

Checklist of the mites (Arachnida: Acari) associated with bats (Mammalia: Chiroptera) in the British Isles

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Abstract

The 16 species of bats that occur in the British Isles are all protected under current legislation, and their conservation is the subject of much scientific research and public concern. Of the many arthropod parasites carried by these bats, mites have colonized the greatest range of niches. This paper presents an annotated list of the 64 species of mite taken from British and Irish bats or their roosts to date. Previous published records are collated and in some cases emended, *Steatonyssus noctulus*, *Alabidocarpus megalonyx*, *Stomatodex corneti* and six as yet unnamed species are reported for the first time, while new host and distributional data are presented. A host-parasite list is provided.

Key words: Acari, mites, Chiroptera, bats, British Isles, checklist

Introduction

Populations of bats (Mammalia: Chiroptera) in the British Isles have reduced so greatly in recent years that only four of the 16 extant species have a 'not threatened' conservation status (Hutson 1993, Bat Conservation Trust 2002). *Myotis myotis* (Borkhausen) was declared extinct here as recently as 1991, although one individual has been found since then. In Great Britain and Northern Ireland, all species and their roosts are protected under the Wildlife and Countryside Act 1981 (as amended) and The Conservation (Natural Habitats etc) Regulations 1994, and, in the Republic of Ireland, under the Wildlife Act 1976. Heightened scientific and public concern over the plight of bats has resulted in a great effort to protect existing populations and encourage the recovery of threatened species.

Bats are infested with a variety of arthropods (Hutson 1971, Whitaker 1988, Lanza 1999), among them members of the arachnid subclass Acari (mites and ticks). Ticks (order Ixodida) are all blood-feeding ectoparasites and, of the bat-associated acarines that occur in the British Isles, are the most completely known faunistically. Two species, *Argas vespertilionis* (Latreille) (family Argasidae) and *Ixodes vespertilionis* Koch (family Ixodidae), are almost exclusively bat parasites. Host and distributional records can be found in Thompson (1936, 1961, 1962a & b, 1964a & b, 1968, 1972), Arthur (1963), O'Gorman (1965), Thompson and Knowles (1968), Fairley and Clark (1972), Martyn (1988), Sutcliffe (1993) and Hillyard (1996). A third species, *Ixodes arboricola* Schulze & Schlottkke, has been found on *Nyctalus noctula* (Schreber) (Martyn 1988), although its usual hosts are birds that, like noctules, use treeholes for nesting or roosting. Milne (1949) lists 'bats' among the British hosts of *I. ricinus* (Linnaeus), but the present authors could find no other published details of such an association. However, this species does occasionally occur on bats in continental Europe (Walter 1985, 1992), and, in view of the wide range of vertebrates it parasitizes in the British Isles (Hillyard 1996), may well be seen on them here.

In terms of both morphology and habit, mites are the most diverse of the arthropods carried by bats. They include obligate blood- or lymph-feeding ectoparasites, scavengers of skin or hair debris, and endoparasites that live within the skin or mucus membranes of body cavities such as the nostrils and mouth. The precise impact that mites have on their hosts (e.g., through exsanguination, irritation, skin and fur damage, and potential pathogen transmission), however, is not understood. Until now, published data for bat mites of the British Isles have appeared in a catalogue of the world fauna (Anciaux de Faveaux 1971-1987), taxonomic revisions (e.g., Evans & Till 1966, Klompen 1992) and species lists resulting from *ad hoc* examinations of hosts for ectoparasites (e.g., Howes 1979, Jessop 1990, 1993).

This paper presents an annotated checklist of the 64 mite species (classified in four orders, 19 families and 34 genera) identified from British and Irish bats or their roosts to date, and is intended to be a foundation on which to build further knowledge of this fauna. Previously published records (excluding those from captive exotic bats) are collated and, in some cases emended, while, as a result of the authors' examination of material donated to the collection of The Natural History Museum, London, *Steatonyssus noctulus* Rybin, *Alabidocarpus megalonyx* (Trouessart), *Stomatodex corneti* Fain and six as yet unnamed species are reported from the British Isles for the first time. In addition, new host and distributional data are presented, and a list of host-mite associations provided (Appendix 1).

Notes on the checklist

The mite taxa are arranged alphabetically by order, as are families within orders, genera within families and species within genera. The information for each species appears in the following format:

Distribution. Host¹/habitat: (area) Watsonian vice-county [Dandy (1969)] or, if not known, county (source of record).

Synonym/s. [If applicable, and only pertaining to records from the British Isles.]

Remarks. [If applicable.]

Abbreviations appearing in the text are: E = England; I = Ireland; S = Scotland; W = Wales, and NHM = The Natural History Museum, London. An asterisk (*) denotes that material on which a previously published record has been based was re-examined by at least one of the present authors.

Checklist of mites recorded from bats in the British Isles

ORDER ASTIGMATA

FAMILY ACARIDAE

Acarus gracilis Hughes, 1957

Distribution. Roost (*Pipistrellus pipistrellus*): (E) Buckinghamshire (Hughes 1957, Woodroffe 1956). Roost (*?Plecotus auritus*): (E) North Hampshire (Hughes 1957, Woodroffe 1956).

Synonym. *Tyroglyphus* sp., Woodroffe 1956: 138.

1. It should be noted that hosts identified as *Pipistrellus pipistrellus* (Schreber) before the recognition of *P. pygmaeus* (Leach) as a separate species (Jones & Barratt 1999) might have been misidentified.

Tyrophagus tenuiclavus Zachvatkin, 1941

Distribution. Roost (*Pipistrellus pipistrellus*): (E) Buckinghamshire (Woodroffe 1956).

