

Bat rescue and rehabilitation for bat conservation, research and monitoring: guidelines

Prepared by members of the IWG on bat rescue and rehabilitation of the Advisory Committee to the EUROBATS Agreement

DRAFT

*version
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Introduction

After the first meeting of the intersessional working group on bat rescue and rehabilitation (BatReR IWG) it became clear that most of the Parties and non-party Range States of the EUROBATS Agreement deal with BatReR issues. The answers to the questionnaire provided by bat experts from the very different regions had demonstrated that bat rescue and rehabilitation concern a much broader circle of issues than just caring for single bats.

It became clear that the rescuers often deal with a significant number of healthy bats, that makes the issues of rescue and rehabilitation a matter of conservation. Bat rehabilitation centres often collect (or can collect) data and material which are important for scientific research such as species distribution and disease monitoring as well as for practical conservation like protection and preventing demolishing of bat roosts, especially in urban areas. It also became clear that in some cases data and material collected by bat rescuers and rehabilitators can not be collected in any other way. As well, it became obvious that bat rescues and rehabilitation to a great extent covers issues of public education.

In 2014, the 7th Meeting of EUROBATS Parties adopted the Resolution 7.10. (see [Annex 2](#)) which urges Parties and non-party Range States to encourage building bat rescue and rehabilitation at the national level and developing the cooperation between bat rehabilitators and bat scientists. In this resolution the Meeting of Parties requested the Advisory Committee of the Agreement to develop guidelines for bat rehabilitators and develop a system for collecting information for international cooperation.

The main goal of the guidelines is to review the basic principles of BatReR, best practice and examples of how BatReR can contribute to bat conservation, research and monitoring, as well as facilitating exchange of ideas and experience by bat workers dealing with these issues.

1. We briefly review the BatReR situation across Europe and neighbouring states (based on answers to questionnaires and publications of Parties and non-party Range States).
2. We provide a general review of basics for BatReR, including communication with public finders, transporting, keeping and releasing individual bats and colonies. (The special issues of veterinary treatment are out of the tasks of the guidelines; they may be found in the corresponding manuals; see section 5).
3. We provide guidelines for how BatReR can be used for bat research, conservation and public education, in particular, good practice where bats are used in public education and events.
4. We consider the potential health risks for bat rehabilitators.
5. We also provide the A list of references for further reading is provided for those who would like to get more detailed information on bat rehabilitation.
6. To facilitate connections between experts and international cooperation, we give. The list of web-links to the corresponding national web-sites or pages is given.

The guidelines are supplemented by the corresponding case studies provided by experts from the EUROBATS Parties and non-party Range States.

1. Review of bat rescue and rehabilitation in Europe

In 2014, the questionnaire was prepared and circulated among the EUROBATS Parties and Range States (Annex 1). The aim of the questionnaire was to collect the information and, correspondingly, to estimate the significance of bat rescue and rehabilitation throughout Europe, particularly in relation to bat conservation, public education and data collection. The respondents were also asked to give references to manuals or guidelines available in national languages and to provide contacts of bat rehabilitation institutions and / or persons. Later, in 2018, national experts were asked to update the information and to give details about national legislation concerning BatReR in their countries. In total, answers from 36 EUROBATS Parties and Range States were received: Albania, Algeria, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, France, Georgia, Germany, Hungary, Ireland, Italy, Latvia, Luxembourg, Macedonia, Moldova, Montenegro, the Netherlands, Norway, Poland, Portugal (Mainland, Madeira, Azores), Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, and the United Kingdom. Additionally, we analysed national reports of the EUROBATS Parties and Range States, scientific publications and spoke individually to bat experts from the Agreement range.

1.1. Countries dealing with bat rescue and rehabilitations

As for 2018, most of EUROBATS States dealt with bat rehabilitation (fig. 1.1): 30 of 36. The development of bat rescue and rehabilitation centres varied from country to country. Some countries, according to answers, had many centres; some, one or few. In some countries the rehabilitation centres had funding support from corresponding ministries, NGOs etc; in others, the rehabilitation was carried out only with private resources by volunteers.



Fig. 1.1. Countries dealing with bat rescue and rehabilitation, based on questionnaires and interviewing of countries' bat workers (orange, yes; grey, no; white, no information). As for September 2018.

In some countries there are many bat rehabilitation centres which have been in place for decades. In others, such centres appeared only recently, and in some cases, no centres exist and bat rehabilitation is done by individual bat workers or volunteers.

In 20 countries there were databases on animals being rescued and rehabilitated. Bat experts from 20 countries used BatReR data as the source for additional faunistic data (new localities, occurrence of species, sex ratio, etc). 23 countries used dead animals originated from BatReR for virological, morphological, parasitological, histological and other investigations and for replenishment of museum collections.

However, only 11 countries had their own manual guidelines for bat rescue and rehabilitation (of different level of development).

1.2. Species being rescued and rehabilitated

The majority of bats being rescued and rehabilitated in borders of the EUROBATS Parties and non-party Range States belong to synanthropic insectivorous species which are more or less common in different regions and typically dwell in buildings, forming their aggregations either all year around or during certain seasons.

The species most commonly rescued and rehabilitated are: *Nyctalus noctula*, *Vespertilio murinus*, *Pipistrellus pipistrellus*, *Pipistrellus pygmaeus*, *Pipistrellus nathusii*, *Pipistrellus kuhlii*, and *Eptesicus serotinus*.

However, the full list of bats that have been rehabilitated include also other species: *Miniopterus schreibersii*, *Rhinolophus ferrumequinum*, *Myotis mystacinus/brandtii*, *M. daubentonii*, *M. emarginatus*, *Plecotus auritus*, *Plecotus austriacus*, *Barbastella barbastellus*, *Pipistrellus maderensis*, *Hypsigugo savii*, *Nyctalus leisleri*, *Eptesicus nillsonii*, *Tadarida teniotis*.

The only one frugivorous species which extends to Europe is *Rousettus aegyptiacus*. [**** to add]

1.3. Numbers of rescued and rehabilitated bats

According to the answers to the questionnaire, the number of bats received annually for BatReR varies from country to country. This number may, obviously, be determined by different factors (the severity of winters, availability of contacts of bat carers, the number of incidents with demolished bat roosts, etc.). However, the number may reach considerable values (>3000 individuals per country / year).

To estimate the conservation significance of bat rescue and rehabilitation respondents were asked to give a rough number of rehabilitated bats by species (1–10, 10–100, 100–1000, >1000 ind. annually). It is not possible to count exact number of bats being rehabilitated. However, the rough estimation (if to take 1–10 as 5 ind., 10–100 as 50, 100–1000 as 500, >1000 as 1000) suggests that each year bat carers through Europe, in total, get 10 000 bat individuals per year (fig. 1.2).

In reality, the number of bats being rescued and rehabilitated throughout Europe is even more: not all countries presented information, and not all countries dealing with rehabilitation were able to provide numerical information. E. g. number of bats rehabilitated only by Kharkiv bat rehabilitation centre (Ukraine) in 2018 was over 2500 of individuals; 93% were common noctules (Vlaschenko&Prylutska, 2018).

The percentage of bats released successfully after rehabilitation differs throughout countries. According to received answers, it ranges from 50% to 70% of bats got for ReR.

Therefore, the total number of bats being rescued and successfully released into the wild through Europe is over than 5 000 – 7 000 per year.

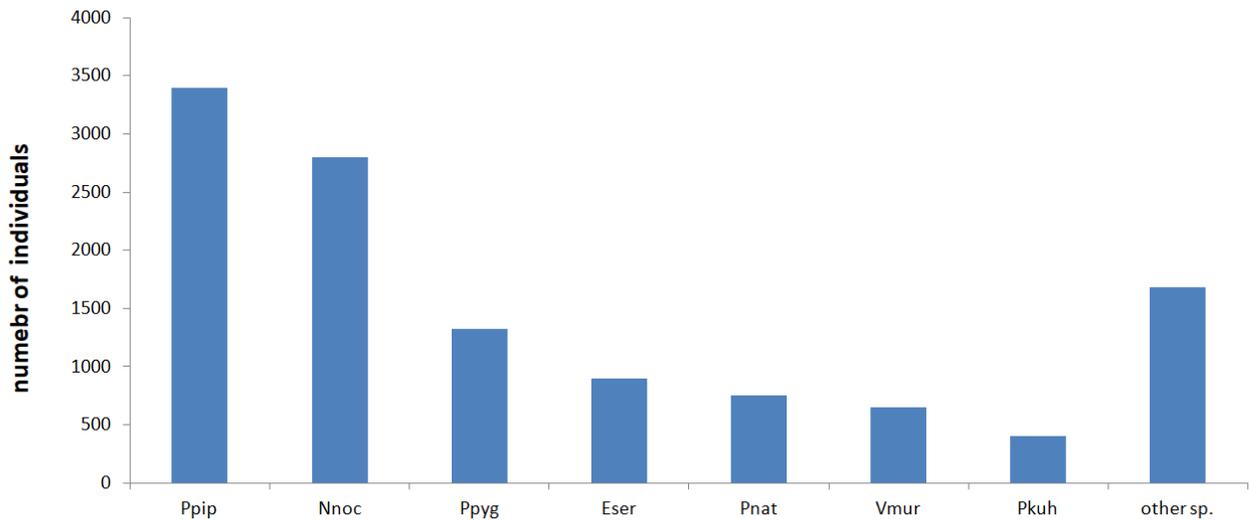


Fig. 1.2. Rough estimation of number of bats by species being rescued and rehabilitated per year in 25 European countries, by answers to the IWG questionnaire.

Nnoc – *Nyctalus noctula*, Vmur – *Vespertilio murinus*, Ppip – *Pipistrellus pipistrellus*, Ppyg – *Pipistrellus pygmaeus*, Pnat – *Pipistrellus nathusii*, Pkuh – *Pipistrellus kuhlii*, Eser – *Eptesicus serotinus*.

1.4. Circumstances of finding bats

Bats got for the rescue and rehabilitation are found in different circumstances (fig. 1.3). The most common situations, throughout all the responded countries, are finding adult bats on the ground or revealing single bat individuals in rooms of buildings. In many countries bat carers deal with bats caught and / or injured by cats. Quite frequently bats come after renovation works in buildings with bat roosts. Bat carers in many countries deal with found orphaned juvenile bats. At least seven countries, as for 2018, dealt with mass invasions of bats into inner rooms of buildings. The same number of countries deal with bats found in fallen trees. Bats given to rescuers also found in some other situations.

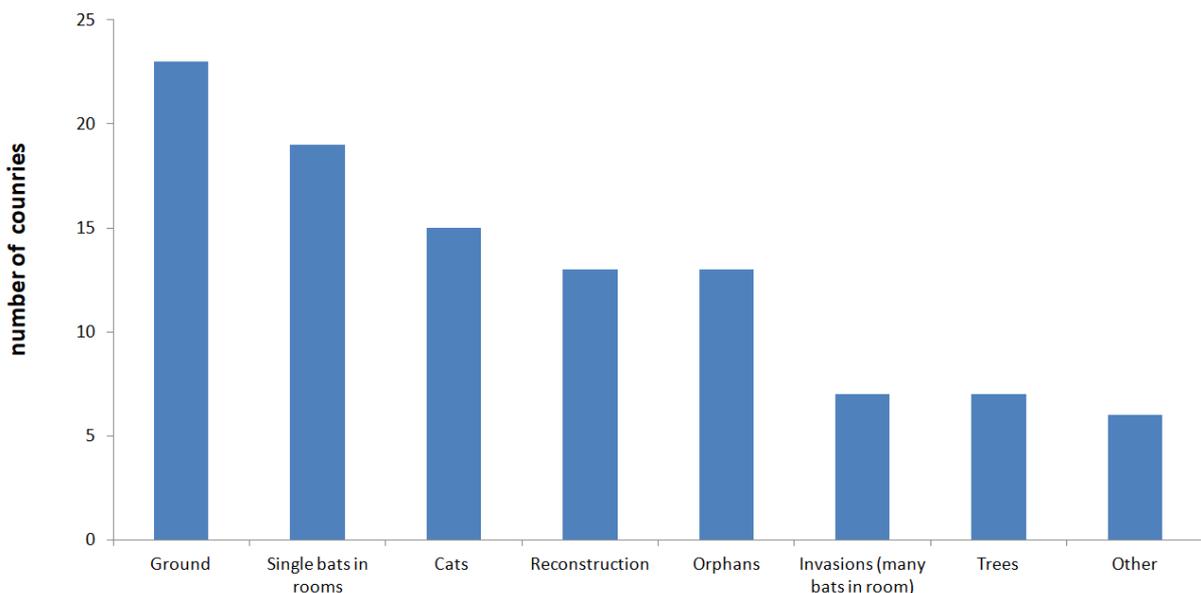


Fig. 1.3. Situations providing bats for rescue and rehabilitation in responded countries.

“Ground”, grounded adult specimens; “single bats in rooms”, single bats found in rooms; “cats”, caught by cats; “reconstruction”, extracted during repairing works in buildings; “orphans”, orphaned juveniles; “invasions (many bats in room)”, seasonal mass getting of bats into inner rooms of buildings; “trees”, bats found in felled trees. Category “Other” includes some other cases, like: bats were trapped in a chimney, hit by a car, found in piles of firewood, etc.

1.5. National bat rescue and rehabilitation legislation

In most countries, bats, their roosts and habitats are protected by national legislation and signed international treaties (EUROBATS Agreement; Convention of Migratory Species of Wild Animals, CMS; Convention on the Conservation of European Wildlife and Natural Habitats). Nevertheless, only 13 countries reported about national regulations for bat rescue and rehabilitation.

National legislation on BatReR varies from country to country. Differences concern e.g. who is allowed to give the first aid to distressed or injured bats, keep bats or use alive bats including disabled bats in education bat events and present them during public events (Table 1.1).

Table 1.1. Details on national regulations onBaReR in different countries, as for 2018.

| Country | Yes | First aid | | | | Keeping | | | | Events | | | | Presenting | | | |
|-------------------|-----|-----------|----|----|---|---------|----|----|---|--------|----|----|----|------------|----|----|----|
| | | E | CP | CO | N | E | CP | CO | N | E | CP | CO | N | W | B | G | H |
| Algeria | | | | | X | | | | X | | X | X | | X | | X | |
| Austria | X | | X | X | | | X | X | | | X | X | | X | | X | X |
| Croatia | | | X | X | | | | X | | NA | NA | NA | NA | | | | |
| Czech Republic | X | X | | | | | X | X | | | X | X | | X | + | X | X |
| Estonia | | | X | X | | | X | X | | | X | X | | - | - | - | - |
| Hungary | X | X | | | | | | X | | | | X | | X | X | X | X |
| Ireland | | X | | | | X | | | | | X | | | X | | X | |
| Portugal Mainland | | | X | X | | | X | X | | | X | | | X | | | |
| Portugal Madeira | | | X | X | | | X | | | | | | X | NA | NA | NA | NA |
| Portugal Azores | | | X | | | | X | | | | X | | | - | - | - | - |
| Slovakia | | | X | | | | X | | | | X | | | X | | | |
| Spain | | | X | X | | | X | X | | | X | X | | X | X | X | |
| Ukraine | X | X | | | | | X | X | | | X | X | | X | X | X | X |
| United Kingdom | X | X | | | | | X | | | | X | | | X | X | | |

Yes, presence of the special legislation concerning manipulations, rescue and rehabilitation of bats. **First aid**, legislation specifies who can give a first aid to a needy bat (picking up, examination, manipulations, transport). **Keeping**, specifies who can give a long-term care (>few days) and contact rehabilitation to bats. **Events**, specifies who is allowed to use alive bats (caught for this purpose or those being rehabilitated or disabled) in bat public event. Var: E, everyone; CP, only certified persons; CO, certified organization; N, nobody. X, valid, NA, not applicable. **Presenting**, specifies a way of presenting bats to people during public bat events, when allowed. Var: W, handling only by a bat worker; B, in a box; G, people can touch bats in gloves; H, touch bats by bare hands).

