

# NATIONAL PROJECT SHOWS SOMERSET TO BE A 'HOTSPOT' FOR BRITAIN'S RAREST BAT – BECHSTEIN'S BAT (*MYOTIS BECHSTEINII*)

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## INTRODUCTION

Bechstein's Bat (*Myotis bechsteinii*) (Fig. 1) is believed to be the rarest of the UK's 17 species of bat, yet evidence from several cave sites scattered across the country suggests that, in Neolithic times at least, it may have once been our commonest (Yalden 1999). Until relatively recently, Bechstein's Bat also had a good claim to be the mammal about which the least was known concerning its behaviour and

ecological requirements in the UK. Indeed, before the accidental discovery of a maternity roost in the New Forest in 1996, no roost site had been identified and, up to that date, the bat had been recorded in modern times in a handful of localities only.

The species has an extensive range in Europe, from southern Britain to the Caucasus mountain range and into the Mediterranean region (Harris *et al.* 1995), but it is seldom found anywhere in large numbers and is classified as 'Near Threatened' on the 2011 IUCN Red List of globally endangered species (IUCN 2011). In the UK it is restricted to southern England, and its scarcity is almost certainly connected to its high dependency on good quality woodland habitat. Low population density, low rates of reproduction and exacting habitat requirements make it particularly vulnerable to habitat loss, which has undoubtedly occurred as woodland has declined in extent and surviving areas have become fragmented due to human activities.

Bechstein's Bat is associated with ancient broadleaved woodland, in the UK particularly Oak (*Quercus robur*) and Ash (*Fraxinus excelsior*) woodland (Hill and Greenaway 2006), although extensive use is made of Beech (*Fagus sylvatica*) woods in mainland Europe. It is a 'gleaning bat', which means that it picks its prey off the surface of vegetation, flying with great precision and agility through the tree canopy. Its preferred prey is moths, but it will take a variety of invertebrates including earwigs and spiders. In the UK the bats use woodlands all year round, favouring old woodpecker



Fig. 1 Bechstein's Bat (*Myotis bechsteinii*) photo:  
Paul Kennedy

holes for both summer and winter roosting. Studies in Europe indicate that female Bechstein's Bats form maternity colonies during the summer. These colonies switch roost-site frequently and often split into sub-groups (Kerth and Koenig 1999). Foraging occurs close to the roosting site, with bats rarely flying more than 1.5km between roost and feeding site (Schofield and Morris 2000). Females vigorously defend discrete feeding territories (typically about 1ha in area), although they will sometimes tolerate female offspring in the same space (eg Kerth *et al.* 2001).

Bechstein's Bat is a species under threat and one which is thought to be in need of focussed conservation effort (JNCC 2010); yet, as recently as 1998, there was a dearth of good quality information concerning its distribution and abundance in the UK. It was to address this situation that a project was initiated to identify woods supporting breeding colonies.

## SURVEY CHALLENGES

The lifestyle and population structure of Bechstein's Bat in the UK make it a difficult bat to survey effectively. Modern bat detectors have proved to be useful tools in the study of many other species, but unfortunately it is almost impossible to distinguish Bechstein's Bats from other *Myotis* species using detectors. In any case, the occurrence of Bechstein's Bats *per se* does not establish presence of a maternity colony because males tend to occupy separate woods from the females for most of the year.

The only truly effective way to establish whether a wood is being used by Bechstein's Bats for breeding purposes is to catch female animals and check their breeding status. However, due to their territorial behaviour, low population density and feeding behaviour, it is not very easy to capture Bechstein's Bats simply by placing a traditional trap in a wood, even supposing it supported a maternity colony. Also, because their echolocation and morphology are adapted to a 'gleaning' lifestyle, flying at relatively low speeds among dense clutter, Bechstein's Bats are particularly adept at avoiding harp traps and mist nets.

## TRIALS OF A NEW SURVEY METHOD

Pioneering work by Frank Greenaway between 1998 and 2000 pinpointed the locations of five

new colonies of Bechstein's Bats in and around Ebernoe Common, West Sussex, and allowed survey techniques to be refined and tested on these. Greenaway, together with Dr David Hill and the University of Sussex, developed an ultrasound synthesizer (the 'Sussex Autobat') that simulates the ultrasonic communication calls of bats. They found that when simulated social calls of Bechstein's Bats were played they could elicit a rapid approach response from the target species which increased the chances of being able to catch the bat in a harp trap or mist net. The response to the 'Autobat' seemed to be particularly strong when calls were played in a female's feeding area. As such feeding areas are always quite close to the maternity roost, the capture of a breeding female was taken as good evidence that there must be a breeding colony nearby.