Remarks. There is uncertainty about the true identity of Woodroffe's specimens and, unfortunately, it has not been possible to locate them for re-examination. *Tyrophagus tenuiclavus* is currently treated as a junior synonym of *T. longior* (Gervais, 1844), but, in a list of Woodroffe's material, Hughes (1957) equated it with *T. dimidiatus* Hermann. Subsequently, Hughes (1961) included both *T. dimidiatus* and *T. tenuiclavus* in the synonymy for *T. longior*, but then synonymized her concept of *T. dimidiatus* with *T. similis* Volgin (Hughes 1976).

Tyrophagus putrescentiae (Schrank, 1781)

Distribution. Bat roost: (E) North Hampshire (J. Ostojá-Starzewski, pers. com.).

Synonym. *Tyrophagus castellanii* Hirst, 1912: 375.

Remarks. A male and female specimen, labelled as *T. castellanii*, are located in the collection of the Central Science Laboratory, Department of the Environment, Food and Rural Affairs, York, UK. *Tyrophagus castellanii* is a junior synonym of *T. putrescentiae*. The specimens are mounted with examples of *Austroglycyphagus geniculatus* and *Dermatophagoides pteronyssinus*.

FAMILY CHIRODISCIDAE

Alabidocarpus intercalatus Fain, 1971

Distribution. *Myotis daubentonii*: (E) East Norfolk* (Fain 1981).

Alabidocarpus megalonyx (Trouessart, 1895) **New record for the British Isles**

Distribution. *Rhinolophus ferrumequinum*: (E) South Somerset (1 female; Yeovil, on whisker, coll. A.E. McR. Pearce, 4.v.1966, det. G.O. Evans, NHM acc. no. 1966.5.5.1), South Wiltshire* (1 female; Fonthill, nr Salisbury, ex adult male, coll. A.M. Hutson, 13.xii.1979, det. A. Fain, NHM acc. no. 1983.4.20.20); (W) Pembrokeshire* (2 females, 1 male; Orielson, around mouth, coll. R.E. Stebbings, vii.1979, det. A. Fain, NHM acc. no. 1983.4.20.32).

Remarks. It was not possible to examine the specimen determined by Evans due to the deterioration of the medium in which it was mounted.

FAMILY CARPOGLYPHIDAE

Carpoglyphus munroi Hughes, 1952

Distribution. Roost (?*Plecotus auritus*): (E) Hampshire (Woodroffe 1956).

FAMILY GLYCYPHAGIDAE

Austroglycyphagus geniculatus (Vitzthum, 1919)

Distribution. Roost (*Pipistrellus pipistrellus*): (E) Buckinghamshire (Woodroffe 1956). Bat roost: (E) North Hampshire (J. Ostojá-Starzewski, pers. com.).

Synonym. *Glycyphagus geniculatus*, Woodroffe 1956: 138.

Remarks. The North Hampshire specimens are mounted on a slide (with examples of *Tyrophagus putrescentiae* and *Dermatophagoides pteronyssinus*) housed in the collection of the Central Science Laboratory, Department of the Environment, Food and Rural Affairs, York, UK.

Glycyphagus domesticus (De Geer, 1778)

Distribution. *Nyctalus noctula*: (E) Surrey [roost] (this paper), South-west Yorkshire (Howes 1979). Roost (*Pipistrellus pipistrellus*): (E) Buckinghamshire (Woodroffe 1956). Roost (?pipistrelle): (E) Berkshire (Woodroffe 1956). Roost (?*Plecotus auritus*): (E) North Hampshire (Woodroffe 1956).

Remarks. Although *Glycyphagus domesticus* is most often encountered in synanthropic situations (Hughes 1976), it also occurs in bird and mammal nests, and has been identified from bat guano in a cave (Pinto da Rocha 1993).

FAMILY PYROGLYPHIDAE

Dermatophagoides pteronyssinus (Trouessart, 1897)

Distribution. Bat roost: (E) North Hampshire (J. Ostojá-Starzewski, pers. com.).

Remarks. A pharate female, protonymph and larva are mounted on a slide (with specimens of *Tyrophagus putrescentiae* and *Austroglycyphagus geniculatus*) housed in the collection of the Central Science Laboratory, Department of the Environment, Food and Rural Affairs, York, UK.

Dermatophagoides pteronyssinus, the European house dust mite, is a cosmopolitan species that lives in the dust of human dwellings and is responsible for causing respiratory allergies in susceptible people. It has also been recorded on or in association with birds and rodents. Fain & Caceres (1973) collected specimens of *D. pteronyssinus* from bats, but suspected that they were accidental contaminants from the dust in the laboratory in which the hosts were examined or from the other animals being processed there.

FAMILY ROSENSTEINIIDAE

Coproglyphus stammeri (Türk & Türk, 1957)

Distribution. Bat roosts: (E) Berkshire (Hughes 1976).

Remarks. See those for *Nycteriglyphus* sp.

Nycteriglyphus sp.

Distribution. *Pipistrellus pipistrellus* roost: (E) Buckinghamshire (Woodroffe 1956). Roost (?pipistrelle): (E) Berkshire (Woodroffe 1956). Roost (?*Plecotus auritus*): (E) North Hampshire (Woodroffe 1956).

Remarks. According to Woodroffe (1956), a description of this species was to be prepared by Dr J. Cooreman, but no such work has been located by us. Hughes (1976) states that specimens found by Woodroffe in bat roosts in Berkshire were *Coproglyphus stammeri*, a species previously classified in *Nycteriglyphus*. It is not known, however, whether these mites were examples of the same taxon sent to Dr Cooreman.

FAMILY SARCOPTIDAE

Notoedres chiropteralis (Trouessart, 1896)

Distribution. *Nyctalus noctula* (captive): England (Kleiman & Racey 1969).

Notoedres myoticola (Fain, 1959)

Distribution. *Myotis daubentonii*: (E) East Norfolk (Klompen 1992).

Nycteridocoptes eyndhoveni Fain, 1959

Distribution. *Rhinolophus ferrumequinum*: (W) Pembrokeshire (Klompen 1992).

