

A Brief Guide to Bat Ectoparasites

David Dodds



Introduction to the third edition

This guide is intended to help bat-workers to identify parasites they find on bats or in bat roosts within the British Isles. It includes information on how to separate members of each order and, where it is possible without the use of a compound microscope, to identify them to family, genus or species.

Whilst studying bat parasites I have often needed to refer to a 600-page Dictionary of Entomology. I have done my best to save readers from that particular pain, by using straightforward terms wherever possible. I hope serious entomologists will forgive me!

The guide was originally produced to accompany a talk at the 2007 Scottish Bat-workers Conference. Since then I have used it to support bat ectoparasite identification workshops at the National Bat Conference. This expanded 2010 edition is intended to fill some gaps, correct one or two errors and be a little easier on the eye than the former A5 format. Any corrections or suggestions for improvements will be greatly received!

Equipment

To use the guide it will be necessary to arm yourself with a x10 hand-lens as a minimum, though a x20 lens or a dissecting microscope will allow more detailed features to be recognised.

Specimens should be stored in a 70% isopropyl alcohol solution in small containers. IPA is available from pharmacies (sometimes with a little insistence and a slightly embarrassing explanation of why you need it!), but gin or vodka, being 40% alcohol, will do at a pinch.

It is best to label containers by putting a small slip of paper inside, with the details in pencil (pencil won't run). That way labels can't get separated from specimens.

The following information is all essential, if a valid biological record is to be made from your specimen. Specimens from more than one bat should never be mixed.

- The date
- Your name
- An accurate location (ideally including a grid reference)
- As much information about the individual bat as you have (species, sex, adult or juvenile, etc).

Capturing Specimens

Most specimens can be removed from bats using forceps. Fast-moving or "clingy" species can often be slowed down with a dab of alcohol on a paint-brush. Ethyl acetate (sold as entomologists' insect killing fluid) is also effective, but beware of the fumes, which can make you (or the bat) dizzy if not used sparingly.

Blow over the bat's fur to find fur-dwelling ectoparasites such as bat-flies and fleas, but be ready to grab them with forceps. They are adapted to move swiftly through fur to escape a grooming bat and you will be astonished how fast they disappear!

It's also worth looking in cracks and crevices within bat roosts. Species such as Bat Bugs (*Cimicidae*) and adult Blyborough Ticks (*Argas vespertilionis*) are temporary parasites and usually leave the host before it leaves the roost.

Recording Schemes & Identification

At present there are two UK recording schemes, which gather data on bat ectoparasites.

The Flea Recording Scheme is Britain's oldest biological recording scheme and is run by Bob George, who welcomes flea specimens from any host species for identification. The Tick Recording Scheme is run by the Health Protection Agency.

