The Jersey Bat Survey

Frank Greenaway

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Prepared by Louise Magris, Environment Department, Environment and Public Services Committee, Jersey C.I.

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Summary

- The Jersey Bat Survey was carried out between 2000 and 2002 to address Jersey's obligations under The Agreement on the Conservation of Populations of European Bats (a treaty under the Convention on the Conservation of Migratory Species of Wild Animals) and also to provide a framework for the enforcement of the Conservation of Wildlife (Jersey) Law 2000.
- As well as being numerous components of local biodiversity their small size, mobility and longevity combine to make bats well suited for use as indicators of general environmental conditions.
- Ecological data was collected on our local bat species using a variety of survey methods e.g. ultrasound detector surveys, roost searches, mist netting. An updated species list and distribution maps for each species have been produced.
- Two new resident species of bats, the brown long-eared bat and Kuhl's pipistrelle, have been confirmed, whilst the two phonic types of pipistrelle ~ the common and soprano have been recorded. The grey long-eared bat was also found to be widespread although they are under represented in detector surveys due to their quiet calls. The resident status of Nathusius' pipistrelle was established although breeding roosts have yet to be identified. Natterer's bat was found to be the only Myotid bat on the Island but it appears more widespread than previously thought. A Leisler's bat was found in 2002 and thought to be a vagrant individual whilst the status of a suspected serotine colony remains unconfirmed.
- Bat activity was strongly associated with linear landscape elements such as hedgerow and streams. To a degree the small parcel size and network of hedgerows can favour the small species of bats found locally although intensive agricultural practices and water quality issues combined the availability of suitable roosts are likely to have negative effects on bat populations.
- Overnight focal point sampling of water bodies with an ultrasound detector showed how the composition of the bat community changed with time after sunset. Myotids and long eared bats were more heavily represented after 180 minutes after sunset suggesting this method gives a more representative method of assessing community structure and behaviour.
- Procedures were put into place for the enforcement of the Conservation of Wildlife (Jersey) Law 2000. A roost register was developed and held on a Geographical Information System for cross-referencing planning applications and a successful process for identifying potential roosts was developed. These screening processes combined with the appropriate mitigation and follow up with architects, builders and contractors has led to the protection of roosts that previously would have lost to development.
- Artificial summer roosts and winter hibernacula have been provided for bats in three critical woodland habitats.
- Targeted information on the Wildlife Law has been developed and 434 local companies associated with the building trade were provided with information on their statutory obligations in relation to bats. Routes of communication and training for authorised officers have been established with the States of Jersey Police.
- A Species Action Plan for local bats has been developed to fulfil our obligations under The Agreement on the Conservation of Populations of European Bats. Habitat management initiatives have been detailed and run in tandem with the existing programme to de-fragment and diversify woodland habitat for red squirrels. A monitoring programme has been designed and will be implemented in 2004 onwards

1.0 Introduction

1.1 Background

The Vespertilinoid bats comprise an important part of Jersey's mammal fauna making up approximately 40% of all local mammal species. They are important components of our biodiversity and their small size, mobility and longevity combine to make them well suited for use as indicators of general environmental conditions (Fenton 1996). The distribution and abundance of bats can be expected to vary markedly in response to abiotic or biotic factors which affects population demography in the long term whilst in the short term spatial positioning will change (Walsh and Harris 1996b). Significant and well recorded declines of British and Continental bat species have been largely attributed to the pressures of widespread landscape change (Daan 1980, Stebbings 1988, Gerrell and Lundberg 1993). Commonly a decrease in habitat diversity will have a negative impact on bat populations for example through changes in farming practice (for instance the increase in the use of pesticides and landscape change). Conversely changes by humans to the landscape that promote habitat diversity may offer bats increased feeding opportunities for example the addition of street-lights that attract insects (Rydell and Racey 1995). Because bats use flight they are very mobile and have widespread access to different habitats which allows different species that share the same roosts to forage in different habitats even when the two species are morphologically similar. Thus relatively complex species assemblages can be seen sometimes in small areas and the health of these populations can provide a sensitive measure of environmental health.

1.2 Local And International Obligations For Bat Conservation In Jersey

Two layers of protection are in place for Jersey's bats

1. Multi-later International Obligations ~ The Agreement on the Conservation of Populations of European Bats or Eurobats (a treaty under the Convention on the Conservation of Migratory Species of Wild Animals or the Bonn Convention) was extended to Jersey. In response to this, The Environment Department, (Environment and Public Services Committee) commissioned an ecological survey to determine the current status of Jersey's bat species, formulate legislation for their protection and action plan for their future conservation.

2. Local legislation - In July 2000 the Conservation of Wildlife (Jersey) Law 2000, was enacted. Previously there was little to no protection for most of Jersey's flora and fauna but the Wildlife Law gave new protections to all bat species and their roosts (Figure 1). The structure of the Island's government places the Environment Department alongside the Planning Department within the Environment and Public Service Committee so providing an opportunity to develop a programme of roost protection through the development control process.

Under Article 5, Paragraph 1 of The Wildlife Law makes it an offence :-
For any person knowingly to kill, injure or take any protected wild animal or protected wild bird or destroy or take the egg of a protected wild bird.
There are numerous defences to this Article, for example if an injured animal is taken into care for the purposes of rehabilitation. Another defence is provided in Paragraph 3(c) :-
A person shall not be found guilty of an offence under paragraph (1) by reason of –
(c) Any act if he satisfies the court -
that the act was the incidental result of a lawful operation, and that the act could reasonably have been avoided.

However, all bat species are considered so vulnerable that this defence is **not** allowed under paragraph 6 :-
A person shall not be entitled to rely on the defence provided by sub-paragraph (c) of paragraph (3) as respects anything done in relation to a bat, otherwise than in the living area of a dwelling-house, **unless he has notified the Planning and Environment Committee of the proposed action or operation and allowed them a reasonable time to advise him as to whether it should be carried out and, if so, the method to be used.**

Figure 1 Extract from the Conservation of Wildlife (Jersey) Law 2000 in relation to the protection offered to all species of bats.

1.3 Aim of The Survey

1. To fulfil the Island's requirements under the Eurobats Treaty :-
   - To gather baseline ecological data on Jersey's bat population
   - To identify, catalogue and protect both hibernacula and summer roost sites
   - To provide Species Action Plans for Jersey's resident bat species
   - To construct a monitoring programme to detect significant changes in Jersey's bat population
2. To provide a policy framework to enforce the Conservation of Wildlife Law with reference to bats

1.4 Historical Information

Local naturalists and more recently the Jersey Bat Group have recorded local bat species from in-hand identification (often from rehabilitation efforts) and more recently using heterodyne recorders (Table 1). No Island wide systematic survey has been previously carried out.

Species		Historic Status
Greater Horseshoe	*Rhinoloplus ferrumequinum*	2 records, last 1959
Natterer's	*Myotis nattereri*	2 records, 1991 and skull in owl pellet 1964. 1990s breeding colony found in tree
Grey long-eared	*Plecotus austriacus*	Common
Common pipistrelle	*Pipistrellus pipistrellus* (45kHz) *Pipistrellus pygmaeus*(55kHz)	Common – no differentiation between phonic types made.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Winter visitor, uncommon
Serotine	*Eptesicus serotinus*	2 records, 1895 and 1986

Table 1 Ecological information on Jersey's bats pre 2001. * refers to status in 1992 as defined by Young and Tonge (1992). A catalogue of historical records kept on file[1].

1.5 Jersey's Landscape

Jersey is 116 km^2 in area and situated in the English Channel 25 km from the north coast of France. A Phase One habitat survey of the Island has provided detailed information on habitat type. However, data obtained using remote sensing from the Landsat satellite can be used to divide the Island into eight broad terrestrial habitat types (Smith and Fuller 1998; Figure 2). Primarily, the Island is farmed but compared with the UK and Europe, holdings are small (mean = 16 ha, Department of Agriculture Statistics Review 1999). Much land is used for the production of Jersey Royal potatoes (3449ha), commonly with maize and rye grass (for silage) grown between potato crops.

[1] Historic bat info fr. Societe.doc

Jersey's woods are small and fragmented into many blocks (Magris and Gurnell 2002), mostly distributed on steep valley sides with some surrounding the reservoirs that supply the Island's fresh water (Figure 3). The Island supports ca. 340km of mature hedgerow this length being the remnants of a more extensive hedgerow system that was much reduced in the 1970s due to Dutch Elm Disease. An extensive programme to replant and gap up existing hedgerows to recreate and upgrade wildlife corridors began in 1999 and to date 35 000 native trees have been planted (Red Squirrel Species Action Plan Anon 2002).

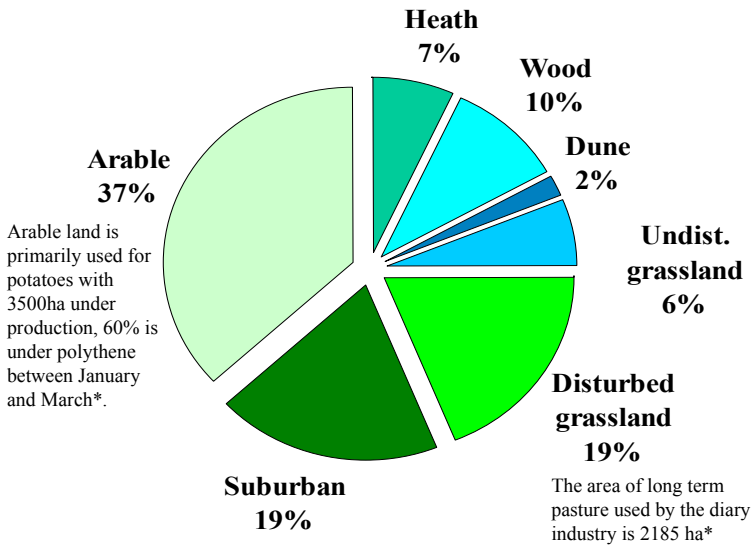

Figure 2 Habitat type in Jersey as a percentage of total land area. 'Disturbed grassland' refers to grass cover crops and improved grassland whilst 'undisturbed grassland' refers to permanent (although not necessarily unimproved) or semi-permanent leys. *Department of Agriculture Statistics Review 1999.

An important factor affecting Jersey's landscape is the human population of ca. 85000. The average density therefore is 733 individuals km-2 thus the whole Island can be classified as urban (defined as > 620 individuals km-2 by McDonnell & Pickett, 1990). Consequently, whilst there are several larger population centres Island wide, there remain few areas without the influence of buildings in some form or another (Figure 3). This is important when we consider the common use of sinanthropic roosts by bats as well as the influence of artificially created feeding sites like around street lights.