The use of the 'Autobat' as an acoustic lure quickly led to the discovery of eight more colonies of Bechstein's Bats in West Sussex during 2002–03, more than doubling the number of breeding sites then known in the UK. Following further testing in Hampshire, Sussex, Surrey and Kent, a protocol was developed to be used to map the distribution of breeding colonies on a national scale.

## THE NATIONAL BECHSTEIN'S BAT PROJECT 2007–11

The Bat Conservation Trust (BCT) organised the National Bechstein's Bat Project, which involved volunteers from ten county-based local bat groups applying the protocol developed during the field trials described above. The aims of the Project are set out in Table 1.

### Survey site selection

Groups participating were asked to select, if possible, one wood to survey in each 10km square in their county that most closely approached a model of the ideal woodland habitat supporting a breeding Bechstein's Bat colony. This model was based on the findings of the initial field trials. Only wooded habitat 25ha or greater in area was considered, as research had indicated that a Bechstein's Bat breeding colony needs blocks of habitat of at least this extent to be viable (Hill and Greenaway 2006). However, the model was flexible to the extent that the 25ha could comprise either a single block of continuous woodland or two or three discrete but

TABLE 1: AIMS OF THE NATIONAL BECHSTEIN’S BAT PROJECT 2007–11 (MILLER 2012)

- Deliver systematically acquired baseline distribution data for Bechstein’s Bat across its entire range in England and Wales;
- Better delineate the species’ range and ‘hotspots’ for conservation action;
- Better understand the habitat associations of the species across its range in the UK;
- Provide a baseline against which ongoing presence of the species in 10km squares can be monitored for future Biodiversity Action Plan reporting and conservation status assessments;
- Provide conservation management guidelines for landowners and managers of sites where Bechstein’s bats are present;
- Provide preliminary data on the distribution of other woodland bat species in relation to woodland quality by recording all other species caught during the surveys.

well-connected woodland blocks. Woodlands that met the size criteria were then assessed against the four key criteria given in Table 2, the best candidate for survey being the site that matched the most criteria. In 10km squares with more than one possible candidate wood, other considerations, both positive and negative, were taken into account to select the best one. Table 2 also lists these secondary considerations.

The Somerset Bat Group (SBG) agreed to participate in the national project, and began trapping in 2010. Before trapping could start there was a need to identify target woods using the criteria listed in Table 2. The SBG enlisted the help of the

Somerset Environmental Records Centre (SERC) to identify the extent of woodland in the county and highlight candidate woods for further evaluation. These woods would be surveyed to check their suitability measured against the model.

Representatives from the SBG attended a BCT-organised workshop run by Frank Greenaway in January 2009 on how to apply the woodland selection criteria. This included visits to several woods in East Sussex known to support Bechstein’s Bat colonies. Following this, during late winter and early spring of 2009 and 2010, SBG volunteers visited candidate woods to assess their suitability for the Project. The results of the SERC desk study and the follow-up SBG field visits were used to make the final selection of woods where trapping sessions would be carried out.

### Trapping methodology

Two trap locations per wood were chosen where harp traps were to be set up. The locations were selected on the basis that they appeared to be in likely bat foraging areas – ideally among understorey shrubs beneath a closed canopy, preferably including oak, and away from rides and the woodland edge. Traps needed to be at least 200m apart to maximise the chances of them being located in different foraging territories. A recording station was also set up (usually about mid-way between the two trap locations) where the survey team would base itself for the evening. The recording station was a place – sited away from the traps – where captured bats

TABLE 2: WOODLAND SELECTION CRITERIA USED FOR THE NATIONAL BECHSTEIN’S BAT PROJECT (MILLER 2012)

1. Canopy cover – high canopy, with at least 75% cover (could be 50–74% cover if there is very well-developed understorey and species-rich herb layers).
2. Canopy composition – predominantly native broadleaved woodland, preferably oak (or ash), or mixed including a high proportion of old oak.
3. Understorey cover – well-developed with at least 50% cover.
4. Understorey composition – native species, especially hazel and hawthorn.