Case study 1.1: Belarus

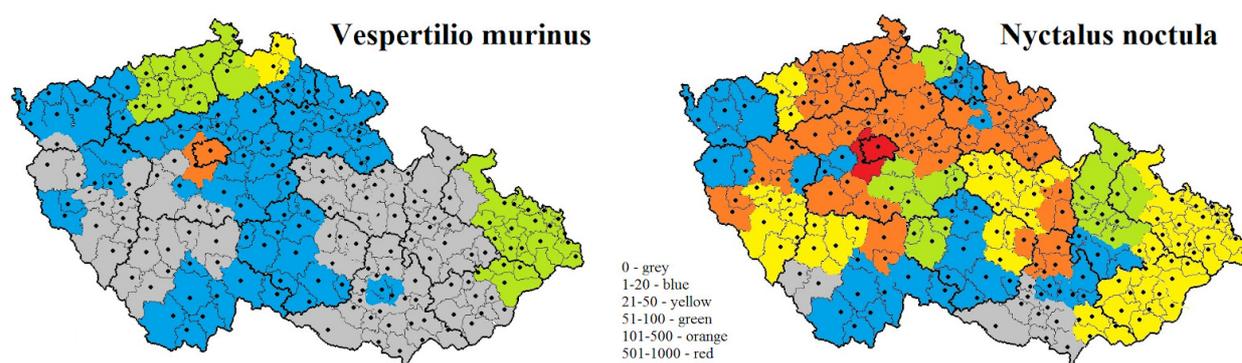
Minsk Bat Contact Centre has existed as an informal organisation since 2007. The work of the Centre is mainly to provide information and support to people who have contacted them when finding bats. If the animals cannot not be left in their original roost (for example, if found on the street, on balconies and in living quarters, during construction works, etc.), bats are accepted by the Centre for rehabilitation and artificial hibernation with subsequent release into the wild. In addition,

the indirect result of the work of the Centre is the accumulation of scientific information and monitoring of the fauna of bats. Thus, during the operation of the Centre, data on the hibernation of 6 species were obtained from 18 localities of Belarus (Shpak, 2017). These data have significantly improved our knowledge of hibernating bats in Belarus, particularly for *V. murinus*, *P. kuhlii* and *N. noctula* where the expansion of the wintering range was registered. Besides the fact of Parti-coloured bat hibernation, its prevalence between wintering bats was shown.

Text: by Aliaksei Shpak

Case study 1.2: Czech Republic – animal rescue centres and bat workers in NGOs

Majority of wild animals found by public reach one of 35 (as for 2021) animal rescue centres which are covered by Czech Union of Conservationists and are supported by the Ministry of the Environment. There are also some private animal rescue centers which must meet legislation requirements. Individual persons can provide to found wild animal only first aid and then should transfer the animal to workers of rescue centre. No center is so far specialized only on bats, nevertheless there are members in NGOs focused on bats (Czech Bat Conservation Trust, Nyctalus) which cooperate with several centres. Rescue centers of CUNC have to send each year list of incoming animals to central database. Database could be shared for scientific purpose. Detailed protocols which can be used for conservational or scientific purpose fill only several centres. Carcasses of bats are provided for scientific purpose only by several centres.



Occurrence data of two bat species from 3-year period from 29 rescue centers in the Czech Republic (modified from: Hudcová, 2013).

Case study 1.3: Serbia

Bat rescue and rehabilitation procedure in Serbia is not defined by national legislation. However, bats are strictly protected mammals by the Serbian law, and special licence for their handling and capturing is necessary. Permit for capturing and handling bats is given by the Ministry agriculture and environmental protection of Serbia. People who have permit that permit are authorized to do rescue and rehabilitation. There is still no Center for bat rescue and rehabilitation in Serbia, but since 2011 bat experts with permits have been involved in that matter. Main activities are advising people what to do if they find a bat, taking care of juvenile and injured animals and bat popularization to the general public. People call Natural History Museum (NHM) in Belgrade to report that they have found bat on the ground or in their home, and occasionally they bring the animal personally to the NHM. A smaller percent of enquiries are solved by telephone conversation, but in most cases bat experts are going to field, picking up the animal and releasing it afterwards or taking it for rehabilitation. Due to non-existence of facilities, animals are temporarily being kept in

houses of authorized bat workers taking care of them. In case of larger numbers of animals rescued at the same time, a group of volunteers (mainly biology students) are involved during feeding sessions. About 10% of rescued animals are juveniles, up to 10% injured animals (most often cat attacks and broken forearms), and majority are healthy adults, sometimes dehydrated and/or underweight. 2 most frequent rescued species are *Nyctalus noctula* and *Pipistrellus kuhlii*, and occasionally *Hypsugo savii*, *Vespertilio murinus* and *Pipistrellus nathusii*. Carcasses of bats that do not survive are being deposited in NHM mammal collection. All the work is being done on the voluntary basis and with no fundings. There is an initiative for forming an official Center for bat rescue and rehabilitation, establishing the network of volunteers and providing funding for future activities.

Text: by Ivana Budinski

Case Study 1.4: Switzerland: Bat Rehabilitation

60 rescue stations are spread over Switzerland operated mainly by volunteers, lead rescue center in Zurich with veterinarian and biologist. Bat Conservation Switzerland has been authorized by Swiss Veterinary Authority to educate volunteers and veterinarians in emergency caring according the law on animal welfare. As cantons (regional departments) are responsible for permissions volunteers get it from regional authority. Workshops and courses are given by the leaders of the rescue center in Zurich. Centres solve 400 - 800 emergency care cases each year and approximately 50% of animals can be set free again successfully.

Text: by Hubert Kraettli

Case study 1.5: UK: Bat Rescue and Rehabilitation

In the UK, bat rescue and rehabilitation is carried out on a local basis. Every county or region has its own bat group, some of whose members take on the task of caring for grounded or injured bats. By the mid-2000s, it had become clear that there was a need for a single point of contact for people who had found grounded or injured bats anywhere in the country, as well as a standard of fitness for bat rehabilitators (who are not regulated by the government). In 2005 Helen Miller, an employee of the Bat Conservation Trust (BCT), began work on establishing a formal network of volunteer bat carers. As of June 2018, the UK Bat Care Network consisted of 337 individual volunteers, 12 regional helplines and 11 wildlife hospitals.

Calls come to the Network via BCT's National Bat Helpline. When a caller reports finding a grounded or injured bat, Helpline staff talk them through containing it and give advice on rabies prevention before giving the numbers of up to three volunteer rehabilitators who cover the caller's area. The caller then contacts the volunteers directly to arrange for the bat to be collected or delivered. If no carers are available, the caller is told to take the bat to the nearest vet.

In order to be listed on the UK Bat Care Network, a volunteer must provide proof of an up-to-date rabies vaccination and a reference from an existing Network member who has trained or worked with them. They also agree to abide by the Network's terms and conditions (see http://www.bats.org.uk/**** [the previous web-link is not valid]). Network members receive reminders when their rabies vaccinations are due, and are made unavailable to take calls if their vaccination is out of date

BCT produces the Bat Care Guidelines (second edition 2016), as well as other guidelines and factsheets to assist carers. Network members receive a monthly newsletter, the Bat Care Bulletin, keeping them up to date with developments in rehabilitation.

Text: by [?????]

Case Study 1.6: Ukraine: Bat Rehabilitation in Kharkiv

Bat group started its activity with two bat rehabilitators-volunteers in 2008. In 2013, they got support from private zoo Feldman Ecopark and establish a group with five employees, own office and recruit new volunteers. Each bat is measured, weight, ringed and detailed protocols including bat history are filled into the database. Each year the centre took care about 800-2200 bats. During 2012, Jan–2017, Sept, the centre had received 8082 bats of 9 species from 59 municipalities.

Text: by Anton Vlaschenko

2. Communication with public when bats are found

The public may apply to bat centres with different questions. These may be situations where contact bat rescue and rehabilitation is required, but may also include more general calls about bats (for example, bats occasionally entering a house in summer, a presence of bat colony in nearby a houses, rabies, etc.).

These situations differ, and it is not possible to provide generic advice applicable for every situation. The final advice depends on many factors, which include: circumstances of finding, condition of a bat, presence of experienced vets and / or bat centres nearby, the local climate and season. (E. g. a bat that has been found in a room may be released in winter in some southern countries, whereas in other countries with temperatures below zero the release would be deadly.) The legislation of a country also defines, to the great extent, the contents of the given advice.

Therefore, all the following recommendations should be read with a regard to the local situation.

2.1. F.A.Q. from public

Answers to the question are country-specific and depend on legislation and development of bat or animal rescue centres, level of public interest and participation on nature protection, as well as type of problems concerning bats. The answers should be always adjusted according to the national legislation.

Here, we provide possible answers to the most frequently questions and possible solutions to the certain situations, which may be adapted to the circumstances appropriate to the country or region.

Answers for questions are based mostly on Bat Conservation Trust (UK) experience where the bat rescue system is well developed, and public is allowed to provide first aid to bats.

Q: A bat in a room, what to do?

A: Flight into the room by open window during nights with favourable weather conditions. Advise to enclose the bat into one single room with a window or door to the outside if possible. If it is dark outside, remove any clutter from the room and open the windows and/or external doors as widely as possible, dim or turn off the lights and let it find its own way out. It's highly recommended to stay in a room with a bat and to make certain the bat has left a room (otherwise the bat may hide inside and, usually next evening reveals itself again. Yet, you may ask to make photo of a sitting bat. This may allow you to identify a bat species, and the call will become a record in a database.

If it's cold season and the outside temperature is below zero, a bat should be accurately caught and placed into a box for further keeping (see chapter 2.2 and fig. 2.2).

The bat can be taken without contact e.g. by covering up a bat landed to the surface by a box or plastic container and sliding a piece of cardboard underneath. Thus, the bat will appear inside the box covered by the cardboard.

Q: I have a bat hibernating in my cellar.

A: Don't disturb it and be sure that there are openings through which a bat can fly away.

Q: I have a bat roost in my house, what do I do?

A: Having a roost should not present any problems; many home-owners and tenants share their property with bats without being alerted to their presence. Bats are not rodents, and do not nibble or gnaw wood or wires, and will not generally cause any structural damage. They use existing spaces to roost, and will not bring in bedding material or food – they are clean and sociable animals which spend many hours grooming themselves. All bats (besides one) in European fauna are insectivores,

and there are no known health risks associated with their droppings. If you need to carry out works or timber treatment, please contact a bat-expert. You may advise to install an insect mesh at the windows near the bat roost. It will prevent accidental entry of bats into rooms.

Q: A bat colony lives in my house. I don't like them. May I move them?

A. The decision should be based on the national legislation and must involve bat-experts. All actions should be directed to the saving of a roost and / or to be absolutely safe to bats. You may advise to install an insect mesh at the windows near the bat roost. It will prevent accidental entry of bats into rooms.

Q: I have found a bat on a ground.

A: See [chapter 2.1](#) and [fig. 2.1](#).

Q: My cat caught a bat, what to do?

A: Cats do not eat bats but they like to play with them. *If a bat has been caught by a cat and has injuries, it needs expert help and contact vet as soon as possible.* Even a tiny amount of cat saliva in a bat's bloodstream can cause infection and without help they are likely to die. Antibiotics are often administered under the correct supervision if there is a suspicion of a cat related injury and this practice has been found to increase survival rates. If the owner of cat is concerned about transmissions of possible infection from bat to cat, he should speak to their vet. In parts of Europe there are a two recorded cases of a virus EBLV-1, being transmitted by cats. See [chapter 3.5.1](#).

Advice should also be given on how the cat owner can stop bats being harmed especially if the cat is a repeat offender. Cats will often learn where a bat roost is and catch bats as they leave the roost, putting a whole colony at risk. Possible ways to reduce this risk is for the cat to be brought indoors half an hour before sunset and keep it in for an hour afterwards or all night when bats are most active (April – October). Mid-June to August is especially crucial as mothers will be raising their pups. See [chapter 2.1](#).

Q: What shall I do I have found an injured bat and there is no bat rescue person/organisation nearby?

A1 (BCT example): If there are no carers nearby, provide the option of taking the bat to a local vet. Though the vet may not have great knowledge of bats, treating it as any small mammal may allow for a prognosis and further treatment if no one else is available.

When going through the vet advice:

You could write the number of a bat rescue centre or carer on the box containing the bat, so the vet can seek further advice. If there is no-one available or it is out of hours, then the vet could look online for the BCT Bat Care Guidelines. <https://www.bats.org.uk/resources/guidance-for-professionals/bat-care-guidelines-a-guide-to-bat-care-for-rehabilitators>

The finder should also make sure that the vet takes a note of where the bat was found and of their own contact details, so that the bat can be released when/if it recovers. Veterinary staff are supposed to record this information anyway, but often don't!

We can email a copy of the BCT Bat Care Guidelines (also easily found on the web to download Add link), put them in touch with closest care contacts if possible, or potentially a bat carer who is happy to give advice remote by phone.

A2: Try to find a bat expert or a zoologist (in a zoo / local university / research institute).

A3: In case, if the injuries are critical and not compatible with life, the bat should be euthanised with an appropriate method. See [chapter 3.2.3](#).

Q: It's winter I've found a bat, it's minus 5 or below, there are no rescue centres nearby.

A: The easiest scheme is the next. The bat should be examined for injuries (using gloves). The bat should be provided with water (from a needle). It should be placed in a box with a fixed lid and holes for ventilation, a crumpled cloth inside (see chapter 2.1). The box should be placed in conditions of the permanent temperature (+2+4C), where a bat might continue hibernation (see chapter 3).

If national legislation allows, and there are no possibilities to transport the bat to a bat centre, a bat worker or zoologist, you can help the bat by yourself, but stay in touch with the bat expert. The bat should be examined for injuries and proper condition by a vet. If the bat is injured, dehydrated or exhausted, follow vet instruction and discuss situation with the bat expert. If the bat is in good condition and have enough fat reserves, it can be hibernated in an appropriate place (for more information see chapter 3).

Q: I have a bat roost in my house and I am planning maintenance or alterations of the building. What should I do?

A: Bats and their roosts are protected by law whether occupied or not. It is illegal to damage, destroy or disturb any bats or roosts without having taken the necessary precautions. If you need to undertake any works that may affect your roost, it is recommended that you take the necessary precautions by seeking advice on how to do works lawfully. This advice can be provided by the relevant authority for your country. The earlier in the process the bats are taken into account, the less disruption there will be.

When works are planned where there is a roost, the work will need to be organised so that any risk of harming the bats or their roosts is avoided, for example, by timing operations to fit with the life-cycle of the bats (e.g. avoid working in time of maternity colonies and hibernation). This is important not only to help protect these scarce species, but also because it will help you get the work done in the most efficient way possible within the constraints of these strict laws.

E. g.: Natural England provides a free advice service for small scale repair works to dwelling places and churches where bats may be affected, and relies on the generosity of volunteers to be able to run this service. If the scale of the works is outside the remit of the volunteer service e.g. works requiring planning permission or a mitigation license, it may be necessary to engage the services of an ecological consultant. The ecological consultant will carry out a survey and write a method statement on behalf of the person proposing the work. They will also help apply for a licence if this is necessary.

For more details you can also see Eurobats publication series, no.4 (Protection of overground roosts for bats, 3rd edition) and no. 10? (Bats and insulation and lining material).

Q: What to do, if I revealed a bat colony, during construction or timber treatment procedures?

A: If bats are discovered during work then the work must be stopped immediately until the relevant authority or bat experts have been contacted and advice given.

For more details you can also use Eurobats publication series, no.4 (Protection of overground roosts for bats, 3rd edition) and no. 10? (Bats and insulation and lining material).

Q: How should I carry out tree works?

A: Bat populations have suffered significant declines across Europe over the past century, and are therefore protected under the European Union's Habitats Directive and / or country specific legislations. Bats and their roosts are protected by law meaning that it is illegal to damage, destroy or disturb bats or their roost sites. A roost is defined as any place that a wild bat uses for shelter or

protection, and the roost is protected whether bats are present or not. It is the land owner's responsibility, in addition to those conducting the works, to ensure that protected species, such as bats, have been taken into account before any actions are conducted that could disturb those animals.

If you need to undertake works (pruning/felling/crowning etc.), you will need to consider if the tree has any features that could support bats. Please note that confirming the presence/absence of a roost may require assistance from a specialist with the necessary training and equipment for a full survey. If you are unsure about bat potential it is best to seek advice.

The presence of bats will not stop works [***** to reformulate, probably; in some countries presence of bats will stop works], but means that advice needs to be sought on how they are to be done lawfully. If the presence of a bat roost is suspected you will typically need to seek the services of an experienced ecological consultant with knowledge of bats to conduct a survey; establishing any impacts the works are likely to have. The consultant should also be able to assist with any EPS licence application required.

If emergency situations arise where urgent tree works are necessary due to confirmed and overriding public health and safety, and the potential for bats is high or actively present, the relevant authority should be contacted for further advice.

If, after inspection the tree is deemed as low potential for a roost to be present (no potential roost sites visible on the tree), then work may proceed with care. As a precaution, and where possible, we recommend any works are conducted in September/October, to avoid maternity and hibernation seasons when bats are most vulnerable to disturbance. If the tree is to be felled then we recommend soft felling, where tree limbs are cut and left grounded over night to allow any bats to make their way out.