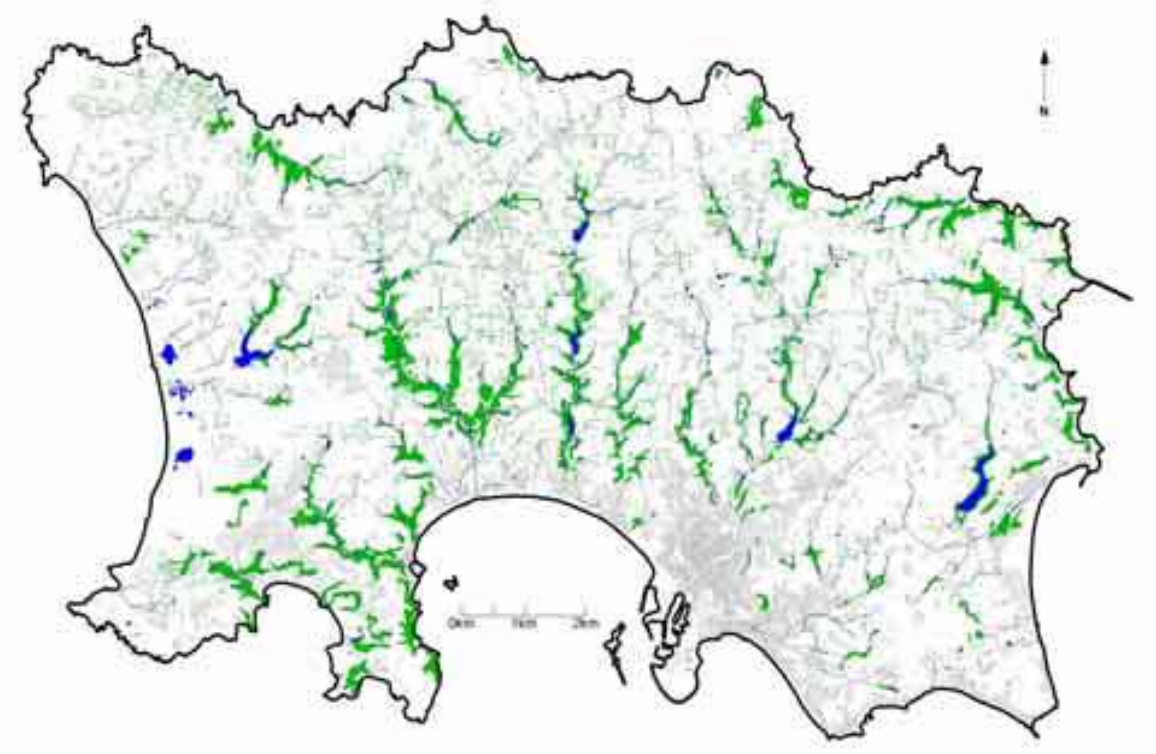

Figure 3 Habitat map of Jersey showing woodlands and hedgerows (green), water features (blue) and suburban areas (grey)

2.0 Methods

2.1 Ecological Survey

2.1.1 Roost & Hibernacular Survey

Using information kindly provided by the Jersey Bat Group, historical roost sites were targeted with postal questionnaires and follow up visits to determine the roost status and the species were present. Media awareness, detector surveys (2.2.2) and a church survey further identified roost sites.

2.2.2 Detector surveys

Data was collected using a Tranquillity II ultrasound bat detector. All recordings were taken at x10 time expansion and a 320ms recording duration. The sensitivity was turned to maximum to ensure continuous recording. The output was recorded to via an analogue line to a Sony minidisk. The data from the minidisks were subsequently downloaded to computer and analysed using BatSound (V3.1 Pettersson Elektronik AB). The spectrograms generated by BatSound were linked to on site notes and track marks inserted during the recording such that identifications and locations could be linked. Power and frequency analysis allowed the calls to be identified to species level when compared to reference material (e.g. Barataud 1995, Russ 1999). Species identifications were verified by appropriate scientists where necessary. Identifying bat species from their calls is not an exact science and bat calls are very plastic. For example bats feeding on flying insects in open uncluttered habitats may make different calls compared to when they are foraging in cluttered environments such as dense woodland.

However with experience and verification it was possible to identify more than 90% of all the calls.

2.2.2.1 Car Transects

Figure 4 A typical 'green lane' driven during bat transects

Initial survey work began by driving pre-determined transects at 10mph with the bat detector positioned at 45° forwards through the sunroof of a car (Colin Catto pers comm.). Track marks were inserted on the mindisk at the start of each road. This technique quickly provided information on important sites for bats and a brief species list that immediately showed differences to the 1992 list. Transects were designed to encompass the Island's green lanes (Figure 4). These narrow lanes are mostly tree lined often with the canopy forming an arch overhead. These sheltered lanes provide a good foraging habitat for bats especially where they run alongside streams and water features.

Transects covered the Island in 6 routes which were driven clock wise and then counter clockwise the next night (Figure 5). They were driven in the most suitable weather conditions for bats i.e. light winds, late afternoon temperatures above 10°C (see Walsh, Harris and Hutson 1993). The number of passes and species of bat per road were recorded and held on GIS. Individual species records were used to construct species distribution maps.

To investigate bat activity derived from the transect data, Activity indexes (A_{tot}) of the total bat species per 100m of road were calculated as follows :-

$$A_{tot} = 0.5\ (A_c + A_{ac})\ /\ (L/100)$$

where A_{tot} = Index of bat activity per 100m of road
A_c = Number of all bat contacts in clockwise transect
A_{ac} = Number of all bat contacts in anti-clockwise transect
L = Length of road

Because detectors do not differentiate between several passes by the same bat and single passes by several bats (Thomas and West 1989), the counts of bat passes represent an index of bat abundance and cannot be interpreted as population density figures.

Similarly the records from the two species of Pipistrelle (45 kHz and 55 kHz) were combined and Pipistrelle Activity Indexes (A_P) were also calculated separately shown below for clockwise and anti-clock routes.

$$A_P = (A_{45} + A_{55})\ /\ (L/100)$$

where A_P = Index of bat activity per 100m of road
A_{45} = Number of all bat contacts of 45 kHz pipistrelles per transect
A_{55} = Number of all bat contacts of 55 kHz pipistrelles per transect
L = Length of road

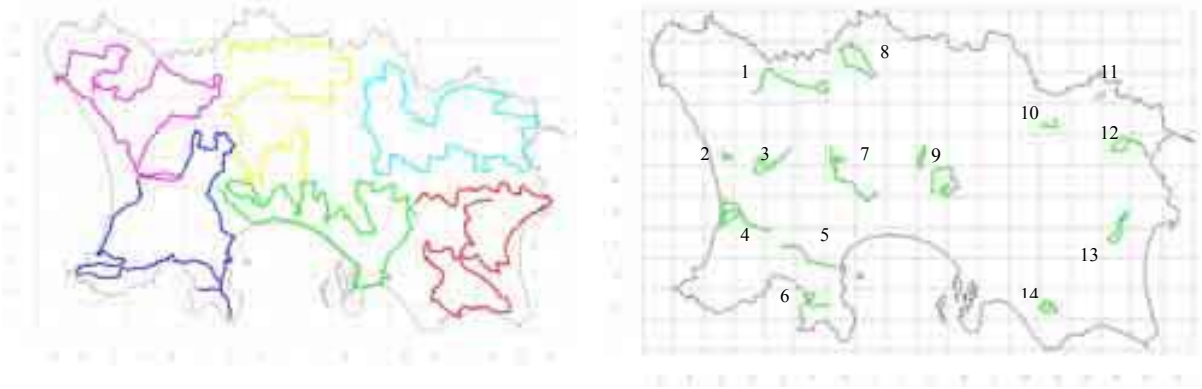

Figure 5 Car transect routes (left; see section 2.2.2.1) pink – transect 1, blue – transect 2, yellow – transect 3, green - transect 4, red – transect 5, light blue – transect 6. Walked transect routes (right; see section 2.2); 1 – Greve de Lecq Woods, 2 – St Ouens Pond; 3 – Val de la mare reservoir, 4 – Blanches Banques, 5 – Railway Walk, 6 – Ouaisne; Fern Valley, 7 - St Peter's Valley, 8 - Mourier Valley, 9 – Fern Valley, 10 – Les Augres Manor, 11- Rozel woods, 12 – St Catherine's woods, 13 – Val de La Mare Reservoir; 14 - Samares manor.

2.2.2.2 Foraging Surveys

Foraging surveys were carried out Island wide by walking repeated prescribed transects throughout the summer months in woodland and other appropriate habitats (Figure 5). Data was recorded to minidisk (see section 2.2.2). Transects encompassed woods, meadows and watercourses such as reservoirs and streams. Additional habitats such as dune and heath were sampled. On selected sites, the bat detector was left in a covered waterproof case to record all night. This enabled data to be collected for specific sites such as woodland ponds. Again, the number of passes and species of bat per section of transect were recorded and held on GIS. For overnight recording at focal points an index of bat activity was calculated as the number of passes per 30 minutes. All species were combined for this analysis but individual species records were used to construct species distribution maps.

2.2.3 Mist Net Surveys

UK licensed bat workers visited Jersey in June 2002 and July 2003 in order to carry out mist netting in sites where detector surveys identified that further work would be merited. Mist nets were erected at Val de La Mare reservoir, Greve De Lecq woods, St Catherine's woods, St Peter's Valley, (See Appendix 1). During the 2002 mist netting session Mr Frank Greenaway led the work and deployed 'Autobat' an ultrasound emission device that plays ultrasound recordings of bats and serves to interest real bats in the nets and has been shown to increase the catch (F. Greenaway pers. comm.).

2.2 Roost Protection Programme

2.2.1 The Development Applications Process

The results of the roost survey (see 2.1.1) and foraging survey are held as layers in the Planning and Environment Committee's Geographic Information System (GIS). On receipt, development applications are entered into the GIS and layers of the system are interrogated in order to provide the statutory constraints on a certain site. For example an application may be sited on 'agricultural priority zone' or in the boundary of a Site of Scientific Interest. Thus 'bat sensitive' sites are electronically triggered and flagged to

the Environment Department for comment. The appropriate recommendations on the development can be made (based on further survey if necessary) and if necessary, procedures for mitigation can then be built into the permit. The Department is also proactive in identifying, surveying and commenting on applications where there might be bats even if roosts are not necessarily known.

2.2.2 Artificial Roosts

A programme of site specific monitoring using Schwegler, Type 1FF bat boxes bat boxes began in summer 2002. Furthermore, green oak slotted hibernation boxes will be provided as artificial hibernacula for the winter of 2003. Both these initiatives have been deployed in two woodland sites at either end of the Island: St Catherine's wood and Greve de Lecq woods.

2.2.3 Education Programme

Bats are a misunderstood and often misrepresented group. In order for conservation initiatives to be successful it is essential to raise their profile and enhance their image. A programme of walks, talks and information via the media continues to be carried out. Leaflets providing more targeted information for builders and surveyors have also been produced. The Jersey Society for the Prevention of Cruelty to Animals and the Jersey Bat Group continue to rehabilitate sick or injured bats. Lines of reporting and the procedures for roost visits, attending sick, injured or trapped bats have been clarified as well as procedures in respect of rabies, an extremely rare disease occasionally carried by bats in the form of European Bat Lysavirus (see Appendix 2). One member of the Environment is now received Human Diploid Cell Rabies vaccine and is aware of the procedures post-exposure should potential infection occur. It is recommended that non-vaccinated personnel are not allowed to handle bats.

3.0 Results and Discussion

3.1 Roost and Hibernacula Survey

Limited information is shown here given that roosts are located in residential dwellings; all 59 confirmed roosts are held confidentially within a Geographical Information System along with species and emergence data. This is cross referenced with planning applications (see section 3.6.1).

Figure 6 Grey long eared bats roosting at the junction of rafters and roof batons in July 2001.

Due to the ease of identification and observation of roosts of pipistrelles bats there is a recording bias with of the recorded roosts being *P. pipistrellus*. However, a breeding roost of *P. kuhli* was discovered in June 2001. Species identification of an individual that died during rehabilitation was confirmed by the National Museum of Scotland adding a new breeding species of bat to the Island. No roosts of either *P. nathusii* or *P. pygmaeus* have been discovered although there are several roosts that it has not yet been possible to visit to identify the species present so it is anticipated that these data will emerge in time. A night roost of *Plecotus austriacus* was found in a Medieval Chapel (at La Hougie Bie) but the only other known roost is in more typical open attic spaces (Figure 6). Despite the lack of breeding roosts many barns that have been inspected as part of the development control process have shown feeding signs as well as droppings and the appropriate mitigation has been recommended in these cases (see 3.6.1).

Hibernacula searches have not been successful. There are three possibilities for hibernation sites and they are unlikely to be exclusive :-

1. Bats hibernate in their summer roosts.
2. Bats have local hibernacula that have not yet been discovered.
3. Bats migrate to the Continent to use hibernation sites.

Instances of individual pipistrelles over-wintering in houses (for example behind fascias) have been reported and on warm days or evenings during the winter, bats are often seen flying. This suggests that some bats hibernate locally and the Island's mild winters allow drinking and foraging to occur fairly regularly. In a study in Oxfordshire a small number of pipistrelle bats used a roost throughout the year, hibernating behind fascias (Maier 1992). Similarly Avery (1985) monitored the winter activity of Pipistrelles in Cambridge during the winters of 1980-82 and showed that they were active during all months except February 1981. Activity was correlated with insect numbers and ambient temperature and information exists for other species (See Mayle 1990).

