Valuing Bats in Ecological Impact Assessment

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Since their publication in 2006, IEEM's *Guidelines on Ecological Impact Assessment in the UK* have provided a standard approach and structure for ecological impact assessments (EcIAs) which has been hugely beneficial. However, while the process of assessing impacts on habitats and species (receptors) is described in detail in the guidelines, the valuation of receptors, on which the rest of the assessment depends, was considered too complex to include. Valuation of receptors therefore remains entirely a matter of professional judgement for ecologists preparing EcIAs. This article provides a framework for valuing bat roosts, commuting routes and foraging areas which is, as far as possible, objective in the hope that increased consistency in this aspect of EcIA can also be achieved.

In our experience, bats can be amongst the hardest of receptors to value consistently. Their highly mobile nature, combined with a high level of legal protection and conservation concern (seven species are UK Biodiversity Action Plan priority species), means that roosting, commuting or foraging bats are likely to be a potential issue on almost any development site, but it does not follow that every site is necessarily valuable for bats.

It has been argued in some EcIAs that any valued ecological receptor (VER) relating to bats is of national or international importance due to their level of legal protection. This approach is erroneous, conflating legislative and policy matters with ecological principles.

This article is based on a paper (Wray *et al.* 2007) presented at the 'Advances in EcIA for Mammals' symposium run jointly by the Mammal Society, Zoological Society of London and IEEM.

Geographic Frames of Reference

In the EcIA guidelines, valuation involves assigning a receptor to a geographic frame of reference, *i.e.* International, UK/National, Regional, County, and District, Local or Parish so that the level of weight or importance attached to any impact can be appropriately assessed. Clearly, any robust approach to valuation needs to be underpinned by adequate survey data, as specified by the Bat Conservation Trust (2007) or other specific guidance, for example, for wind farms see Rodrigues *et al.* (2008) or Natural England (2009). In the case of bats as receptors, such data are not readily forthcoming and in this paper, we attempt to make a judgement as to the appropriate valuations.

Distribution and Rarity

One of the problems in assigning bat VERs to geographic frames of reference in EcIA is that the distribution and rarity of species varies greatly. A pipistrelle maternity colony and a grey long-eared maternity colony are not likely to be valuable at the same geographic scale, due the great difference in rarity of the two species. To overcome this, our first step is to define the relative rarity of each species as Common, Rarer, or Rarest based on the known distribution and population size in the UK. Table 1 shows this for each bat species for the UK regions. Accurate population figures are not available for all species even at this geographic scale and the data presented here are primarily estimates in Richardson (2000), Harris *et al.* (1995), and Harris and Yalden (2008).

Valuing Roosts

Bats use a range of different types of roost, and not all have the same level of importance in supporting a local population of bats. At one end of the scale, a night roost may be used by a single bat or small number of bats to rest during night-time feeding activities.

Table 1: Categorising bats by distribution and rarity

Rarity within range	England	Wales	Scotland	Northern Ireland
Rarest (popn. under 10,000)	greater horseshoe[1] Bechstein's[2] alcathoe?[3] greater mouse-eared[4] barbastelle[5] grey long-eared[6]	greater horseshoe whiskered[7] Brandt's[8] Bechstein's alcathoe? noctule[9] Nathusius' pipistrelle[10] serotine[11] barbastelle	whiskered Brandt's alcathoe? noctule Nathusisus' pipistrelle Leisler's[12]	whiskered
Rarer (popn. 10,000 – 100,000)	lesser horseshoe[13] whiskered Brandt's Daubenton's[14] Natterer's[15] Leisler's noctule Nathusius' pipistrelle serotine	lesser horseshoe Daubenton's Natterer's brown long-eared[16]	Daubenton's Natterer's brown long-eared	Daubenton's Natterer's Leisler's Nathusius' pipistrelle brown long-eared
Common (popn. over 100,000)	common pipistrelle[17] soprano pipistrelle[18] brown long-eared	common pipistrelle soprano pipistrelle	common pipistrelle soprano pipistrelle	common pipistrelle soprano pipistrelle