Note. Some countries determinate the interval of felling trees in accordance with bird nesting, vegetative period of a tree, etc.

Q: What to do if find bats when felling trees?

A: As bats are protected, if you are undertaking tree works, the tree should already have been assessed for the presence/absence of bats (and relevant licences obtained if a roost is present). However, bat roosting sites can change depending on a variety of factors and therefore the presence of bats should never be ruled out completely.

If, in the unlikely event any bats or new evidence are discovered prior to work or whilst work is in progress, we advise pausing work and consulting the relevant authority immediately for further advice. This will help to avoid any harm to bats and offences being committed.

If a tree was fallen, and a single bat was revealed, follow the scheme at the [fig. 2.2](#). Make sure that no orphan(s) are left in a hollow. If the fallen tree appeared to be a shelter for a colony inside it, the next steps depend on the season and the composition of the colony. If the colony is winter, bats should be given a shelter for continuation of their hibernation (see [section 3.3.4](#)). If the colony was deprived of the roost in the warm period of year and consists of volant / adult bats, they should be picked up carefully and released with the darkness. [***** add more information] Connect with a bat expert for additional information. If the colony consists of females with non-volant juveniles the advice of a bat expert is needed. If adult females left flew away, and orphans left on the ground or inside the fallen tree the advice of a bat expert is needed. [***** add more information]

Q: I was bitten by bat what should I do?

A: A small number of bats in Europe have been found to carry a type of rabies. This virus is transmitted via a bite or scratch from an infected animal so the risk is very small and is removed if you do not handle the bat. Bats seldom show any aggression but they are wild animals and may be frightened or in pain. In situations where handling is necessary, i.e. if a grounded or injured bat

needs to be contained, wear protective thick gloves or use a tea towel and handle the bat as little as possible. If despite precautions you are bitten or scratched by a bat or if a bite or scratch is suspected:

- Wash the area bitten or scratched immediately with soap and water for at least five minutes. Additional cleansing of the area with an alcohol base or other disinfectant is also recommended.
- Seek advice from your doctor as soon as possible.

For more detailed on rabies see [chapter 3.5](#).

2.2. First advice to the bat finder

The basic scheme of actions when somebody finds a bat on the ground or outdoors is given at [fig. 2.1](#). In general, this scheme also is appropriate to the situations when a bat is found inside a building.

The bat-worker should also ask the finder if anyone has been bitten. In case a man was bitten by a bat, ask the finder to contact a corresponding doctor immediately (due to the rabies risk). In case, the bat is supposed to bite a home pet, advice to contact a vet. The succeeding steps should follow national rules. Until situation is solved, the bat should be kept by a bat worker (e.g. keeping the bat separately by a bat worker from other bats and not released).

In countries, where the first aid is allowed to be provided by public, the first step is for a bat-worker to ask a finder to pick up safely the bat and place it into the temporary box for further release or rehabilitation, transporting to a bat centre, vets, etc.

A finder should avoid handling the bat if possible. The bat can be taken without contact e.g. by covering up a bat by a box and sliding a piece of card underneath. If this is not possible, the finder should not touch a bat with bare hands, but always use thick gloves or bundled piece of cloth.

- Ask the finder to put a bat or few bats in a box with a secure fitting lid. A lid should be fixed tightly, so the bat can't push it and escape, because small species can squeeze even through 0,5 cm fissure. A lid of a shoe box should be fixed by a sticky tape. A few little air-holes in the lid of the box for ventilation are recommended for paper boxes and are necessary for plastic containers. In a corner of the box there should be attached a crumpled cloth with no loose threads, tattered edges or holes, where a bat can rest. (Also, paper kitchen towels are suitable for a short time (should be removed with a cloth). On the opposite site provide water in a bottle cap ([fig. 2.2](#)). The box with a sheltered bat should be placed in a quiet room and safe from cats, dogs and small children.

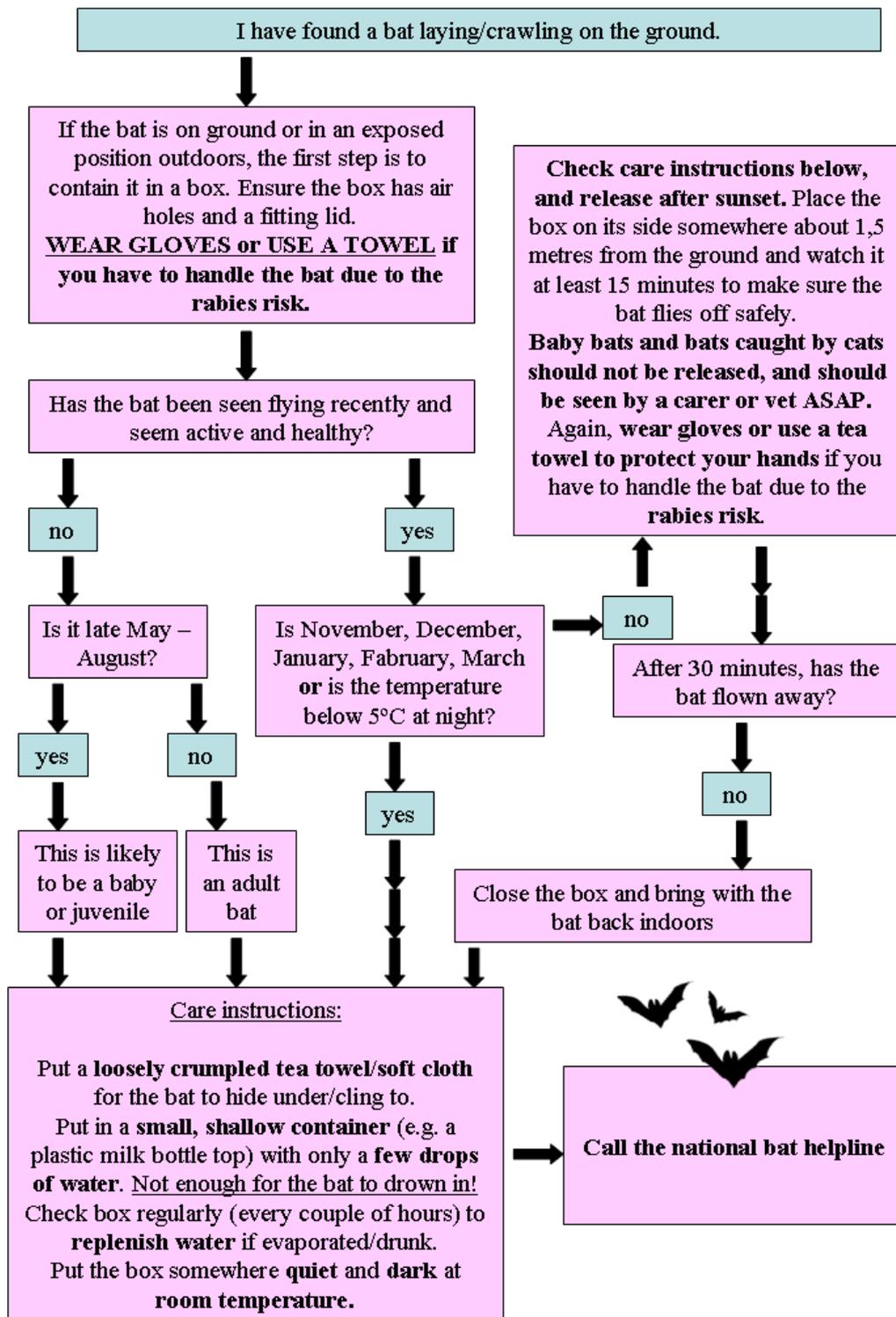


Fig. 2.1. Flowing chart for the situation with a grounded bat (modified from BCT, UK). The scheme may be applied in the countries, where national legislation allows providing first aid to a bat by public.

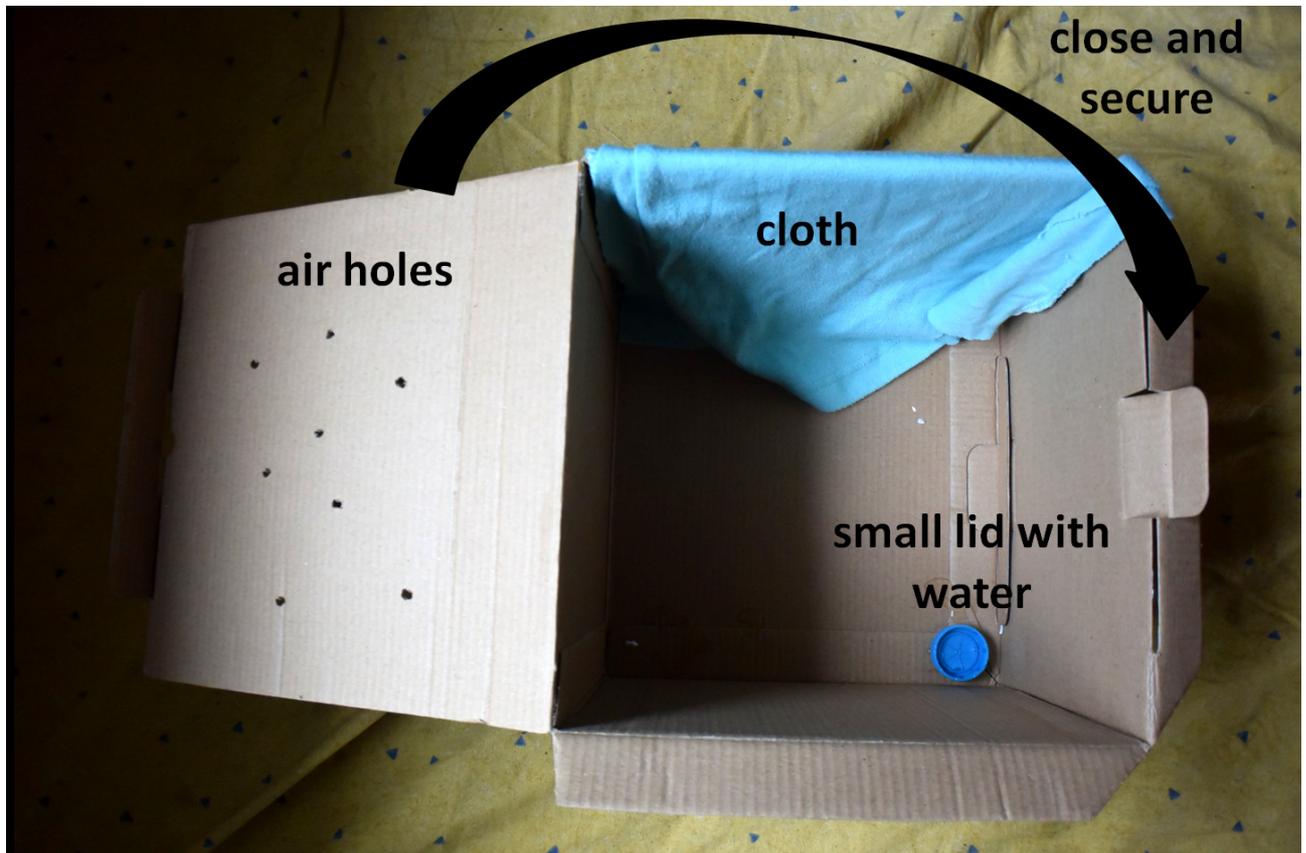


Fig. 2.2. An example of a box for short temporary keeping bats.

If the bat is injured, after cat attack, emaciated, dirty (e.g. by glue, tar), immobile or if the weather condition does not allow the release,

- Ask the finder of to stay in touch and wait until a bat worker comes.

If a bat is healthy, and it is an adult individual which just landed in an improper place (or occasionally flew into a house), season and weather conditions are appropriate, it may be released.

- Ask the finder to go during sunset to the place of finding or to the suitable place nearby (e.g. park, pond with old trees, riverside), put the open box in a place at least 1,5 m from ground and enfold the cloth partly over the top edge of box that the bat can crawl up and fly up from edge of the box. Wait 30 minutes and watch the bat. Each bat needs different time for warming its body to the functional temperature. If the bat does not fly away within this time, take it back inside and contact the bat-expert. Point out to take a torch and gloves in case bat can not fly properly and land on the ground (see more details in [chapter 3.4](#)).

In case there is a colony in danger (e.g. felling tree, reconstruction of roost, insulation, invasions, etc.) it is always necessary the presence of bat worker.

- Ask the finder to put bats into appropriately large box or more boxes depending on the number of bats. Bats should not lay in a bottom in more layer, because they can easily overheat or suffocate. Providing water is not recommended in huge amount of bats, because stressed bats often crawl and soak themselves. Ask the finder to do photo-, video-documentation of the case, especially the place, where the bats where found and take contacts if any person or company was engaged in discovery of colony or in unwanted damage of bat roost (e.g. disinfestation company, construction company, tree felling company).

3. Basics for handling, transporting and keeping bats

Bat care and rehabilitation is dependent on national legislation, which varies between countries, in relation to the standard of rescue centres, number of bat workers, availability of drugs, and possibilities of accommodation needed for proper bat care. To prevent injury or transmission of any possible infection, gloves should be always used. This chapter summarizes only the basic treatment, much more details can be found in special literature devoted to bats in captivity (see [chapter 5](#)).

3.1. Transporting bats

Most oftenly, **single bats** are discovered by public. Individuals can be transported both by a finder and / or a bat worker. We strongly recommend to use gloves for any contact operations with a bat to mitigate the rabies risk. A bat can be transported by a finder in a box recommended for a temporary keeping ([section 2.2, fig. 2.2](#)). The cap with the water must be always removed to prevent soaking of the bat. To transport bats for short distances it is possible to use almost any type of box, having no slits or holes bigger than 5mm allowing the bat to escape, with a crumpled cloth inside providing shelter for the bat and in case of plastic boxes always with small air-holes. Also, bats can be transported in fastened cloth bags, which hang in a safe place or which are put into the box to prevent any harm of bats. It is necessary to keep them in proper thermal conditions. Adult bats have a wide thermal range to survive, nevertheless they can easily overheat. In winter, we advice to keep bats for transport in minimal temperatures above zero (e.g. 5°C) to prevent awaking of bats during transport. For a few bats and short way, the transportation box can be relatively small ([fig. 3.1](#)). (Note. In case of egyptian fruit bat (*Rousettus aegyptiacus*) the temperature should not drop below 20°C.)

Colonies can be found unexpectedly (e.g. during building reparation works seasonal invasions of bats inside rooms or in felt trees), and they need to be rescued promptly. As above, gloves should be used. It is very important to choose the appropriate size of transport box/boxes. The bats should be able to lie on the bottom of the box in a single layer to prevent soaking, ideally with a crumpled cloth at the bottom. If there is a time and possibility to fix shaggy fabric at the box walls, where bats can hang, it is always a better solution, and in a such way, more bats can be transported in one box. The fabric must not have loose thread, tattered edges or holes because the bats can entangle themselves. Bats may also be transported by a bat-worker in cloth bags free enough to allow bats to move freely inside. The cloth bags should hang on a secure space during transport to prevent injuries of bats.

During the meeting with a finder of a bat(s), a bat worker should:

- Write down the contact details of the finder, the location and circumstances of finding the bat and, if possible, to fill in the information included in the protocol ([Annex 2](#)).
- Decide if the situation requires additional input and if it is necessary to contact other organisation (e. g. bat experts at universities, NGOs with experiences with building renovation, officials from national conservation agencies, local authorities, media)
- Take photo and video documentation, if necessary



Fig. 3.1. Transport box for one or few bats can be small, if transportation time is not too long to cause dehydration or souring of a bat. Inside there is a crumpled cloth; a mesh is placed at one of the box's walls.

3.2. Basics of handling individual bats and colonies

3.2.1 Individual bat or small number of bats – entry control

After transporting the bat to a rescue center or a rehabilitator, it is necessary to examine the bat and assess its condition to make a decision about the further steps. The bat should be examined with gloves.

During examination, bats should not be held by their forearms: it is very stressful for bats and, in the case of a broken or twisted arm, also very painful. The tips of the wings should also not be used to hold the bat. The bat should be hold softly, but firmly in one hand and the second hand is used for examination ([fig. 3.2](#)).



Fig. 3.2. Examination of wings of *Nyctalus noctula*.

Nutritional condition of a bat

Nutritional condition may be estimated both visually, by palpation and with weighing. The proper estimation of bats' body condition is especially important in winter, because only bats with sufficient fat reserves should be hibernated.

In short-haired bats, such as noctules, the body condition is visible at first glance ([fig. 3.3](#)), whereas in other species, a bat worker must palpate the site between shoulder blades and neck, and loin region to check the amount of fat.