The occupation of the Island during the Second World War has left many tunnels that may be prove suitable for bats although initial impressions are that they are very dry. Hibernating bats require a minimum humidity of about 70% and the humidity of hibernation sites in caves is usually over 90% (Mayle 1990). There are a number of Health

and Safety issues concerned with entering these tunnels and further preparation and investigation is necessary. However further investigation of these tunnels and possibly maritime caves may identify local hibernation sites.

It will be difficult to assess whether bats migrate without carrying out a mark release recapture study which is not planned locally although the recovery of bats ringed elsewhere may provide some information on this.

Unplanned arousals during hibernation disturb the water balance of the bats that can affect their survival through the winter months. Therefore it is imperative to protect hibernation sites once they are located.

3.2 Detector Surveys

3.2.1 Car transects

Car driven transects covered 365 km in July/August 2001. Nearly 900 contacts were recorded and 804 of these were identifiable (Figure 7).

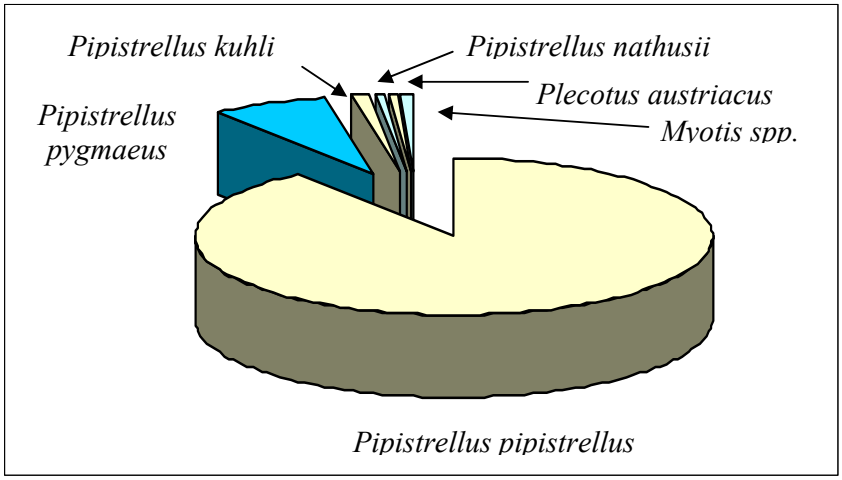

Figure 7 The species composition of calls recorded during car transects as shown by total number of contacts per species.

The most frequently recorded species was *Pipistrellus pipistrellus* comprising 91% of the calls. *P. pygmaeus* was recorded less frequently and occasional calls of *P. nathusii* and *Plecotus austriacus* were recorded. Of interest was the small number of calls of *P. kuhli* previously unrecorded on the Island, the later discovery of a breeding roost (see section 3.1) confirmed there resident status on the Island. The small number of *Myotis spp*. contacts suggested the continued presence of *Myotis nattereri* on the Island; this was further confirmed from mist netting results (see section 3.3).

Total bat activity varied throughout the transects (Figure 8) and the relationships between total bat activity per section of transect and the surrounding habitat was examined. Buffer zones of 50m were added to each section of road and the length of hedgerow and streams in each buffer zone was calculated. All parameters were standardised per 100m of road.

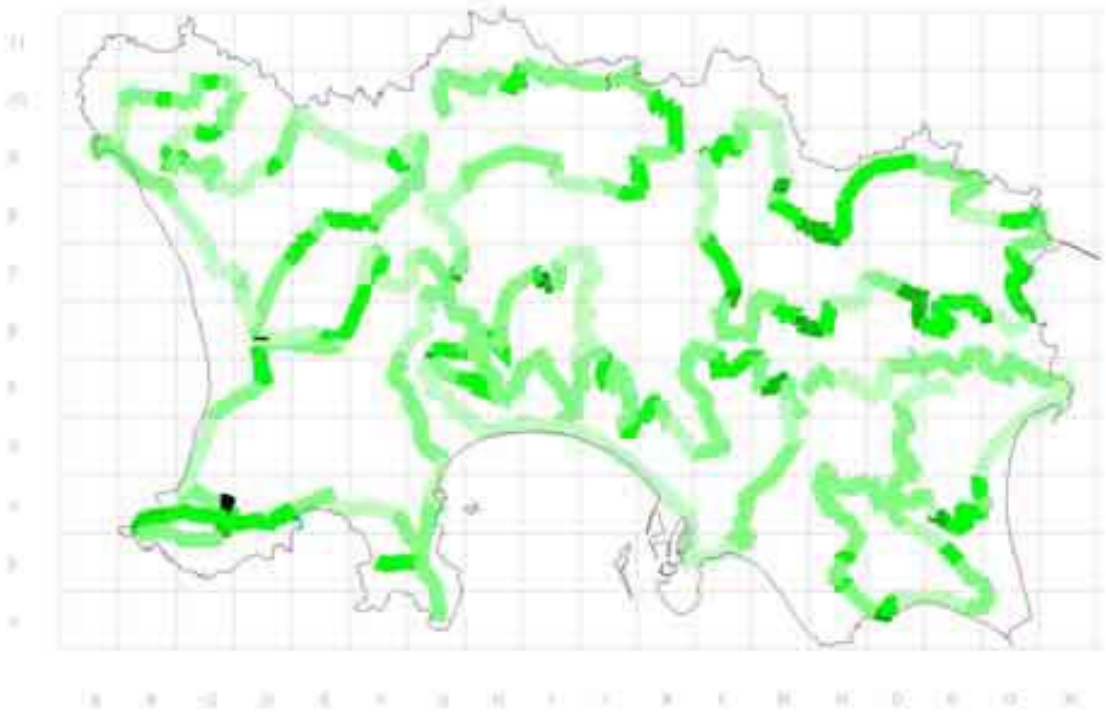

Figure 8 Mean total bat activity during car transects. High bat activity is shown in the darker colour. Activity is shown per road. Categories of Activity Indexes are <0.1, 0.1-0.39, 0.4-0.79, 0.8-1.19, 1.2-1.49, >1.5

Habitat data was taken from the Phase I habitat survey and the bat activity was found to correlate with all types of hedgerow (Table 2) and this relationship was also seen when the length of stream within the buffer zone was added in.

Correlation	Pearson Correlation co-efficient	P-value	Significance
$Log_{10}(A_{tot})$ & Low boundaries	0.198	<0.003	Significant
$Log_{10}(A_{tot})$ & Low boundaries and scattered trees	0.200	<0.003	Significant
$Log_{10}(A_{tot})$ & tall high boundaries	0.088	0.191	N.S.
Log_{10}(TBA) & HEDGES	0.269	<0.001	Significant
$Log_{10}(A_{tot})$ & HEDGES and Streams	0.235	<0.001	Significant

Table 2 Correlations with Total Bat Activity (A_{tot}) and categories of linear landscape elements taken from the phase one habitat survey. Hedges refer to all boundary habitats combined.

A linear regression was carried out on the amount of linear landscape elements (stream and hedges) and total bat activity. The amount of flightline features was found to explain 7.5% of bat activity (d.f. = 1, 220; F = 17.84; P < 0.001; $\log_{10} A_{tot}$ = -0.717 + 0.0034 linear features)

Linear landscape elements have a duel role: firstly they have a role as connective elements in a metapopulation context and secondly they function as (daily) migration and foraging routes (Verboom and Huitema 1997). Smaller species, more typical of the species assemblage in Jersey, are particularly reliant on linear landscape elements and

this was confirmed by this study. Linear landscape elements provide sonar guidance, foraging habitat and also provide protection against predators or wind. Verboom and Huitema (1997) showed that pipistrelles were predominately found close to the vegetation of linear landscape elements and a proportional increase in pipistrelles activity with the density of linear landscape elements as was also found in this study. They also found that pipistrelles were present in isolated, small fragments suggesting that open barriers of 110-150m wide do not form a serious barrier. Clearly it is likely that cutting linear landscape elements may have serious implications for the opportunities for bats to exploit and area.

Due to their early emergence time, areas of high pipistrelle activity at the beginning of transects may indicate areas in close proximity to roosts (Figure 9). This may be particularly true, if the oppositely timed transect shows far fewer bats. Similarly the transects highlight feeding areas (if feeding buzzes are recorded) and commuting routes. All this information can provide clues on roost proximity, habitat use and social behaviour.

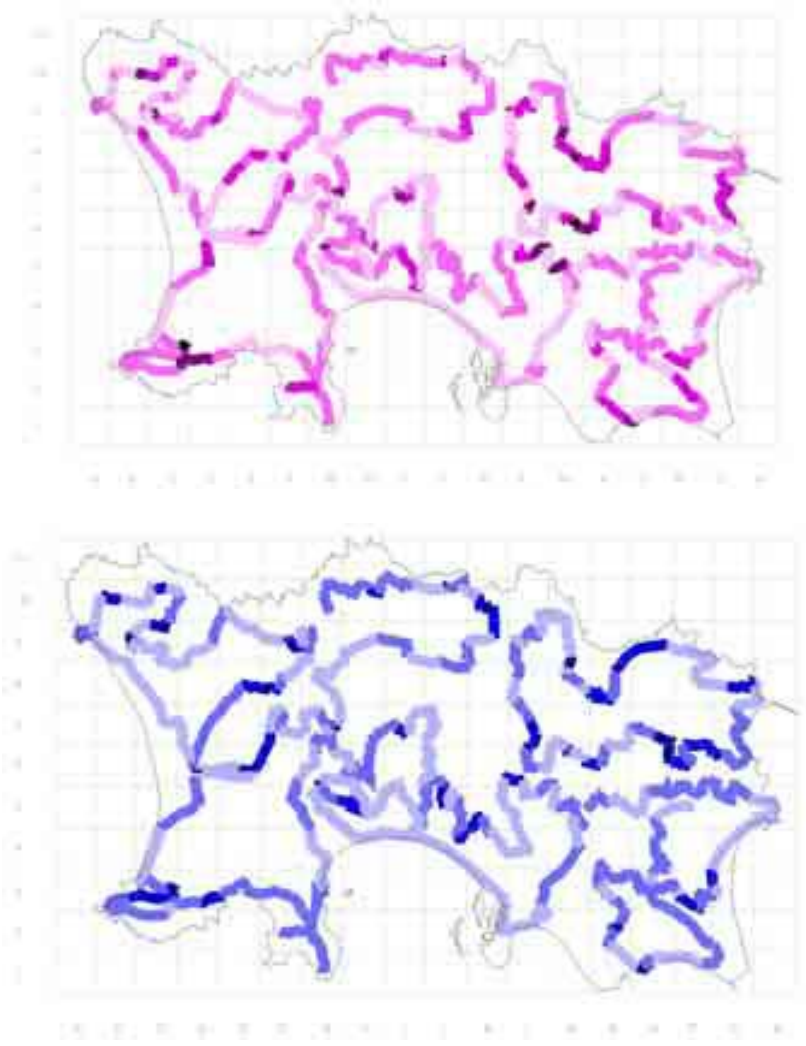

Figure 9 Pipistrelle Activity (45 and 55kHz combined) during anticlockwise car transects (Pink) and pipistrelle activity during clockwise car transects (blue). Activity is shown per road and higher activity is shown in the darkest shade; categories of Activity Indexes are <0.99, 0.1-0.49, 0.5-0.99, 1-1.99, >2.

Bat activity per 15 minute time slot for the first three hours after sunset was calculated (Figure 10). By two hours after sunset the composition of the active bats began to shift from being dominated by the four species of pipistrelle with more individuals of Myotids and long-eared bats being recorded. This trend was observed in the focal point sampling whereby long-eared bats and Natterer's bats were heard much later on at night. This serves to illustrate that carrying out detector walks early in the evening can give a skewed picture of the composition of the bat population. Lunar cycle has been shown to have no significant effect on the foraging activity of bats although low temperature and rain and wind often do (Gaisler *et al*. 1998). Therefore the use of overnight focal point sampling in appropriate weather conditions gives a more realistic record of species composition and activity.

