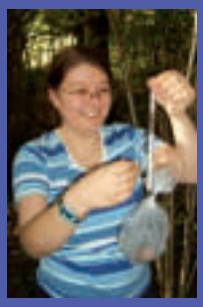
volume 1 2014

the dormouse monitor

the newsletter of the national dormouse monitoring programme

INSIDE

Welcome



We had a very damp wet winter but it was also very mild, so it will be interesting to see how well our dormice survived hibernation. However, now we are in the midst of spring as the blues paint our woods a glorious hue, and we can start to think of a new dormouse season.

Much has happened over the last year. There was the Dormouse Monitoring conference in November which covered various topics, including how to set up local and county dormice groups and how to undertake and promote suitable woodland management for dormice.

Many counties and regions now have dormouse groups including Devon, Kent, Southend, Surrey, Sussex, Warwickshire, Lincolnshire and the North West Dormouse Partnership. If you would like help or advice in setting up yours please don't hesitate to get in touch.

Ian has also been busy developing the training resources on the PTES website - please check out the short training videos on various aspects of the NDMP, including box checking, handling and sexing.

In the meantime - happy dormousing - we look forward to hearing from you.

Best wishes

Nida Al-Fulaij & Susan Sharafi

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The National Dormouse Monitoring Programme is funded by PTES and Natural England.
The Dormouse Monitor is compiled by Nida Al-Fulaij & Susan Sharafi.
Cover image kindly provided by Jamie Edmonds. Printed by 4-print on environmentally friendly paper.
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Using science to steer practical conservation

The very fact that I'm writing this for a publication entitled *The Dormouse Monitor* shows just how much enthusiasm and passion there is for these species. Not only do we have a dedicated monitoring programme for hazel dormice here in the UK and a bi-annual publication, but enthusiasm across the world means that this year the ninth (!) international dormouse conference will be held in Denmark, in September. There has been a huge body of research carried out over several decades on all the dormouse species. And there are at least three very comprehensive and interesting books about dormice by Pat Morris, Sven Bucnher and Rimvydas Juškaitis.

Here at PTES, we also realised that there has been much useful scientific research into the species, in particular how dormice interact with their environment, which would be very useful for those of us involved in land management. We decided we needed to make that information accessible to everyone, not just the scientific community. So we commissioned Rowenna Baker, a passionate ecology student, to make a precis of 100 scientific dormouse papers that relate specifically to practical conservation for the species here in the UK. The aim to is to put these short documents in a searchable format on the PTES website so that when you would like to look up what research, say, has been carried out on how dormice use hedgerows, then you can easily access it. The PTES website is being redesigned but in the meantime you can access the papers, by author and title, on our current website.

Effects of weather and season...

...was the title of research carried out by Paul Bright in the 1990s. He studied a population of dormice in Somerset over the summer months to see if their activity patterns are strongly influenced by summer weather conditions. Interestingly higher ambient temperatures during May-June and September-November did increase the amount of time that dormice were active for. But the same was not true during July and August. As we might suspect, rainfall impacted on the amount of time the animals spend foraging too.

Variation in daily torpor in dormice...

...was studied by Rimvydas Juškaitis in Lithuania over the course of eight years. Having found over 1,000 dormice in torpor during that time, Rimvydas had a huge body of data to analyse. Interestingly he discovered that torpor was more common in males (75%) than in females (45%), with the lowest number of any dormice being found in torpor during the months of August and September.

Each review has a short background to the study, a clear description of the methodology used and succinct key results. There is then a list of key messages for landowners or managers to take away from the work which will help them to implement practical measures on the ground. We really hope that you find these documents useful and informative.