- Well-fed condition – the body has „tube shape“, no depressions in the neck and / or loin region, the fat is well palpated. The area behind neck and shoulders is full with fat. This condition is good for hibernation. A healthy bat in a room temperature during warm season of the year warms itself from low body temperature to active body temperature during 30 minutes and behaves normally. In winter some bats can be in a „sleepy mode“ and they can be very reluctant to show any activity and remain inactive.
- Normal condition – in the loin region there are slight depressions; the warming process is similar to the well-fed condition.
- Lean condition – in the loin region, behind the neck and between shoulders there are apparent depressions; the fat layer is absent or very slight. Nevertheless, after warming the bat is very active.
- Emaciated/dehydrated condition – in the loin region, behind the neck and between shoulders are apparent depressions and the fat can not be palpated. Dehydration can be revealed by pulling up a fold of skin on the back of the bat and observe it return back. If the fold of skin remains or returns slowly, it means dehydration. Also, dry skin of wing membranes indicates this status. A bat is not able to warm itself at room temperature, often also lays on the bottom of the container.
- Over-fed conditions – the body has „pear shape“. Fat bulbs in the loin region are in short-haired bats clearly visible and in bats with long hairs palpated. The area behind neck and shoulders is full with fat, sometimes even prominent. Bat in such condition should be first hold on diet in a room temperature, until it is in a well-fed condition. Hibernation of over-fed bats can be dangerous and bats can die several days after awakening. In the case of a bat female, always ensure that the shape of the body is not caused by pregnancy. Giving birth could occur also in captive bats in end of winter or early spring, when they did not hibernate (e.g. because of the injury).



Fig. 3.3. In short-haired bats the body condition can be estimated visually, whereas in species with longer hairs it is necessary to use palpation. Left: a common noctule in a lean condition, Right: a well-fed common noctule bat in condition ready for hibernation.

The bat also should be weighed. However, the optimal weight varies among different seasons of the year and the region (how long the hibernation lasts), and depends on individual size. The weight which is appropriate for individuals younger than 1-year old, in winter, may be crucial for mature specimens. Average „summer“ weight is not appropriate for a bat which is going to hibernate for few months (Table 3.1).

Table 3.1. Examples of good weight for four bat species of different species for Ukraine (severe winters). [to add]

Parasites

Bats can suffer from many different types of ecto-parasites (fleas, flies, mites, ticks). The larger of them can be removed manually by tweezers from the body or membrane; tiny mites can be removed by a small dough roller from flour and water. External antiparasitic treatment with chemicals should be applied very carefully, in amounts which are suitable for such little mammals as bats (e.g. small amounts of antiparasitic spray for kitten / whelps applied at a cotton swab). Internal antiparasitics should be delivered only to bats in lean, normal or well-fed condition.

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Most common injuries are:

- Torn wing membranes – holes in wings (fig. 3.4) usually recover and the bat is able to fly after some recovery time. In some cases even large vertical cuts will heal, but usually a bat with a split or torn membrane is unable to fly in the future. Some of such bats are likely to be assessed as unable to return back to the wild, but could live in captivity without special care.
- Dried wings' tips – under the strong long lasting dehydration (usually in winter) wing membranes dry up. It is very remarkable especially on the tips (one or two distal falanx(es) of the 3rd finger). In the worst cases the phalanx bone become bared and finally is broken off. Some species (e.g. *Plecotus* and *Eptesicus*) can display self-destructive behaviour and chew the dead parts of a wing and further continue with healthy parts of bone. Bats with missing tips are likely to be assessed as probably unable to return back to the wild, but could live in captivity without special care.
- Broken fingers – depending on the species and extent of the injury, the bat is likely to be assessed as unable to return back to the wild, but could live in captivity without special care.
- One limb or one forearm broken (fig. 3.4) – depending on the species and extent of injury, the is likely to be assessed as unable to return back to the wild, but could live in captivity if healed, but with some special care. Often the limb, where an open fracture is identified, must be amputated (in this case euthanasia should be considered).
- Both forearms, limb or forearm and limb broken – bats likely to be assessed as both unable to return back to the wild or live in captivity without really special care (euthanasia recommended).
- Blood around anus together with inactivity of bat when was warmed up, likely inner injury – euthanasia recommended.
- Traces of bites on the body, torn membrane, broken arms, inactivity (all together) – euthanasia recommended.

We recommend placing injured and emaciated bats on a heating stone (usually used for reptiles) or heating pad in the box. Treatment and surgery of bats can be found in special literature (see [chapter 5](#)) and should be only undertaken by those with appropriate knowledge, skills and experience.

In spring, summer and early autumn bats in a normal condition and slightly injured animals can be released when the weather (and weather forecast) is suitable (no rain, not windy, $>5^{\circ}\text{C}$ at night at least for three days). In the winter, when the outside temperature often reaches values below zero, hibernating bats with sufficient fat reserves and no visible injuries can be overwintered in a suitable cellar, in a box with cloths (from not-mildew material) to hang on and a shallow bowl with water. The hibernaculum should be visited and checked weekly without awaking bats. Each awakening burns fat storage, so the bat may require additional feeding that is not a good option, especially in conditions of the lack of man / time power (see below). Because of this, it's not recommended to place an active bat into a container with already torpored / hibernating bats: the new bat may wake them up. For more information see [section 3.3.4 Hibernation](#).



Fig. 3.4. Injuries of wings. Left: Holes in a membrane usually recover by themselves. With holes, bats fly and hunt also in the wild. Right: Fracture of a bat's forearm bat.

3.2.2. Bat colony – entry control

Large colonies could be discovered during building works, felling trees or during autumn/spring migration due to invasive behaviour recorded often in pipistrelles. When colonies are discovered, it is particularly important that bat experts are informed and involved. The right protocols need to be followed. Both data and carcasses could be important for science, conservation and public health and contribute to the knowledge of species. In countries, which take care about **hundreds of bats and bat workers don't have enough capacity, it is preferable to save as many as possible of those bats in a good condition**. In badly injured and/or emaciated bats, euthanasia should be considered. Bat workers should consider carefully their capacity, because feeding one bat takes a minimum of 5-10 minutes/person, so for a colony with 100 animals it takes 8-16 hours. After transportation the bats should be assessed and separated into several groups ([fig.3.5](#)):

- Dead bats (if possible, keep for scientific purposes, deeply frozen)

- Ill or wounded bats – broken legs, forearms, etc. (euthanasia recommended)
- Emaciated and dehydrated bats (in bad cases euthanasia recommended)
- Wounded bats – broken fingers, long rupture on wing membrane (consider whether appropriate to keep as a permanently disabled bat captive bat or otherwise, euthanasia recommended)
- Slightly injured bats – little holes in wing membranes, abrasions. It is important mostly during winter, because slight injuries (abrasions, scratches, slight swelling) can become inflamed during hibernation and veterinary care is needed afterwards.
- If small babies are present, let them find and attach to mothers (for left pups consider euthanasia or keeping in captivity for education purposes)
- Bats in normal condition without visible injuries.
- **Females and males should be kept in separate boxes. [*** in winter]**

In **spring, summer and early autumn** bats in a normal condition and slight injuries (small holes in wings) which do not influence flight ability, can be released when the weather (and weather forecast) is suitable (no rain, not windy, $>5^{\circ}\text{C}$ at night at least for three days), and those that have potential for being returned to the wild, should be kept and rehabilitated.

In the **winter** is situation in many countries different, because it is a hibernation period and outside temperature often reach values below zero. Bats in a normal condition with no visible injuries should be placed for the hibernation as quick as possible into a suitable cellar in appropriate boxes or containers. Bats should be weekly controlled, because due to stress some of them do not fall into the sleep but swarm in the box, which leads to exhaustion and disturbing interrupting a whole colony. Such individuals should be taken back into care. **We do not recommend mixing sexes, because males often harassed sleeping females and mate with them. Also, new bats should not be added to hibernating bats, because they are often awake them.**

Never put into hibernation box bats with injuries, because even small abrasions could be infected with bacteria and inactive hibernating bats do not care about themselves.

For more details see [section 3.3.4 Hibernation](#).



Fig. 3.5. When colony is found and transported, one of the most important actions is to separate bats according to their injuries, condition and sex, which determinate their next destiny.

3.2.3. Marking bats [***to add]

3.2.4. Euthanasia

Euthanasia should be considered always when welfare of injured or disabled bats in captivity is not compatible with life or qualitative life in captivity. Euthanasia is a most sensible and kind option, if bat suffers considerable pains and bat workers can not provide fast action to reduce the pain such as surgery, when bats has multiple injuries which endangering him on life and when bat after treatment will have very poor quality life in captivity (e.g with amputated or half amputated both limbs). Euthanasia should be also considered, when veterinarians state following diagnoses: bat is terminally ill; bat can not roost, groom or eat; bat has fractured spine; bat is suffering with internal bleeding; viscera of bats are visible; severe metabolic bone disease; multiple fractures of limbs. Also, when big colonies which need several-week or months care are delivered to bat workers and there is not enough man power, euthanasia should be considered in wounded animals to ensure enough time and volunteer capacity to rescue healthy bats, which can be returned back into the wild.

Appropriate methods should be always used according to the national legislation. In many countries, only competent persons are allowed to euthanize animals.

The best recommended option is two phase chlorophorm (or ether or isoflurane) inhalation in a sufficiently ventilated room. A bat is placed into a doubled cloth bag. Between the bags a cotton disk with applied chlorophorm is placed. In such case, the chlorophorm acts gently, and the bat in the inner bag falls asleep. After that, the inner bag with the sleeping bat should be placed into a closed small plastic container without holes. A cotton disk with additionally applied small amount of chlorophorm (a drop or few) should be placed inside to finalise the euthanasia.

If necessary to terminate suffering as soon as possible, can be also used in small bats the dissection of cervical vertebrae.

Important. Not appropriate methods of bats' euthanasia.

Freezing of alive bats is absolutely unacceptable! to add [*****]

Medical injections of [*****].

Euthanized bats should be stored deeply frozen (at least -18°C) for further research. If the rabies is suspected, bats should be delivered to the competent authority as soon as possible (see [section 4.7](#)).

3.3. Basics for keeping bats

The final goal of bat rescue and rehabilitation should be to return bats back into the wild. In some cases bats do not fully recover and stay as permanent disabled individuals dependent on human care. For the correct type of arrangement of box interior, food and vitamins requirements, bat species should be recognized. We strongly recommend to keep both sexes separated (especially in late summer, autumn, winter and early spring) to prevent mating.

3.3.1 Temporary care

Plastic fauna boxes are very easily to handle and keep clean; they are available in most pet shops in several sizes. A box for temporary care should have proportions of at least 40x30x30 cm or similar for two active bats of noctule size. In very short care it is possible to add more individuals, but not more than 10 altogether, because there is a risk of bite incidents and **soaking**. In injured bats the size of the used box depends on vet recommendation, and it is usually smaller. Both sexes should be kept separately. At least two walls of the box should be provided by a soft net with small

mesh (1mm) , partly covered with cloth, which enables bats to use safe roost of fissure type. The cloth must not have loose thread, tattered edges or holes because the bats can entangle themselves. Bedding should not be dusty or toxic, there is good experience with some types of litter for cats for health bats. Water in a shallow bowl (e.g. 1cm height) should be always present, and bowl(s) with food (e.g. live mealworms larvae) are added according to bat condition (Fig. 3.*). Every box should be visibly marked by symbols which describe species, number, sex or other important information about of bats (e.g. in plastic envelope attached to the side of box).

In case of injured bats, the box should have some readjustment. For bedding should be used easily changeable soft paper towels. It is better to use light colour of cloth to see blood or any other traces which can indicate the change in bat condition. Heating stones or pads placed canted in the box and secured not to fall down are very important in injured or emaciated bats or in bat pups. Water should be provided. In case there is a pup with an injured mother, cover the water bowl with half submerged mesh to prevent drowning of a pup. Never put a bowl with food to prevent contamination of injuries of bats.



Fig. 3.*. Large plastic box can be used for temporary care, because it is easy to handle and kept clean.

Basic food for insectivorous bats is represented by healthy mealworms (larvae of *Tenebrio molitor*) fed by various types of food (cereals, fruit, vegetable, non-toxic leaves, etc.). To provide vitamins and minerals supply, a vitamin powder mixture are put on the mealworms or soluble vitamins are added to the water. Some species lives quite well on this diet (pipistrelles, noctules, vespertilio, serotine) for long years in captivity. In some species it is necessary to add other insect species such as crickets, beetles, wax-moth larvae, superworms (larvae of *Zophobas morio*), etc. Nevertheless, even individual bats may have different tastes and can refuse some insect species or new items of food. SAlso, soft mixtures can be used instead of insect, but only short term, because of lack of the cuticle. The cuticle of insect is important to prevent the dental plaque and also for correct digestion.

Note. In *Rousettus*, the diet is composed of various fruit and vegetables, which must be fresh (e.g. apples, pears, grapes, figs, mango, papaya, carrot, tomatoes, beet, etc.).

Species mostly accepted to the rescue centres are **aerial insectivores** and they are used to seek their food in the air, so it depends on species and adaptability of each individual, when it learns to look food in the bowl. At the beginning it is usually necessary to feed them from tweezers.

Before feeding, bats must be warmed up to their normal body temperature. The bat should be held in the hand with gloves softly, but tightly, wrapped by fingers. A soft fabric towel can be used instead of hard gloves. The feeding room should be quiet and without sharp light. Water should be provided during the first feeding by syringe, when the bat is licking the tip of it (not allow the water to spirth forth). Mealworms should be killed and decapitated, that the bat can lick its guts, until the bat is eager to eat them. It is better to offer meal worms by pincers from below, because bat **learns itself to** seek food on the ground. It can speed up the process of learning to feed on mealworms from

the bowl (fig. 3.*). Bats in normal condition should be fed once a day during the evening. Feeding one cooperative bat lasts 5-10 minutes, but often it may take much more time.

Note. Pincers should not have sharp ends, only rounded, because they may harm tongue and mouth of a bat.



Fig. 3.*. Bat can be held during feeding in a glove or in a towel to prevent bite incidents. If the grip is tight, but soft, many bats stay calm and cooperate.

In emaciated bats or dehydrated bats it is important to recognize the current state. At the beginning it is better to provide Ringer solution and Glucose (G5) by infusions, or per mouth slightly sweet solution of glucose and water. If the bat reacts normally, and actively wants water, it is possible to feed him. We recommend to start with feeding first by guts and only by some few mealworms. Another feeding and providing water with glucose should be done after several hours. Following days the amount of mealworms should be gradually increased according the state of the bat. For feeding can be also used commercially available convalescence support diet for cats and dogs.

Non-volant juveniles are often found during summer. Bare and blind juveniles should be fed several times a day by pup milk formula for cats or dogs. Gradually during following days add guts of mealworms and later mixed whole mealworms can be added to diet. Heating pads or stones should be placed in the box. If it is possible to make a group of juveniles or add a juvenile to its own species, they seem to face up the orphanhood much better. If there are not conditions in a rescue center to prepare orphaned bats to return back into the wild, it is recommended not to release them. Care of non-volant juveniles is time-consuming and not always successful. If there are not conditions to provide proper car, consider euthanasia.

To feed a ***colony of bats*** is time-consuming. If bats are fed from pincers, feeding by superworms shorten the time if compared with mealworms. Also it is possible to use hand blender to make smooth mealworm mash with addition of little amount of water and feed bats by syringe. **Help of volunteers is crucial in case of feeding big numbers of batshuge colonies.**

Case study 3.*: Coping with a mealworm shortage

In the United Kingdom, mealworms (*Tenebrio molitor* larvae) have proved to be the most satisfactory food for insectivorous bats in care. However, because the UK mealworm market is dominated by one wholesaler (Livefoods Direct Ltd), any disruption to their operations can quickly lead to a national shortage. One such shortage began in May 2018, when one of Livefoods Direct's production cabins overheated and wiped out two to three weeks of mealworm production. The Bat Conservation Trust (BCT)'s Bat Care Co-Ordinator decided to use the existing infrastructure of the UK Bat Care Network to help carers cope. Network members were encouraged to share tips about any shops that still had mealworms, as well as alternative foods that had worked for them. The Co-Ordinator also facilitated the sharing of mealworms by putting carers with surpluses in touch with those in need. The alternative foods most widely reported to be successful were tinned dog food with high meat content (sometimes mixed in a blender with other protein sources such as egg or cottage cheese), morioworms (*Zophobas morio* larvae), and young crickets. The Bat Care Co-Ordinator is also looking into encouraging more carers to breed their own mealworms, although the advantages of this must be balanced against the risk of developing allergies through repeated exposure.