Nycteridocoptes poppei Oudemans, 1898

Distribution. *Myotis daubentonii*: (E) East Norfolk (Klompen 1992); (S) Ayrshire (this paper).

ORDER MESOSTIGMATA

FAMILY HAEMOGAMASIDAE

Eulaelaps stabularis (Koch, 1836)

Distribution. *Rhinolophus ferrumequinum*: (E) Devon (this paper).

Remarks. *Eulaelaps stabularis* is a blood-feeding species that lives in association with birds and mammals, although it has not previously been recorded from bats. In the British Isles, it has been found on the bodies and in the nests of rodents and insectivores, and in the nests of the wheatear, *Oenanthe oenanthe* Linnaeus, and the sand martin, *Riparia riparia* (Linnaeus). The finding of the single adult female mite on a bat is presumed to be an accidental occurrence.

FAMILY LAELAPIDAE

Androlaelaps casalis (Berlese, 1887)

Distribution. Roost (pipistrelle): (E) West Sussex (this paper). Roost (?*Plecotus auritus*): (E) North Hampshire (Woodroffe 1956).

Synonym. *Hypoaspis casalis*, Woodroffe 1956: 138.

Remarks. This species preys on small mites and insects, but will also take other food, e.g., egg yolk, fresh meat and blood. It is found in a wide variety of habitats, e.g., the bodies and nests of mammals (particularly rodents) and birds, horticultural peat, broiler house litter, and grain and hay sievings. In addition to the British records of bat associations, *A. casalis* has been found on *Tadarida brasiliensis* (Geoffroy), the Brazilian free-tailed bat, in Alabama, USA (Durdin et al. 1992).

Echinonyssus talpae (Zemskaya, 1955)

Distribution. *Eptesicus serotinus*: (E) via London Zoo (this paper).

Remarks. Members of the genus *Echinonyssus* are obligate blood-feeding ectoparasites of carnivores, insectivores, lagomorphs and rodents. *Echinonyssus talpae* is predominantly found in association with the European mole, *Talpa europaea* Linnaeus, and occasionally on other insectivores and rodents. The presence of five specimens (male, female and three nymphs) on one *Ep. serotinus* is presumed to be an accidental occurrence, but, in the absence of additional collection data, their route on to the host can only be speculated upon. A live bat could have picked up the mites while taking prey from the ground or when using a feeding perch vacated by a predatory bird (owls, for example, feed on moles). If, however, the mites were removed from a dead host, contamination from other species being studied could have occurred during transport or storage of specimens.

FAMILY MACROCHELIDAE

Macrocheles glaber (Müller, 1860)

Distribution. *Nyctalus noctula*: (E) South-west Yorkshire (Howes 1979).

Remarks. Macrochelids are common occurrences in accumulations of decaying organic matter, e.g., compost, manure, tidal debris, and mammal and bird nests. They prey on nematodes, Collembola, and the eggs and immatures of Diptera and other insects. Adult females use arthropods, particularly Diptera and Coleoptera, for transport to new habitats. The single deutonymph of *M. glaber* recorded by Howes (1979) is likely to have originated from the birds' nests or rot holes in the tree in which the host bat was found. Species of *Macrocheles* have previously been found in bat guano in caves in Italy (Cicolani & Sabatino 1991).

FAMILY MACRONYSSIDAE

Macronyssus diversipilis (Vitzthum, 1920)

Distribution. *Myotis bechsteini*: (E) West Sussex (this paper). *Myotis daubentonii*: (E) West Sussex*, West Suffolk*, East Norfolk (Martyn 1986), Surrey, East Norfolk (this paper). *Myotis nattereri*: (E) Oxfordshire*, East Suffolk, West Norfolk (Martyn 1986), South Wiltshire, West Sussex, Hertfordshire, Oxfordshire (this paper); (I) Fermanagh (this paper). Whiskered bat: (E) Cheshire* (Radford 1939).

Synonym. *Liponyssus granulatus* (Kolenati, 1856), Radford 1939: 47 [misidentification].

Macronyssus ellipticus (Kolenati, 1856)

Distribution. *Myotis brandtii*: (E) South Wiltshire, West Sussex (this paper). *Myotis daubentonii*: (E) South Wiltshire, East Suffolk, West Norfolk (this paper), Suffolk (Evans & Till 1966). *Myotis myotis*: (E) West Sussex (this paper), Suffolk (Evans & Till 1966). *Myotis mystacinus*: (E) South Wiltshire, West Sussex, West Kent (this paper). *Myotis nattereri*: (E) South Wiltshire, Surrey, East Suffolk (this paper), Suffolk (Evans & Till 1966). *Plecotus auritus*: (E) West Sussex (this paper).

Macronyssus flavus (Kolenati, 1856)

Distribution. *Nyctalus leisleri*: (I) South Tipperary (this paper). *Nyctalus noctula*: (E) ?North Hampshire* (Radford 1941), East Suffolk* (Hutson 1964), South-west Yorkshire* (Howes 1979), Cornwall, Surrey [roost], North Essex, Cambridgeshire, Northamptonshire, East Gloucestershire, Staffordshire, Durham (this paper); (S) Orkney Islands [North Ronaldsay]* (Racey 1977); (W) Caernarvonshire [Bardsey Island] (this paper); Britain (Evans & Till 1966). Noctule: (E) East Kent* (Hirst 1922). *Pipistrellus pipistrellus*: (E) East Suffolk (Hutson 1964).

Synonyms. *Liponyssus flavus*, Hirst 1922: 791. *Liponyssus britannicus* Radford, 1941: 311. *Macronyssus flabus*, Racey 1977: 556 [incorrect subsequent spelling].

Remarks. Radford (1941) gives no locality data for his material apart from 'Army School of Hygiene'. On the assumption that this refers to the organisation of the same name that is based in the English town of Aldershot, a vice-county record for North Hampshire is proposed.