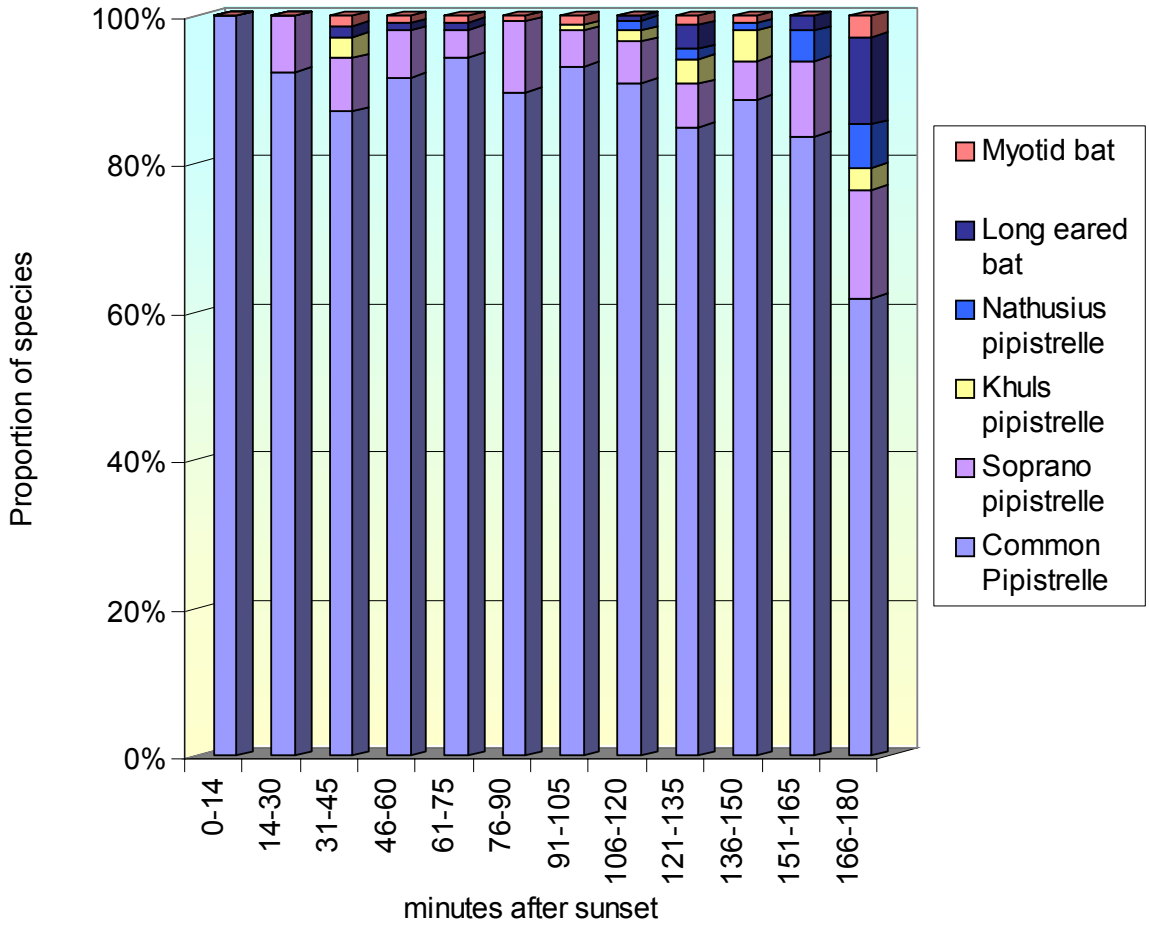

Figure 10 Bat activity in the first 180 minutes after sunset (n = 1024 timed calls)

3.2.2 Transects In Key Foraging Habitat

Total bat activity was calculated for 30 minute time slots for the walked transects (means are given when more than one transect was walked). The number of different species recorded varied across the different sites and did not correlate with the total bat activity (Pearson correlation co-efficient = 0.363, *P* = 0.183) so that although in cases there was considerable bat activity it may have arisen for example, primarily from common pipistrelles.

The results reveal the most diverse sites to best Catherine's wood, St Peter's Valley, Greve de Lecq and Val de la Mare reservoir. There were no relationships when bat activity was correlated with woodland size, species diversity or the amount of hedgerow within 500m of the woodland. Clearly these are factors that are known to affect bat activity (de Jong 1995) and it is likely the data sets were not extensive or robust enough to illustrate the relationships and should not be taken to suggest these are not important factors for bat conservation.

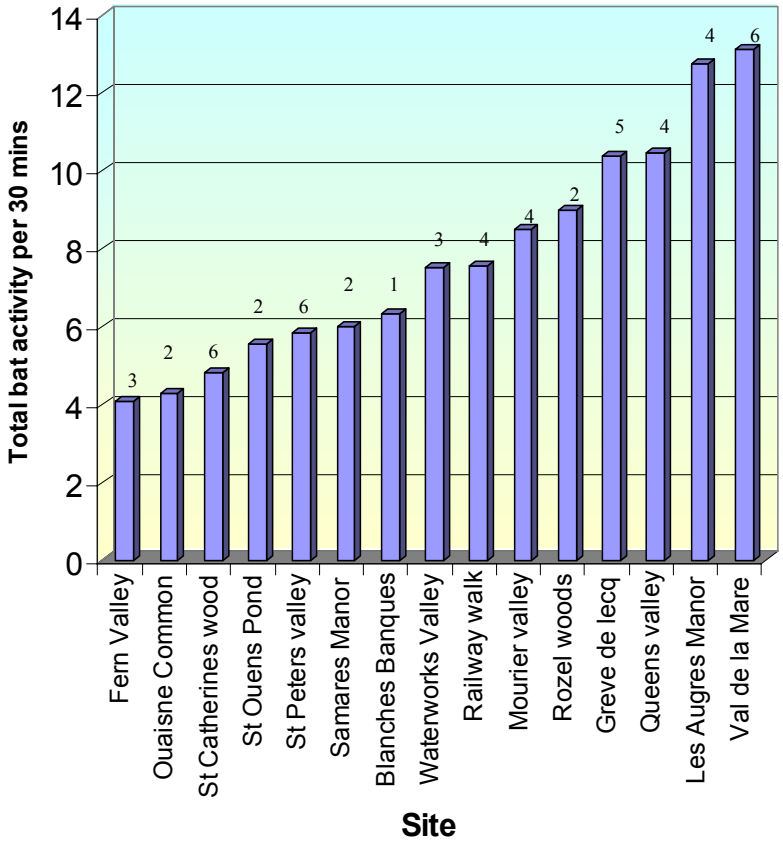

Figure 11 Bat activity (A_{tot}) for walked transects. Figures above the bars refer to the total number of species of bats seen during the sampling. A_{tot} was calculated from one walk except for: St Peter's Valley n = 3, C.V. = 45%; Waterworks Valley n = 2, C.V. = 24%; The Railway Walk n = 3, C.V. = 69%; Greve de Lecq Walk n = 4, C.V. = 64%; Queens Valley Walk n = 2, C.V. = 89%; Val de la Mare n = 2, C.V. = 89%.

3.3 Mist Net Surveys

Mist netting revealed the existence of a new species of bat for the Island, *Plecotus auritus* the brown long eared bat (Appendix 1). These were identified at two different sites in 2002 and 2003 and suggest their presence as a resident species on the Island. To confirm this further work needs to be carried out but unfortunately long-eared bats are under recorded in detector surveys so further data will have to be gathered from in-hand identification. The only species of Myotid bat caught was Natterer's bat confirming suspicion that the Myotid recorded in detector recordings was *Myotis nattereri*.

Overall 22 bats were caught during mist netting and the proportion of species is somewhat different to that encountered in detector or roost surveys (Figure 11).

Thirty six percent of the mist-net catch comprised long-eared bats that is considerably more than identified from roost counts or during car transects (where they comprised less than 1% of the total contacts).

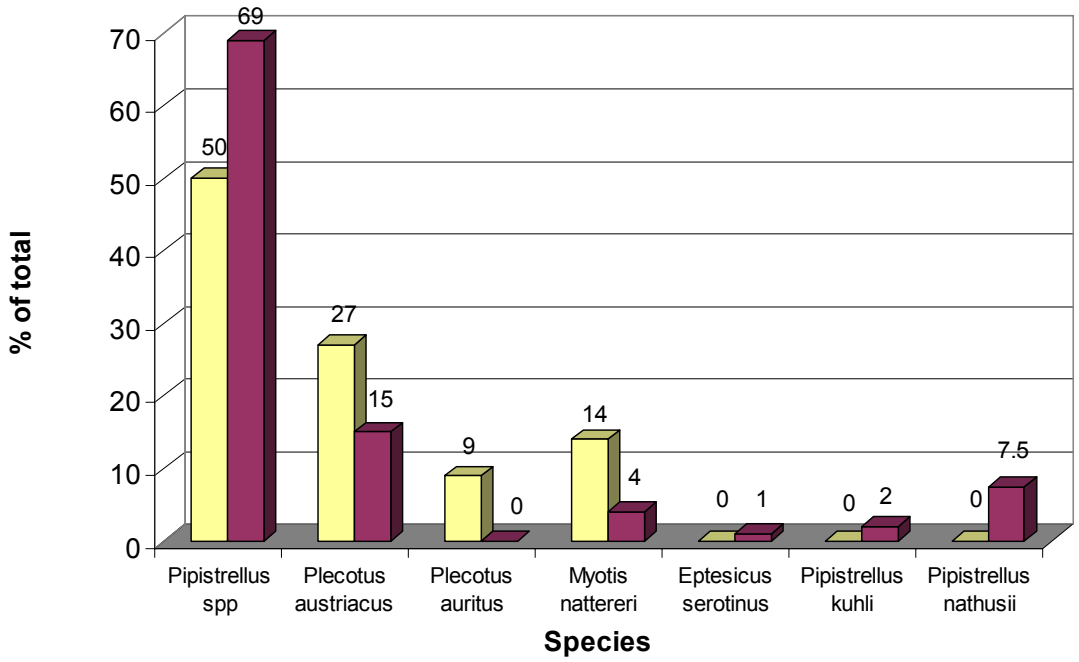

Figure 11 Proportion of species caught in mist nets (yellow bars) set in 4 woodlands during summer 2002 and 2003 (n=22). Proportion species received for rehabilitation or as mortality (red bars) since 1986 (n=231).

Clearly there is some bias in the results since many of the individuals of *Plecotus austriacus* were caught in one net at the same time suggesting that a nearby roost was emptying. However overall these results support the evidence that long-eared bats are under recorded in detector surveys due to their very quiet calls and more prevalent on the Island than the detector data would suggest. The numbers and species of bats received (since 1986) for rehabilitation or as mortalities significantly correlate with the numbers and species composition between those caught in nets (Pearson correlation = 0.906, P = 0.005). Although the most uncommon species have not been represented in the net surveys this is likely to be a result of the far smaller sample size compared to the larger and thus more representative sample of rehabilitated and dead bats recently recorded. Furthermore it supports the hypothesis that at least grey long-eared bats are found fairly frequently. It also highlights the need to use a variety of techniques to gain a comprehensive knowledge of the different bat species

3.4 Species List 2003

Using the data from all the survey methods an undated species list has been produced (Table 2). Overall the number of bat species recorded on the Island has increased partly due to the identification of more pipistrelle species. This is undoubtedly as a result of increased survey effort and the availability of time expansion detectors and suitable

analysis software. The recording of vagrants on the Island is likely due to its close proximity to France and further survey work will be needed to confirm the status of *Nyctalus leisleri* and *Plecotus auritus* (see below 3.5).

Species		Status 2003
Greater Horseshoe	*Rhinoloplus ferrumequinum*	Last record 1959
Natterer's bat	*Myotis nattereri*	Uncommon resident
Grey long-eared	*Plecotus austriacus*	Relatively common resident
Brown long-eared	*Plecotus auritus*	Two individuals recorded 2002 and 2003
Common pipistrelle	*Pipistrellus pipistrellus* *Pipistrellus pygmaeus*	Very common resident Relatively common resident
Nathusius' pipistrelle	*Pipistrellus nathusii*	Relatively common resident
Kuhl's pipistrelle	*Pipistrellus kuhli*	Uncommon resident
Serotine	*Eptesicus serotinus*	Unknown, believed uncommon resident
Leisler's bat	*Nyctalus leisleri*	One male individual recorded 20.5.02. Believed to be a vagrant.