[1]*Rhinolophus ferrumequinum*; [2]*Myotis bechsteinii*; [3]*Myotis alcathoe*; [4]*Myotis myotis*; [5]*Barbastella barbastellus* ; [6]*Plecotus austriacus*; [7]*Myotis mystacinus*; [8]*Myotis brandtii*; [9]*Nyctalus noctula*; [10]*Pipistrellus nathusii*; [11]*Eptesicus serotinus*; [12]*Nyctalus leisleri*; [13]*Rhinolophus hipposideros*; [14]*Myotis daubentonii*; [15]*Myotis nattereri*; [16]*Plecotus auritus*; [17]*Pipistrellus pipistrellus*; [18]*Pipistrellus pygmaeus*

There may be limited fidelity to the roost structure and it could easily be replaced. At the other end of the scale, a large maternity roost or hibernation site where large numbers of bats gather from over a wide area and have used the same site over many years or generations. This type of roost is obviously of much greater significance.

Having categorised bat species by rarity and distribution above, different roost types can be assigned to a geographic frame of reference based on the rarity of the species concerned. Table 2 shows our proposed valuations for different roost types, for bats in each rarity category. So, for example, maternity sites of common species would be valued at County level, whereas maternity sites of the rarest species would be valued at National level. Conversely, feeding perches for even the rarest species would not be valued above County level, reflecting their lower importance for the integrity of bat populations.

Table 2: Valuing bat roosts

Geographic frame of reference	Roost types
District, Local or Parish	Feeding perches (common species) Individual bats (common species) Small numbers of non-breeding bats (common species) Mating sites (common species)
County	Maternity sites (common species) Small numbers of hibernating bats (common and rarer species) Feeding perches (rarer/rarest species) Individual bats (rarer/rarest species) Small numbers of non-breeding bats (rarer/rarest species)
Regional	Mating sites (rarer/rarest species) including well-used swarming sites Maternity sites (rarer species) Hibernation sites (rarest species) Significant hibernation sites for rarer/rarest species or all species assemblages
National/UK	Maternity sites (rarest species) Sites meeting SSSI guidelines
International	SAC sites

Valuing Commuting Routes and Foraging Areas

Two additional problems apply when assigning values to commuting and foraging bats. Firstly, rather than looking at different kinds of bat activity (*i.e.* different roost types), we are trying to distinguish between different intensities of use or bat behaviour. Secondly, these activities cannot be considered in isolation and need to be assessed in the context of surrounding roosting, commuting and foraging opportunities, which will often be outside the survey area for a project. For example, commuting bats close to a SSSI roost for that species should take that into account, even if the roost is not itself a receptor being considered in the EcIA. Similarly, valuation of bats foraging should take into account the availability of foraging habitat in the surrounding areas. In some situations, the type of foraging habitat available close to a roost can be critical to, for example, breeding success and recruitment and these factors must all be brought in to the analysis.

Table 3: Scoring system for valuing commuting and foraging bats

Geographic frame of reference	Score
International	>50
National	41 - 50
Regional	31 - 40
County	21 - 30
District, local or parish	11 - 20
Not important	1 - 10

For both commuting routes and foraging habitats, a scoring system has been developed to determine the appropriate geographic frame of reference (see Table 3). Usually several bat species are present on a site, in which case each species should be valued individually, and the highest value obtained (usually for the rarest species present) used in the EcIA.

Commuting Routes

When valuing commuting routes the rarity of the species involved, the approximate numbers of bats using them (based on survey data), the proximity of known roosts, and the nature and complexity of linear features in the landscape are all taken into account to put the bat activity recorded into context. Table 4 provides scores for each of these factors. One score is taken from each column, depending on the 'best fit' for the situation and they are added together in order to arrive at a total score.

For example, a soprano pipistrelle commuting route in England comprising small numbers of bats away from known roosts in a landscape of flailed hedgerows would score 2+10+4+3=19. Referring to Table 3 indicates that this commuting route would be of District value or below. However, large numbers of commuting barbastelle bats on the same site would score 20+20+4+3=47 indicating a commuting route of National value.

