RSPCA Wildlife Rehabilitation Protocol: Bats

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Two week old Common Pipistrelles at West Hatch Wildlife Centre
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Protocol for the rehabilitation of British Bats.

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Note: highlighted sections of text are areas where further research is required.

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1 Introduction

The RSPCA's Wildlife Centres and the Wildlife Department have prepared a series of husbandry protocols for the different species that are admitted to the Wildlife Centres.

The protocols have been produced by amalgamating the working practices from each centre into one document which has then been discussed at a workshop before being agreed by RSPCA staff. Any areas where agreement cannot be reached are then highlighted as areas for future research.

Where possible, an expert (from outside the RSPCA) on the behaviour and ecology of the species in question was invited to attend these workshops so they could offer advice and comment.

These protocols are based on the experience and knowledge of our wildlife centre staff and are supported by research demonstrating their success. They are subject to review and updates will be added as and when required. New protocols will also be added over time.

This protocol contains general information only. The RSPCA makes no warranties, representations or undertakings about any of the content of the protocol (including without limitation any as to the quality, accuracy or fitness for any particular purpose of such content).

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2 Species information

2.1 Species or group of species covered by this protocol

Species common name: BATS
Families scientific name: RHINOLOPHIDAE; VESPERTILIONIDAE

Common name	Status	Distribution
Greater Horseshoe bat	Native, endangered	SW England, S Wales.
Lesser Horseshoe bat	Native, endangered	SW & S England, Wales
Whiskered bat	Native local	Most UK
Alacathoe bat	Native, not known	Yorkshire and Sussex
Brandt's bat	Native, local	W & N England
Natterer's bat	Native, fairly common	UK
Bechstein's bat	Native, very rare	S & W England, S Wales.
Daubenton's bat	Native, fairly common	UK
Serotine	Native, locally abundant	S & SE England
Noctule	Native, uncommon	England, Wales, SW Scotland
Leisler's bat	Native, scarce	S,C & E England, Wales, N. Ireland
Common pipistrelle (45)	Native common	UK
Soprano pipistrelle (55)	Native, common	UK
Nathusius' pipistrelle	Establishing as resident	Occasional but increasing
Barbastelle	Native, rare	England & Wales
Brown long eared bat	Native, common	UK
Grey long eared bat	Native, very rare	S England (expanding?)
Greater Mouse-Eared bat	Extinct?	Formerly S England
Parti-coloured bat	Vagrant – occasional records	

2.2 Identification of species covered by this protocol

- According to the Bat Conservation Trust, there are 17 species of bat in the UK. This includes the Greater Mouse Eared bat, which was thought to be extinct, but as one individual of has been found hibernating in the same roost for three years in a row, it is once more considered to be a British species.
- Identification of adult bats is difficult without practice and experience, but the FSC guide listed at the back of this protocol is an excellent way to start.
- An adult bat is one that should be able to feed for itself on the wing. Most juveniles should be at this stage by September/October.
- Bat pups are usually born between late June and early August and births are usually synchronised within the colony to occur over a very short space of time. The majority of births are singles; twins are very rare. At birth, pups can weigh between 20-30% of the adult body mass and are blind and naked. The eyes open in the first few days and the fur grows rapidly. Pups often have disproportionately large feet. They will grow rapidly so that they are nearly as big as their parents by 14-22 days. The wings do not develop fully until they reach this size and so they cannot fly until that point. Once flying, they will start to feed for themselves and will be weaned between 45-65 days old.
- Survival of pups is correlated to the age and experience of the mother. When the mother is out feeding, the young bats will huddle together in a crèche. Each pup forms a bond with its mother in the first few hours of life, which allows them to identify each other, when the mother returns to the roost.