The report of *M. flavus* from *P. pipistrellus* (Hutson 1964) cannot be confirmed. One of the two females collected proved to be *M. kolenatii* (see below), but the other could not be located for re-examination. Because *M. flavus* has occasionally been found on *P. pipistrellus* (Dusbábek 1964), the British record is included for the time being.

Macronyssus kolenatii (Oudemans, 1902)

Distribution. *Pipistrellus pipistrellus*: (E) East Suffolk* (Hutson 1964/this paper), Cheshire* (Radford 1953a); (I) Mid Cork, Kilkenny, Fermanagh (this paper); Britain (Evans & Till 1966). *Nyctalus noctula*: (E) South-west Yorkshire (Howes 1979).

Synonym. *Hirstesia britteni* Radford, 1953a: 239.

Remarks. The East Suffolk record is based on the re-examination of one of the specimens identified as *M. flavus* in Hutson (1964) (see 'Remarks' for *M. flavus*).

Macronyssus uncinatus (Canestrini, 1885)

Distribution. *Nyctalus noctula*: Great Britain (Corbet & Harris 1991). 'The noctules': (E) North-east Yorkshire (Walsh 1928). *Pipistrellus pipistrellus*: Great Britain (Corbet & Harris 1991). *Rhinolophus hipposideros*: (E) South Devon (Turk & Turk 1952), Britain (Evans & Till 1966). *Rhinolophus ferrumequinum*: (E) Dorset (this paper).

Synonyms. *Leiognathus uncinatus*, Walsh 1928: 170; Corbet & Harris 1991: 121. *Hirstesia sternalis* (Hirst, 1922), Turk & Turk 1952: 484; Dusbábek 1964: 117. *Macronyssus rhinolophi* (Oudemans, 1902), Radovsky 1967: 141.

Macronyssus sp. A

Distribution. *Barbastella barbastellus*: (E) West Sussex (this paper). *Plecotus auritus*: (E) West Kent (this paper).

Remarks. A single female and protonymph from *B. barbastellus* and one female from *P. auritus* were available for study. Although all specimens keyed down to *M. cyclaspis* (Oudemans) *sensu* Radovsky (1967), they differed slightly from Radovsky's redescription. Consequently, a definitive identification will be made once type and other determined material has been examined. The host range of the British mites corresponds with that suggested for *M. cyclaspis*, i.e., *B. barbastellus* as its principal host, with *P. auritus* as an alternative (Dusbábek 1964, Radovsky 1967). Whatever the specific identity of this taxon, it represents a new addition to the British fauna.

Macronyssus sp. B (suspected new species)

Distribution. *Nyctalus leisleri*: (E) Surrey (this paper). *Nyctalus noctula*: (E) South Hampshire, Surrey [roost] (this paper).

Remarks. The following combination of character states differentiate this species from other members of the genus: the female possesses a broadly oval dorsal shield bearing more than 30 pairs of setae, sternal porose areas comprising irregular striae and peritremes extending anteriorly to between coxae I and II; the male possesses a narrowly oval dorsal shield bearing at least 28 pairs of setae (30 present on one side of the specimen), a ventral shield that expands posteriorly to coxa IV and is not constricted between the opisthogastric and anal elements, and peritremes reaching to about the posterior quarter of coxa II. A morphological account of this species is being prepared for publication in a separate paper.

Ornithonyssus pipistrelli (Oudemans, 1903)

Distribution. *Eptesicus serotinus*: (E) Dorset* (Evans & Till 1966). *Myotis nattereri*: (E) Dorset (this paper). *Plecotus auritus*: (E) Dorset* (Evans & Till 1966), Oxfordshire, West Gloucestershire (this paper); (I) Kilkenny (this paper); (W) Glamorgan (this paper). *Plecotus austriacus*: (E) Dorset (this paper).

Steatonyssus murinus (Lucas, 1840)

Distribution. Roost (*Pipistrellus pipistrellus*): (E) Buckinghamshire (Woodroffe 1956). Roost (?pipistrelle): (E) Berkshire (Woodroffe 1956). Roost (?*Plecotus auritus*): (E) North Hampshire (Woodroffe 1956).

Remarks. Because no type material of *S. murinus* has survived and its original description is inadequately detailed to allow identification, Till & Evans (1964) concluded it was a *species incertae sedis*, while Radovsky (1967) treated it as a *nomen dubium*. No author has subsequently challenged these decisions. Unfortunately, Woodroffe's specimens could not be located for study, but C. D. Radford, their identifier, determined other material as *S. murinus* that proved to be *S. periblepharus* (pers. obs., ASB), and this could, therefore, be their true identity.

Steatonyssus noctulus Rybin, 1992 **New record for the British Isles**

Distribution. *Nyctalus noctula*: (E) Surrey [roost] (1 female; Thursley, ex nest box, coll. F. Greenaway, 2.iii.2002, det. A.S. Baker 14.iii.2002, NHM acc. no. BMNH(E) 2002-196), Norfolk (2 females; Cley, coll. D. Harris, 1.v.1971, det. A.S. Baker 19.v.2002, NHM acc. no. 1982.5.3.2130(1)), Staffordshire (1 female; Cannock, coll. A.M. Hutson, 14.vi.1983, det. A.S. Baker 19.vi.2002, NHM acc. no. BMNH(E) 2002-197).

Steatonyssus nyassae (Hirst, 1922)

Distribution. *Eptesicus serotinus*: (E) East Kent (Thompson 1936).

Synonym. *Liponyssus nyassae* Hirst, 1922: 777.

Remarks. Thompson (1936) listed his material as *Liponyssus nyssae* and *Pteronyssus nyssae* [incorrect subsequent spellings] on respectively page 135 and 136 of his paper. This record should be regarded with caution because the only other reports of *S. nyassae* are from an 'elephant shrew' in Malawi (Hirst 1922) and a single specimen of the bat *Scotophilus murinoflavus* (Heuglin) in Sudan (Zumpt & Till 1954). Thompson's mites were originally identified as *Ceratonyssus musculi* (Koch) (Thompson 1935), a species now regarded to be of uncertain taxonomic position (Till & Evans 1964) or treated as a *nomen dubium* (Radovsky 1967). Unfortunately, his material could not be located for re-examination.