#### Positive considerations

- Presence of a small stream or pond within the woodland which retains water in summer.
- South-facing woods at lower elevations within the known range.
- Evidence of woodpecker holes.
- Stands of mixed ages including trees of >100 years.
- Occurrence of other suitable woodlands across the wider landscape (20km sq).

#### Negative considerations

- Evidence of recent management to clear understorey, remove older trees, or reinstate coppicing.
- Higher altitudes or excessive exposure within the known range.

could be identified and processed prior to release. On the night of the survey, the project equipment was set up at the two trap locations.

The ‘Sussex Autobats’ used during the surveys were preset to play a standardised series of ultrasonic bat calls. These calls were simulated predominantly to mimic Bechstein’s Bat social calls, but also included a few simulations of social calls made by another woodland specialist bat, the Barbastelle (*Barbastellus barbastella*), and also the Mouse-eared Bat (*Myotis myotis*), now extinct in the UK. Each ‘Autobat’ was linked to a pair of speakers mounted to face each other with a battery-powered rotating metal vane (a ‘Twiddler’) between them. The purpose of the Twiddler was to reflect the simulated calls in a 360° arc around the trap location. The mounted speakers were placed next to the harp trap, as close as possible to the centre of the trap’s frame.

Traps were operated with the ‘Autobat’ switched on for 90 minutes. The lure was turned on one hour

after civil twilight to ensure that the traps were being run in complete darkness when Bechstein’s Bats were likely to have already left the roost and begun to forage for food. Traps were checked about once every 15 minutes and any captures were removed, bagged and taken to the recording station. There, each bat caught was identified to species level, sexed, aged, assessed for breeding condition, and then released.

## RESULTS

The 10km squares containing woodland habitat matching at least one woodland selection criterion are shown in Figure 2. Thirty-six 10km squares out of a possible 52 were identified as containing suitable habitat. Of these, trapping was undertaken in 32 (89%), 27 in 2010 and 5 in 2011.

A total of 188 bats of at least eleven species were caught during the survey in Somerset (Table 3),

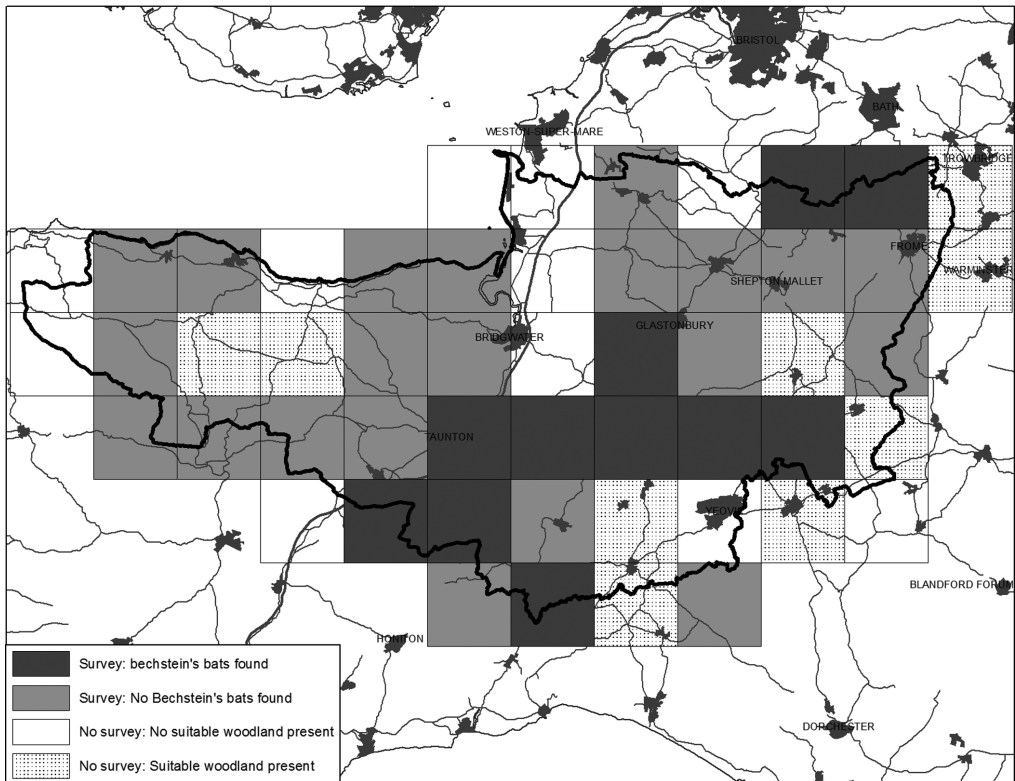


Fig. 2 Surveyed 10km squares and findings of Bechstein’s Bat; unsurveyed squares with and without suitable woodland also shown. Contains OS data © Crown Copyright and database right 2012