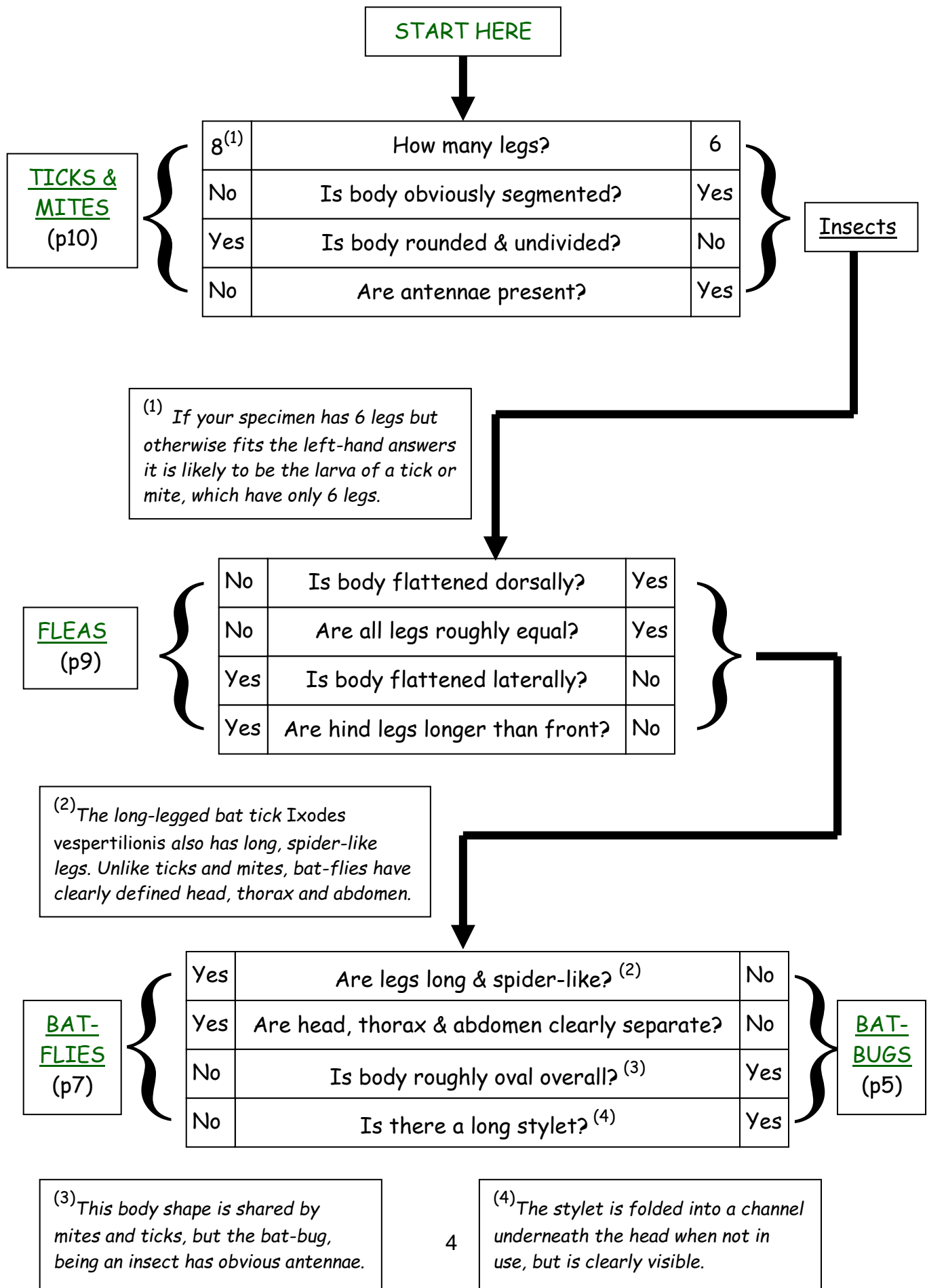
In addition, I welcome specimens of any bat ectoparasites, especially from outside the British Isles and am happy to feed back as much information as I can to anyone submitting them.

The Tick Recording Scheme
Health Protection Agency
Centre for Emergency Prep. & Response
Salisbury
SP4 0JG

The Flea Recording Scheme
Mr Bob George
54 Richmond Park Avenue
Queens Park
Bournemouth
BH8 9DR

www.hpa.org.uk

Key to Orders



Bat Bugs (*Cimicidae*)

Bat bugs belong to the order *Hemiptera*, the true bugs. These are piercing and sucking insects, most of which, for example Shield Bugs, consume plant juices. Bat Bugs and human Bed Bugs however, belong to the genus *Cimicidae*, which suck body fluids from their hosts.

It is thought that Bed Bugs are descended from Bat Bugs and they are morphologically very similar. There are some records of Bat Bugs leaving bat roosts in houses to feed on the human residents.

They are temporary parasites, normally only found on the host whilst feeding. They are often present in roosts in large numbers, occupying cracks or crevices. Their cast skins and detritus are obvious in some roosts.

Cimex feed by extending a stylet (a long sharp organ, normally folded into a channel beneath the head) and pressing it through the hosts' skin. The stylet is prehensile and is able to cut its way through the flesh, moving around until it contacts a capillary from which blood is drawn up.

The species usually found in the UK is *Cimex pipistrelli*, though another species, *Cimex dissimilis* has been recorded. Microscopic characters are used to separate the two from each other and from *Cimex lectularius*, the human bed bug. The relative dimensions of the antenna segments are also significant. They have been recorded in roosts of Pipistrelles and Noctules.



Cimex pipistrelli



Two *Cimex* sp. on the forearm of a Noctule Bat
(picture courtesy of Paul Hope)



Cimex pipistrelli ventral view of the head, showing the stylet
(sharp feeding organ), folded away

Bat Flies (*Nycteribiidae*)

Bat flies belong to the order *Diptera*, along with such varied insects as crane flies and midges. They are distinguished from other *Diptera* by being effectively wingless (some species have vestigial wings and are highly adapted to life as a bat parasite, moving swiftly through the fur and living on the bats body fluids.