Steatonyssus occidentalis evansi Micherdziński, 1980

Distribution. *Eptesicus serotinus*: (E) East Sussex, Surrey (this paper), East Suffolk* (Evans & Till 1966), England (via London Zoo) (this paper).

Synonym. *Steatonyssus occidentalis* (Ewing, 1933), Evans & Till 1966: 334.

Remarks. *Steatonyssus occidentalis evansi* was separated from *S. o. occidentalis* on the basis of the longer and more slender idiosomal setae (Micherdziński 1980). Comparison of the eight English examples with two specimens of *S. o. occidentalis* (Ewing) from North America suggests the presence of qualitative (e.g., opisthonotal seta J5 has a more anterior position in *S. o. evansi*) as well as other quantitative differences. A morphological study of a larger sample of the two subspecies may well provide evidence for elevating *S. o. evansi* to the rank of species.

Steatonyssus periblepharus Kolenati, 1858

Distribution. *Myotis mystacinus*: (E) Northamptonshire (this paper), Cheshire*, Yorkshire* (Till & Evans 1964); Britain (Evans & Till 1966). *Myotis nattereri*: (E) Oxfordshire (this paper). *Pipistrellus pipistrellus*: (E) North Essex, Buckinghamshire (Till & Evans 1964), West Cornwall (with Scilly) [St Agnes], South Somerset (this paper), North Devon (Thompson 1936), East Suffolk (Hutson 1964); (I) North-east Galway (Fairley & Clark 1972), Fermanagh (Till & Evans 1964); (W) Glamorgan (this paper); Britain (Evans & Till 1966). *Pipistrellus pygmaeus*: (E) West Sussex (this

paper). *Pipistrellus*: (E) Cumberland (Hirst 1922). Pipistrelle: (E) Buckinghamshire, Cambridgeshire, Essex, Somerset, West Sussex (this paper); (I) Fermanagh (this paper). *Plecotus auritus*: (E) Cornwall* (Turk & Turk 1952), West Gloucestershire (this paper). *Plecotus austriacus*: (E) Dorset (this paper). Long-eared bat: (E) Norfolk (this paper).

Synonyms. *Liponyssus chiropteralis* Hirst, 1922: 776. *Steatonyssus murinus* (Lucas, 1840), Turk & Turk 1952: 484. *Ceratomyssus musculi* (Koch, 1836) [in part], Thompson 1935: 145 [*sensu* Thompson 1936: 135].

Remarks (also, see 'Remarks' for *Steatonyssus murinus*). Thompson (1936) listed his material as *Liponyssus chiropteralis* and *Pteronyssus chiropteralis* on respectively page 135 and 136 of his paper.

Steatonyssus sp. A

Distribution. *Nyctalus leisleri*: (E) Staffordshire [roost] (this paper).

Remarks. The single female specimen from this locality is morphologically close to *S. spinosus* Willmann and *S. noctulus* Rybin in that it possesses long opisthonotal setae Z5 (Rybin 1992). However, it can be distinguished from *S. spinosus* by the longer Z5 (59 versus ca. 45µm), and from *S. noctulus* by Z5 being almost three times the length of S5, but shorter than J1-3 (versus twice as long and at least as long, respectively). We are reluctant to describe a new species based on a single representative, but the continuing sampling of mites from native bats will hopefully yield material that will clarify the taxonomic status of this specimen.

FAMILY PHYTOSEIIDAE

Euseius finlandicus (Oudemans, 1915)

Distribution. *Myotis daubentonii*: (E) West Sussex (this paper).

Remarks. Phytoseiids are predominantly predators of phytophagous mites, with small insects and plant material supplementing the diet of some species. Most live on the aerial parts of vegetation, although some occur in soil. In Great Britain, *Euseius finlandicus* has been found mainly on trees (both deciduous and evergreen), but also on lower growing plants, such as brambles (*Rubus fruticosus*), ferns (*Dryopteris* sp.) and ragwort (*Senecio* sp.) (ASB, pers. obs.). Its diet includes mites of the superfamily Eriophyoidea (gall mites) and family Tetranychidae (spider mites). The bat could have picked up the single adult female mite from summer roosting sites in trees.

FAMILY SPINTURNICIDAE

Eyndhovenia euryalis (Canestrini, 1884)

Distribution. Noctule: (S) Orkney Islands [North Ronaldsay] (this paper). *Rhinolophus ferrumequinum*: (E) North Somerset* (Hirst 1927), North Devon, Dorset (this paper), Cumberland (Turk & Turk 1952); (W) Pembrokeshire (this paper). *Rhinolophus hipposideros*: (E) Wiltshire (Turk 1945).

Synonyms. *Spinturnix euryalis* Hirst, 1927: 323; Turk & Turk 1952: 485. *Spinturnix omahonyi* Turk, 1945: 800.

Remarks. Records indicate that *E. euryalis* is highly host specific for bats of the genus *Rhinolophus*. The finding of a specimen on a noctule in the Orkneys is, therefore, questionable. The specimen was donated to the NHM in the 1970s, but, unfortunately, the accompanying collection data are insufficient to trace the history of the host specimen.

Paraperiglischrus rhinolophinus (Koch, 1841)

Distribution. *Rhinolophus ferrumequinum*: (E) Dorset, Somerset (this paper). *Rhinolophus hipposideros*: (I) Mayo (Turk 1945); (W) Glamorgan (this paper), Denbyshire* (Rudnick 1960).

Synonym. *Periglischrus rhinolophinus*: Turk, 1945: 798.