TABLE 3: SUMMARY OF BATS CAUGHT DURING THE BECHSTEIN'S BAT SURVEY IN SOMERSET, 2010–11

Species	Scientific name	Nos (%)	♂:♀ ratio	No. of squares	Mean catch per 10km square
Lesser Horseshoe Bat	<i>Rhinolophus hipposideros</i>	2 (1)	1:1	2	0.06
Daubenton's Bat	<i>Myotis daubentoni</i>	3 (1.5)	1:2	3	0.09
W/B/A Bat*	<i>Myotis</i> spp.*	42 (22)	29:13	20	1.3
Natterer's Bat	<i>Myotis nattereri</i>	24 (13)	16:8	18	0.75
Bechstein's Bat	<i>Myotis bechsteinii</i>	16 (9)	5:11	11	0.5
Common Pipistrelle Bat	<i>Pipistrellus pipistrellus</i>	13 (7)	7:6	10	0.4
Soprano Pipistrelle Bat	<i>Pipistrellus pygmaeus</i>	8 (4)	7:1	8	0.25
Brown Long-eared Bat	<i>Plecotus auritus</i>	75 (40)	42:32	25	2.3
Noctule Bat	<i>Nyctalus noctula</i>	2 (1)	1:1	1	0.06
Serotine Bat	<i>Eptesicus serotinus</i>	2 (1)	1:1	2	0.06
Barbastelle Bat	<i>Barbastella barbastellus</i>	1 (0.5)	1:0	1	0.03
All species		188 (100)			

\* There are several small *Myotis* sp. bats which are difficult to separate even when in the hand, namely Whiskered Bat (*M. mystacinus*), Brandt's Bat (*M. brandtii*) and the Alcaethoe Bat (*M. alcaethoe*), a species only recently discovered to occur in the UK. For the purposes of the project these bats were recorded collectively as 'W/B/A'.

including 16 Bechstein's Bats. Details of each Bechstein's Bat are given in Table 4 and the distribution of 10km squares surveyed and of Bechstein's Bats caught is shown in Figure 2. Interestingly, an equal number of Bechstein's Bats to those in Somerset were caught in Dorset during the Project, but in Dorset more male bats than female were captured (four females, twelve males).

At the national level, the Bechstein's Bat Project was successful in identifying a number of 'hotspots' for the species in southern England and in extending the known range for Bechstein's Bat northwards into north Buckinghamshire and Worcestershire. A total of 57 Bechstein's Bats (29 females, 28 males) were caught during the Project at 37 sites, all of which represented new records for the species in the 10km squares concerned. With the exception of three sites, adult males and females were always caught in different woods. Where males and females were caught together this was either at the start of the survey season (in two sites), or where a juvenile male was caught alongside breeding females (in the third site).

The 'hotspot' areas (where multiple squares containing breeding females were found) in the UK identified by BCT from the survey findings are: Dorset/Somerset, Hampshire/Isle of Wight, and Sussex. According to BCT: 'We consider that these hotspot areas, identified from the overall results of the Bechstein's Bat Survey are core areas for the population of this species which are likely to be significant in terms of the long-term viability of Bechstein's Bat in the UK' (Miller 2012).

## DISCUSSION – IMPLICATIONS FOR CONSERVATION PRACTICE IN SOMERSET

Somerset and Dorset appear to be of national importance for the future of Bechstein's Bat as a UK species. However, the 2010–11 surveys do not indicate an even distribution of breeding sites across Somerset, but rather one that is skewed towards the south and east of the county. Breeding colonies of Bechstein's Bat are clustered in the Blackdowns and along the Polden ridge into mid-Somerset. Two squares in the north-east of the county that were found to support Bechstein's Bats suggest that further breeding colonies may await discovery in the large blocks of woodland on the eastern side of the county in the area known as Selwood Forest.