Unlike most flies *Nycteribia* do not lay eggs. The female briefly leaves the bat colony to attach a sticky puparium to the substrate alongside. This later hatches and the new bat-fly is able to quickly access the bat colony. This enables bat-flies to colonise certain host species in place of fleas, which cannot complete their life-cycle in certain species such as Daubenton's Bats.

Three species have been recorded in the UK:

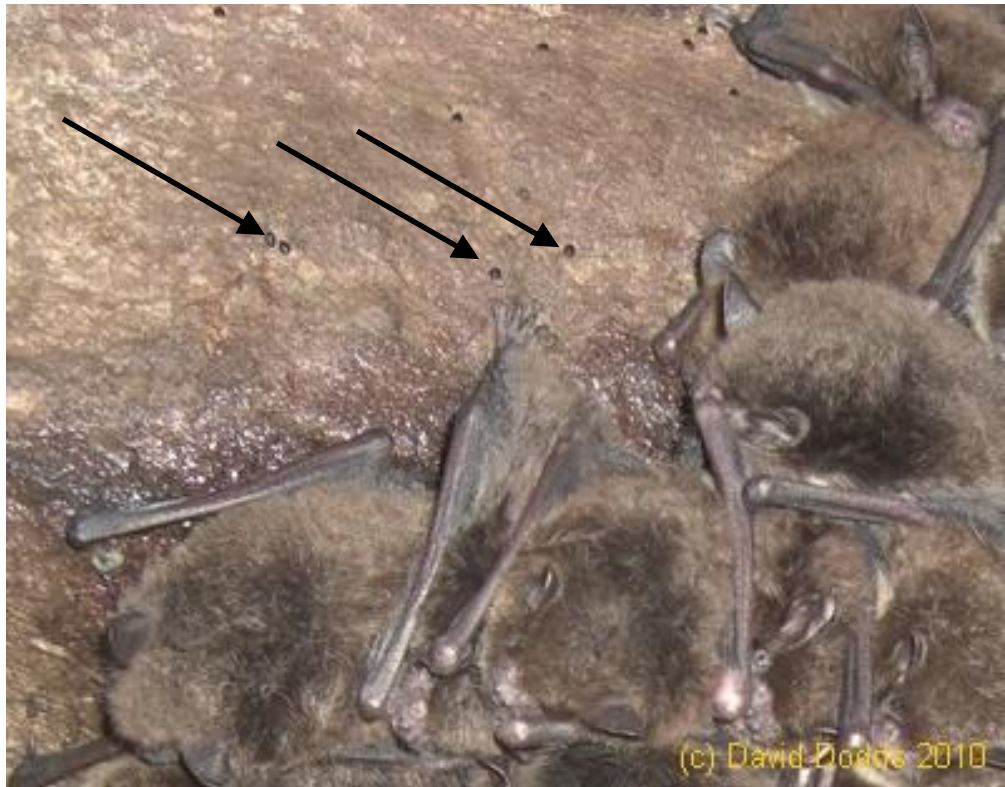
- *Nycteribia kolenatii*, usually found on Daubenton's Bats
- *Basilia nana*, usually found on Bechstein's Bats
- *Phthiridium biarticulatum*, usually found on Horseshoes.

The following key is summarised from Hutson (1984), which also contains detailed species descriptions and information on other species, which may still to be recorded in the UK.

1. - Pair of claspers ⁽¹⁾ at rear underside of abdomen, which has a rounded end (males)
...2
- Abdomen without claspers and ends in a pair of lobes (females) ...4
2. - Tibia ⁽²⁾ c. 2.5x as long as broad; claspers straight; group of 6-8 spines on rear underside of abdomen ...*Nycteribia kolenatii*
- Tibia at least 3.5 times as long as broad ...3
3. - Claspers curved; group of 6-8 spines on rear underside of abdomen ...*Basilia nana*
- Claspers straight, group of c. 40 spines on rear underside of abdomen ...*Phthiridium biarticulatum*
4. - Lobes at end of abdomen about 4x as long as broad ...*Phthiridium biarticulatum*
- Lobes at end of abdomen short and blunt ...5
5. - Tibia c. 2.5x as long as broad; usually on Daubentons Bats ...*Nycteribia kolenatii*
- Tibia c. 3.5x as long as broad; usually on Bechstein's Bats ...*Basilia nana*

⁽¹⁾ A pair of claw-like structures, visible below the rear abdomen of male specimens.