2.3 General information on species (or group) as relevant to care in captivity

(e.g. food type, solitary/social, migrant/resident, fossorial/arboreal, crepuscular/nocturnal/diurnal)

- Bats in the UK are all insectivores and have evolved to exploit different niches in the environment, to minimise direct competition. They eat a variety of insects (see section 5.1) and use different methods to hunt them.
- All UK bats are nocturnal and hibernate during winter.
- Bats are gregarious creatures, living in colonies for most of the year, whether they are hibernating or nursing. In some species, the males and females roost separately during nursing, while in other species the sexes will mix. Males and females of all species will hibernate in mixed groups. They display unusual reproductive biology with females storing sperm over winter. This needs to be considered if taking in female bats in early spring as it can lead to unseasonal early births.
- Mostly resident (some migratory species)
- Roosts sites are very specific. As bats are colonial adults should be released back in the area where found. Many species will use one roost site during summer and another when hibernating during winter and they show great fidelity for these roosts.
- They typically leave their roosts at dusk to forage and will hunt for as long as they need to, therefore the time they spend on the wing can vary greatly with season and food supply.
- Home range and habitat use varies with species.
- Bats are not blind – in fact, some have excellent night vision.
- All bats found in the UK use a system called echolocation to hunt and navigate. The system is similar to sonar, in that the bat emits a signal and analyses the returning signals which bounce off objects in the bats environment.
- Bats and their roosts are protected by law. If anybody should deliver a juvenile bat(s), that may have been disturbed while in their roost, the member of staff admitting the animal(s) should collect as much information as they can about the location of the roost and then pass the information on to the Inspectorate as a possible complaint.

2.4 Importance of Environmental Enrichment

- Fulfil social physical and mental requirement
- Promote foraging skills and fitness in pups
- Promote physical health of adult
- Provide stimulation for mental health in pups and adults

2.5 Bats and rabies (lyssavirus)

Following the death of a bat worker in 2002, due to infection by a European Bat LyssaViruses (EBLV), it has become prudent to take sensible precautions when handling bats. EBLVs are a form of rabies and two types have been found in European bats, EBLV 1 and EBLV 2.

Gloves must be worn when handling any bat: surgical + cotton/washing up gloves for small species and surgical + leather gloves for large species.

It is recommended that any centre wishing to take in bats for rehabilitation should have at least one member of staff nominated to oversee all bat care and that they should be vaccinated against rabies. Any member of staff who is likely to be involved in the handling of bats on a regular basis should also consider being vaccinated. These vaccinations are available free of charge from your doctor; they can obtain the vaccine from the Health Protection Agency. Any employee of the RSPCA can have the vaccine provided for them if necessary.

3 Pre-admission treatment.

This part of the protocol is to provide information for telephone queries regarding bats and bat rehabilitation, prior to receiving a bat a an RSPCA Wildlife Centre. There are two possible scenarios:

1. A member of the public/Inspector/ACO is reporting a sick/injured/abandoned/grounded bat and wants further information as to what to do;
2. Prior to admission, some animals may be held at a veterinary surgery or other facility. Some, if not all, of these facilities may request information on care of the animal, before they send it to an RSPCA centre;

Some bat pups may be found in a house etc. where there has been no apparent disturbance. In this situation, attempts should be made to reunite the pups with their mother by taking the pups outside the roost as the bats are starting to emerge; hopefully the mother will then collect her pup. If the pups have genuinely been orphaned, they will need to be brought into care.

3.1 Information should be collected on the following:

a) All names and addresses of any people involved with the bat casualty, for reference in case rabies procedures are required (data to be kept on file for 6 months).
b) Species, if known
c) Extent of injuries, evidence of shock
d) Body condition, any previous injuries
e) Age of animal, is it weaned or unweaned?
f) Location animal was found (important to ensure it is returned to the same place)
g) All records of previous treatment (if from another establishment)

3.2 Advice related to care, e.g. diet, provision of heat etc.

Emphasis on rehydration – provide water in small shallow container (milk carton lid, pill bottle lid) with water soaked kitchen towel or sponge.

Keep in plastic tank on kitchen paper, in warm place, offer water on fine paint brush.