Spinturnix acuminatus (Koch, 1836)

Distribution. *Nyctalus noctula*: (E) North Hampshire (Rudnick 1960), Hertfordshire (Hirst 1927), Oxfordshire (Turk 1945), East Suffolk (Hutson 1964), South-west Yorkshire (Howes 1979); (S) Orkney Islands [North Ronaldsay]* (Racey 1977). *Pipistrellus pipistrellus*: (E) Kent (Hirst 1927).

Spinturnix kolenatii Oudemans, 1910

Distribution. *Eptesicus serotinus*: (E) East Kent (Thompson 1935), Surrey, England (via London Zoo) (this paper).

Synonym. *Spinturnix* sp., Thompson 1935: 144 [*sensu* Rudnick, 1960: 223].

Spinturnix myoti (Kolenati, 1856)

Distribution. *Myotis daubentonii*: (E) South Hampshire* (Hirst 1927), Surrey (Hirst 1927), North-east Yorkshire* (Rudnick 1960), North-east Yorkshire (Jessop 1993). *Myotis mystacinus*: Great Britain (Corbet & Harris 1991). *Myotis nattereri*: (E) West Sussex, Surrey, Oxfordshire (this paper); (W) Merionethshire* (Rudnick 1960).

Synonym. *Spinturnix vespertilionis* (Linnaeus), Hirst 1927: 323; Turk 1945: 799.

Remarks. We examined a number of *Spinturnix* specimens that fell between the definitions of *S. myoti* and *S. mystacinus* given by Rudnick (1960). In spite of subsequent evaluations of specific morphological characters for *Spinturnix* mites (Uchikawa & Wada 1979, Uchikawa et al. 1994), the status of these two species has not been established. The above-mentioned samples will, therefore, be incorporated into the British list once the validity of *S. myoti* and *S. mystacinus* has been clarified. For the time being, those specimens that fit either description given by Rudnick (1960) are listed under the respective species name.

Spinturnix mystacinus (Kolenati, 1857)

Distribution. *Myotis mystacinus*: (E) East Gloucestershire (Thompson 1935).

Synonym. *Spinturnix murinus* (Walckenaer & Gervais, 1847), Thompson 1935: 144 [in part, *sensu* Rudnick 1960: 207]; Turk 1945: 799.

Remarks (also, see 'Remarks' for *Spinturnix myoti*). Rudnick (1960) identified one of the four specimens mentioned by Thompson as *S. mystacinus*, but did not indicate whether he had examined the remaining material.

Spinturnix plecotinus (Koch, 1839)

Distribution. *Nyctalus noctula*: (E) Oxfordshire (Turk 1945). *Plecotus auritus*: (E) Surrey (this paper), South-west Yorkshire (Hirst 1927), Durham (Jessop 1990); (W) Merionethshire (this paper); Ireland (Turk 1945).

Spinturnix sp. A

Distribution. *Barbastella barbastellus*: (E) West Sussex (this paper); (W) Carmarthenshire (this paper).

Remarks. This species, of which only a few adult females have been collected, is morphologically similar to *S. acuminatus*, but possesses a greater complement of posterodorsal

idiosomal setae. When it has been possible to acquire a large number of representatives, including adult males, the specific identity of this taxon will be investigated further.

ORDER ORIBATIDA

FAMILY PALAEACARIDAE

Aphelacarus acarinus (Berlese, 1910)

Distribution. Roost (*?Plecotus auritus*): (E) North Hampshire (Woodroffe 1956).

Remarks. *Aphelacarus acarinus* has been collected in a variety of terrestrial habitats, e.g., bat droppings (Miko 1990), stored grain, soil, broiler house litter, and rotten wood and guano in caves.

ORDER PROSTIGMATA

FAMILY CHEYLETIDAE

Acaropsellina docta (Berlese, 1886)

Distribution. Roost (*Pipistrellus pipistrellus*): (E) Buckinghamshire (Woodroffe 1956). Roost (*?pipistrelle*): (E) Berkshire (Woodroffe 1956). Roost (*?Plecotus auritus*): (E) North Hampshire (Woodroffe 1956).

Synonym. *Acaropsis docta*, Woodroffe 1956: 138.

Acaropsellina sollers (Kuzin, 1940)

Distribution. Roost (*Pipistrellus pipistrellus*): (E) Buckinghamshire (Woodroffe 1956). Roost (*?pipistrelle*): (E) Berkshire (Woodroffe 1956).

Synonym. *Acaropsis sollers*, Woodroffe 1956: 138.

Remarks. Summers (1976) designated this species as the type of his new genus *Acaropsellina*. The conspecificity with *A. docta* suggested by Woodroffe (1956) has not been confirmed, and both species are currently recognized.

Cheletonella sp.

Distribution. Roost (*Pipistrellus pipistrellus*): (E) Buckinghamshire (Woodroffe 1956). Roost (*?Plecotus auritus*): (E) North Hampshire* (Woodroffe 1956).

Cheyletus woodroffe Jeffrey, 1980

Distribution. Roost (*?Plecotus auritus*): (E) North Hampshire* (Jeffrey 1980).

Synonym. *Cheyletus* sp., Woodroffe 1956: 138.

FAMILY DEMODECIDAE

Demodex chiropteralis Hirst, 1921

Distribution. *Plecotus auritus*: ?British Isles (Hirst 1921).

Demodex soricinus Hirst, 1918

Distribution. *Plecotus auritus*: ?British Isles (Hirst 1921).

Remarks. This is a dubious record, representing as it does the only occasion on which *D. soricinus* has been associated with a bat. Species of *Demodex* are highly host specific, and the other reports of *D. soricinus* are all from the common shrew *Sorex araneus* Linnaeus (Insectivora: Soricidae) (Bukva 1993).

Stomatodex corneti Fain, 1960 **New record for the British Isles**

Distribution. *Barbastella barbastellus*: (E) North Hampshire* (2 female, 1 male; Long Sutton, Basingstoke, original identifier unknown, NHM acc. nos 1961.10.26.50-52).