⁽²⁾ The lower of the two large leg parts, equating to the human shin.



Daubenton's Bat colony, showing Bat-fly puparia alongside



Nycteribia kolenatii

Bat Fleas (*Ischnopsyllidae*)

Although bat fleas belong to a distinct family, they are superficially similar to the fleas which plague cats, dogs and sometimes us and are instantly recognisable as fleas. They are often seen as small oval shapes, moving rapidly through a bats fur and are difficult to capture without fast reactions.

Like all fleas, only the adults are present on the host: the egg and larval stages are found in detritus within maternity roosts. The vector by which newly hatched fleas move to the roost is believed to be juvenile bats, which can fall from the roost whilst the mother is out feeding. When she returns she collects the juvenile and takes it back to the colony, bringing a group of newly hatched fleas, which then disperse into the colony.

Eight species have been recorded in the UK, two of which are extremely rare: *Ischnopsyllus elongatus* is primarily a parasite of Noctules.

Ischnopsyllus intermedius is mainly a Serotine parasite, but has been found on Noctules & Leislars's Bats.

Ischnopsyllus octactenus has Pipistrelles as its principal host. Also recorded on Leisler's.

Ischnopsyllus simplex simplex has been found on Whiskered and Natterer's Bats

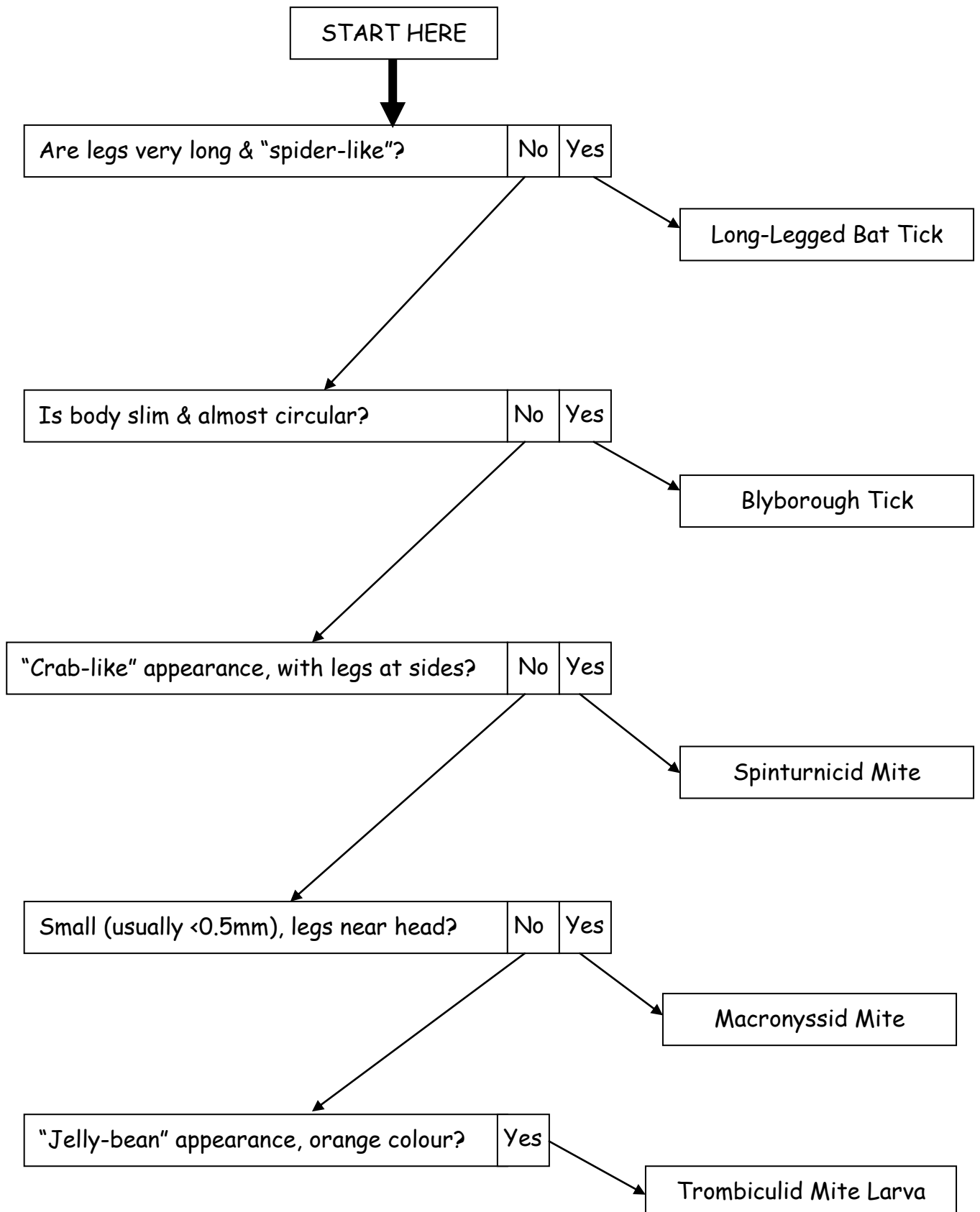
Ischnopsyllus hexactenus parasitises primarily Brown Long-eared Bats