Table 2 Species list and status following two years of field work 2000-2002.

3.5 Island wide Species Distribution

P. pipistrellus was the most frequently seen bat, recorded in all survey methods and found Island wide (Figure 12). Whilst numerically *P. pygmaeus* was recorded less frequently, its distribution is similarly widespread. Pipistrelles are aerial hawkers feeding primarily on small flying insects. In order to exploit the dusk peak in insect activity they emerge from their roosts 15-30 minutes after sunset. This makes them easily observed and roost owners are far more likely to be aware of their presence than the species that emerge later in the evening such as the long eared bats and the myotid bats. Observations have been made of both species hunting the *Diptera* feeding on the seaweed on the beaches to sand dunes and more typically woodland edge habitat.

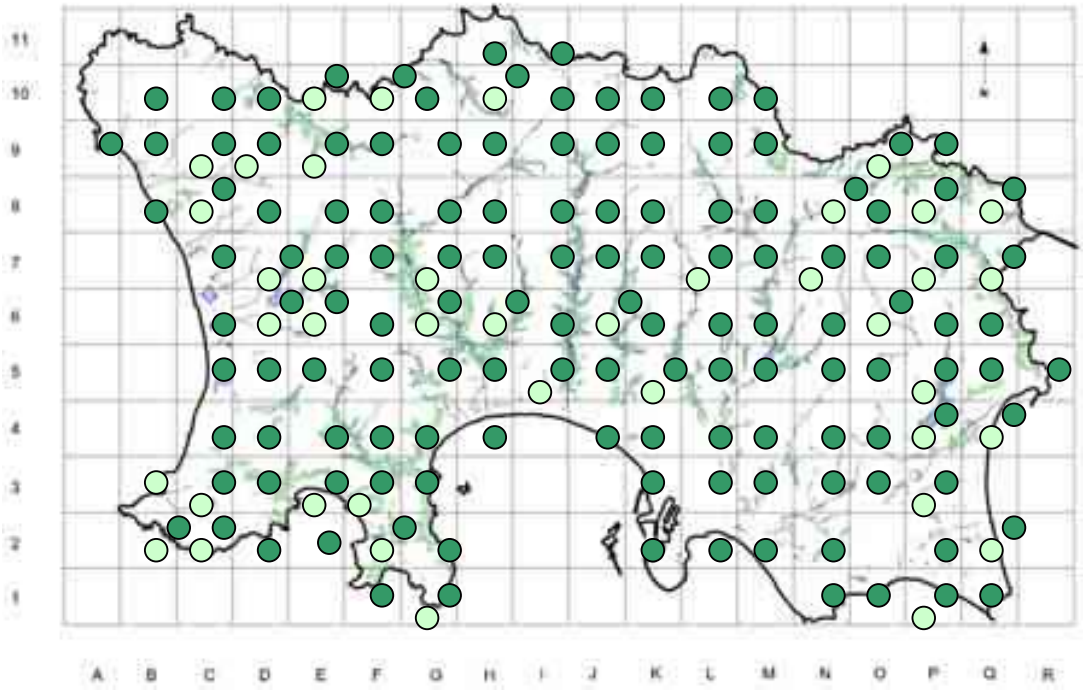

Figure 12 The distribution of *P. pipistrellus* (dark green circles) and *P. pygmaeus* (light green circles). Data is comprised of detector contacts, roosts (no roosts of *P. pygmaeus*

are known) and mist net captures. Woods are marked in green and water features in blue.

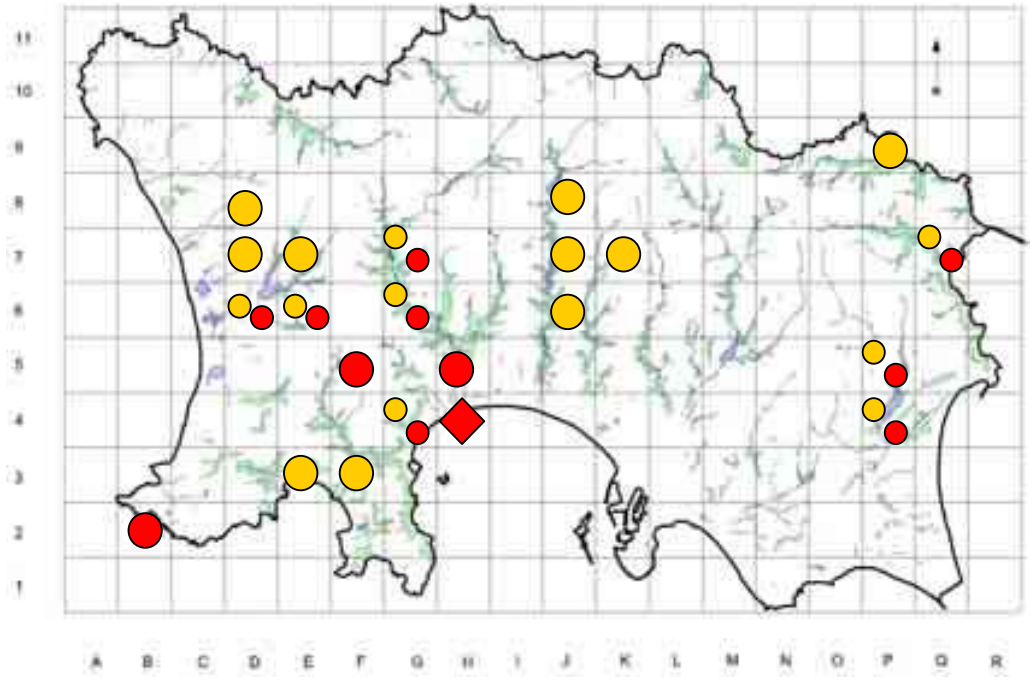

Figure 13 The distribution of *P. kuhli* and *P. nathusii* in Jersey. *P. kuhli* - detector contacts in red circles, roost in red triangle; *P. nathusii* - Detector contacts in orange circles. Woods are marked in green and water features in blue.

The other two species of pipistrelle were less widely distributed and recorded far less frequently (Figure 13). However the discovery of a breeding roost of Kuhl's pipistrelles and the continuous recording of Nathusius' pipistrelle throughout the year updated their previous status. The range of Nathusius' pipistrelle is from western Europe east to the Russian republic and Asia Minor (Corbett and Harris, 1991) and it migrates south-west in autumn and winter where in Britain it is classified as a migrant winter visitor that might breed and research by Barlow and Jones (1996) suggests that *P.nathusii* is more established in Britain than previously believed. This study supports the view that they are present year round in Jersey. There are plenty of roosting opportunities for all pipistrelle species locally and continued roost visits should serve to locate breeding colonies of both species.

Figure 15 Pregnant female Natterer's bat mist netted in Greve de Lecq woods (E9, Figure 8; 29.6.02). Photo credit - Frank Greenaway.

Myotid bats (most likely *M. nattereri*) have been sparsely recorded (Figure 14), again most often in conjunction with water features. Important foraging habitats have been shown to include woodland edges, parkland, treelines and roadside verges as well as grassland and near water. Mist netting confirmed the presence of at least one breeding colony locally with the capture of a pregnant female (Figure 15). *M.*

nattereri is a gleaner, taking prey from surfaces but it can also capture prey on the wing. Important prey includes Diptera (true flies), Trichoptera (Caddis flies), Coleoptera (beetles) and non-flying groups such as Hemiptera (true bugs), Dermaptera (earwigs), Arachnida (spiders) and Opiliones.

They emerge relatively late from their roosts so that they are often not noticed by the home owner. Natterer's bats commonly roost in crevices in the stonework of man-made structures (Swift 1997). Briggs (2000) studies the success of mitigation measures made for bats during barn conversions and noted that Natterer's bats will often have a variety of roosts that are used in different ways. Some mortice joints will be favoured for the nursery site, others for non-breeding females, and others for solitary males. A Natterer's colony can be spread out in different 'roost sites' within a geographical area but in some circumstances, all these roost types can all be found within the same building. It is common to find Natterer's bats moving frequently between different mortice joints; perhaps to avoid those mortice joints that have become filled with droppings, or to avoid a build-up of parasites, or to select a roost with a different microclimate. Sheltered roosts, such as those within a barn, offer the advantage of relative permanency, microclimate stability, reduced risks of predation, and protection from sunlight and adverse weather. The newly volant young can make practise flights within the barn and this reduces the risk of predation; they prefer an open flight path into barns.

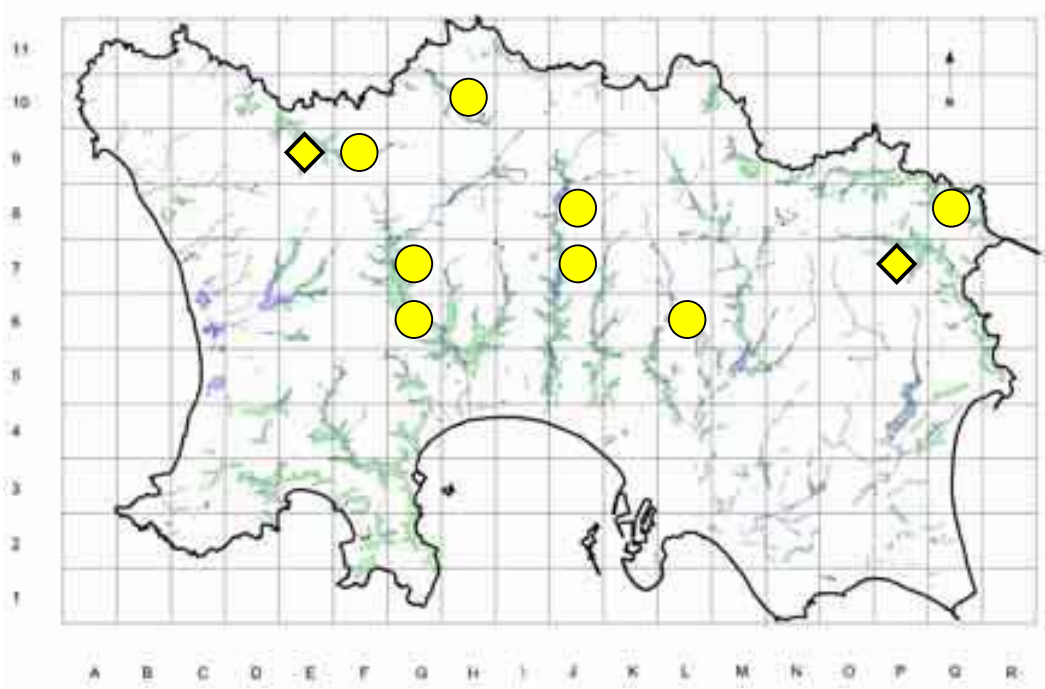

Figure 15 The distribution of Myotids in Jersey - Detector contacts in yellow circles, mist net capture yellow triangles (Nets were set in woods centring on E9, P7, E7 & G6). Woods are marked in green and water features in blue. The green circle marks the position of the recording of a single Leislers bat *(Nyctalus leisleri)*.

Historically *P. austriacus* has been considered widespread but relatively uncommon on the Island and the results of this study confirm this (Figure 16). Despite few roost or detector records, they were caught in mist nets and are well represented in rehabilitation efforts. It is likely that detector surveys have underestimated their

distribution. Long eared bats are also gleaners and feed primarily on moths. Because some species of moth are sensitive to sound, these tymphadae moths can exhibit escape manoeuvres in response to echolocating bats, long eared bats use calls that are quieter than those of other bats and shorter in duration. Consequently they are not always picked up by bat recorders.

Of importance was the capture of two individuals of *P. auritus* a species previously unrecorded on the Island. Little can be known of their status at present and further study will be difficult since it is not possible to differentiate between grey and brown long eared bats from their calls.

Long eared bats have very specific roost requirements. They are well known to use tree holes and are commonly found in bat boxes. However, both brown and grey long-eared bats commonly form nursery colonies in houses and these sinanthropic roosts make them particularly vulnerable (Swift 1998). Attics are commonly chosen and the bats fly in the roost and feeding remains and scattered droppings are often seen throughout. The location of the roost in respect of foraging areas is vital as well as the temperature and degree of disturbance. Long-eared bats are extremely loyal to favourable roost sites.