Foraging Areas

Similarly, when valuing foraging areas, the rarity of the species, the approximate number of bats using them (based on survey data), the proximity of known roosts, and the landscape-scale foraging opportunities available are all taken into account. Table 5 provides scores for each of these factors, using the same approach as described for commuting routes above.

For example, individual lesser horseshoe bats foraging in Wales, in an area with few potential roost sites and isolated woodland patches in an agricultural landscape, would score 5+5+3+3=16 indicating a foraging area of District value or below. Conversely, a small number of foraging serotine bats on the same site would score 20+10+3+3=36 indicating a foraging area of Regional value.

Using and Refining this Approach

One obvious refinement to the approach described would be further sub-division of the UK regions in Table 1, particularly for England and Scotland where the bat assemblages present in the south and north of the countries are very different. Currently, there are insufficient published data on regional bat population sizes to enable this, indeed even some of the national data are inferred or based on estimates of unknown accuracy.

Regular users of the IEEM guidelines will have noted that some of the geographic frames of reference have been combined in the tables. In our experience, National and UK value are rarely distinguishable when considering bat receptors. The does not mean that we fail to appreciate the regional distinctiveness of our bat populations, rather that a receptor of National value in any UK country will tend to be of UK value. The other geographic frames of reference combined are those at the lower end of the scale: District, Local and Parish. We have found it extremely difficult to provide a framework that can meaningfully distinguish between these, given that receptors falling into these categories are generally small numbers of common or individual rarer bats. However, the combining of these categories is less critical, given that the threshold for full consideration in the EcIA is usually set above this level.

Table 4: Valuing commuting routes

Species	Number of bats	Roosts/potential roosts nearby	Type and complexity of linear features
Common (2)	Individual bats (5)	None (1)	Absence of (other) linear features (1)
-	-	Small number (3)	Unvegetated fences and large field sizes (2)
Rarer (5)	Small number of bats (10)	Moderate number/Not known (4)	Walls, gappy or flailed hedgerows, isolated well-grown hedgerows, and moderate field sizes (3)
-	-	Large number of roosts, or close to a SSSI for the species (5)	Well-grown and well-connected hedgerows, small field sizes (4)
Rarest (20)	Large number of bats (20)	Close to or within a SAC for the species (20)	Complex network of mature well-established hedgerows, small fields and rivers/streams (5)

Table 5: Valuing foraging areas

Species	Number of bats	Roosts/potential roosts nearby	Foraging habitat characteristics
Common (2)	Individual bats (5)	None (1)	Industrial or other site without established vegetation (1)
-	-	Small number (3)	Surburban areas or intensive arable land (2)
Rarer (5)	Small number of bats (10)	Moderate number/Not known (4)	Isolated woodland patches, less intensive arable and/or small towns and villages (3)
-	-	Large number of roosts, or close to a SSSI for the species (5)	Larger or connected woodland blocks, mixed agriculture, and small villages/hamlets (4)
Rarest (20)	Large number of bats (20)	Close to or within a SAC for the species (20)	Mosaic of pasture, woodlands and wetland areas (5)

In our experience, using the approach outlined above for real situations we have been involved with generally produces a result which corresponds with our professional judgement on valuation of the receptor. But it would be counter-productive for ecologists to use this approach without a critical eye on the result produced: if there are factors not covered above that make a particular receptor valuable at a higher, or lower, geographic frame of reference. This is entirely appropriate if it can be adequately justified.

Consequently, this approach should be used as a framework rather than a rulebook, but one which could help all of us involved in preparing EcIAs to be more consistent and to better explain our rationale in the valuation of bats as receptors. We are aware that many ecologists have asked us for copies of this framework following our presentation in 2007, and we would be very interested to hear how well you have found it to work in practice, and any suggestions for improvement.

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Photo 1. Gas pipeline severing bat commuting routes

Photo 2. Lesser horseshoe bat Photo: David Wells

Photo 3. Example of bat commuting habitat in an intensively managed landscape

Photo 4. Example of bat foraging habitat in a 'patchy' landscape Photos 1,3,4: Cresswell Associates

Where is All the Data Going?