Ischnopsyllus octactenus

Ticks and Mites

This simple key covers the tick species specific to bats and the mite species likely to be encountered by bat-workers. It excludes invasive or internal mite species



Bat Ticks

Two tick species exclusive to bats are found in the UK, although the sheep tick *Ixodes Ricinus* is occasionally found on bats, as well as humans, dogs etc. *I. ricinus* is sufficiently different to be easily separated from the two bat-specific species on the basis of its unflattened body and short legs (see picture on page 12).

Blyborough Tick (*Argas vespertilionis*)

This tick occupies crevices in bat roosts. Adults are rarely found on bats as they feed quickly whilst the bat is torpid.

Larval and nymph stages stay attached to the bat for up to three weeks and are often found in large numbers on sick or injured bats. Their primary hosts are Pipistrelle bats. They embed their mouthparts so that the flattened body sits vertically, aligned with the fur.

The common name comes from the village Church at Blyborough, Lincolnshire, where a large number of these ticks were found, associated with a Pipistrelle roost in the nineteenth century.



Blyborough Tick (*Argas vespertilionis*)

Long-legged Bat Tick (*Ixodes vespertilionis*)

This tick is closely related to *Ixodes ricinus*, the sheep tick which plagues people and pets in some areas, but it exclusively parasitises bats.

They are usually found on walls and in crevices of bat roosts in caves and are believed to feed primarily in winter. Their preferred hosts are Horseshoe bats, though they are occasionally found on Pipistrelles and *Myotis* species.



Long-legged Bat Tick (*Ixodes vespertilionis*)



Sheep Tick (*Ixodes ricinus*)

Bat Mites

Spinturnicid Mites (*Spinturnix* sp. etc.)

These are often the most obvious parasites on a bat, as they live only on the wing and tail membranes and are comparatively large, (up to 1.5mm long). Their crab-like appearance is distinctive.

They are well- adapted to life attached to a bat's wing and only leave to move to another bat. Eggs and larvae develop within the female, which gives birth to protonymphs, similar to the adults and able to immediately survive on the bat.

Males have an obvious shield-shaped plate on the underside and a pointed abdomen, whereas females have teardrop-shaped shields and a rounded abdomen. Id to species is primarily based on the arrangement of setae (hair-like structures), which can are often hard to see clearly without using a compound microscope.

Nine species have been recorded in the UK:

Spinturnix plecotinus parasitises Brown Long-eared Bats, though it is uncommon.

Spinturnix andegavinus is often found in large numbers on Daubenton's Bats.

Spinturnix myoti is usually found parasitising Natterer's Bats.