Livefoods Direct, "During the weekend of 12th May one of our cabins went up to 38 degrees and wiped out 2-3 weeks of our smaller worm production," statement on website, accessed 11 July 2018, <https://www.livefoodsdirect.co.uk/Category/Mealworms>

3.3.2 Keeping permanently disabled bats in captivity

Keeping of permanently disabled bats is in many countries allowed only to certified persons or NGOs. If the bats are not stressed by bat worker manipulation and touch, they can be used according to national legislation during educational programs. For permanent keeping they should have much bigger boxes (e.g. modified wardrobe) with several roosting possibilities, clothes, curtains, etc., with access to water and food (fig. 3.*). If they are capable of gliding flight, the cage should have proportions to enable at least short gliding flights. For pipistrelles, noctules and parti-coloured bats it is recommended to form little groups of two and more bats of the same sex, because in these species even males are very social and form bachelor groups. It is not necessary for them to be the same species, but they should be similar sized species. **Correct management of groups is important for welfare of bats. There is also experience that some individuals of the same species do not stick and communicate together, but have no problems to cluster with different individuals.** Abandonment of cluster by one individual can besides thermal condition show also health problems of such bat.

Males and females should be kept separately to avoid breeding. Females accepted to the centres can be fertilised or pregnant and can give birth in captivity even in winter or early spring. Fate of juveniles depends on circumstances, but hand-raised pups should not be released.

Note. Keeping of *Rousettus* is more complicated in respect to space, temperature and maintainance of hygienic conditions. The feces are liquid and if bats have free approach to the food, they do not consume all and can drop it everywhere. These bats are often kept in Zoos or as legal houtholds pets mostly in a separate room or in outside bat aviaries (in southern countries with warm winters).

Information on the long-term care of bats, housing, food and vitamin requirements, possible diseases, etc. can be found in [chapter 5](#)).



Fig. 3.*. Example of interior design for permanently disabled bats kept in captivity, which do not need special care.

3.3.3. Outside bat aviary

The bat aviary (fig. 3.*) can be used for several purposes. Its construction and its interior design should be adjusted to concrete purpose. As in other wild animals, the transfer to open place could in some individuals result in inability to find food, even if they have there their original box of temporary keeping with food and water resources and they can starve to death. The bats should be thus controlled to check their health state. The aviary should be insured against predators, mice or shrews penetration.



Fig. 3.*. Constructing the bat aviary.

Purpose to keep there slightly disabled bats, who can not return back in the wild. To prevent reproduction, the sexes should be separated. Also, if bats are used during bat public events or they are females, the contact with wild bats (potential risk rabies, copulation) have to be prevented, e.g. by double mesh in distance 5cm which does not allow close contact of animals. There should be available more types of roosts with several water and food resources on different levels. Also we recommend to have there a bigger box (e.g. 0,5m x 1,5m) with mesh inside with one wall with open access to the aviary close to the bottom of the box (e.g 5-10cm fissure), imitating a huge tree bat box. On the bottom on this big box should be always placed water and food. Some disabled bats do

not use aviary and live in that box, whereas other crawl along whole aviary. If the bats in captivity are fed by free-living insect, antihelminthics should be also provided.

The flight cage is mainly used for recovery of bats with healed injuries of wings or limbs and support their flying ability before release. Also they are used to adapt fledged juveniles with mothers (injured and cured) for future release. Bats should be placed here in their original box, which is opened and enables both exit and return. Bats should have several roosting possibilities and access to food and water resources on different height levels including ground. The bats should be regularly controlled. The aviary could be also fitted from outer sites by possible roosts (e.g. bat boxes or custom-made fissure roosts) for wild bats to enable contact of both groups.

Other equipment depends on species of bats (e.g. a source of light to lure flying insects or a little compost to lure other insect species).

3.3.4. Hibernation

Hibernation is a natural part of a European bat cycle. Nevertheless, it is not always possible to hibernate all bats.

Never hibernate:

- Ill, emaciated and dehydrated bats – takes longer time to recover
- Bats in lean condition – according condition feed week or more and then hibernate
- Bats with parasites – use antiparasitics and let bat recover
- Wounded bats
- Slightly injured bats – light abrasions, light swelling
- Bats with alopecia or partial alopecia (hair loss)

In female bats, which can not be hibernated from various reasons, bat workers must be ready for possibility of giving birth during the care in captivity. Females are fertilized during autumn, but also mating in the winter quarters are known. Females kept under warm temperature, according to their current condition, can start ovulation and give birth in captivity much earlier than in nature. In emaciated or wounded females were recorded also abortions or premature labour.

Hibernation in winter is possible only for healthy bats in good condition without any injuries.

Individual bats should be prepared for hibernation as quick as possible. Before transporting to hibernation site, bats should not eat at least one day to defecate. **Sex should be strictly separated**, because bats mate not only during their main mating season in autumn, but they can mate in the hibernacula, as well as some males are ready to mate shortly after end of hibernation. The separation of sexes prevent male harassment and better results of hibernation success with only necessary physiological awakening is reached. Also it reduces risk of unwanted mating and following pregnancy of females with overlooked injury (e. g. close fractures of wrist, which often rotated and bat can not properly use its fingers for flight, but it crawls without problem).

For the hibernation bats should be placed e.g. into plastic fauna boxes with cloths and mesh from not-moulded material to hang on. Additional micro-shelters may be arranged inside the box according to species requirements. The water should be provided in a shallow bowl on the side opposite to a mesh or cloth. During hibernation, when activity is very low, plastic box 40x30x30 cm is sufficient maximally for 10 bats of size of noctule bat. In a lack of fauna boxes, for short-term hibernating and in relatively dry hibernacula, big carton boxes can be used. Here should not be placed any water to prevent soaking of paper box and bats. Another possible option is using wooden boxes. However, in this case ventilation holes should be provided.

Every bat species has specific demands on temperature and humidity. Noctules, pipistrelles, parti-coloured bats and serotines tolerate relatively dry air in a cellar with a low stable temperature, which is suitable for apple or potatoe storage (1 to 5°C). Nevertheless, other species required higher humidity (e.g. *Myotis*) or higher temperature (e.g. *Rhinolophus*), and different types of artificial hibernacula have to be found. The thermometer should be placed inside to control the temperature. Fluctuations of the temperature in a hibernacula cause multiple awakening of bats, increased activity and consequently loss of weight and reduce of survival rate. **We do not recommend to add new bats to hibernating bats, because it can cause increased activity in the whole group and risk of biting accidents. Such injuries are often infected, and, if unnoticed, they develop to various types of ulcers and slow inflammation process.**

Utmost solution is to hibernate bats in a cool fridge. Even though they have constant temperatures, they are relatively dry and bats can have problems with wing membranes. For short-term hibernation with regular check it may serve good, nevertheless it can not be recommended for 4-6 months.

During hibernation bats should be weekly controlled. If any bat appears to be active, it's necessary to pick it out of the box and check his health condition. Usually, the awakened bats appear to be in lean or emaciated condition and need additional feeding.

Success of hibernation of colonies found in winter depends on many circumstances. The main goal is to hibernate as many bats as possible in a shortest time as possible. Keeping hundreds of bats is extremely time consuming and requires the help of many volunteers. The colonies can be found in different situations, but the most complicated cases rise during felling trees or reconstruction. Bats from such colonies can be seriously or slightly injured or they can have high level of stress hormones, which do not allow some of them to fall into deep hibernation. In colonies, **carefully separation of bats according sex, condition and injuries is fundamental for increasing survival rate.** In such colonies, fast daily control for one week is recommended to pick out active bats which disturb sleeping bats.

Before **release back into the wild** (see [chapter 3.4](#)), bats should be checked. The weather forecast should be favourable for several days with no rain and night temperatures above 5°C. After awakening, some bats can be released the same day, whereas some bats must be fed for several following days. First food supply should be very low with a gradual increase in the amount of food. More details in [chapter 3.4](#).

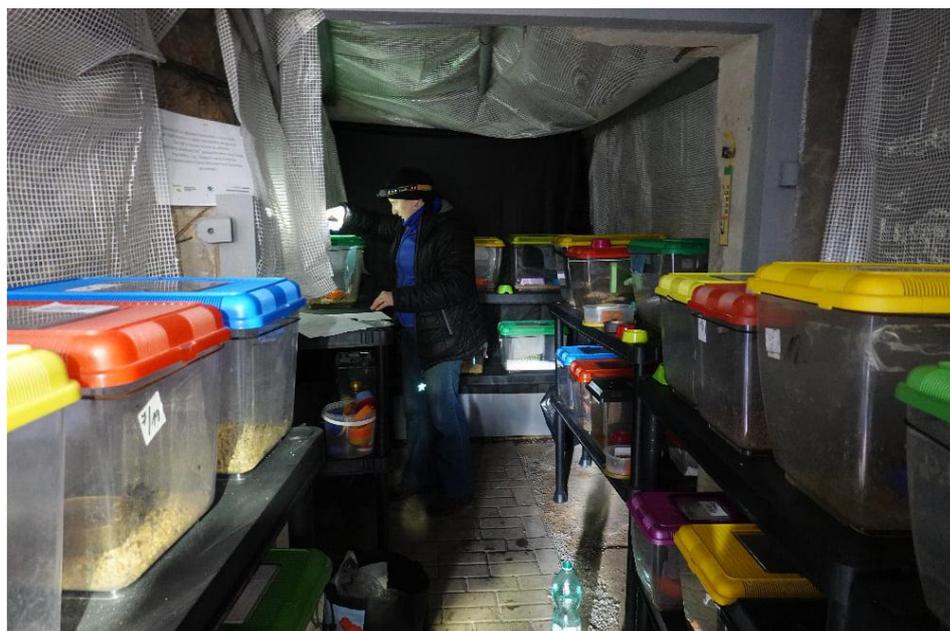


Fig 3.*. Artificial hibernation site in a dry carst cave.

Case study 3.*: A successful rescue of a big winter colony of common noctules in Kyiv

Bats got by rehabilitators after demolishing of their shelters, in particular winter shelters, may be in a good condition. They need a quick providing them with a new place for hibernation, with a stable low temperature.

At the end of November, 2019, the big colony of 371 common noctules was extracted from their shelter in the balcony of a multi-storied flat building in Kyiv, Ukraine.

The biggest part of them was arranged for further hibernation (without feeding). The main attention was given to do it as quick as possible and to minimise the time of animals' being in active condition. The place for hibernation was an inner room in an overground not heated building.

The animals were placed in big plastic terrariums with fabric fixed on the walls and microfibras at the bottom, by groups from few to one hundred individuals. One part of the colony was arranged in the building the next day after extraction. Another part of the colony was firstly placed in the attic and in a fridge. Later, in February, it was delivered to the same building.

The boxes were checked once a week. The temperature in the room was recorded. It fluctuated from +0,9C to +8C.

In March, 2020, the animals were extracted from boxes for release. Only one specimen was found dead; others were alive. According to the standard scheme, animals were weighed, given water and sorted by their weight and estimated condition. Animals with a weight over 24 g were released at the same day; animals with a lower weight were additionally fed during a few days. Two bat experts and five volunteers were involved for the final release stage of the rescue process. In total, in the rescue of this colony, over 14 people were involved.

Case study: CZ – colony Dobrichovice (bats with stress from insulation), colony Znojmo (bats from reconstruction works, more weeks in hibernation without seapartion with small abrasions), colony pipistrelles svatá ján reconstruction, immediate transport

3.4. Release back into the wild

Successful release of healthy bats should be the main goal of bat care. The ability to fly should always be confirmed in released bats, because they can have some hidden injuries, which disable coordinated flight.

Bats should be ideally released in borders of the same settlement or nearby where bats were originally found. If this is not possible for any reason, then appropriate habitats preferred by the species should be found. Places near rivers or other water bodies with older trees nearby are favourable for many species. Bats may also be released near a known roost of the same species. In case if the rescue was carried out in another region, the transportation of bats back to the place of their finding should be organised.

The decision about the day of release depends on the circumstances. Bats should be released during or after sunset when the weather conditions are good (the wind is less than 4 m/s, no rain, at least 5°C during the night) and the weather forecast is favourable for several days. This is crucial mostly in pre- and post-hibernation periods.

Bats to be released should be preliminarily warmed up to shorten the period of awakening process.

At the place of release, surroundings should be checked to prevent deadly accidents. Always wear a strong light to check that all bats flew and do not fall on the ground or not just glide to the nearby tree or shrub. The open transport box should be placed at least 1.5 m from the ground and cloth or mesh partly folded over the top of the edge of box, so that the bat can crawl up and take off from

the top edge of the box. Some bats fly immediately, but some can be still in torpor, even though you keep them warm prior to release. In some cases, several individuals do not abandon the box. It could be due to hidden injuries, but also because of the overfed condition of a bat.

Release of the colony after hibernation often needs special attention and efforts. According to suitability of hibernacula and behaviour of the particular bats during hibernation the condition of bats can differ. It is recommended to have enough volunteers and food supply (mealworms, superworms, etc.) before awakening a big colony. Number of bats hibernating in one fauna box or container usually do not exceed several tens of individuals. Bats can be thus awaked and released gradually box to box, if there is not sufficient capacity of bat workers or volunteers (fig. 3.*). The condition and possible injuries of all bats should be checked before the release.

After release, it is necessary to check that bat flew away and not landed nearby (trees, shrubs, land). A powerful torch or a head-lamp, is strongly recommended. Bats which do not fly away should be checked for inconspicuous injuries and a general condition.

Release of the bats can be also used as a public event. In such cases, bats are often released from the hand with gloves. More bat workers are necessary to manage the public and ensure sufficiently big space for flying bats.



Fig. 3.*. Right: Release of the bats can be a great opportunity to organise a public event. Left: Release of the hundreds of bats which can be time demanding and help of volunteers is necessary.

Case study Ukraine: spring bat release event [* to add]**

3.5. Health risks for bat rehabilitators

3.5.1. Bat rabies

Viruses found in European bats check by Peter Lina

Rabies is an infectious and (in humans) almost invariably fatal encephalitis caused by viruses of the genus *Lyssavirus*, in the *Rhabdoviridae* family. As of 2018, 16 different lyssavirus species have been recognised by the International Committee on the Taxonomy of Viruses, with two more possible species awaiting classification.

Bats are the primary hosts of most other lyssaviruses, although worldwide, domestic or feral dogs are far more likely to transmit rabies to humans. Fourteen of the 16 recognised *Lyssavirus* species have been found in bats, and the two genotypes awaiting classification are also bat-specific. The type species of the genus, known as Genotype 1 or “classical rabies,” occurs almost globally in terrestrial mammals (particularly members of the dog family), but is not found in bats outside the Americas.

At least six lyssaviruses are known to be present in European bat species:

European Bat Lyssavirus-1 (EBLV-1) is found primarily in two species from the *Eptesicus* genus: the Common Serotine (*Eptesicus serotinus*) and the Meridional Serotine (*Eptesicus isabellinus*). These species account for around 95% of all EBLV-1 cases in Europe. However, antibodies to the virus have also been found in a number of other species around Europe, including the greater mouse-eared bat (*Myotis myotis*), long-eared bats (*Plecotus* spp), Natterer's bat (*Myotis Nattereri*), the common pipistrelle (*Pipistrellus pipistrellus*), Nathusius' pipistrelle (*Pipistrellus nathusii*), Schreiber's bent-winged bat (*Miniopterus schreibersii*), the European free-tailed bat (*Tadarida teniotis*) and the greater horseshoe bat (*Rhinolophus ferrumequinum*). None of the non-serotine species is thought to be an important vector for the disease.

European Bat Lyssavirus-2 (EBLV-2) is found in Daubenton's Bat, (*Myotis daubentonii*) and in the Pond Bat, (*Myotis dasycneme*).

Bokeloh Bat Lyssavirus (BBLV) has been found, so far, in 4 cases in Natterer's Bat, *Myotis nattereri* in respectively Germany, France and Poland.

West Caucasian Bat Virus (WCBV) has been found in species from the genus *Miniopterus*.

Lleida Bat Lyssavirus (LLEBV) has been found in 3 cases in Schreiber's Bent-winged Bat, *Miniopterus schreibersii*, in respectively Spain and France.

Kotalahti Bat lyssaVirus. A single case has been found in Brandts Bat, *Myotis brandtii*, in Finland.

Zoonosis

The transfer of rabies infection can take place by a bite, but also by contact with saliva or urine of infected animals through mucous membranes or open injuries of the skin.

The incubation period varies and depends on a number of factors, including the distance between the place where the infection occurred and the central nervous system. The concentration of the inserted virus particles can also play a role in this.