WEAR GLOVES	surgical + cotton/washing up gloves for small species surgical + leather gloves for large species
DIET	dead, headless mealworms, hand-feed mealworm innards
HUSBANDRY	secure bat escape proof box can be placed on towel on heat pad. If plastic box, provide kitchen roll for bat to hang from.

3.3 Advice related to the treatment of particular problems.

Euthanase all bats with compound # radius/ulna, humerus, (not fingers)

REHYDRATION – lectade/water/CCF – 0.2ml (small species)

3.4 Advice regarding the fitness of the animal for transport.

Ensure that container holding the bat has no holes larger than 5mm (1/4 inch) as small bats can escape through small holes. A margarine tub with holes punched through the lid is ideal.

4 Health and Safety

4.1 Introduction

The RSPCA has developed the Wildlife Centre Protocols to provide guidance and advice on the keeping of certain species of wild animal for rehabilitation. Anybody who intends to treat sick, injured and/or orphaned wild animals must accept that there are risks in doing so. Some wild animals are potentially dangerous and may be capable of causing serious injury. Furthermore, all wild animals have the potential to carry parasites, disease and bacterial infections. Some of these may be passed to humans (zoonoses) or to other animals, either domestic or wild. Barrier nursing methods should be used to minimise the spread of these infections between animals.

4.2 Risk assessments

It is recommended that any establishment admitting bats should complete risk assessments for all areas.

This is a brief summary of some of the possible risks and suggested ways to reduce the effects.

Members of public are advised to use gloves or a suitable alternative (e.g. towel) when handling bats and to keep dogs etc away from bats.

Hazards	Control measures	Level of risk
Bites and scratches	Gloves to be used when restraining	Low
Diseases (Lyssavirus)*	Gloves should be worn when handling Treatment areas must be cleaned thoroughly after examination	Low
Parasites	Gloves should be worn when handling	Low

* Staff/volunteers who handle bats should be vaccinated against rabies. This is available free of charge through the Health Protection Agency (HPA). More information can be found here: http://www.bats.org.uk/pages/bats_and_rabies.html

5 Decision making – to treat or not to treat

5.1 Information should be collected on the following:

a) All names and addresses of any people involved with the bat casualty, for reference in case rabies procedures are required (data to be kept on file for 6 months).
b) Species, where possible
c) Extent of injuries, evidence of shock
d) Body condition, any previous injuries
e) Age of animal, is it weaned or unweaned?
f) Location animal was found (important to ensure it is returned to the same place)
g) All records of previous treatment (if from another establishment)

5.2 Triage

Options for the animal are: euthanasia, treatment or immediate return to the wild.
The considerations listed below will help to guide this decision.

5.2.1 ASSESSMENT RELEVANT TO THE CONDITION OF THE ANIMAL

a) Unweaned pups require specialist facilities and staff with the necessary skills and experience. The rearing of pups should only be undertaken by such staff.
b) Is the animal very seriously injured or in immediate need of veterinary care? (Multiple injuries give a poor prognosis)
c) Sex (females lactating need to be returned quickly)
d) Breeding status (note: females in early spring may be pregnant)
e) Time of year (males in autumn can be difficult to feed). All bats are difficult to feed closer to hibernation.
f) Euthanase all bats with compound # radius/ulna, humerus, (not fingers)
g) Euthanase all bats with COMPLETE WING membrane tears (see Fig. 1), unless facilities are available to allow bat to recover. NB partial tears or holes (small or large) in wing membrane and tail membrane have good release rates and should be referred to Wildlife Centre.

5.2.2 ASSESSMENT RELEVANT TO THE CENTRE AND THE MANAGEMENT OF THE ANIMALS

a) Is a vet available to see the animal?
b) Is there appropriate housing/space available to accommodate the animal?
c) What are current staffing levels?
d) Is there a member of staff who has been vaccinated against rabies?
e) What is the predicted intake of animals in the short term?
f) Do the staff have the necessary skills and experience?
g) RSPCA policy is to not keep permanent captive bats.