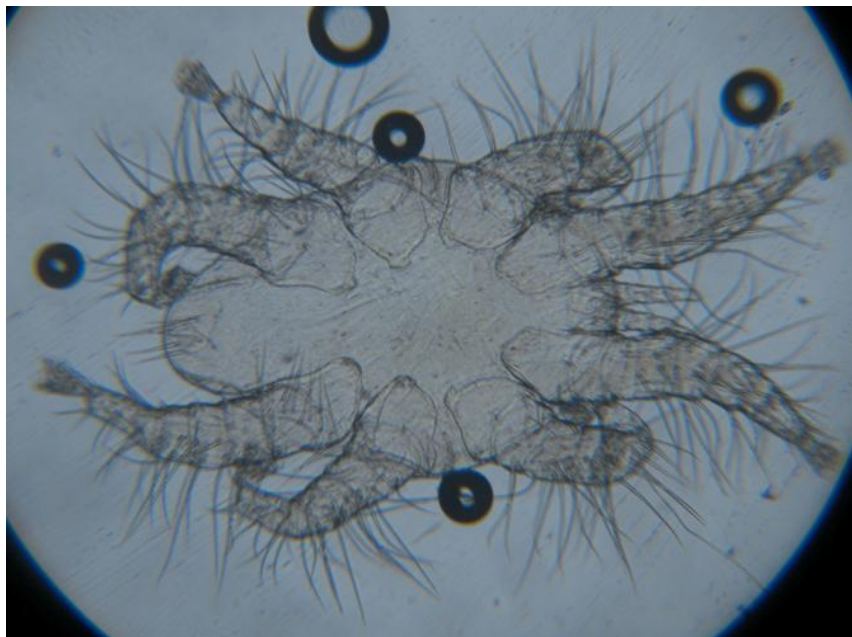
Spinturnix mystacinus is usually hosted by Whiskered Bats.

Spinturnix acuminatus is a parasite of Noctules and rarely Pipistrelles.

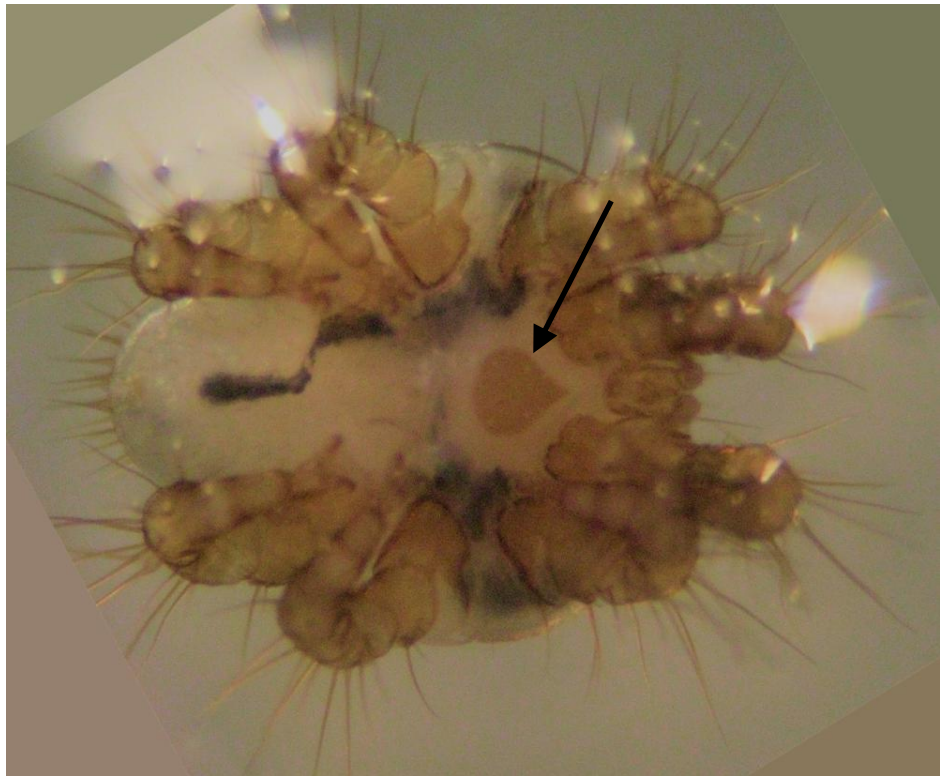
Spinturnix kolenatii is usually found on Serotines in the UK.

Spinturnix punctata has recently been recorded on Barbastelles.

Paperiglischrus rhinolophinus & *Eyndhovenia euryalis* parasitise Horseshoe bats.



Spinturnix punctata



Spinturnix andegavinus female



Spinturnix andegavinus male

Chigger Mite Larva (*Leptotrombidium* sp.)

These mites are usually seen in the ears of bats, or occasionally on faces or forearms. With legs hidden from view, they resemble tiny orange jelly-beans.

Only the larvae are parasitic. The nymphs and adults live amongst detritus within the roost, predated on smaller arthropods.

Four species have been recorded in the UK, on various bat species, but id to species level involves looking at difficult microscopic characters.



Leptotrombidium sp. larvae on a Barbastelle
(Picture courtesy Colleen Mainstone)



Leptotrombidium sp.