Remarks. The type material of *S. corneti* was collected from *B. barbastellus* in Belgium, while specimens from *Nycteris* sp. in Rwanda were provisionally identified as this species (Fain 1960). We can find no other published records.

FAMILY MYOBIIDAE

Acanthopthirius etheldredae Perkins, 1925

Distribution. *Pipistrellus pipistrellus*: (E) Cambridgeshire* (Perkins 1925, Radford 1941, Radford 1948); (I) Kilkenny (this paper); Great Britain (Radford 1954, Corbet & Harris 1991).

Synonyms. *Myobia etheldredae*, Radford 1941: 314; 1954: 247. *Myobia ethedredae*, Radford 1948: 464; *Acanthopthirius etheldrae*, Corbet & Harris 1991: 128 [incorrect subsequent spellings].

Acanthopthirius mystacinalis (Radford, 1935)

Distribution. *Myotis mystacinus*: (E) Cheshire (Radford 1935, 1936a, 1953b); Great Britain (Corbet & Harris 1991). Whiskered bat: (E) Cheshire (Radford 1939); Great Britain (Radford 1954).

Synonyms. *Myobia mystacinalis* Radford, 1935: 255; 1936a: 35; 1939: 44. *Foliomyobia mystacinalis*, Radford 1953b: 82; 1954: 247. *Neomyobia mystacinalis*, Corbet & Harris 1991: 101.

Acanthopthirius noctulius (Radford, 1938)

Distribution. *Nyctalus noctula*: England (Radford 1951); Britain (Radford 1938); Great Britain (Corbet & Harris 1991).

Synonyms. *Myobia noctulia* Radford, 1938: 437. *Radfordia noctulia*, Radford 1951: 269; Corbet & Harris 1991: 121.

Acanthopthirius pantopus (Poppe & Trouessart, 1895)

Distribution. *Barbastella barbastellus*: (E) Surrey* (Radford 1952a).

Synonym. *Neomyobia pantopus*, Radford 1952a: 377; Corbet & Harris 1991: 130.

Neomyobia chiropteralis (Michael, 1884)

Distribution. *Pipistrellus pipistrellus*: Gloucestershire (Michael 1884, Radford 1936a). *Rhinolophus hipposideros*: (E) South Devon (Radford 1936b), ?Gloucestershire (Michael 1884, Radford 1936a), England (Radford 1953b); Great Britain (Radford 1954).

Synonyms. *Myobia chiropteralis* Michael, 1884: 1; Radford 1936a: 38; 1936b: 145. *Foliomyobia chiropteralis*, Radford 1953b: 80; 1954: 247.

Neomyobia plecotia (Radford, 1938)

Distribution. *Plecotus auritus*: (E) West Cornwall (this paper; from NHM collection, F.A. Turk original identifier); Britain (Radford 1938, 1952b, 1954). *Pipistrellus pipistrellus*: (E) South Hampshire (Radford 1938).

Synonym. *Myobia plecotia* Radford, 1938: 435.

Neomyobia rollinati (Poppe, 1909)

Distribution. *Rhinolophus ferrumequinum*: ?England (Radford 1934); Great Britain (Radford 1954).

Synonym. *Myobia rollinati*, Radford 1934: 361.

Pteracarus pipistrellius (Radford, 1938)

Distribution. *Pipistrellus pipistrellus*: (E) South Hampshire* (Radford 1938, 1952b), Great Britain (Radford 1954). ?*Plecotus auritus*: England (Dusbábek 1973). Common small bat: (E) South Wiltshire* (Dusbábek 1973).

Synonyms. *Myobia pipistrellia* Radford, 1938: 439. *Neomyobia pispistrellia* [incorrect subsequent spelling], Radford 1952b: 542. *Pteracarus pipistrellia*, Radford 1954: 247.

Remarks. In a list of English material examined, Dusbábek (1973) includes examples of *P. pipistrellius* from *Plecotus auritus*, indicating that Radford (1938) first reported this association. However, only *P. submedianus* is given as a parasite of *Pl. auritus* in Dusbábek's subsequent host distribution list, while we can find no reference to these specimens in Radford (1938). Furthermore, *Pl. auritus* does not appear in a subsequent discussion of the host specificity of *P. pipistrellius* (Uchikawa 1979), despite Dusbábek (1973) being cited. It has not so far been possible to determine which specimens Dusbábek examined, and consequently the record from *Plecotus auritus* is regarded as questionable for the time being.

Pteracarus submedianus Dusbábek, 1963

Distribution. Long-eared bat: England* (Dusbábek 1973).

FAMILY PSORERGATIDAE

Psorergatoides sp. A (suspected new species)

Distribution. *Noctula noctulus* (captive): (E) Hertfordshire (this paper).

Remarks. This is the first time that *Psorergatoides* has been found on a species of *Noctula*. *Psorergatoides* sp. A can be differentiated from the other members of the genus by the size of the dorsal shield and the length of certain leg setae. A morphological account of this species is being prepared for publication in a separate paper.

FAMILY TROMBICULIDAE

Leptotrombidium avonense Vercammen-Grandjean & Langston, 1976

Distribution. *Plecotus auritus*: (E) South Wiltshire (Vercammen-Grandjean & Langston 1976).

Leptotrombidium rassicum (Oudemans, 1902)

Distribution. *Pipistrellus pipistrellus*: (E) East Suffolk (Hutson 1964).

Synonym. *Trombicula rassicum*, Hutson 1964: 451.

Leptotrombidium sp. A

Distribution. *Eptesicus serotinus*: (E) North Somerset (this paper).

Remarks. This taxon most obviously differs from *L. russicum sensu* Vercammen-Grandjean and Langston (1976) by having shorter idiosomal setae. At present, these mites cannot be assigned to a species.

Neotrombicula autumnalis (Shaw, 1790)

Distribution. *Myotis nattereri*: (E) North Devon (Thompson 1935).

Synonym. *Trombicula autumnalis*, Thompson 1935: 145.