No Bechstein's Bats were caught at all on Exmoor or the Quantock Hills despite the presence there of significant blocks of ancient woodland. This may seem surprising when one considers that the Exmoor and Quantocks Oakwoods Special Area of Conservation (SAC) is formally designated, at least in part, because of the occurrence of Bechstein's Bat. We suspect that the apparent absence of breeding colonies in west Somerset is connected to the relatively high altitude of many of the woods there which does not favour a species that, in the UK, is very much on the northern edge of its European range.

The thin ribbon of rather long and narrow woodlands along the Polden ridge could be particularly significant for Bechstein's Bat in



TABLE 4: SUMMARY DATA FOR BECHSTEIN'S BATS CAUGHT IN SOMERSET DURING THE NATIONAL BECHSTEIN'S BAT PROJECT

Date	10km square	Sex	Age class	Breeding status	Woodland selection criteria (see Table 2 for details)				No. of criteria met
					1: Canopy cover	2: Canopy composition	3: Understorey cover	4: Understorey composition	
22/05/10	ST 22	Female	Adult	Non-breeding	✓	X	✓	✓	3
08/06/10	ST 52	Female	Adult	Pregnant	✓	✓	✓	✓	4
08/06/10	ST 52	Female	Adult	Pregnant	✓	✓	✓	✓	4
08/06/10	ST 52	Female	Adult	Pregnant	✓	✓	✓	✓	4
16/07/10	ST 32	Female	Adult	Lactating	✓	✓	✓	✓	4
16/07/10	ST 32	Female	Adult	Non-breeding	✓	✓	✓	✓	4
14/08/10	ST 43	Female	Adult	Non-breeding	✓	✓	X	✓	3
04/09/10	ST 21	Female	Juvenile	N/A	✓	✓	✓	✓	4
21/05/11	ST 75	Female	Adult	Non-breeding	✓	✓	✓	✓	4
31/05/11	ST 65	Female	Adult	Non-breeding	✓	X	✓	X	2
04/06/11	ST 42	Female	Adult	Pregnant	X	✓	✓	✓	3
31/07/10	ST 62	Male	Adult	Not recorded	✓	✓	✓	✓	4
17/05/11	ST 11	Male	Adult	Testes developed	X	✓	✓	✓	3
21/05/11	ST 75	Male	Adult	Testes developed	✓	✓	✓	✓	4
04/06/11	ST 42	Male	Adult	Testes developed	X	✓	✓	✓	3
07/06/11	ST 30	Male	Adult	Testes developed	X	X	X	✓	1

Somerset, potentially providing a wooded 'corridor' linking the woods of the Blackdown Hills with those in the east of the county. The fragmented nature of many of the woodlands in this area is of some concern and the strengthening of links at a landscape scale ought to be an important focus for conservation action.

Our results suggest that the national model of what constitutes a 'suitable wood' for Bechstein's Bat works reasonably well in Somerset, despite the model having been developed in south-east England. A 'typical' wood supporting this species in Somerset is broadleaved with a closed canopy and dense understorey dominated by hazel (*Corylus avellana*), and with plenty of mature oak trees and significant areas of boggy, wet ground often with large stands of Pendulous Sedge (*Carex pendula*). Many of the woodlands that proved to be positive for this species had a distinctly under-managed appearance bordering on 'benign neglect'. It is worth bearing this in mind when conservation organisations are contemplating coppicing large areas of ancient woodland or opening up of large areas of wooded landscapes.

Lastly, it should be noted that, while a significant proportion of the woods that were surveyed and found to support Bechstein's Bats are owned or managed by conservation bodies, a high proportion (seven out of eleven) are in private ownership, highlighting the need for an approach

to conservation of this species that engenders the support and trust of private landowners.

#### Additional note (August 2012)

It has been brought to our attention that two female Bechstein's Bats have been caught during 2012 in woodland in the Quantock Hills in 10km square ST14, in an area where the species was not recorded in 2011. One of the bats was lactating, indicating that the Quantock Hills do indeed support a breeding colony. These records were made by Geoff Billington and ecologists from Greena Consultancy while undertaking work for EDF and AMEC in connection with proposals for a new nuclear power station at Hinkley Point.

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