After an infection, the virus moves subcutaneously through the nervous system at a rate of 3-4 mm per hour to the central nervous system. There, multiplication of the virus takes place in the neurons. From the central nervous system the virus spreads through the nervous system further into the body. It is not spread through the blood.

After the death of an infected animal, the virus can remain alive for a period of about two weeks at a normal temperature (on the fur) and even many years at freezing temperatures (brain tissue and salivary glands).

Since 1977, six people in Europe have died from bat rabies, two children in the former Soviet Union (1977, 1985), a bat researcher in Finland (1985), an amateur bat conservationist in Scotland (2002), a man in Ukraine (2002) and a man in France (2019). The genotype of the rabies virus from which the first child passed away is unknown. The second child and the man in France were infected with EBLV-1, the fatal cases in Finland and Scotland with EBLV-2, and of the case in Ukraine, the genotype of the virus and the bat species that had inflicted a bite are not known. This number of deaths is remarkably low when realized that many amateur bat workers, students and professional scientists have been dealing with a study of Serotine Bats or other bat species and have often worked with unprotected hands, with regular bite contacts, while these individuals were not vaccinated against rabies. In addition, many others will have been in direct contact with bats and have also suffered from bites, without being vaccinated preventively or curative.

It seems that people are likely to be significantly less susceptible to an infection with one of the EBL-viruses than to an infection with the classical rabies virus. But there is also evidence that the concentrations of EBL-viruses in the salivary glands of infected bats are relatively low, so that at a bite only relatively few virus particles are transferred.

Identifying possible rabies in bats

It is very important to understand that a bat with rabies may show no symptoms at all, but can still spread the virus. When bats do display symptoms, these vary. Some infected bats have been reported to show aggressive or agitated behaviour. They may seem bolder than normal, roosting out in the open instead of hiding themselves away. On the other hand, some infected bats appear quieter than normal. Failure to eat, drink or groom are other possible warning signs. In advanced stages, flight may be uncoordinated or the bat may become unable to fly altogether. Paralysis may occur, and the bat may scream when disturbed. It is important that the bat is observed by someone with a thorough knowledge of bat behaviour who can recognize abnormalities.

Preventative measures

People who may come into contact with bats because of their work should take the necessary precautions. Nevertheless, any unnecessary direct contact with bats will have to be avoided. When handling bats it is advisable to wear gloves. The Bat Conservation Trust in the UK has produced a guide to choosing the right gloves for batworkers: http://www.bats.org.uk/publications_download.php/1352/Wearing_gloves_when_you_handle_bats_2018.pdf

Pre-exposure vaccination against rabies is highly recommended for people likely to come into regular contact with bats. In some countries (for example, the UK), free vaccinations are available for rehabilitators and others working with bats on a voluntary basis.

In the case of preventive vaccination, on days 0, 7 and 21 (day 21 may also be day 28) each time 1 ml rabies vaccine is injected into one of the upper arm muscles. Thereafter, in principle, an injection (booster vaccination) of 1 ml of vaccine can suffice every two years. A revaccination can be delayed for an extended period of time when a titre of antibody in the blood reveals that there is still sufficient immunity to rabies. Excessive vaccination may lead to side effects. Should a bite of a rabid bat occurred within two years of vaccination, a post-exposition vaccination will be advised on days 0 and 3, unless the titre is ≥ 1.0 IU/ml. This scheme can also be held when the last vaccination occurred between 2 and 10 years ago and the vaccination commences within 24 hours of the bite of a rabid bat.

There is no public health reason to exclude bats from buildings in Europe. In the first place, many of the bats present are not carriers of rabies. If examination shows that infected animals have probably been present in a colony with rabies virus, it is probably better not to take measures. In colonies where rabies infected bats have been found, most of the animals, including the young, are simply surviving. Most likely, the immune system of these animals builds sufficient resistance to rabies, so that such a colony is free of rabies for a long time and therefore does not constitute a nidus of any possible contamination.

Response to possible exposure

Anyone who has been bitten by a bat or exposed to bat saliva should do the following as soon as possible:

- Wash the bite spot /or hands well with water and soap in running water for 10 minutes
- Disinfect the bite spot and/or hands with alcohol 70% and if not available with ordinary household methylated spirit or betadine iodine 10%
- Seek urgent medical advice.

Anyone who has been bitten by a rabid bat or has had any other direct contact with that animal, or has had such contact with a bat that could not be examined for rabies, and has not previously been vaccinated against rabies, needs a more extensive post-exposition vaccination on days 0, 3, 7, 14, 30 and 90, each with 1 ml of vaccine. When this post exposure vaccination commences within 5 days of contact with a bat, usually, certainly with a serious injury, also human anti-rabies

immunoglobulins (HARIG) should be administered when the vaccination on day 0 take place. The dose of HARIG to be administered depends on the body weight of the person concerned.

Rabies vaccine is not cheap and HARIG is even very costly. It is, therefore, very important to let examine a rabies suspected bat, which caused a bite contact, as quickly as possible, so that the treatment can be stopped in case of a negative rabies test.

Bats, which have inflicted a bite or which otherwise have had direct contact with damaged skin (hands) or mucous membranes and which are still available, should be examined for rabies as soon as possible. Dead bats with direct contact with men or pets should also be made available for rabies testing as soon as possible. A live bat that has caused a bite case should be offered to for euthanasia and should be submitted for rabies examination.

Pets who have been in direct contact with bats should be vaccinated against rabies for safety as soon as possible by a veterinarian. However, most contact cases between bats and pets are not observed and there is usually no vaccination in these animals. A natural transfer of bat rabies to dogs and cats has not yet been demonstrated, although a cat in France showed contamination with EBLV. This can be an indication that dogs and cats and possibly other terrestrial mammals are also not very susceptible to an infection with one of the EBL-viruses.

Cats are among the main predators of bats in Europe and are thus more likely than dogs to come into contact with them, although most attacks are probably not observed by humans.

**First International Conference “Rabies in Europe”
Kiev (Ukraine), 15-18 June 2005
Conclusions and Recommendations
Session 6: Bat rabies**

Epidemiological data available so far show that the destruction of an infected bat colony is ineffective and must be avoided. This strategy will disturb the balance of the metacolony and should be avoided as far as possible not to induce an unpredictable dispersion of infected animals. It is preferable to monitor the known positive colonies (salivary excretion and serological survey with marking of sampled bats belonging to the colony), collection of all sick or dead bats.

Medical treatment. People who may come into contact with bats because of their work should take the necessary precautions. Direct body contact with bats should be avoided as much as possible. Although there is very little chance of being infected with bat rabies virus, preventive vaccination against rabies is highly recommended in a number of cases. If necessary, vaccination may be carried out in consultation with a family or company doctor or with an area health authority.

If a bat has been bitten or has had direct hand contact, the following actions should be carried out as soon as possible:

- Wash the bite spot /or hands well with water and soap in running water for 10 minutes
- Disinfect the bite spot and/or hands with alcohol 70% and if not available with ordinary household methylated spirit or betadine iodine 10%
- Contact immediately the family or company doctor or with an area health authority.

The administering of rabies vaccinations is done on the basis of schemes recommended by the World Health Organisation (WHO). A distinction is made between preventive and treating or curative (post-exposition) vaccinations.

Anyone who has been bitten by a rabid bat or has had any other direct contact with that animal, or has had such contact with a bat that could not be examined for rabies, and has not previously been vaccinated against rabies, needs a more extensive post-exposition vaccination on days 0, 3, 7, 14, 30 and 90, each with 1 ml of vaccine. When this post exposure vaccination commences within 5 days of contact with a bat, usually, certainly with a serious injury, also human anti-rabies

immunoglobulins (HARIG) should be administered when the vaccination on day 0 take place. The dose of HARIG to be administered depends on the body weight of the person concerned.

Rabies vaccine is not cheap and HARIG is even very costly. It is, therefore, very important to let examine a rabies suspected bat, which caused a bit contact, as quickly as possible, so that the treatment can be stopped in case of a negative rabies test. People who, in connection with their work, are likely to come into contact with bats in several occasions, could be considered to be on the schedule of preventive vaccination in such a case.

3.5.2. Other zoonosis and infection

Bats, as many other wild animals, can be transmitters or reservoirs of viruses, bacteria and fungi. These contaminants are present also in places, where bats form huge colonies of thousands of individuals with mass of guano (e.g. caves, old buildings, etc.).

Persons, who can regularly come into contact with wild animals and therefore can incur injuries by bites or scratch, are advised to also be vaccinated against tetanus. An infection with the tetanus bacterium, *Clostridium tetani*, can have a very serious course and can lead to death. The procedure for preventive vaccination and the post-exposition treatment against tetanus is not discussed here. After a preventive vaccination, a revaccination (booster vaccination) is usually only necessary after 10 years. The symptoms of tetanus are untreatable.

Also, when bat workers come in contact with huge mass of bat droppings e.g during saving colony, there is a danger in people with suppressed immunity to suffer with histoplasmosis, the illness caused by fungus *Histoplasma capsulatum*, which causes lung and bronchial system disorders. Mostly in South European region (consider, if give here also) [Lena check publication, Ivana and Branka](#)

3.5.3. Mites and parasites

Almost all acteroparasites are not dangerous to people; mention Nycteribia and bat fleas which can pottenianaly suck bleed; plenty of parasitic mites are special only for bats, they can cause in sensitive people allergy reactions such as ecczema. The only exceptions are bugs, which are clearly visible, if bat is transporting them. Most of bugs stayed at the original bat roost in fissures. [***to fourmulate]

3.5.3. Allergy to bat food

Some people can develop allergic reaction to fodder for bats in captivity (*Tenebrio molitor*, *Zophobas morio*), specifically to insects' frass and scales. The symptoms include allergic conjunctivitis, rhinitis, eczema, asthmic problems and in serious cases also anaphylactic shock. It is recommended to keep mealworms outside living space; the type feeding can also reduce amount of microscopic fragments, which are airborne (e.g. oat flakes instead of bread or meal products).

3.6. Health risks for bats – transmission from bat rehabilitators

Even though bats and humans do not share most of diseases, there is an evidence of transfer of some other viruses from bats to humans, where bats serve as a reservoir of viruses, mostly in tropics (e.g. Ebola, SARS, etc.). In context of recent coronavirus pandemic disease and potential of mutations, bat rehabilitators should follow also basic hygienic procedures to protect not only himself, but also the bat and in case of positivity or symptoms of disease do not handle with bats. It is not concerning only viruses or bacteria, but also fungi (e.g. spread of *Pseudogymnoascus destructans* by speleologists). They should wear single-use gloves and masks according to current state of any disease suspicious from human-bat transmission in the country.

4. Bat rescue and rehabilitation for bat research, conservation and public education

In the rescue centers are yearly accepted thousands of bats of different species and thus represent a huge store of data. If there is no connection between rescue centers and bat specialists in the country, information about bat species occurrence, disease, roost biology and related conservation problems are lost. Often it is not very easy to establish cooperation between centers and NGOs or individual bat workers; sometimes it is even impossible. Rescue organization can keep no evidence of findings or they can have own databases, which are not willing to share. Even if they are willing to share their database, if they have no bat expert at the center, identification of species is however often incorrect. If the cooperation is possible even in small steps, both conservation organizations or universities and rescue centers can profit (e.g. collective grants, collective public events, medialization which can attract donors, etc.). Cooperation often starts during bat public events, due to social media or offers of voluntary works for students.

Cooperation with rescued centers with shared database, where bats are identified by bat expert, can be a mighty tool, especially in countries with few bat specialists, and can be used as a method for: bat monitoring, bat conservation, bat biology studies, parasitological, virological research, and for public education. Not survived animals are the source for the replenishment of museum collections.

4.1. Source of new faunistic data

Bat contact and bat rehabilitation centers are a powerful tool for collecting new faunistic bat data, which otherwise could not be collected at all. In some sense, such centers may be considered as nodes of citizen science, although with active involvement of bat experts.

Cooperation with scientists enables distinguishing of different bat species. Many of bat species are very similar and workers usually used the determination of the most common species, e.g. all small bat species including small *Myotis* and *Hypsugo* assigned to genus *Pipistrellus*, etc. Correct determination of species is also important for bat-workers (e.g. thermal and moisture demands for hibernation in *Pipistrellus* versus small *Myotis*) or potential risk of EBLV.

Several southern bats (e.g. *Hypsugo savii* and *Pipistrellus kuhlii*) move the borders of their occurrence more to the north and because of their synanthropic style of life can be present in particular findings.

Case study 4.*: Ukraine: Contact-centres and new discoveries

In 2009–2015, the Kyiv contact-rehabilitation centre had received almost 900 calls from 116 settlements in all provinces of Ukraine as well from other countries (Russia, Kyrgyzstan, Moldova, Belarus, Latvia). The centre worked in telephone, e-mail, and Facebook modes.

All calls were processed by the common scheme and included into data-base. All correspondents received either consultative or contact help (in case of contact rehabilitation). Correspondents were asked to make and send photos of found animals (all materials were compiled and are stored in the archive). In 50–60% of calls the species of animals was identified. As a result, the data massif on records of nine bat species (*Eptesicus nilssonii*, *Eptesicus serotinus*, *Myotis mystacinus s. l.*, *Nyctalus noctula*, *Pipistrellus kuhlii*, *Pipistrellus nathusii*, *Plecotus auritus*, *Plecotus austriacus*, *Vespertilio murinus*) was collected (Godlevskaya, 2012; 2015).

In many cases, received data were the first in their way. The raw of records concern first records of species in certain regions or season of year. Some records were the first bat data on fauna of a region. Calls to the centre made possible revealing of bat colony roosts. Among others, the received

data pool made possible to reveal and to confirm the significant expanding of the winter range *N. noctula*, as well as *V. murinus* (Godlevska, 2014, 2015b).

4.2. Bat monitoring

If the protocols and database of findings of particular bats and colonies are carefully filled up, they can be used as a very mighty tool for bat monitoring. In many countries, every year huge amount of reliable data can be evaluated from the rescue centres. In databases covered decades can be recorded changes in distribution and abundance mainly in synatropic species. The data thus can help also to evaluation of conservation status at least at national level.

4.3. Bat conservation

Repeated findings from the same place often signify a presence roost important to bats (hibernation site, swarming site, maternity). Evidence of findings enables protection of particular bat roosts and huge colonies and prompt act during reconstruction and insulation of buildings, as well as during felling trees. Details of finding also enables determination of different roosts especially in the buildings, which can act as deadly traps (e.g. gas-heaters, vertical shafts, etc.). Thus suitable measures preventing bat invasion can be done both locally, but also on wider scales.

4.4. Bat biology

Results from detailed database together with possibility of involvement of students of life sciences can also enable compile knowledge of not so easily accessible data, such as sex and age composition of hibernation colonies, swarming aggregations, roosting preferences of different species as well as migration behaviour and seasonal pattern of occurrence.

Case study 4.*: Studying bat lifespan

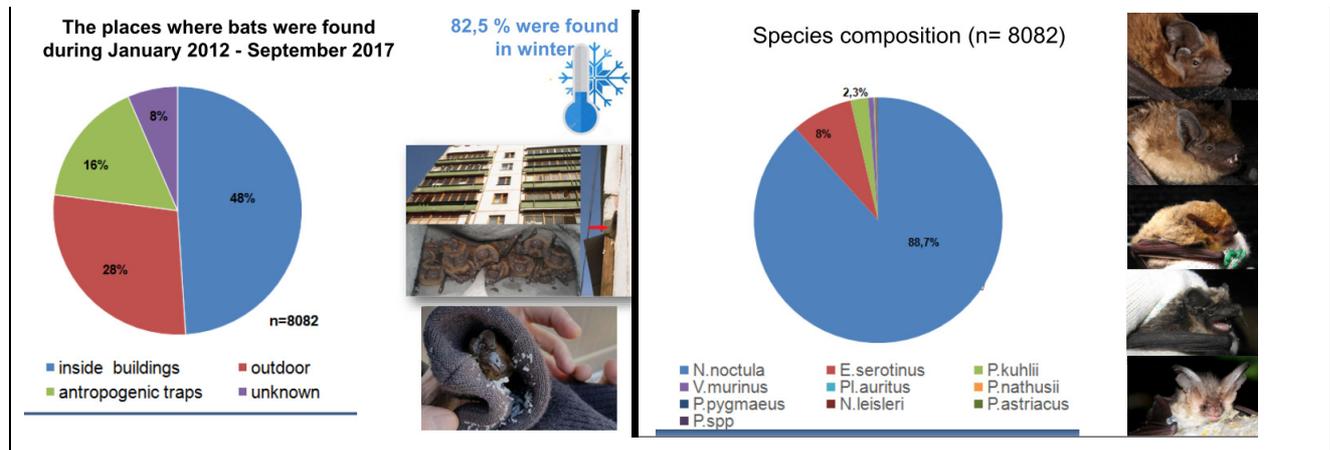
[*** to add] I thought people would be interested in this new paper on mitochondria and aging in bats. Maggie Brown of the West Yorkshire Bat Hospital contributed dead pipistrelles to the research and is named as a co-author. A great example of bat care's value to science!