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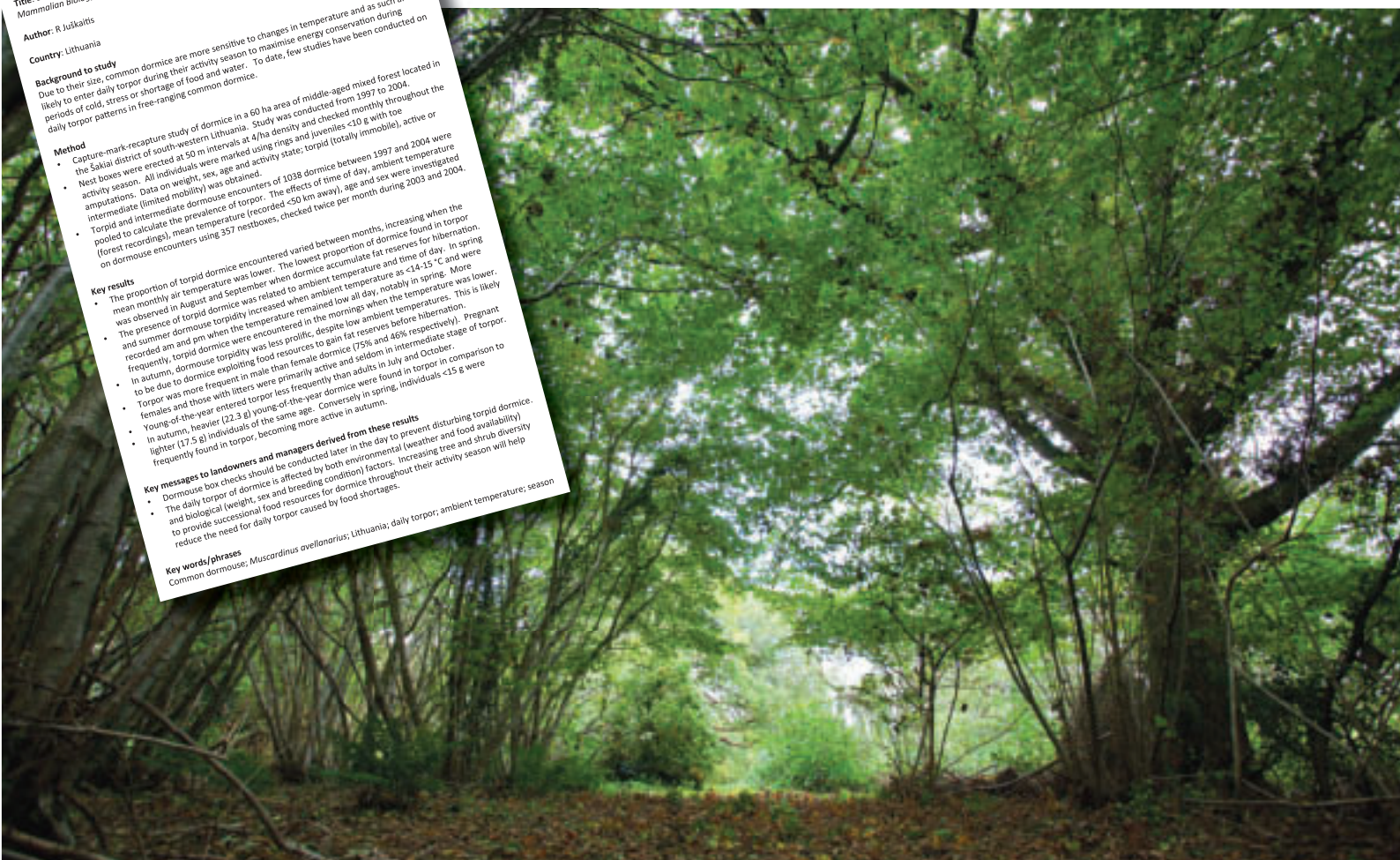

Title: Daily torpor in free-ranging common dormice (*Muscardinus avellanarius* L.) in Lithuania, *Mammalian Biology*, 2005

Author: R Juškaitis

Country: Lithuania

Background to study
Due to their size, common dormice are more sensitive to changes in temperature and as such are likely to enter daily torpor during their activity season to maximise energy conservation during periods of cold, stress or shortage of food and water. To date, few studies have been conducted on daily torpor patterns in free-ranging common dormice.

Method
- Capture-mark-recapture study of dormice in a 60 ha area of middle-aged mixed forest located in the Šakiai district of south-western Lithuania. Study was conducted from 1997 to 2004.
- Nest boxes were erected at 50 m intervals at 4/ha density and checked monthly throughout the activity season. All individuals were marked using rings and juveniles <10 g with toe amputations. Data on weight, sex, age and activity state; torpid (totally immobile), active or intermediate (limited mobility) was obtained.
- Torpid and intermediate dormouse encounters of 1038 dormice between 1997 and 2004 were pooled to calculate the prevalence of torpor. The effects of time of day, ambient temperature (forest recordings), mean temperature (recorded <50 km away), age and sex were investigated on dormouse encounters using 357 nestboxes, checked twice per month during 2003 and 2004.