5.3 Treatment on admission

5.3.1 IF ANY OF THE FOLLOWING PROCEED TO DETAILED EXAMINATION BY EXPERIENCED BAT HANDLER AND REFER TO VET IF NECESSARY.

- Wounds, fractures
- All those with torn wing membranes
- Unweaned pups
- Head injuries, jaw damage
- Caught in fly paper
- Skin problems/ heavy ecto-parasite load
- Emphysema
- Severe dehydration
- Severe malnutrition
- Potential burns if bat has been caught in light fitting or by chemical spill/spray.
- Fishing hooks

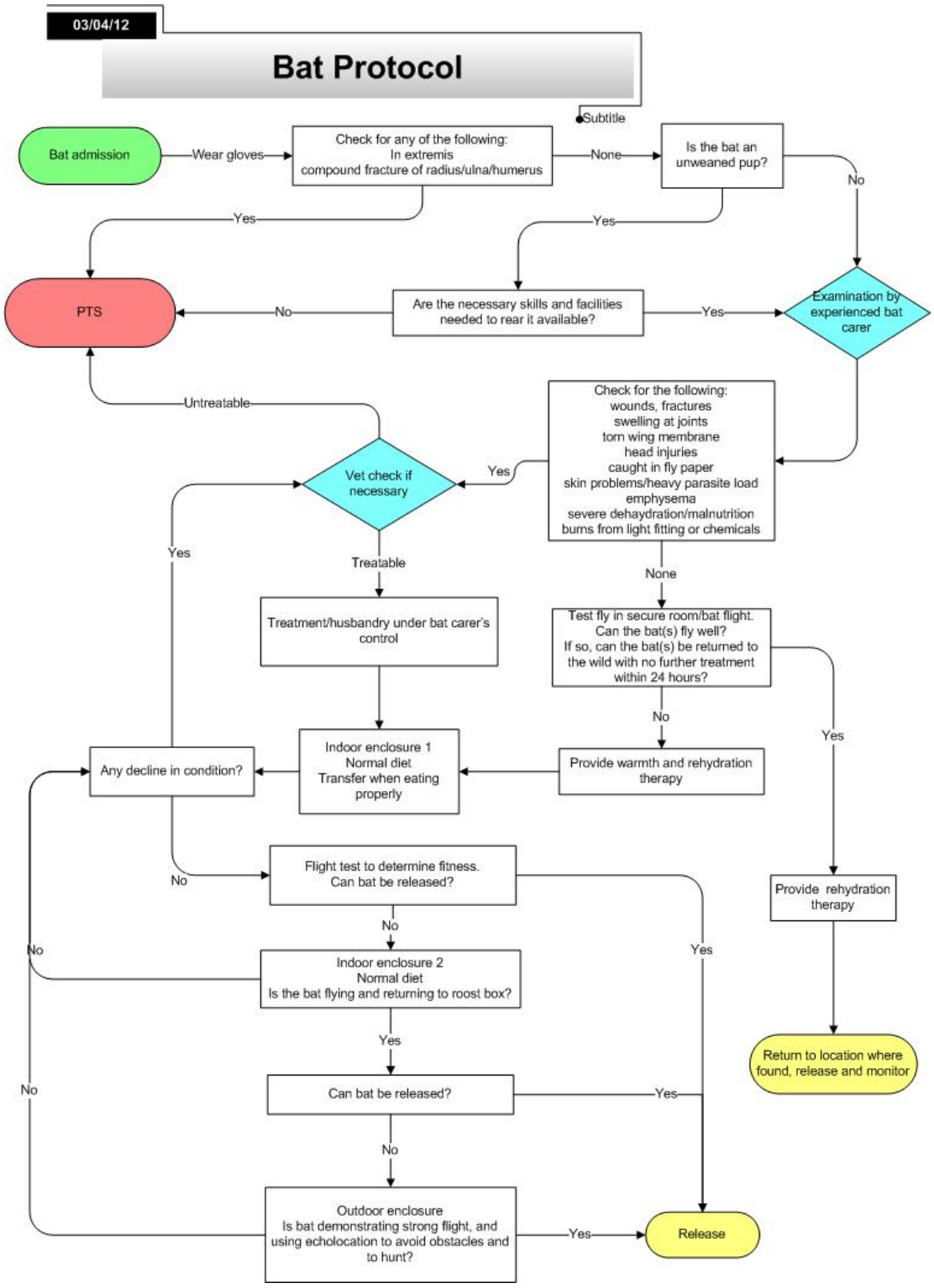
5.3.2 If none of the problems listed in 3.3.1