<https://www.aging-us.com/article/101861/text>

Case study 4.*: Ukraine: species composition

[*** to add]

According Prylustka et al 2018 (and othe presentation concernning this theme):Results of bat rehabilitiaition centre work 2012-2017, Kharkiv, Ukraine.



4.5. Public education

– if the legislation of country permits, disabled bats kept in rescue centers and accustomed to handling and petting can be used at public events as well as for education training for officials, insulation companies or forestry staff.

Holding annual **International Bat Nights** is good possibility for establishment the cooperation between bat workers and rescue centres. Captive disabled bats represent an important educational tool for their wild counterparts. Only bats that cannot be released back into the wild should be considered for education and the possible use is restricted to natural temperament, species of bat and actual condition. One of the most popular, social and generally easily tamed species is noctule bat. On the other hand, species that are considered high disease risks (such as Daubenton's bats, serotines, pipistrelles) should not be used widely for public engagement events. To reduce the risk of transmission of zoonotic disease any bat to be used for education must be kept isolated from other bats for at least six months. This isolation period is essential to ensure the health and safety of the bat, the handler and the general public. When using a bat for education the following should always be considered:

- where handled, bats should always be shown in gloved hands,
- the general public should not be allowed to handle the bats,
- showing of a bat in the hand should only constitute few minutes of a talk, the bats have to be used for handling and stay calm during manipulation
- the welfare of the bat should always be a priority, and sufficient food and water provided to the bat as required.
- until the bat is needed, it should be kept out of sight and in a secure box where it is comfortable and its welfare needs are met, and covered so that the bat does not undergo any additional stress.

Caution on species used in demonstrations. There is information that representatives of some species are critically stressed because of touching (e. g. *Plecotus*, *Barbastella*, *Rhinolophus*). Such species should not be used for long demonstration. The most appropriate species (of European fauna) seems to be *Nyctalus noctula*. It is comparatively big and stands well touching and petting. Nevertheless always depends on character of particular bat.

Case study 4.*. Serbia: bats use for public education

Non-releasable bats and bats in rehabilitation are being used for bat popularization and education of general public. Most commonly we have *Nyctalus noctula* and *Pipistrellus kuhlii*. Those animals are being shown to people during International bat night events. Occassionally we organize lectures

in schools and kindergartens, where kids can see and touch them. Few times we organized “feeding” events where children came with their parents, and assisted during feeding sessions. Also, few times we were releasing bats in front of the “audience” – for example, once a girl rescued a grounded bat that she found in the school yard. After one week of rehabilitation, animal was ready to be released back to the nature. That girl came together with her parents and school friends to watch that bat being released and flying away.

Text by: ***

4.6. Parasitology

When good cooperation between scientists and rescues centers are established (e.g. volunteering), it can be used for research of quantity and species of their specific ectoparasites such as mites, fleas, bugs or other parasitic insect, which can be outspread also to bat condition, colony size, roost type, etc.

4.7. Destination of dead bats

[previously: Epidemiology, toxicology and preservation of dead bats]

Dead bats should never be thrown away because they still can be used for many scientific purposes. Non well documented bats can be used for educational purposes. Private collections have hardly any scientific value and are usually not accessible to researchers, so that in fact research material is lost.

The purpose of reseacrh on a dead animal determines how it should be kept for the time being. It is important that the information about an animal, such as the finding location and date and its conditions, are recorded as accurately as possible and attached with a label to the animal. Animals of which material should be used for toxicological research (e.g. pesticides, traces of lead), DNA analyses, histopathology, rabies research, or other disease tests should be kept at-10 to-20 °C. In any case, they should not be kept in alcohol, formalin or other preservatives.

In order to prevent the drying out of the animals in a freezer, small bats, like the Common Pipistrelle Bat, can be stored in, for example, a small plastic or glass medicine jar.

Larger animals can, for example, be kept in larger glass or plastic medicine jars or in a plastic food box. Dead animals can also be wrapped in aluminium foil. For some research, the animals should be delivered deep-frozen.

Consult the concernd researcher how this can be achieved. Animals for toxicological research should be sent to a research institute as soon as possible, as some substances can quickly disappear from a dead animal. Dead animals for scientific museum collections or for research on endoparasites can be stored frozen or in alcohol (preferably ethanol) 70-96%. In case ethanol is not availble, household methylated spirits can also be used.

Preserve the animals never in formalin. Make with a scalpel or a pointed scissors a small, long cut of about 5 mm in the abdominal skin, so that the preservation fluid can penetrate the inner side of the bat as well. When more animals are kept together, each animal should be labeled with the requirede data, so that exchange of such data cannot take place. The data can best be written with a pencil, Indian ink or any other alcohol proof ink on the label which can then be attached with a thin string or cotton thread to one of the hind legs of the bat.

As said before, dead bats of which no proper finding data are known, can be used for educational purposes. Of dead bats which have already been dissolved, the skeleton material can still be used for a scientific museum collection.

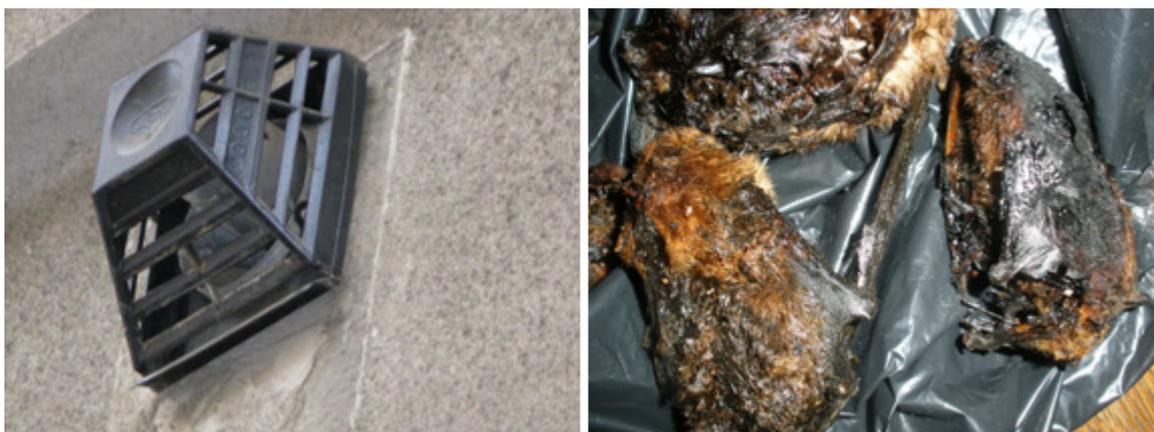
Dead bats should be mailed in a sturdy box and not in an envelope, even not in a blister envelope. Animals that are not treated with a preservative are first wrapped in a plastic bag and then wrapped

with paper. Never send dead animals just before a weekend or before general public holidays. Send dead animals per priority mail. Both the post(wo)man and the recipient will not appreciate stinky parcels. Dead bats can, of course, also be delivered at the visiting address of the concerning research institutes.

Case study 4.*: the Netherlands: rehabilitation centres and bat rabies surveillance

Case study 4.*: Czech republic – colony in gas-heaters: cooperation between NGOs Nyctalus, Czech Bat Conservation trust and media

In old estate in Prague many households use gas-heaters. The vents of gas-heaters are covered by various types of metal equipment, which should protect invasion of birds and light waste. Bat rehabilitators were called by neighbour, because owner did not care about bats, and he used gas heater even when bats were present. After strong reproof, he let dismantle the gas heater, and took out 24 dead and dying burned bats and 13 alive bats. We asked other neighbours and discovered that this roost was traditionally inhabited during autumn migration and also during hibernation. The case was medialized, and thus other new cases of bats in gas-heaters were reported including regular occurrence of colonies ([Zieglerová et al. 2016](#)). This case was also assigned to Czech Bat Conservation Trust, which suggest and realized acceptable solution of this problem, and to Czech Inspection of Environment.



Noctules squeeze through horizontal fissures in metal protection of gas heater, invade into it and according to the type they can be imprisoned here. Distress calls of bats often lure other bats. Once the heating season starts, bats are burned alive.

DOPLNIT POKUSY S jUNKERS - Helena

5. List of manuals and guidelines on bat rescue and rehabilitation

Books and articles

- Barnard, S. M. (ed.). 2009. Bats in captivity. Volume 1: Biological and Medical Aspects. – Washington, DC, Logos Press. 600 p.
- Barnard, S. M. (ed.). 2010. Bats in Captivity. Volume 2: Aspects of Rehabilitation. 2010. Washington, DC, Logos Press. 468 p.
- Barnard, S. M. (ed.). 2011. Bats in Captivity. Volume 3: Diet and Feeding-Environment and Housing. Washington, DC, Logos Press. 420 p.
- Barnard, S. M. (ed.). 2012. Bats in Captivity, Volume 4: Legislation and Public Education. Washington, DC, Logos Press. 332 p.
- Brown M., Brown B. 2006. Bat Rescue Manual. [***]
- Dondini, G., Vergari S. 1998. Manuale per la conservazione dei pipistrelli. Mem.Museo, Riserva Nat. Or. Onferno, 1: 1-52 pp. Linee guida per il primo soccorso. [In Italian.] – PDF by GIRC on www.pipistrelli.org
- Jahelková, H., Hájková, P., Bláhová, A. 2009. Péče o netopýry: Metodika péče o nalezené, zraněné a hendikepované netopýry, č.21. Český svaz ochránců přírody, MŽP. [In Czech.]
- Lollar, A., French, B. A. S. 1998. Captive care and medical reference for the rehabilitation of insectivorous bats. Bat Conservation Intl.
- Miller, H. (ed.). 2016. Bat Care Guidelines (2nd edn). The Bat Conservation Trust, London. <https://www.bats.org.uk/resources/guidance-for-professionals/bat-care-guidelines-a-guide-to-bat-care-for-rehabilitators>
- Prylutska A. S., Vlaschenkjo A. S., Domanska A. D., Hukov V. S. Bat rehabilitation handbook. Kharkiv: Tsyfraprynt. 126 p. [In Ukrainian: Прилуцька А. С., Влащенко А. С., Доманська А. Д., Гуків В. С. 2021. 126 с.] – http://www.bat-kharkov.in.ua/wp-content/uploads/2021/04/Manual_for_bat_rehabilitation_ua-1.pdf

Web-pages

- Have found a bat in winter, what to do? – <http://kazhan.org.ua/ukr/nearbats/winter.htm> [In Ukrainian]
- Rehabilitation basics. – <https://www.bats.org.uk/resources/resources-for-bat-carers/rehabilitation-basics>

6. National bat rescue and rehabilitation contact

[*** List of BRR /animal rescue centers + websites + facebook; should be collected]

| Country | City | Organisatin | Web-link |
|----------------|-----------------------|-------------|--|
| Bulgaria | Stara Zagora Sofia | | Green Balkans BRCC/NMNHS |
| Czech republic | Prague Prague | | Nyctalus Nyctalus |
| France | | | Muséum d’histoire naturelle de Bourges |
| Hungary | Budapest | | Budapest Zoo |
| Ireland | Kildare | | Kildare Animal Foundation |

| Country | City | Organisatin | Web-link |
|------------------------|---|--|--|
| Italy | Rome | | Ass Tutela Pipistrelli |
| | Pistoia | | |
| | Pisa | | WWF Pisa |
| Luxembourg | Dudelange | | Natur&ëmwelt |
| Montenegro | | Public enterprice for the National parks of Montenegro Natural History Museum of Montenegro | |
| Norway | Oslo | Norwegian Zoological Society | |
| | Tønsberg | Norwegian Zoological Society | |
| Portugal - Mainland | Lisboa | ICNF | |
| | Pombal | Plecotus | |
| | Santarém | Plecotus | |
| | Sintra | AES | |
| Portugal - Madeira | Funchal | Madeira Fauna & Flora and Eurobats advisor | |
| Romania | Satu Mare | Romanian Bat Protection Association | |
| Serbia | Belgrade | WCS Mustela | |
| | Belgrade | NH Museum / WCS Mustela | |
| Slovakia | | Slovak Bat Conservation Society ZO SZOPK Miniopterus Rehabilitation stations ZOO Bojnice State Nature Conservancy of SR, Velka Fatra NP Administration | |
| Slovakia | | Faculty of Natural Sciences, Pavol Jozef Šafárik University in Košice | |
| Slovenia | responsible for whole Slovenia | | Golob d.o.o., Zatočišče za živali prosto živečih vrst |
| | SW Štajerska region & Central Slovenia | | SDPVN |
| | Central Slovenia region | | SDPVN |
| Switzerland | | | Bat Conservation Switzerland |
| UK | | BCT | |

| Country | City | Organisatin | Web-link |
|----------|------|--|----------|
| /England | | | |
| Ukraine | | Ukrainian Bat Centre for Bat Conservation, UCEBA Bat Rehabilitation Center Feldman Ecopark | |

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References

- [The Norwegian Zoological Society's bat care centre – five years of practice] - Fauna, Oslo 60 (3-4): 183 -189 (in Norwegian, English figure texts and English summary).
- Ancillotto L., Serangeli M.T. & Russo D. (2013). Curiosity killed the bat: Domestic cats as bat predators. *Mammalian Biology*. 78: 369-373
- Arthur, L., & Lajoinie, N., 2004. Vers un réseau national de soins aux chauves-souris. *Symbioses*, N.S. 10 : 21-22.
- Bareille, S., 2013. Nos chers SOS chauves-souris... 10 ans après. *Kawa Sorix*, 11 : 9-10.
- Benoist, D., Nicolle, L., Sauvage, E., & Sicot, M.C., 2013. *SOS Chauves-souris : Guide d'intervention*. G.M.N., Epaignes, 40p.
- Godlevska L. V. New *Vespertilio murinus* (Chiroptera) winter records. An indication of expansion of the species' winter range? // *Vestnik zoologii*. – 2013. – T. 47, №3. – C. 239-244.
- Godlevska L. V. Results of the work of the bat contact-centre (Ukraine) // *Scientific Notes of Taurida V. I. Vernadsky National University*. – Series: Biology, chemistry. – 2012. – Vol. 25 (64), No 4. – P. 12-20. (In Russian with English summary.)

Godlevska L. Results of the work of the Kyiv bat contact-centre in 2012–2015 // Proceedings of the Theriological School. – 2015. – Vol. 13. – P. 11–19. (In Ukrainian.)

Godlevsky L., Tyshchenko V., Negoda V. First records of *Pipistrellus kuhlii* from Kyiv // Vestnik zoologii. – 2000. – T. 34, № 3. – P. 78.

Hanák V., Neckářová J., Benda P., Hanzal V., Anděra M., Horáček I., Jahelková H., Zieglerová A., Zieglerová D. 2009. Fauna netopýrů Prahy: Přehled nálezů a poznámky k urbánním populacím netopýrů. *Natura Pragensis* 19, pp. 3-89

Handbuch Fledermaus-Notpflege (Vers. 2014/1 in Überarbeitung) für die fachspezifische berufsunabhängige Ausbildung (Art. 192 Abs. 1 Bst. b TSchV) (Bewilligung-Nr. 13/0028 Stiftung zum Schutze unserer Fledermäuse in der Schweiz, Dr. Hans-Peter B. Stutz).

http://www.sdpvn-drustvo.si/FOTKE/PROJEKTI/Publikacije/Glej_netopir_09.pdf

Hudcová, S. 2013. Analýza nálezových dat výskytu netopýrů na území hlavního města Prahy a v jejím okolí související s lidskou činností. Diploma thesis (in Czech language with English summary). – soon prepared for publication [to update the reference]

Jahelková H, Neckářová J., Zieglerová A., Zieglerová D. 2008. Nové nálezy zimujících netopýrů rodu *Pipistrellus* sp. v Praze a okolí. *Vespertilio* 12: 27-32

Jahelková, H., Hájková, P., Bláhová, A. 2009. Péče o netopýry: metodika péče o nalezené, zraněné a hendikepované netopýry, Český svaz ochránců přírody, 111 pp.
<http://www.ceson.org/document/metodikapeceonetry.pdf>

Lehotská, B., 2006: netopiere (Chiroptera) urbanizovaného prostredia Bratislavy. In: *Acta Environmentalica Universitatis Comenianae*. – Vol. 14, No. 2, p. 55-63.

http://www.fns.uniba.sk/fileadmin/user_upload/editors/actaenvi/ActaEnvi_2006_2/07_Lehotska.pdf

Likožar, L., 2011. First record of Savi's pipistrelle *Hypsugo savii* (Bonaparte, 1837) in NW Slovenia. *Natura Sloveniae, Ljubljana* 13(1): 63–64. (http://web.bf.uni-lj.si/bi/NATURA-SLOVENIAE/pdf/NatSlo_13_1_8.pdf)

Mastrobuoni G., Gaiba G., Ragno R. 2005. Prima segnalazione per il Lazio (Italia Centrale) di *Vespertilio di Bechstein*, *Myotis bechsteinii* (Chiroptera: Vespertilionidae). *Boll. Mus. reg. Sci. nat. Torino* 22: 525-530.