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Wales is lucky in many respects; fantastic scenery, a clean environment, albeit a bit wet at times, and a strong cultural heritage. It also boasts the first complete network of Local Records Centres (LRCs) anywhere in the UK. This is probably not as impressive as the scenery or culture, but for those who need access to high quality biodiversity information the Welsh LRC network, provides seamless coverage across Wales. For nearly a decade Welsh LRCs have offered data services to environmental consultants and over the past year and a half we have been working with IEEM's Welsh Section to better understand and cement our working relationship.

Initial engagement with IEEM was through workshops held in North and South Wales during 2009. This was followed earlier this year by a questionnaire sent out to 50 environmental consultancies and more recently a meeting held with government and private sector ecologists in North Wales. As well as generating better understanding between the complementary communities of ecological and data managers, these efforts helped us identify the key issue of data flow between consultants and LRCs from our discussions. This is the focus for this article and I hope to be able to put forward a perspective borne in Wales, but which is equally applicable throughout the UK.

The Local Records Centre I work for, Cofnod in North Wales, is relatively new to providing data to consultants. However in just three years we have built our customer base from zero to over 120 consultancies, many of which are repeat customers. Consultants appear to understand the charging model established through LRCs and in most cases their costs are recouped through their clients. I hear feedback from consultants saying they like the quality and speed of our service, the way the data are presented and they find it useful background to planning their own surveys and desktop assessment. Yet for the hundreds of requests for information we have dealt with over the past three years, I can count the amount of data we have received from consultancies on one hand. This is not entirely surprising as there is little compulsion to supply LRCs with data. However, the same cannot be said for data that comes from volunteers and public sector organisations, which continues to increase annually.

I hear with increasing regularity that the greatest source of new data, especially for protected species, is through the thousands of privately funded surveys carried out each year by environmental consultants. So why are we worried about this? You could say it is in our interest, as we are concerned with gathering as much relevant data as possible. However LRCs are not the end users of data, we merely manage it; try to improve its completeness, its uniformity and its quality. So it should be the end users who are most interested in making sure they have access to the most comprehensive relevant data. Environmental consultants are major end users, making it important that others, and for that matter themselves, can potentially access improving data. In most cases valuable studies end up forming part of paper archives. Take documents prepared for the planning process, there seems to be a common misconception that once a document reaches the 'public domain', it becomes automatically available for all to use and consume, including LRCs. Yet in truth much of this data ends up in various paper or electronic filing systems. These systems tend to be cumbersome, making the data virtually impossible to cross reference. Eventually the data gets lost under the weight of more recent information and all the valuable time and effort used to create it goes to waste.

LRCs offer an alternative to this, but why is data not being shared more fully? From the engagement with IEEM we have had in Wales some common reasons have started to emerge:

- Concerns over ownership of the data and in particular whether there would be a breach of client confidentiality.
- A lack of clarity about what data are required and how to share it.
- The extra time and possible expense involved in sharing data.

Data Ownership

The issue of data ownership seems to be the most misunderstood; I for one have wrongly believed that the owner of the data was whoever paid for its collection. Although this holds true under certain circumstances, the owner of the data is generally the one who created it. This is a clear principle under copyright law. There are two exceptions to this. Firstly, data collected whilst in someone's direct employ becomes the property of the employer. Secondly, where there is a legal transfer of ownership, usually through a signed contract between the collector and another party. So what does this mean? Well for most freelance consultants it means that, unless specified by the client, any data collected is theirs freely to share. For consultancies with employees, the data is owned by the consultancy and unless specified by the client, they in turn can freely share it. Given the legal position there seems to be two main reasons for not sharing data. Firstly, procedural difficulties in, for example, persuading a larger consultancy it can freely share its data. Secondly, concerns over whether the sharing of such data will damage customer relations and be a breach of client confidentiality. Neither of these issues seem insurmountable, however the first relies on organisational change, the second could be just a matter of clarifying intentions to share data. For some time we have been promoting the use of the following data sharing clause by consultants asking them to use these when setting up contracts with their clients:

'Unless you request otherwise, we intend to share all relevant biological survey data with the appropriate Local Records Centre.'

This clause and other similar ones we have discovered are widely used by environmental consultants. By doing