Warm up administer rehydration fluid using syringe or a small, clean, disposable paintbrush, whatever is easiest, then leave the bat to settle for a few hours.

Later, try with further rehydration fluids and try hand feeding up to 3 or 4 mealworm innards. Leave 10 dead mealworms in the tank if bat is mobile and seems bright enough (and if good body weight for that species).

Fig 1 – Pipistrelle bat showing complete membrane detachment.

5.4 Flow chart



6 Accommodation

The progression from *Indoor1* to *Indoor 2* to *Outdoor 1* represents the movement of an animal through the Centre as its condition improves. Not all of the housing categories will be relevant, depending on the casualty's age, condition, injuries etc.
Clearly indicate where differences exist for Adults and Young.

6.1 Indoor 1 (intensive care)

Enclosure: Plastic tank (approx 30cmx20cmx25cm tall) with mesh roof for most species, Noctules and serotines should be housed in a larger box.

Wooden box, hinged lid (44cm x 24cm x 22cm) with mesh window, can also be used but care must be taken that the boxes are disinfected thoroughly between casualties.

Lighting requirements: Normal day/night lighting. Plastic clear box can be covered with towel for extra warmth/security

Substrate: Paper towel/kitchen roll on floor of box + hung down sides of box for bat to hang from or hide behind. Two layers for plastic box. (picture) Must be changed daily.

Temperature: Babies/juveniles/sick adults: heat mat under box with towel on top of heat mat.

If using a propagator with heat source, keep at temperature 27 – 31 Celsius (for pups / hand-rearing).

Ventilation: Avoid draughts and noisy areas

Humidity: Avoid hot dry conditions

Access to water: Shallow lid approx. 3.5cm x 2cm (add small piece kitchen towel soaked in water for unweaned juveniles)

Environmental Enrichment: Quiet room/area. For unweaned pups add fake fur like material and toilet roll innard to hide in.

When to move to next stage:
Adults: test fly for release once eating well and injuries healed.
Juveniles + long term injured adults – when eating whole mealworms + injuries healed, move to 4.2 or 4.3
Individual bats can be marked using rings, fur clips or water based markers. A licence may be required for this so advice should be sought from the local Statutory Nature Conservation Organisation (SNCO) e.g. Natural England, Countryside Council for Wales.

6.2 Indoor 2 (less intensive monitoring)

Enclosure: An empty and unused room that has been modified to prevent bats from escaping/hiding and with any potential hazards removed or covered.

Lighting: Natural: from secure window or $1cm^2$ wire mesh grill across window

Artificial lighting must be guarded to prevent bat landing on it and sustaining burns

Substrate: Most floor surfaces OK, e.g. carpet, linoleum

NB – beware: bats may crawl under carpets/blankets so do not walk on them until checked!

Temperature: Summer – normal room temperature

If dealing with bats during the hibernation season, remember that some bats can be released if conditions are suitable. Avoid overwintering if at all possible. If you need to keep bats during this period, they should be kept in unheated room, but a heat pad should be available to them.

Ventilation: Meshed window (summer)

Access to water: Small lids (approx 3.5cm x 2cm in bat box and on floor)

Environmental Enrichment: Bat boxes on walls, resting places (e.g. towels hung in upper corners of room. Meshed window allows insects in + UV light. Prefer same species company.

Mealworms can be provided in hanging bird feeders if bats are flying.

When to move to next stage: When able to do short flights + preferably return to bat box to roost during day.