Mingo-Casas P, Sandon̄s V, Obōn E, Berciano JM, Vāzquez-Morōn S, Juste J, et al. (2018) First cases of European bat lyssavirus type 1 in Iberian serotine bats: Implications for the molecular epidemiology of bat rabies in Europe. *PLoS Negl Trop Dis* 12(4): e0006290.
<https://doi.org/10.1371/journal.pntd.0006290>

Molina-López, R. A., Mañosa, S., Torres-Riera, A., Pomarol, M., & Darwich, L. (2017). Morbidity, outcomes and cost-benefit analysis of wildlife rehabilitation in Catalonia (Spain). *PLoS one*, 12(7), e0181331.

Orehar, N., 2009. Pomoč poškodovanim netopirjem. *Glej, netopir!* Ljubljana 6(1): 44–45.

Petrinjak, A. & L. Likožar, 2009. Halo, halo, tu netopir, potrebujem pomoč. *Glej, netopir!* Ljubljana 6(1): 41–43. (http://www.sdpvn-drustvo.si/FOTKE/PROJEKTI/Publikacije/Glej_netopir_09.pdf)

Podgorelec M., Petrinjak A., Mlakar J., Kaučič R., Zidar S., Presetnik S., Zgajmajster M., Knapič M., Likožar L. Voluntary helpline provides important data on bats in Slovenia // 13th Bat Research Symposium. – poster & abstract.

Podgorelec, M., [in press]. Odziv na klice javnosti v zvezi z netopirji (2012, 2013). *Glej, netopir!* Ljubljana 10(1): xxx - Podgorelec, M., 2011. Odziv na klice javnosti v zvezi z netopirji (2010, 2011). *Glej, netopir!* Ljubljana 8(1): 29–31. (http://www.sdpvn-drustvo.si/FOTKE/PROJEKTI/Publikacije/glej_netopir_8-01.pdf)

Presetnik P., K. Koselj, M. Zgajmajster, N. Zupančič, K. Jazbec, U. Žibrat, A. Petrinjak & A. Hudoklin, 2009. Atlas netopirjev (Chiroptera) Slovenije, Atlas of bats (Chiroptera) of Slovenia. Atlas faunae et florae Sloveniae 2. Center za kartografijo favne in flore, Miklavž na Dravskem polju, 152 str.

- Presetnik, P., M. Podgorelec & A. Petrinjak, 2013. Is the parti-coloured bat *Vespertilio murinus* Linnaeus, 1758 a common bat species in Slovenia? *Natura Sloveniae*, Ljubljana 15(2): 39–50. (http://web.bf.uni-lj.si/bi/NATURA-SLOVENIAE/pdf/NatSlo_15_2_4.pdf)
- Roué, S.Y., Sané, R., & Leblanc, F., 2002. Synthèse de la table ronde "sauvetages". *Symbioses*, N.S. 6 : 41-44.
- Schach-Duc, Y., 1993. Soins aux chauves-souris et déduction quant à leur biologie et leur comportement. in : *Actes des 4èmes Rencontres Nationales "Chauves-souris", Bourges, les 30-11 et 01-12-1991*. S.F.E.P.M. - S.F.F., Paris, 74-86.
- SDPVN yearly publication Glej, netopir! (<http://www.sdpvn-drustvo.si/zlozenke.html>)
- Serangeli M.T., Cistrone L., Ancillotto L., Tomassini A. & Russo D. (2012). The post-release fate of hand-reared orphaned bats: survival and habitat selection. *Animal Welfare* 21: 9-18.
- Serangeli M.T., Cistrone L., Ancillotto L., Tomassini A. & Russo D. (2012). The post-release fate of hand-reared orphaned bats: survival and habitat selection. *Animal Welfare* 21: 9-18.
- Servat *et al.* 2017 - Bilan de la surveillance des infections à Lyssavirus chez les Chiroptères en France métropolitaine: 4 cas détectés en 2017
- Shpak A. Bats of Minsk (Belarus): species composition, habitat ecology and features of hibernation // 3rd International Berlin Bat Meeting: Bats in the Anthropocene. – 2013. – P. 83.
- Shpak A. Hibernating bat species of Belarus: results of the work of the Minsk bat-contact Centre // Proceedings of the Theriological School. 16 (2017): 135–141.
- Tyshchenko V. M., Godlevska O. V. First winter records of *Vespertilio murinus* and *Nyctalus noctula* (Chiroptera) in Kyiv // *Vestnik zoologii*. – 2008. – Vol. 42, № 3. – P. 280. (In Ukrainian.)
- van der Kooij, J. & Gebhard J. 2010. A practical approach to the successful release of hand-reared bats. - Powerpoint presentation at the Pre-Symposium Bat Care Workshop at the 2nd International Berlin Bat Meeting.
- van der Kooij, J. 2007. Norsk Zoologisk Forenings flaggermusmottak – fem år har gått [The Norwegian Zoological Society's bat care centre – five years of practise] - *Fauna*, Oslo 60 (3-4): 183-189 (in Norwegian, English figure texts and English summary).
- van der Kooij, J. 2007. Norsk Zoologisk Forenings flaggermusmottak – fem år har gått [The Norwegian Zoological Society's bat care centre – five years of practice] - *Fauna*, Oslo 60 (3-4): 183-189 (in Norwegian, English figure texts and English summary).
- van der Kooij, J. 2007. Norsk Zoologisk Forenings flaggermusmottak – fem år har gått
- van der Kooij, J. 2010. Bat Care. What are the benefits? - Powerpoint presentation at the Pre-Symposium Bat Care Workshop at the 2nd International Berlin Bat Meeting.
- van der Kooij, J. 2013. Fledermauspflge Norwegen – Wie und wieso? - Powerpoint presentation at the Pre-Symposium Bat Care Workshop at the 3rd International Berlin Bat Meeting.
- van der Kooij, J. Bat Care in Norway – 12 years of practice. In prep.
- van der Kooij, J. Bat Care in Norway – 12 years of practise. In prep.
- Vlaschenko A. S. Sex ratio in four bat species in north-eastern Ukraine // *Journal of V.N. Karazin's National University. Series: biology*. — 2008. — № 814, Iss. 7. — P. 65–73. (in Russian)
- Vlaschenko, A. S., & Plylutska, A. S. (2018). The Bat Rehabilitation Center of the “Feldman Ecopark”, Kharkiv, Ukraine/Das Bat Rehabilitation Center des „Feldman Ecoparks“, Charkiw, Ukraine. *Nyctalus (NF) Berlin*, 19(2), 158-161.
- Zell, C., 2013. Sauvetage in extremis de 464 noctules communes à Strasbourg. *LPO Info Alsace*, 49 : 2.
- Zieglerová et al. 2016 [***]

Annex 1. Questionnaire

IWG14 – Bat Rehabilitation: Questionnaire

| | |
|-----------------|--|
| Country | |
| Completed by | |
| Organisation | |
| Contact details | |
| Date | |

Bat rehabilitation is temporary caring for bats which lost their roosts, or were injured or orphaned, following to release them back into the wild. Please, forward the questionnaire to responsible bat-rehabilitation workers in your country.

* Circle what is applicable.

General

1) Who is rehabilitating bats in your country? Approximate number?

| | | |
|-------------------------------|------|-----|
| a) Persons | Y/N* | n = |
| b) NGOs | Y/N* | n = |
| c) Governmental organizations | Y/N* | n = |
| d) Others | Y/N* | n = |
| e) Nobody | Y/N* | |

If others, please, specify:

2) Who is funding bat rehabilitation in your country?

| | |
|-------------------------|------|
| a) Governmental bodies | Y/N* |
| b) Local authorities | Y/N* |
| c) NGOs / funds | Y/N* |
| d) Private contributors | Y/N* |
| e) Others | Y/N* |
| e) Nobody | Y/N* |

If others, please, specify:

3) Are there any regulations for bat rehabilitation in your country? Y/N*

If yes, please, give details:

4) Do bat rehabilitation centres (or people) in your country co-operate with each other? Y/N*

If yes,

| | |
|--|----|
| a) Bat rehabilitation centres (or people) co-operate closely | X* |
|--|----|

| | |
|---|----|
| b) Bat rehabilitation centres (or people) co-operate more or less | X* |
| c) Only some bat rehabilitation centres (or people) co-operate | X* |
| d) Bat rehabilitation centres (or people) don't co-operate | X* |

5) **Are there summarizing descriptions of bat rehabilitation systems in your country? Y/N***

If yes, please give references to the summarizing publications:

6) **Are there databases for bat rehabilitation records available? Y/N***

If yes,

| | |
|--|---|
| a) All bat rehabilitation records are inserted in a national database | X |
| b) Each rehabilitation centre (or person) has its own database, available for sharing | X |
| c) Each rehabilitation centre (or person) has its own database, but they do not share data | X |
| d) Only a few rehabilitation centres (or persons) record received bats | X |
| e) Others | X |

If others, please, specify: _____

Rehabilitation for conservation of bat populations and their roosts

7) **Can you estimate the number of received and released rehabilitated bats per year in your country? Y/N***

If yes, please, give approximate numbers: _____

If available, please, give references to the summarizing publications: _____

8) **What species are mostly rehabilitated? In what numbers (per year)?**

| | |
|-------------------------------------|---------------------------------------|
| a) <i>Nyctalus noctula</i> | 1-10 / 10-100 / 100-1000/ >1000 ind.* |
| b) <i>Vespertilio murinus</i> | 1-10 / 10-100 / 100-1000/ >1000 ind.* |
| c) <i>Pipistrellus pipistrellus</i> | 1-10 / 10-100 / 100-1000/ >1000 ind.* |
| d) <i>Pipistrellus pygmaeus</i> | 1-10 / 10-100 / 100-1000/ >1000 ind.* |
| e) <i>Pipistrellus nathusii</i> | 1-10 / 10-100 / 100-1000/ >1000 ind.* |
| f) <i>Eptesicus serotinus</i> | 1-10 / 10-100 / 100-1000/ >1000 ind.* |
| g) Others | 1-10 / 10-100 / 100-1000/ >1000 ind.* |

If others, please, specify: _____

If available, please, give references to the summarizing publications: _____

9) **Which bats are mostly rehabilitated (choose max 4 points)?**

| | |
|--|----|
| a) Extracted during renovation works in buildings | X* |
| b) Single bats in rooms | X* |
| c) Seasonal mass invasions of tens/hundreds of bats in rooms | X* |
| d) Caught by cats/dogs | X* |
| e) Grounded adult specimens | X* |
| f) Found in felled trees | X* |

| | |
|-----------------------|----|
| g) Orphaned juveniles | X* |
| h) Others | X* |

If others, please, specify: _____

10) Are bat rehabilitation records used to rescue / monitor colonies or to prevent demolishing of roosts during renovation and insulation works?

Y/N*

Rehab data and rehab bats for scientific purposes

11) Are bat rehabilitation records used for collecting additional faunistic data (new localities, occurrence of species, etc, etc,)?

Y/N*

If published, please give references:

12) Are dead animals used for virological, morphological, parasitological, histological etc. research? Or for museum collections?

Y/N*

If yes,

| | |
|---|----|
| a) All died bats are stored in a freezer for further research* / museums* | X* |
| b) Dead bat bodies are occasionally utilised | X* |
| c) Others | X* |

If others, please, specify:

13) Do you have national regulations concerning the use of dead animals for different purposes?

Y/N*

If yes, please, specify:

Rehabilitated bats for public education

14) Are bats under rehabilitation used for public education during bat events in your country?

Y/N*

15) Are healthy wild bats used for public education during bat events in your country?
Y/N*

16) Are there any regulations and restrictions for using (rehabilitated) bats during bat events in your country?

Y/N*

If yes, please, specify:

If available, please, give references to the summarizing publications:

17) What bat species are used during bat events?

Please, specify:

18) During bat events, in your country, visitors can:

| | |
|---------------------------------------|----|
| a) See bats in hands of bat-workers | X* |
| b) See bats only in a box | X* |
| c) Touch bats by hands in gloves | X* |
| d) Touch bats by hands without gloves | X* |

19) Who is authorized in your country to euthanize bats of which their clinical situation avoids further successful rehabilitation?

Please, specify: _____

Rehabilitation itself: exchange of experience

20) Do you have any manuals or guidelines in your country in national language(s)?

Y/N*

If yes, please, give reference, if possible with an on-line link.

21) Please point few names and contacts of experts involved in bat rehabilitation in your country.

| Name | Country | City | Organisation | E-mail |
|------|---------|------|--------------|--------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

22) Please give references to main bat rehabilitation web-sites, if available:

Other

23) Rabies vaccination is compulsory for all people who works with bats in animal rescue centers

Y/N*

Annex 2. EUROBATS Resolution 7.10 Bat Rescue and Rehabilitation

The Meeting of the Parties to the Agreement on the Conservation of Populations of European Bats (hereafter “the Agreement”),

Recalling Article III of the Agreement, especially paragraphs 1, 2, 4 and 5;

Noting that bat rescue and rehabilitation involves rescuing bats and bat colonies at risk and temporarily caring for bats which have lost their roosts, or those which are diseased, injured or orphaned; then every effort is made to release them back into the wild;

Further noting Resolution 5.2 on Bats Rabies in Europe that recommends rabies surveillance of bats which have died or injured bats which have been euthanized;

Further noting Resolution 5.4 on Monitoring Bats across Europe for the further collection of faunistic data;

Further noting Resolution 5.7 on Guidelines for the Protection of Overground Roosts, with particular reference to roosts in buildings of cultural heritage importance since most bats received by bat rehabilitators are found in or nearby buildings;

Further noting Resolution 6.5 on Guidelines on Ethics for Research and Field Work Practices;

Further noting Resolution 6.8 on Monitoring of Daily and Seasonal Movements of Bats;

Further noting Resolution 6.16 on Implementation of the Conservation and Management plan 2011-2014 that parties should continue efforts to raise public awareness to improve education;

Further noting Resolution 7.11 on Bats and Building Insulation which recommends the collection and sharing of information on bat presence in buildings;

Recognising that Bat rescue and rehabilitation may play an important role in bat conservation;

Further recognising that relevant information obtained from bat rehabilitators can be used for practical bat conservation including roosts;

Further recognising that data collected by bat rehabilitators can provide important information for scientific research such as species distribution and disease monitoring as well as for practical conservation;

Further recognising that the level of bat rehabilitation varies across Parties and Non-Party Range states ranging from countries with no rehabilitators to those with established operating networks;

Further recognising that the recording protocols are not standardised and differ widely across Parties and Non-Party Range states;

Further recognising that public awareness is important for effective bat conservation;

Urges Parties and non-party Range States to:

1. Encourage the establishment and support of effective animal rescue and rehabilitation systems which include bats in their countries;
2. Encourage capacity building and training in order to raise the standards of bat rescue and rehabilitation;
3. Recommend the use of standardised record protocols (Annex 1) by bat rehabilitators and encourage the contribution of data to any existing national database, or if absent, encourage the establishment of such a database;
4. Encourage collaboration between bat rehabilitators and bat scientists for the purposes of data collection, other scientific research and exchange of knowledge;
5. Use only captive disabled bats for public events when national legislation permits it;

Requests the Advisory Committee to develop guidelines for bat rehabilitators and develop a system for collecting information for international cooperation.

Annex for Resolution 7.10

A standard form of bat record protocol applicable for bat conservation should include at least these items:

ID number

Name of finder:

Name of rehabilitator/organization:

Date of finding:

Location of finding (address if appropriate):

Place of finding: ground building block-of flats facade cellar
 tree unknown other

Circumstances of finding: reconstruction in tion fallen tree
 brought by cat dog unknown
 other

Bite incidents human cat other

Species:

Sex: male female **Age:** no plant baby juvenile adult

Individual/colony: Individual Cold Size of cold

Condition of bat: normal dehydrated exhausted emaciated
 injured dead other

Sent for disease test: Yes No

Final fate: Released Euthanasia Captivity Death

Comments:

We also recommend to take photographic documentation if possible.