Remarks. There are few records of this species from bats, the vast majority are from a wide range of ground-dwelling mammals and birds. Because Thompson's material could not be located, it has not been possible to confirm either its generic or specific identity.

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Appendix 1. Host-mite associations for bats of the British Isles (mite species given in order of appearance in checklist; † = dubious identification, ‡ = species of uncertain status, (?) = host identity uncertain)

***Barbastella barbastellus* (Schreber)** (common name: Barbastelle; conservation status: rare)
Macronyssus sp. A, *Spinturnix* sp. A, *Stomatodex corneti*, *Acanthophthirius pantopus*

***Eptesicus serotinus* (Schreber)** (Serotine; vulnerable)
Echinonyssus talpae, *Ornithonyssus pipistrelli*, *Steatonyssus nyassae*†, *Steatonyssus occidentalis evansi*, *Spinturnix kolenatii*, *Leptotrombidium* sp. A

***Myotis bechsteinii* (Kuhl)** (Bechstein's bat; rare)
Macronyssus diversipilis

***Myotis brandtii* (Eversmann)** (Brandt's bat; vulnerable)
Macronyssus ellipticus

***Myotis daubentonii* (Kuhl)** (Daubenton's bat; not threatened)
Alabidocarpus intercalatus, *Notoedres myoticola*, *Nycteridocoptes poppei*, *Macronyssus diversipilis*, *Macronyssus ellipticus*, *Euseius finlandicus*, *Spinturnix myoti*

***Myotis myotis* (Borkhausen)** (Greater mouse-eared bat; extinct)
Macronyssus ellipticus

***Myotis mystacinus* (Kuhl)** (Whiskered bat; vulnerable)
Macronyssus ellipticus, *Steatonyssus periblepharus*, *Spinturnix myoti*, *Spinturnix mystacinus*, *Acanthophthirius mystacinalis*

***Myotis nattereri* (Kuhl)** (Natterer's bat; vulnerable)
Macronyssus diversipilis, *Macronyssus ellipticus*, *Ornithonyssus pipistrelli*, *Steatonyssus periblepharus*, *Spinturnix myoti*, *Neotrombicula autumnalis*

***Nyctalus leisleri* (Kuhl)** (Leisler's bat; vulnerable)
Macronyssus flavus, *Macronyssus* sp. B, *Steatonyssus* sp. A

***Nyctalus noctula* (Schreber)** (Noctule; vulnerable)
Glycyphagus domesticus, *Notoedres chiropteralis*, *Macrocheles glaber*, *Macronyssus flavus*, *Macronyssus kolenatii*, *Macronyssus uncinatus*, *Macronyssus* sp. B, *Steatonyssus noctulus*, *Eyndhovenia euryalis*, *Spinturnix acuminatus*, *Spinturnix plecotinus*, *Acanthophthirius noctulius*, *Psorergatoides* sp. A

'The noctules'
Macronyssus uncinatus

***Pipistrellus nathusii* (Keyserling & Blasius)** (Nathusius's pipistrelle; rare)
No records to date

***Pipistrellus pipistrellus* (Schreber)** (Pipistrelle; not threatened)

Acarus gracilis [roost], *Tyrophagus tenuiclavus* [roost]‡, *Austroglycyphagus geniculatus* [roost], *Glycyphagus domesticus* [roost], *Nycteriglyphus* sp. [roost], *Macronyssus flavus*, *Macronyssus kolenatii*, *Macronyssus uncinatus*, *Steatonyssus murinus*‡ [roost], *Steatonyssus periblepharus*, *Spinturnix acuminatus*, *Acaropsellina docta* [roost], *Acaropsellina sollers* [roost], *Cheletonella* sp. [roost], *Acanthopthirius etheldredae*, *Neomyobia chiropteralis*, *Neomyobia plecotia*, *Pteracarus pipistrellius*, *Leptotrombidium rusicum*

***Pipistrellus pygmaeus* (Leach)** (Pipistrelle; not threatened)

Steatonyssus periblepharus

Pipistrelle roost

Androlaelaps casalis

***Plecotus auritus* (Linnaeus)** (Brown long-eared bat; not threatened)

Acarus gracilis (?) [roost], *Carpoglyphus munroi* (?) [roost], *Glycyphagus domesticus* (?) [roost], *Nycteriglyphus* sp. (?) [roost], *Androlaelaps casalis* (?) [roost], *Macronyssus ellipticus*, *Macronyssus* sp. A, *Ornithonyssus pipistrelli*, *Steatonyssus murinus*‡ (?) [roost], *Steatonyssus periblepharus*, *Spinturnix myoti*, *Spinturnix plecotinus*, *Aphelacarus acarinus* (?) [roost], *Acaropsellina docta* (?) [roost], *Cheletonella* sp. (?) [roost], *Cheyletus woodroffei* (?) [roost], *Demodex chiropteralis*, *Demodex soricinus*†, *Neomyobia plecotia*, *Pteracarus pipistrellius* (?), *Leptotrombidium avonense*

***Plecotus austriacus* (Fischer)** (Grey long-eared bat; rare)

Ornithonyssus pipistrelli, *Steatonyssus periblepharus*

Long-eared bat

Pteracarus submedianus

***Rhinolophus ferrumequinum* (Schreber)** (Greater horseshoe bat; endangered)

Alabidocarpus megalonyx, *Nycteridocoptes eyndhovenia*, *Eulaelaps stabularis*, *Macronyssus uncinatus*, *Eyndhovenia euryalis*, *Paraperiglischrus rhinolophinus*, *Neomyobia rollinati*

***Rhinolophus hipposideros* (Bechstein)** (Lesser horseshoe bat; endangered)

Macronyssus uncinatus, *Eyndhovenia euryalis*, *Paraperiglischrus rhinolophinus*, *Neomyobia chiropteralis*

Bat roost

Tyrophagus putrescentiae, *Dermatophagoides pteronyssinus*, *Coproglyphus stammeri*