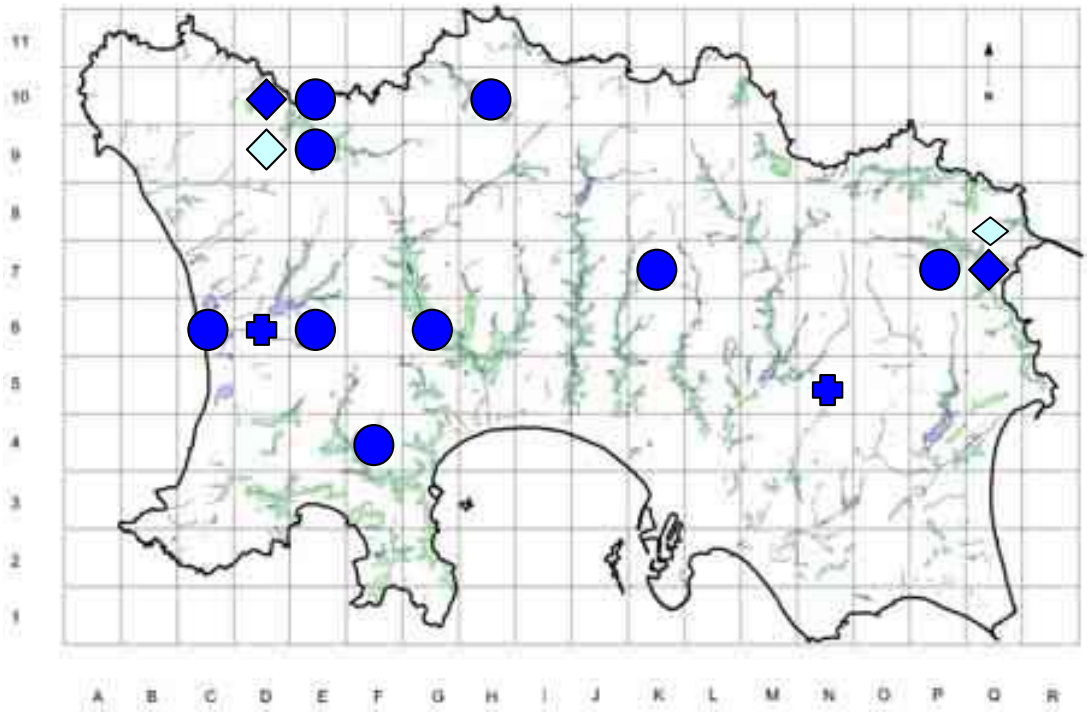

Figure 16 The distribution of *P. austriacus* in Jersey - Detector contacts in blue circles, mist net capture blue diamonds (Nets set as in Figure 9), roosts in blue crosses. Woods are marked in green and water features in blue. Light blue diamond marks the position of the capture of a male *P. auritus* in mist nets.

3.6 Roost Protection Programme

3.6.1 The Development Applications Process

Procedures are now in place for the Environment Department to enforce the Conservation of Wildlife Law through the Development Control process[1]. Roost information is held as a layer on the GIS and relevant applications are trigger a response. The Department is also more proactive and identifies potential bat roosts and makes site visits to assess whether they contain bats. Once a roost is identified the Department assesses the extent of the threat to the population concerned and either provides recommendation for a refusal or suggests statutory mitigation advice[2].

In general, cases have centred on residential buildings whereby liaison with the homeowner and architect has led to a favourable outcome. This is particularly valuable when bats are discovered during works that do not require planning permissions. For example, it was during the replacement of a fascia that led to the discovery of the *P. kuhli* roost. Appropriate timing of the works and cladding rather than replacement of the fascia, ensured that the bats returned the next season.

Twenty one development applications have been identified to date as potential bat sites and the plans called down for consultation. Following site visits and survey work, twelve sites were found to have bats present and mitigation was included as statutory guidance through the development control process. Of these twelve only three were previously known to have bats and identified from the roost register, this reiterates the value of speculative viewing since without the mitigation measures imposed these nine previously unidentified sites would certainly have been lost. Three further applications had works in progress that had probably already affected bats but there was no evidence left to be certain of this so no further action could be taken. This raises the importance of the continued targeting of stakeholders such as architects and builders and staff of the Planning Department to ensure there is close involvement with all the relevant parties from the start to the finish of a project. Clearly laid out procedures and lines of communication through the Environment Department ensure that advice and supervision is provided throughout.

3.6.2 Bat Crime

A recent report has shown that most bat crime is perpetrated through the building industry (Childs 2003). Whilst the States of Jersey Police Force has been unable to provide a specific 'wildlife liaison officer', routes of communication have been created[3]. As yet the strength of local legislation has not been tested in relation to bats but its presence is a deterrent and it provides a framework for the recommendation of good practice. Targeted information was sent to the following user groups in 2001 to explain the new legislation in relation to bats and their roosts: Architects (37 companies); Building contractors (134 companies); Carpenters (29 companies); Electricians (63 companies); Pest Controllers (7 companies); Plumbers (63 companies); Roofing and guttering Contractors (35 companies); Surveyors (31 companies); Tree surgeons and Landscape Gardeners (35 companies).

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[1] ..\..\..\..\..\09 Law\02 Wildlife Law\01 Enforcement\Policy of Enforcement\Policy of Enforcement July 2003.doc

[2] ..\Roosts\Mitigation advice\Generic mitigation advice BATS 7-4-03.doc

[3] ..\..\..\..\..\09 Law\02 Wildlife Law\01 Enforcement\Policy of Enforcement\Policy of Enforcement July 2003.doc

3.6.3 Education Programme

A programme of talks, walks and environmental education has led to an increased awareness of the needs for bat conservation and their status under the law. These continue to raise awareness and often talks and walks lead to the discovery of new roost sites. For example in July 2002, thanks to a previous radio broadcast, workmen voluntarily stopped removing a roof on the discovery of a single bat in order for the Environment Department to attend and a rescue and mitigation to take place.

Given the suburban nature of the Island, the recommendation of wildlife friendly gardening and the creation of features like garden ponds are important and can have positive and real impacts on urban biodiversity. The bat serves as a charismatic and appropriate flagship species for such improvements, particularly since so many roosts are in areas of relatively dense housing and bats can easily be seen Island wide.

3.6.4 Artificial Hibernacula

Three artificial hibernacula was developed in a woodland site in 2002 (St Peter's Valley) following the recommendations of Mitchell & Leith (1999). Whilst it is often difficult to achieve the exact conditions that will encourage the bats to colonise artifical sites, the success of the hibernacula will continue to be monitored.

Green oak wooden hibernation boxes were purchased and erected in 2003 according to accepted guidelines (see Mitchell-Jones and Leish, 1999 and Stebbings and Walsh, 1991). Five boxes were sited in two key woodland sites in the east (St Catherine's wood) and west (Greve de Lecq) of the Island. The success of these will continue to be monitored.

3.6.5 Artificial Roost Sites

In a comparison of eight box designs, Gerrell (1985) found that bats preferred boxes made out of porous concrete or sawdust and cement to wooden ones. Thus in all literature and practice the Department recommends Schwelger boxes[4] and 10 boxes were purchased and erected in two key woodland sites in the east (St Catherine's wood) and west (Greve de Lecq) of the Island. Type 1FF boxes have been used to appeal to Natterer's Bats as summer roosts. The success of these will continue to be monitored.

3.6.6 Predation

Bats are a successful group since they manage to avoid many predators due to their nocturnal habits. However owls are a possible predator and Jersey supports a successful population of Barn Owls as a result of a recent nest box programme. Bats formed only 0.61% of total prey of barn owls in Spain and 0.26% in Poland (see overview in Mayle 1990) although prey remains of 20 of the 21 species of bat present in Poland were found in owl pellets and those found most often were species associated with human habitation. Alternatively a German study suggested that that the species most likely to be taken by barn owls as prey are those which share the roosting sites. It has been concluded that the impact of predation is low in terms of quantity but could be significant due to the low reproduction rates of most bat species. In Britain most reports of bats being taken as prey come from Barn Owls – this was the case in Jersey with the first record of a Natterer's bat appearing in an owl pellet. Local observations of barn owl pellets (Magris 1995, Magris 2000 and Magris unpublished) have shown that bat remains are seldom found. However cat predation can be an occasional localised problem (Magris 2000) especially if cats are able to access bats as they emerge from their roost.

[4] http://www.Alanaecology.com)

4.0 Conclusions and Recommendations

4.1 Habitat Management

One of the pivotal points of the European Bat Agreement 1991 is to protect key habitats.

Bats follow an extreme 'k-strategy' life history[5] so are particularly vulnerable to environmental changes which lead to reduced longevity or reproductive success (Walsh and Harris 1996a). Changes or losses of foraging habitats may strongly affect such life history parameters, and it has been suggested that land use change is one of several causal factors contributing to recent population declines for some species of European bats (Daan 1980, Stebbings 1988, Gerrell and Lundberg 1993). Walsh and Harris (1996b) found habitat as the primary predictor of bat abundance in a nationwide bat survey of Britain. Logistical regressions on bat abundance and habitat type by Walsh *et al* (1995) showed that a variety of habitats were important in the pastural habitat but only semi-natural broadleaved woodland was of critical importance in the arable landscape. Study showed a strong avoidance of arable by bats. Activity over pasture is dependent on species – larger species such as serotines and greater horseshoe bats readily exploit pasture foraging for beetles and moths whereas species such as pipistrelles tend to avoid open fields (Racey and Swift 1985).

Management should aim to maintain and enhance physical diversity and features used by insects in freshwater habitats, woodlands and pasture.

4.1.1 Habitat Management – Woodland

Using data from the National Bat Survey, Walsh and Harris (1996a) were able to show, that bats show a far stronger preference for woodland edge (particularly semi-natural broad leaf woodland) and all water bodies (see 4.1.3) than any other habitat type which emphasises these habitats as key foraging sites. Avoided habitats were exposed habitats and intensively managed habitats such as agricultural or improved grassland and clearly these results reflect potential prey availability within habitats as well as the opportunities for the bats to reach them. Woodland diversity and water quality of riparian sites may have a profound effect on the quantity and quality and type of prey available to forging bats, affecting the quality and hence conservation of these important habitats (Walsh and Harris 1996a).

Other habitats such as cattle pasture are important foraging areas for bats (Vaughan, Jones and Harris 1997) especially Natterer's bat with adjacent hedgerows providing good habitats for insects growth and reproduction (Fry and Lonsdale 1991). This reaffirms the need for a habitat mosaic connected by robust linear features.

The policy of woodland management for woodland age and native species diversity is entirely appropriate for bats. Veteran trees are a vital resource for many types of wildlife and bats are no exception. The amount of woodland edge habitat is relatively high due to the small, fragmented size of our woods and their linear nature since they often remain in valley bottoms (Magris 1998).

[5] K-selection strategy – Selection of life history traits which promote an ability to make a large proportionate contribution to a population which stays close to its carrying capacity-the traits broadly being large size, delayed reproduction, iteroparity, a small reproductive allocation, much parental care, and the production of few but large offspring. (Begon, Harper and Townsend 1990)

4.1.2 Habitat Management – Landscape Connectivity

Locally the woods are interspersed with an agricultural mosaic of fields or suburban areas and these are mainly linked by hedgerows (some 350km). Clearly to some degree this is a favourable habitat particularly for the smaller species of bats. Walsh and Harris (1996a) showed that linear vegetation corridors were strongly selected for by bats reiterating the need for landscape connectivity; it is likely that treelines are used as linear foraging sites as well as commuting routes. This study similarly highlighted the importance of hedgerows as flightlines for commuting bats and bats were observed foraging in hedgerows as well. Implicit within these results is the essential requirement to minimise habitat fragmentation which leads to the further dispersion of feeding patches which will have a profound affect on the long-term survival of local populations.