Key results
- The proportion of torpid dormice encountered varied between months, increasing when the mean monthly air temperature was lower. The lowest proportion of dormice found in torpor was observed in August and September when dormice accumulate fat reserves for hibernation.
- The presence of torpid dormice was related to ambient temperature and time of day. In spring and summer dormouse torpidity increased when ambient temperature and time of day. In spring recorded am and pm when the temperature remained low all day, notably in spring. More frequently, torpid dormice were encountered in the mornings when the temperatures. This is likely to be due to dormice exploiting food resources to gain fat reserves before hibernation.
- In autumn, dormouse torpidity was less prolific, despite low ambient temperatures). Pregnant
- Torpor was more frequent in male than female dormice (75% and 46% respectively).
- Young-of-the-year entered torpor less frequently than adults in July and October.
- In autumn, heavier (22.3 g) young-of-the-year dormice were found in torpor in comparison to lighter (17.5 g) individuals of the same age. Conversely in spring, individuals <15 g were frequently found in torpor, becoming more active in autumn.

Key messages to landowners and managers derived from these results
- Dormouse box checks should be conducted later in the day to prevent disturbing torpid dormice.
- The daily torpor of dormice is affected by both environmental (weather and food availability) and biological (weight, sex and breeding condition) factors. Increasing tree and shrub diversity to provide successional food resources for dormice throughout their activity season will help reduce the need for daily torpor caused by food shortages.

Key words/phrases
Common dormouse; *Muscardinus avellanarius*; Lithuania; daily torpor; ambient temperature; season

CLARE PENGELLY

How can we better manage a variety of woo

The management of forests and woodland in England and Wales is performed for a variety of reasons, from commercial forestry through to conservation and recreation. Woodland management practices can range from large-scale clearfelling of trees and commercial thinning, down to coppicing and the creation of woodland glades.

A key question in hazel dormouse conservation is how and to what extent the management of woodland habitat affects dormouse populations. The key habitat features that dormice prefer are reasonably well understood. These are generally recognised to be: a diverse understory; a relatively open but well-connected canopy; coppice coupes; and early successional species-rich woodland. This was informed in a large part by work pioneered by Pat Morris and Paul Bright in the nineties. It is important, however, to recognise that this habitat is not frozen in time, but is instead a continuously changing environment requiring repeated maintenance, for example to prevent the canopy from closing and shading out the understory. In order to achieve this, these woodland and forest areas must be actively managed. The effects of the frequency, distribution and timing of different types of woodland management on the long-term fate of dormice populations are poorly understood.

I have recently begun a PhD at the University of Exeter's Environment and Sustainability Institute in Penryn, Cornwall to begin to look into this question. This work will focus on the responses of dormouse individuals and populations to woodland and forestry practices. The research is being carried out in conjunction with the Forestry Commission to translate it into further guidance on the management of woods, and the mitigation of the impact of forestry operations on dormice.

Beyond coppice woodland and other habitats traditionally seen as being beneficial for dormice, the number of woodland or forest types in which dormice can be found is uncertain. Moreover, many previously held assumptions about the habitat preferences of dormice seem to be up for debate at the moment. It is unclear how common they are in more heavily managed woodlands and forests, with the numbers of records of dormice in intensively managed conifer plantations seemingly on the rise. More research is needed, however, into whether there are enough dormice in these habitats to form stable populations, and how much these might contribute to national abundance.

As the hazel dormouse is a European Protected Species they are safeguarded by legislation making it an offense to harm or disturb them from their resting and breeding places. Therefore it is important to investigate the short-term effects of timber removal, so that the impact of operations on individual dormice is reduced and consideration

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odlands for dormice?

is taken over the health of the remaining population. Questions can be asked over the precise planning of operations, such as: Is there enough refuge habitat provided? Does an adequate amount of breeding and feeding resources remain? And has connectivity been retained on site? This is especially true of larger-scale, more commercial operations. There are questions over the effects of operations on the displacement of dormice, and the consequences of this displacement on breeding and survival rates.