6.3 Outdoor 1

Enclosure: Bat flight (suggested 7m x 4m x2.3m) 1cm^2 wire mesh + inner mesh lined
Safety door to prevent escape.

Substrate: Concrete

Shelter: Three sided + roofed lean to area 2m x 1m containing various bat roosts e.g. bat boxes, hollow tree log.

Access to water: Small lid 3.5cm x 2cm in bat box + shallow containers can be placed on floor and made safe by covering with fine plastic mesh (also breeding area for midges as natural food).

Environmental Enrichment: Lights (UV and mercury vapour) planting to encourage insects (evening primrose, honeysuckle etc.). Movable baffles as obstacles. Prefer same species company.

When to move to next stage: Strong sustained flight, echolocating (feeding buzzes?) avoiding obstacles and landing well, feeding on insects on the wing

Bat flight at RSPCA Stapeley Grange: external view (right) and interior showing shutters and insect attractants (lamp, vegetation).

7 Diet

Every effort should be made to mimic the animal's natural food as closely as possible. If this is not possible, a semi-natural diet should be proposed.

7.1 Food in the wild

Adults

Common name	Diet
Greater Horseshoe bat	moths, large **beetles**, caddis and crane flies
Lesser Horseshoe bat	small moths, *Diptera* e.g. **craneflies**, small beetles. Lacewings
Whiskered bat	may flies, small moths, *Diptera* e.g. craneflies
Alacathoe bat	unknown, probably may flies, small moths, *Diptera* e.g. craneflies
Brandt's bat	may flies, small moths, *Diptera* e.g. craneflies
Natterer's bat	*Diptera* e.g. craneflies, moths, caddis flies
Bechstein's bat	moths
Daubenton's bat	**caddis flies**, *Diptera* e.g. craneflies, moths beetles, mayflies, water boatman
Serotine	large beetles, large moths
Noctule	**large beetles**, crickets, moths
Leisler's bat	moths, beetles, caddis, *Diptera* e.g. dung flies
Common pipistrelle (45)	***Diptera*****,** caddis, moths, flies lacewings
Soprano pipistrelle (55)	*Diptera*, caddis, moths, flies lacewings ??
Nathusius' pipistrelle	*Diptera*, caddis, moths, flies lacewings ??
Barbastelle	*Diptera*
Brown long eared bat	**moths,** craneflies, caddis, beetles, *Diptera*
Grey long eared bat	moths, craneflies, caddis, beetles, *Diptera* ??

(Richardson, 1985) Main items in bold, if known.

Young: Mothers milk then on to above foods once flying from 3 weeks

Need details on composition

7.2 Semi-natural captive diet

Adults: Above insects encouraged into the flight , but supplemented by giving mealworms as unlikely to be able to provide enough natural food.

Young: As adults once weaned

7.3 Captive diet

Note that there are three sizes of mealworm, mini, regular and giant. Larger bats like noctule, Liesler's and serotine would have regular and smaller bats would have mini. However it is advised to offer a choice, especially with bats who are having difficulty eating.

Adults

Type of food	Amount	Time given/how often
Regular mealworms (head removed)	10-15 (small bat) 20 (medium bat) 50+ (large bat)	SID (PM)
Waxworms can be used	20 to serotines/noctules etc	SID (PM)
Mini mealworms	60 or ad lib to pipistrelles and similar	evening
Starved/awkward bats – AD diluted by water	0.2-0.5ml dependent on size	BID using syringe (TID if very underweight) until eating properly
Mealworms (innards – hand fed)	5+ depending on species/condition	BID until eating whole

Young

Type of food	Amount	Time given/how often
ESBILAC (unweaned only)1:2 then	0.1ml - 0.4ml pipistrelles to 0.5ml –0.7ml for Daubenton's	2 hourly decreasing to BID 7am to 11pm
Regular mealworms (hand feed innards), in conjunction with milk feeds above (head removed) then on to:	2 – 8 to encourage feeding	BID decrease milk and increase innards
Whole regular mealworms	10-15 (small bats)	Evening (kill mealworms first)

7.4 Comments

May need to hand feed until feeding without assistance. Horseshoe bats never seem to self feed. New bats may not recognise mealworms as a food source (even bats in good condition). If not eaten after 24 hours, try removing head of mealworm and squeeze contents of mealworm directly into bats mouth. Slowly stroking bats head and neck with thumb may encourage the bat to open mouth.