4.1.3 Habitat Management – Water features and riparian habitats

In an assessment of habitat use, *M. nattereri* was found most commonly over rivers, lakes and in ancient semi-natural woodland and mixed plantations (Vaughan, Jones and Harris 1997). This species feeds largely by gleaning Diptera from the surface of leaves. Overall it has been shown that bats make disproportionate use of rivers and lakes for hunting (Vaughan, Jones and Harris 1997); about 3% of the surface area of the British Isles is covered by fresh water but most of the foraging bats are found there. In Jersey water and swamp-type habitats form less than 1% of the surface area increasing the importance of this resource even further.

Clearly many factors affect the invertebrate communities found in and around rivers and lakes e.g. flow rate, substrate, eutrophication, acidification, pollution, neighbouring land use and water abstraction. There is some evidence that rivers without vegetation may be less attractive to bats than rivers with trees (Racey and Swift 1985) – clearly this is related to the fact that vegetation on river banks and in the water affects the river insect community (Jeffries and Mills 1990). An important finding by Walsh and Harris (1996a) was the lack of preference for rivers in intensively agricultural land classes. Clearly agricultural run off or other pollutants can lead to a decrease in insect availability. The policy of Island wide improvement of water quality through the proposed Agri-environment scheme and the implementation of Water Quality Objectives will likely have positive effects on bat populations.

A significant sector of land use where habitat improvements could have important benefits is domestic curtilages. Clearly bats would benefit as would invertebrates, amphibians and to a degree reptiles. Enhancement opportunities of the (sub)urban habitat are suggested in the Urban Habitat Statement[6]. Similar ground could be gained if agricultural reservoirs could be designed and managed in sympathy with local wildlife.

4.1.4 Habitat Management – The Parallels Between Bats and Squirrels

Many of the Island's woods are already managed by the Environment Department and so habitat enhancement for bats is relatively straightforward. Furthermore, ongoing established ongoing initiatives to benefit the red squirrel have direct advantages for bats. Red squirrels are a charismatic and established flagship species. However the parallels between their needs and those of the bats should be emphasised and built upon.

[6] L:\Filing\ESU\10 P&E Internal Structures, Strategies, Reviews & Frameworks\Biodiversity Volume 2\Urban biodiversity\Urban biodiversity Habitat statement CN corrections.doc

Existing woodland management aims to: increase species and age diversity by planting native species; retain veteran and ivy clad trees; retain standing dead wood; provide dead hedging. These measures are reflected in the Red Squirrel Species Action Plan (Anon 2002) and also in the proposed agri-environment scheme.

A study investigating a similar fragmented woodland and agricultural habitat in Sweden (de Jong 1995) showed that bats rarely crossed open habitats and the spatial arrangement of fragments was critical in allowing the optimal use of the habitat. The Department has co-ordinated and implemented extensive hedgerow planting since 1998 using red squirrels as a flagship species for this type of habitat regeneration. Due to the dependence of bats on woodland connectivity, the approach taken de-fragmenting woodland blocks to support meta-populations of red squirrels (Gurnell *et al*. 2002) will have similar positive effects on bat populations.

The planting prescriptions suggested in the Red Squirrel Species Action Plan (Anon 2002; see also Gurnell *et al*. 2002) consist of an appropriate composition of native species and the planting schemes fit appropriately with landscape management for bat populations. Furthermore emergent hedgerow trees are important in the life-cycles of many Diptera and may benefit bats (Peng, Sutton and Fletcher 1992).

4.2 Species Action Plans

The conservation objectives for each bat species have been encapsulated in an overall species action plan (see Appendix 3) for inclusion in Volume 2 of the Biodiversity Strategy for Jersey (Anon 2002).

4.3 Monitoring Programme

A key requirement under Eurobats is the monitoring of local populations in order to detect a change in their conservation status. Furthermore bats are good indicators of broader environmental health and therefore are important broader environmental monitoring[7]. Two monitoring strategies are proposed – monitoring roost sites (summer roosts and hibernacula both artificial and natural) and also monitoring bat activity at key foraging sites.

4.3.1 Monitoring Bat Roosts

Basing monitoring solely on colony counts may lead to invalid comparisons in different areas because of unequal sampling effort and because shifts in colony size may not necessarily correlate with changes in roost location and emigration and/or immigration rates are high and variable between years (Walsh *et al.*, 1995). Although monitoring roosts over time in conjunction with other monitoring can provide important information it is resource hungry. An alternative is to encourage and train roost owners to carry out monitoring of their roosts. This is successfully carried out in the UK as part of the National Bat Monitoring Programme whereby detailed instructions and support are given and robust data is collected. Adopting this approach locally could increase pride in the ownership of roosts as well as allow data to be successfully collected with volunteers.

4.3.2 Monitoring Bat Activity At Key Foraging Sites

Aim – To detect significant* changes in bat activity in two key foraging habitats ('woodland' and 'water') as compared to the levels observed in 2002.

[7] ..\..\..\..\04 Research\Monitoring strategy\Monitoring strategy docs\EMS V5 16-09-03.doc

*****A significant change is defined as a change in activity of 1.6 bat contacts per 30 minutes.

Methodology - The monitoring programme is based on the focal point sampling technique whereby the detector is left at a sampling point (see section 2.2.2.2) overnight once per site in good weather conditions between mid June and mid July annually. Subsequent downloading of the acoustic data will provide information on bat activity for 8 hours or 16, 30 minute sub samples.

Habitat Stratification and Rationale – A stratified random block design was chosen. Two key bat foraging habitats (strata) were identified i) 'woodland' and ii) 'water'. Water habitats are those open water bodies surrounded by trees such as woodland ponds or reservoirs. Both of these habitat types represent foraging habitat with the 'water' sites being the most important since all bats need to drink. We have to be careful not to mis-interpret any results from the monitoring programme. For example an increase in the activity of bats in the water habitat may be the result of some factor excluding bats from sub-optimal habitats and forcing them to use the most important habitat at high densities. This scenario would ultimately leading to a decline in bat numbers (and thus activity) in these 'best' sites but we would not identify this until potentially too late. Therefore we must also monitor bat activity in woodlands an important habitat where a decline in numbers may be detected earlier allowing us to address the situation.

The Island was divided into quarters each quarter representing the area reasonably assumed that all species may cover in one evenings foraging. Using random number tables, four random 'woodland' and four 'water' sites were chosen per quarter (see Appendix 4).

Bat activity is calculated for each half hour throughout the night (see section 2.2.2.2). These time blocks represent a subsample of bat activity and provide 64 annual samples for both wood and water habitats annually.

Statistical Power of the Monitoring Programme - The Jersey Bat survey estimated an average activity index 3.94 bats ½ hr^{-1} (s.d. 3.537, C.V. 89.7%) at overnight sampling stations. This figure has been taken as the baseline level of bat activity that we would not wish to see any future activity levels to decline below. Using the sampling regime described above this programme can detect a change in bat activity of 1.6 bats ½ hr^{-1} with 95% certainty. Clearly this is not a change in actual bat numbers of 1.6 (a very large change that we would be concerned about!), instead it is a change in the number of contacts of the order of 40% of current levels. If a declining change was observed it would highlight a cause for concern triggering extra study or highlighting amelioration measures that might be necessary.

4.4 The Status of Jersey's Fundamental Obligations Under The Agreement on the Conservation of Populations of European Bats

The Jersey Bat Survey was commissioned by the Environment Department to fulfil our obligations under The Eurobats treaty which states that 'Each Party to this Agreement shall designate one or more competent authorities to whom it shall assign responsibility for the implementation of this Agreement. It shall communicate the name and address of its authority or authorities to the other Parties to this Agreement'. The Environment Department is now in a position to communicate and exchange our information and the

status of our conservation programmes (Table 4) to the United Kingdom through whom we make our response to the Secretariat.

Fundamental obligation	Vehicle / Policy for Implementation	Lead Agency	Status
Each Party shall prohibit the deliberate capture, keeping or killing of bats except under permit from its competent authority.	Conservation of Wildlife Law	Environment Department & States of Jersey Police	Enacted & Policy of Enforcement in place
Each Party shall identify those sites within its own area of jurisdiction which are important for the conservation status, including for the shelter and protection, of bats. It shall, taking into account as necessary economic and social considerations, protect such sites from damage or disturbance. In addition, each Party shall endeavour to identify and protect important feeding areas for bats from damage or disturbance.	• Conservation of Wildlife Law • Planning and Building Law (1964) - Sites of Special Interest	• Environment Department • Environment and Public Services Committee	• Enacted & Policy of Enforcement in place. Training provided for Planning Department staff • Enacted
When deciding which habitats to protect for general conservation purposes each Party shall give due weight to habitats that are important for bats.	• Conservation of Wildlife Law • Biodiversity Strategy - Species Action Plan for Jersey's bats • Planning and Building Law (1964) - Sites of Special Interest	• Environment Department • Environment Department • Environment and Public Services Committee	• Enacted and Policy of Enforcement in place • Approved by the States of Jersey • Enacted
Each Party shall take appropriate measures to promote the conservation of bats and shall promote public awareness of the importance of bat conservation.	Biodiversity Strategy - Species Action Plan for Jersey's bats	Environment Department	Ongoing
Each Party shall assign to an appropriate body responsibilities for the provision of advice on bat conservation and management within its territory particularly with regard to bats in buildings. Parties shall exchange information on their experiences in this matter.	Environment and Public Services Committee (Environment Department)	Environment and Public Services Committee (Environment Department)	Ongoing
Each Party shall take such additional action as it considers necessary to	As necessary	Environment Department	As necessary

safeguard populations of bats which it identifies as being subject to threat and shall report under Article VI on the action taken.			
Each Party shall, as appropriate, promote research programmes relating to the conservation and management of bats. Parties shall consult each other on such research programmes, and shall endeavour to co-ordinate such research and conservation programmes.	• The Jersey Bat Survey • Environmental Monitoring strategy (Bat monitoring programme)	• Environment Department • Environment Department & NGOs	• Completed • Initiated 2004
Each Party shall, wherever appropriate, consider the potential effects of pesticides on bats, when assessing pesticides for use, and shall endeavour to replace timber treatment chemicals which are highly toxic to bats with safer alternatives.	Conservation of Wildlife Law	Environment Department	Enacted – advice and literature available and targeted at stakeholder groups

Table 4 The policy vehicles for implementation, lead agency and status of Jersey's fundamental obligations under The Agreement on the Conservation of Populations of European Bats.

5.0 References

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Appendix 1 – Sites And Results From Mist Netting

Gross data is given. F-female, M-male, f/a-length of forearm

❖ *St Catherine's wood – 29.6.03*

Net over stream (GR)	1 x common pipistrelle M
	1 x common pipistrelle F pregnant
	1 x soprano pipistrelle F parous
	1 x Grey long-eared 9g F f/a 43.1mm
	1 x Natterer's bat 8g F pregnant f/a 38.8mm (ringed U4173)

❖ *St Catherine's wood – 29.6.03*

Net at top of meadow	1 x Grey long-eared 9g F parous f/a 41.0mm, thumb 5.9
	1 x Grey long-eared 8g F parous f/a 40.9mm
	1 x Grey long-eared 7.5g F parous f/a 42.4mm
	1 x Grey long-eared 7g F f/a 38.7mm
	1 x soprano pipistrelle F non-parous f/a 32.4
	1 x common pipistrelle F
	1 x common pipistrelle F parous f/a 32.9mm

❖ *St Catherine's wood – 1.7.03*

Net at stream	1 x common pipistrelle F 4g f/a 30.5mm
	1 x Brown long-eared M 7.5g f/a 38.5mm
	1 x Natterer's bat 7g M f/a 38.8mm (ringed U4174)
	1 x common pipistrelle F
	1 x common pipistrelle F

❖ *Greve de Lecq Woods – 30.6.02*

Net at stream	1 x Grey long-eared 9.5g F parous f/a 39.2mm
	1 x Brown long-eared M 7.5g f/a 38.5mm

❖ *Greve de Lecq Woods – 30.6.03*

Net at stream	1 x Natterer's bat 8g M
	1 x common pipistrelle M 3.5G f/a 31.4mm

❖ *St Peter's Valley – 2.7.02*

Nets on Gargate Track	Nothing caught (eventually rained off)

❖ *Val de la Mare Reservoir – 28.6.02*

Entrance at arboretum	Nothing caught
Top of reservoir at crane	1 x common pipistrelle

Appendix 2

Bat Conservation Trust Good Practice Guidelines on Bats and Rabies for Bat Groups (April 2003)

Following the death from bat rabies of a bat worker in Scotland in November 2002, the BCT, in conjunction with the Department for the Environment, Food and Rural Affairs and the Department of Health, has reviewed the Health and Safety advice given to bat groups and the general public on bats and rabies. We have produced these Guidelines and are asking Bat Groups to undertake to distribute them to all members of the group who handle bats. However, these Guidelines are likely to develop in response to feedback from bat groups, in which case we will let you know of changes. It is hoped that these Guidelines, together with the accompanying Bat Related Inquiries, cover most eventualities.

