wear thick rubber gloves. Keep in the car some gloves boxes, soap, disinfectant and water to wash hands whenever required.*
- *Transport the captured animals in cars, outside of the passenger section. A pickup car may be preferred so that the cages are placed at the rear of the car. This area should be ventilated by opening the windows if a hardtop is present.*
- **Protect animals from the sun and the heat.** *Do not pile cages up.*
- *Carefully wash and disinfect the car, once the traps have been unloaded.*

## 1.2. Trapping protocol

Trapping rodents for medical or ecological researches requires a trapping protocol to be defined. The description of this protocol is necessary to evaluate the success and the representativeness of the trapping. This protocol should be set up according to the objectives of the study. A certain minimum number of animals are generally required to assess the prevalence of pathogens or to investigate population genetics and morphometrics. However, it is very important to realize that rodent populations are seasonally heterogeneous in respect of age structure and breeding status, and consequently for various infection parameters that depend on the functional group of the host individual. Reliable comparisons can be made only between same functional groups. Multiannual differences in infection parameters may depend of differences in age structure, not on differences between comparable units, functional groups.

The trapping system and intensity should be similar at each sampling site in order to avoid biases when comparing the rodent communities between habitats and localities.

When targeting the diversity of rodent, the trapping protocol should take into account the landscape features. One simple way is to **categorize the landscape** into main categories (stratified sampling) and then to manage equal trapping pressures in each of them. In South-East Asia, we have distinguished four main landscape categories, further divided in sub-units, for the CERoPath trapping protocol. This may be adapted in other regions:

- 1- Built-up areas: villages and isolated houses;
- 2- Flood plains (humid or irrigated areas): alternating paddy cultivation and pasture in the rainfall farming systems or more complex rotations including legumes (soy bean, mung bean, peanut) and cash crops (paddy, vegetables, maize) in irrigated systems;
- 3- Dry lands: including annual (maize, dry rice), multi annual (cassava, grassland, pineapple), perennial (orchards and young bamboo, teak, young plantations of rubbers and eucalyptus), cultivated areas and fallow lands covered by grasses and shrubs;
- 4- Wooded areas: including forests (deciduous dipterocarp, mixed deciduous and evergreen forest), and mature plantations (bamboo, teak, rubber tree, eucalyptus...).

This typology is very simple from an ecological point of view but it allows a description of the major rodent habitats.

The organization of the trapping using several **lines of traps** is generally used to have a clear and reproducible protocol with a calculable trapping pressure. We recommend composing each line with 10 traps, placed every 5-10 meters. These lines should be retained for 3-5 nights at the same locality. We also recommend sampling each of the landscape categories using several trap-lines (10 to 20 lines). The duration of the setting of the trap-lines is a compromise between too much mobility (where the rodents do not have the opportunity to encounter the traps and to get used to them) and too much stability (where the majority of animals are removed from the area by the trapping, leading to a decrease in the trapping success over time). This trapping system will hopefully provide a good representation of the rodent diversity and community structures and take into account the variation within these landscape categories. However, we acknowledge that there are many other methods, and we recommend adopting this method according to the environment and the aim of the study.

To be accepted by local people (and in order to limit trap removal or displacement), the owner of the field should be contacted before setting the traps. In order to facilitate the daily control and the trap recovery, each trap should be marked by a piece of surveyor's flagging attached at proximity (i.e. 1-2 m) in the vegetation (being aware that it may increase the danger of traps to be stolen). A unique code is attributed to each trap line. Trap lines are localized using their centre with the geographical coordinates given by a GPS receiver.

**Local hunters** can help with the acquisition of additional animals. This has proven efficient in South-East Asia, where rats are often hunted for food. Hunters have a great knowledge of rat ecology and they can catch many animals each night. Farmers are also helpful because they notice the presence and the abundance of rats by observing their tracks and the state of their holes in the edge of fields. Usually farmers can inform if rodents are present or not in their field. However they may not know about small-size rodents. They also may provide a negative answer if they are against any intrusion in their fields.

Hunters should be informed of the objectives of the study. Animals are preferably needed alive, with a little information about the place of capture (land use, and location). The GPS location can be later taken near to the place of capture. Hunters should not put several animals together in a single cage or a container. They should store animals away from their living place. Hunters should not keep living animals too long and inform the surveyor as soon as they are caught.

If a species cannot be caught alive, killed animals should be processed rapidly or placed into a fridge, preferably in a plastic bag to avoid any contact with blood.

### 1.3. Recording trapping data

First, traps containing rodents should be carefully labeled to indicate the place of capture (with an identifying code), the date of capture (if the animal is kept alive) and landscape information. The label should be out of reach of the animal to prevent its destruction (so avoid putting it directly on the cage).

The place of capture should be precisely described and recorded for each individual and each trap-line. We provide in Appendix 1 a model of the data sheet to be filled during the fieldwork for this purpose. It should first indicate the identifying code of the sampling site and its **geographic coordinates**. This is required for all the analyses that are later done on animals: their description in a collection, the spatial analysis of their habitat, the study of their dynamics, but also in order to later come back to the same place for further samplings. A GPS receiver is the best instrument to use in the field to record the position of the capture place.

#### Definitions

A **GPS** (Global Positioning System) is an accurate worldwide navigational and surveying facility based on the reception of signals from an array of orbiting satellites.

A GPS receiver calculates its position by precisely timing the signals sent by these GPS satellites. Accuracy of a basic GPS receiver is about 10 meters. Some other systems, such as differential GPS have a higher accuracy (about 1 meter or less), by integrating external information into the calculation process. Some GPS receivers are integrated into a pocket computer, which allows bringing geographic maps, aerial pictures and satellite images in the field to better visualize the surroundings and the landscape. They can also include a GIS (Geographic Information System) software to directly record field observations into a spatial database (Fig. 5).



Figure 5: GPS receiver with integrated GIS software (Photo: Herbreteau V.)

#### Recommendations:

- Always bring a GPS receiver to the field. Use the WGS84 datum (same as in Google Earth).
- Indicate, together with the GPS coordinates, the administrative location (country, province, district, sub-district, village) in order to help reading and sorting data.

The accuracy of the positioning should be indicated together with the position on the trapping data sheet since it can vary widely with the system used. When a GPS receiver is not available, other but less accurate solutions may be used. For instance, the sampling point can be visually identified from Google Earth/Map images and then associated with geographic coordinates. If the precise origin of the animal is unknown (for example, animals brought by hunters, or found in a market), we recommend to record the geographic coordinates of the place where the animals were collected and to give the rough distance to the place of capture. One can use the following codification, based on decimal logarithm (base 10 logarithm):

Code =  $\log_{10}$  (distance), i.e. "0" = 1 m, "1" = 10 m "2" = 100 m "3" = 1 km "4" = 10 km "5" = 100 km.

**The surroundings** of each sampling site should be precisely described. We propose in Appendix 1 a three-level classification: "low resolution" for the main landscape categories (for example: built-up / flood plains / dry lands / wooded areas), "medium resolution" for a more detailed category (for example: village, rice field, corn field, dry evergreen) and "high resolution" to give more precision (harvested, flooded, etc.). Some information about the distances to houses, roads, rivers, etc, as well as about the human presence can be recorded. Basic weather information should be added, especially if weather is exceptional and disturbing animal distribution and trapping.

The last table in the data sheet allows records of the animals captured at the given site every day to be made, and to keep track of the number of traps, used, lost and replaced, in order to calculate the trapping pressure.

We finally recommend taking four photographs in the direction of the cardinal's points to help visualizing the landscape description recorded in the data sheet.

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