7.5 Supplements

Nutrobol – tiny pinch each day on mealworms for long term captives only as mealworms are short of calcium

7.6 Environmental enrichment

Natural foods encouraged by lighting (UV/mercury vapour) and fragrant evening scented plants near + inside bat flight.
Mealworms can be provided in a bird feeder to encourage bats to fly

8 Preparation for release

8.1 Training the animal for survival

If possible fly bat each evening for physiotherapy (assuming problem was injury). Fitness is rapidly achieved in bats that are ready for release.
For adults and hand-reared young, the main requirement is sustained flight. Young bats should have same species company for both roosting, grooming and play flying to develop social and flying skills.
Access to natural foods allows the young bats to practice flying and echolocation skills

8.2 When to release

When flight is normal and the bat is within normal weight range for that species.
Not in heavy rain, wind. In winter, release bats in mild spells if roosts have been disturbed.
Young hand-reared bats – release when prolonged nice weather and insects plentiful and plenty of time to explore and join a roost prior to winter and hibernation
Should be at normal daily emergence time for species concerned.

8.3 Where to release

Adults – back to where from (or suitable nearby environment for that species if habitat is totally unsuitable where found)
Juveniles should be returned to location where found, if at all possible.
If not, they should be released in areas where that species is present.

8.4 How to release

Hard release - releasing from hand. Keep bat warm in transport, once at release site hold in gloved hands, cupped over bat, to warm up. Bat should shiver and then start moving. Raise arms above head until bat takes flight. Can take 30-45 minutes with some bats. Can be used for adults and juveniles.

Juveniles can also be released from their bat box, placed on side of bat flight or wall – support feed with mealworms (but most do not return)

8.5 Information

What measurements should be taken prior to release
Sex, weight, forearm length

8.6 Tagging

C-rings available to use by licensed bat workers only
Radio tracking is possible using tags weighing 0.19g

9 Areas for research

Post release survival of adults and juveniles
Keeping bats during hibernation season – can they be kept on an unheated room, should they be allowed to hibernate properly,
Post-release radio-tracking of hand-reared bats especially to see if join roosts, time spent foraging etc.
Hard vs soft release of juveniles
Radio-tracking of wing injured bats that have recovered sufficiently to be released.

10 References

Bat workers manual: Eds. AJ Mitchell-Jones and AP McLeish 3rd Edition, 2004 JNCC
Which bat is it?: B. Stebbings
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Bats of Europe: Christian Dietz and Otto Von Henversen 2004 (Illustrated ID Key) Free to download from:
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Bats: P. Richardson. Whittet Books, 1985
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Kelly, A., S. Goodwin, A. Grogan & F. Mathews (2008) Post-release survival of hand-reared pipistrelle bats (Pipistrellus spp). *Animal Welfare,* **17,** 375.
Kelly, A., Goodwin, S., Grogan, A. and Mathews, F. (2012) Further evidence for the post-release survival of hand-reared, orphaned bats based on radio-tracking and ring return data. *Animal Welfare* **21**(1):27-31.

The Vincent Wildlife Trust also produces information leaflets on some species and a pipstrelle ID guide: http://www.vwt.org.uk
The Bat Conservation Trust has many leaflets that are available to order, or can be downloaded from http://www.bats.org.uk/

11 Annex - Pictures

Inside of the bat flight at Stapeley Grange, showing the roosting area

Inside of the bat flight at Stapeley Grange, showing detail of the bat boxes

Bat flight at Mallydams Wood

Bat flight at Stapeley Grange