Whilst we all acknowledge that the risk of catching bat rabies from a British bat is extremely small, we do need to follow these good practice guidelines, not only to make bat work as safe as possible, but also to be responsible proponents of bat conservation.

Should another person die from bat rabies in the UK, not only will this be a tragedy for those directly concerned, the damage done to bats and bat conservation will be very difficult to repair.

Good Practice Guidelines

1. Anyone who handles bats regularly should be fully vaccinated against rabies.
2. Protective gloves should be worn when handling bats, even if you have received rabies vaccinations.
3. If anyone is bitten or scratched by a bat they must wash the area of the bite thoroughly but gently with soap and water, and then immediately phone their doctor for advice on post exposure treatment.
4. Bat workers who have not received rabies immunisation vaccines should not be sent out on any bat group or BCT business that is likely to involve handling bats (e.g. grounded or injured bat calls).
5. Only in an emergency situation where no vaccinated bat worker is available is it acceptable for an unvaccinated person (who must be aware of these Guidelines and the Protocols attached) to respond to the call. They must wear protective gloves to handle the bat. If bitten or scratched by the bat they must follow point three above.
6. Bats used for P.R. purposes at events or shown to the public at the bat workers' home should not be handled by members of the public. The bat worker who is presenting the bats should wear protective gloves when handling the bats.

Anyone who takes in grounded and injured bats must record the following details

- who brought the bat to them
- when they brought it in
- who originally found the bat
- date when the bat was found
- place where the bat was found
- contact details for these people

- details of the bat, and the nature of any injuries and treatment

They must be able to match each bat up with its records. The BCT has forms for recording the details of grounded and injured bats; please contact the office if you require one.

7. Bat carers should ascertain whether anyone who brings bats in to them has been bitten or scratched by the bat, and if so they should advise them to seek post-exposure treatment from their GP immediately.
8. If a bat carer suspects that one of the bats in their care has rabies they must inform their local veterinary surgery immediately (there will be an on-call vet twenty four hours a day) and a decision must be made by the vet and the bat carer about whether the bat should be euthanased. If the bat is euthanased the vet will then get in touch with the local Animal Health Office. The AHO will arrange for the dead bat to be taken to the Veterinary Laboratories Agency. If the bat does turn out to have rabies, the bat carer will have to hand over the records on that bat to the AHO so that the AHO can contact the people who found the bat and brought the bat in.
9. N.B. Before symptoms are displayed the affected bat behaves normally but CAN STILL TRANSMIT THE VIRUS, but as the disease becomes more advanced the bat may become very agitated and overtly aggressive, or alternatively very quiet. There have been only two rabid bats identified in the U.K., so we have only limited examples of behaviour, but what was common in both cases was aggressive agitation and incoordination. At the later stages one bat roosted in the open and did not eat or groom; the other bat did eat and drink as normal until it was too weak to approach the feeding bowl, but it too stopped grooming and looked dishevelled.
10. All dead bats should be sent to the Veterinary Laboratories Agency as part of the ongoing passive surveillance programme; tubes and envelopes for sending dead bats are available from BCT on request. If a bat bit somebody before it died then this must be indicated on the form that accompanies the bat.
11. Any suspected vagrant bat, whether it is thought to have arrived in the U.K. by its own efforts, or whether it is thought to have been assisted (for example if it has been found in a shipment of goods) should be reported to the local Animal Health Office. The batworker should phone their local veterinary surgery, who will pass the details of the bat and the circumstances on to the local A.H.O.
12. When dealing with callers, bat groups that operate a Helpline should follow the Bat Related Enquiries produced by the BCT.

Appendix 3 – Species Action Plan for Jersey Bats

1. Current status

All bat species are considered collectively for the following reasons:

- the key personnel involved in bat conservation are involved with the conservation of all species occurring;
- all species are protected so the legal framework and procedures are the same for all species;
- many of the conservation problems faced by bats are applicable to all species - where they differ this has been highlighted.

The bats listed below have been recorded locally since 2001. Bats are difficult to survey and the information is therefore the summary of different techniques each with limitations. Overall there is a lack of information on their population dynamics and the relative impact of the factors believed to be causing their population decline at the national scale.

Most records relate to Pipistrelle bats and practically all the known summer roosts are used by this species or grey long-eared bats. Hibernation sites generally come to light during building works when single or small numbers of bats may be discovered although searches continue.

Species		Status 2003
Greater Horseshoe	*Rhinoloplus ferrumequinum*	Last record 1959
Natterer's bat	*Myotis nattereri*	Uncommon resident
Grey long-eared	*Plecotus austriacus*	Relatively common resident
Brown long-eared	*Plecotus auritus*	Two individuals recorded 2002 and 2003
Common pipistrelle	*Pipistrellus pipistrellus* *Pipistrellus pygmaeus*	Very common resident Relatively common resident
Nathusius' pipistrelle	*Pipistrellus nathusii*	Relatively common resident
Kuhl's pipistrelle	*Pipistrellus kuhli*	Uncommon resident
Serotine	*Eptesicus serotinus*	Unknown, believed uncommon resident
Leisler's bat	*Nyctalus leisleri*	One male individual recorded 20.5.02.

2. Current factors affecting species

Numerous sources of evidence suggest a decline in bat populations, in at least some species, throughout Britain. Due to the incompatability of the historical data we can not quantify this trend for Jersey but anecdotal evidence suggests that bat populations are lower than in the past. However, the factors contributing to a decline in bat populations elsewhere certainly apply to Jersey; the main threats to bats can be divided into three groups:

- factors affecting foraging areas.
- factors affecting roosts.
- direct losses to populations.

2.1 Factors affecting ability to forage

Since bats may forage a considerable distance (up to 4km) from their roost sites they may use large areas of the Island for foraging. Each of the species of bats have their own habitat preferences (see 1.1). Foraging habitat must provide bats with their insect food and must be linked to a sheltered network of 'commuting' routes which enable them to fly across the landscape sheltered from strong winds and protected from predators. Therefore the structural nature of the vegetation within foraging areas is as important

to bats as plant species diversity. Therefore any loss and disruption to flightline features (linear landscape elements) such as hedgerows is critical to bats.

The small parcel size of land in Jersey and retention of linear features provides a favourable habitat for bats. However, undeveloped land, which does not meet the standards for designation as SSIs, forms the bulk of bats' foraging areas. These sites are vulnerable to development pressures and unfavourable changes in land management. For example, the loss of large rear gardens to small-scale housing development often results in the loss of long-established trees or hedgerows and so reduces the structural diversity of foraging habitats for bats. The fragmentation of habitats used by bats is a further threat since bats are amongst the most susceptible mammal species to habitat fragmentation, the other notable species locally being the red squirrel.

Reduction in insect prey due to modern farming practices and inappropriate riparian management can also reduce foraging success.

2.2 Factors affecting roosts

Bats tend to roost communally and require a range of roosting sites throughout the year with summer roosts generally (although importantly not always) being found in different places to hibernation sites. All local species are thought to be reliant on buildings or other structures. The mild local climate suggests that some species are likely to use trees for roosting although the lack of veteran trees locally may have an effect.

Because bats roost communally, whole populations are vulnerable to the destruction of occupied roosts through conflicts with householders, building alterations, demolition or remedial timber works where roosts occur in buildings, and pruning or felling works where roosts occur in trees. The low reproductive capacity of bats means that rebuilding populations after catastrophic declines may be very slow if not impossible.

Bats have very specific roost requirements and the assumption that any loss to a roost site can be permitted because there are other apparently suitable roost sites in the vicinity is likely to be misplaced.

2.3 Direct losses

- **Cat predation.** A significant number of bats received by the JSPCA and the Jersey Bat Group have been injured or killed by cats. There are instances where individual cats become accomplished at catching bats.
- **Deliberate persecution**. It is possible that deliberate persecution is a significant threat. The main threat would be from householders unwilling to retain a bat roost in their house and directly removing it without reference to the statutory authorities.

3.0 Current Action

3.1 Legal status

European

- Agreement on the Conservation of Populations of European Bats (1992) (Under the Bonn Convention on the Conservation of Migratory Species of Wild Animals)

Although Jersey is not yet a signatory, over much of Western Europe bats are protected by the following conventions: -

- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1982)
- EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora. (1992)

Local The following legislation protects all species of bats and their roosts :-

- Conservation of Wildlife (Jersey) Law 2000

In addition bats are important contributors to local biodiversity and as such receive consideration through the Island Plan and Planning and Building Law 1964 and 2000, The Biodiversity Strategy and various Habitat Statements. As such the presence of bats (or any other protected species) is a material planning consideration when determining planning applications.

3.2 Management, research and guidance

- The provision of statutory advice required by the legislation protecting bats is carried out by the Environment Department and competent individuals. Visits to people with bat roosts requested under bat protection legislation generate biological records and provide highly targeted educational opportunities.
- A baseline survey was completed in 2003 and the current initiative is a Bat Monitoring Programme. The Environment Department leads this work in partnership with the Société Jersiaise and the Jersey Bat.
- The Environment Department undertakes educational work, in the form of talks and guided walks as well as distributing targeted information to appropriate groups e.g. architects, roost owners and gardeners.

4. Action Plan objectives and targets

Ongoing :

- Ensure that knowledge of best practice for the conservation of bats is used locally.
- Increase knowledge of the status, distribution, ecology and population trends of bats locally.
- Encourage conditions which would lead to an increase in bat populations
- Protect roost sites, foraging habitat and connecting features.

5. Proposed Actions

5.1 Policy and legislation

Ongoing

- Effective enforcement of the Conservation of Wildlife Law through the development control process.
- Seek the inclusion of effective measures which protect bats and their habitats through the site designation process.

5.2 Species management and protection

Ongoing

- Identify roosts (both summer especially hibernaculum) and ensure that the information is available for use in the development control process to safeguard sites. Consider use of 'citizen science' in encouraging roost owners and a revitalised bat group in the collecting of data.
- Identify important bat foraging and areas.

- Protect, maintain and enhance insect-rich riparian habitats and linear landscape feature suitable for foraging and commuting e.g. woodland edge, trees, pasture, open water and wetland areas and their associated habitats. Carry out habitat management initiatives in accordance with the Jersey Bat Survey Report and the Red Squirrel Species Action Plan. Promote the parallels between bats and red squirrels and emphasize the benefits to bats arising from conservation initiatives for red squirrels.
- Emphasize the contribution made by bats to (sub) urban biodiversity. Promote the benefits of correctly designed garden ponds in adding to urban biodiversity.

5.3 Advisory

Ongoing

- Revitalise the Jersey Bat Group to enable it to respond assist in requests for advice and information arising locally.
- Maintain and continue to develop a public awareness campaign and target appropriate stakeholder groups with relevant support literature.
- Maintain and reinforce communication between groups involved in local bat conservation and rehabilitation.

5.4 Future research and monitoring

- Enact the Bat Monitoring Programme from 2004 onwards
- Encourage householders or other roost owners to collect and submit records on their roosts.

5.5 Communications and publicity

Provide education for the general public and the affected user community.

6. Co-ordination and review

This Biodiversity Action Plan will be implemented over 10 years with a first review after 5 years. Its actions are co-ordinated within the Environmental Monitoring Strategy overseen by the Monitoring Task Group (within the Jersey Environment Forum) and the Monitoring Working Group (within the States of Jersey). These groups will meet at a minimum on a yearly basis.

Review will be carried out in conjunction with related Habitat Action Plans as appropriate. The Action Plan will be revised and updated in the light of review results and any relevant changes in circumstances and/or additional information which becomes available during the review period.