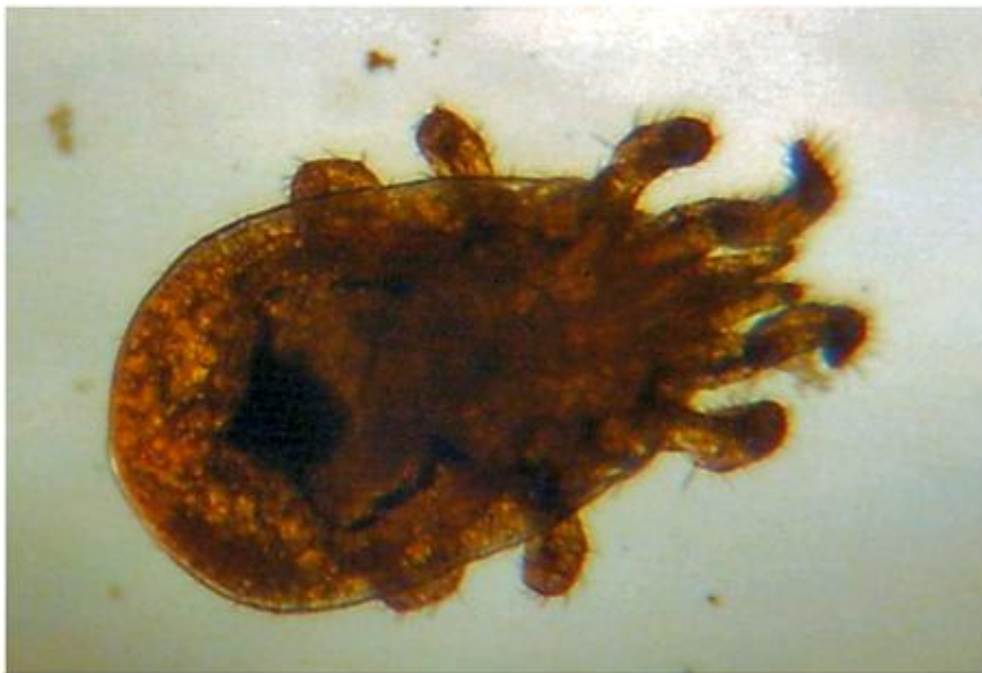
Macronyssid Mites (*Macronyssus* sp. & *Steatonyssus* sp.)

This is a group of around 15 small mites, found both on wing membranes and within the fur of most bat species. They are often visible as small (usually under 0.5mm) moving specks or red "jewels" on a bat's wing membrane or fur. Freshly engorged mites are usually much more clearly visible due to their larger size and bright red colour.

When viewed under magnification their bodies are oval in shape, with the legs concentrated near one end.

Identification to species can be difficult, even with access to a compound microscope. The status of several species is open to question and published information can be difficult to access. (The most recently published description of a species present in the UK is in a journal published in Cyrillic Russian!)

They reproduce rapidly and in large numbers. The majority of larvae and nymphs (the juvenile stages) are groomed off by the bat. When a sick or injured bat is unable to groom itself effectively their numbers can increase startlingly and it is not unusual for bat carers to remove hundreds of these mites from a casualty bat.



Macronyssus sp.

Selected Further Reading

Introductory

Hutson, A.M. (1971) Ectoparasites of British Bats Mammal Review Vol 1, No. 6

Fleas

Whitaker, A.P. (2007) Handbooks for the Identification of British Insects: Fleas Royal Entomological Society / Field Studies Council

George, R.S. (2008) Atlas of the Fleas (Siphonaptera) of Britain and Ireland Biological Records Centre / Field Studies Council

Bat-Flies

Hutson, A.M. (1984) Handbooks for the Identification of British Insects: Keds, Flat-flies and Bat-flies Royal Entomological Society

Bat-Bugs

Southwood, T.R.E. & Leston, D. (1959) Land and Water Bugs of the British Isles Warne

Usinger, R.L. (1966) Monograph of the Cimicidae Thomas Say Foundation

Mites and Ticks

Baker, A.S. & Craven, J.C. (2003) Checklist of the Mites Associated with Bats in the British Isles Systematic and Applied Acarology.

[Download from: http://www.nhm.ac.uk/hosted_sites/acarology]

Hillyard, P.D. (1996) Synopses of the British Fauna: Ticks of NW Europe Field Studies Council

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