There are ways in which protecting individual dormice can have population level conservation benefits, such as in preventing the complete removal of suitable habitat. On the other hand it presents an interesting paradox, in that the individual-level protection for dormice could constrain or even prevent habitat management that would benefit populations in the long-term.

As may ring true with many dormouse monitors, a large number of woodlands in the UK are already undermanaged. There is a danger that legislation will further deter people from managing their woodlands and lead to declining habitat quality for dormice. Not to mention the difficulties in planning commercial forestry operations. Even in conservation woodlands, many species are dependent on practices that have been carried out in British woodland for hundreds of years and the dormouse is no exception. Therefore it is important to assess the longstanding benefits of woodland management for dormice populations.

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One of the aims of the study, therefore, is to approach this issue from both sides in assessing the immediate effects of forestry operations on the fate of individual dormice, and the long-term effects of management plans and procedures on populations.

Most studies of hazel dormice have focused on the ecology and behaviour of individuals, with some also focusing on habitat associations. Few have looked at population-level responses to habitat change over time. This is in part due to the difficulty of examining long-term responses of populations over wide areas.

In addressing the impact of management on populations, I will be using data from the National Dormouse Monitoring Programme (NDMP). This is a fantastic opportunity to look at population trends over 20 years and the drivers of these trends. Such long-running and widespread monitoring programmes are unusual, and provide a rare opportunity to gain insight into the dynamics of population change.

Before looking at how forest management might be affecting dormice, it is important to first assess the changes that have occurred in the national population. As well as being able to assess the driving forces behind these changes across a nationwide network of sites, it enables any evidence to be put into the context of the current state of the population. In light of this, I have been looking at the trends in dormouse numbers at NDMP sites over the last 20 years.

It is possible to look at the relative importance of many factors that might be causing dormouse populations to decline, to identify key areas where conservation actions would be most beneficial. I will be looking into the effect of weather patterns, woodland characteristics such as size and isolation, as well as forestry practices.

Over the course of my PhD I hope to address some of these questions around management of sites for and with dormice, and be able to provide more effective guidance for woodland owners and forestry managers who wish to improve the dormouse conservation value of their site.

Cecily Goodwin
University of Exeter

I am currently looking for any organisations or wildlife trusts that own or have access to sites with dormice and have detailed knowledge of the site management plans, including plans for active management over the next year. I am also looking for sites with historical management records and dormice records spanning the same period. If you think you might be able to help, particularly if you have multiple sites that fit this description, please get in touch with Cecily Goodwin via C.Goodwin@exeter.ac.uk.

A closer look at how our dormice fared in 20

The met office described the weather of 2012 as 'a year of dramatic contrast. The relatively warm and dry first three months were followed by an abrupt shift in weather patterns bringing an exceptionally wet period for most of the country from April lasting through much of the summer'.

The indication from the NDMP data was that dormice remained in torpor for longer than usual which meant they had a shorter activity period and breeding was supressed. There also appeared to be a higher mortality in those litters that were born. Recruitment into the population was poor but adult animals appeared to be going into hibernation at heavier weights which should have given them a good chance of overwinter survival (full report in *The Dormouse Monitor* Vol. 1 2013). The expectation was that animals would come out of hibernation in spring 2013 at good weights, perhaps giving them the opportunity to start breeding early.

The winter of 2012/13 was cold, colder than average, and February was the chilliest month of all at 2.8°C. This should have helped dormice remain in hibernation but three torpid animals were found in February during annual box clearing at three sites in Somerset and Carmarthenshire. A few more animals were found in March but as it is not really until April that NDMP box checks are started in earnest, these animals were chance discoveries. 55 dormice were recorded in 9,155 boxes checked in April and 400 dormice were recorded in 18,968 boxes checked in May (Fig. 1). These spring figures are some of the lowest recorded in the NDMP over the past 23 years but as it is thought that the dormouse population that went into hibernation in the winter of 2012 was also very low, it is not surprising.

Figure 1. The number of adult dormice recorded per 50 boxes in May and June.

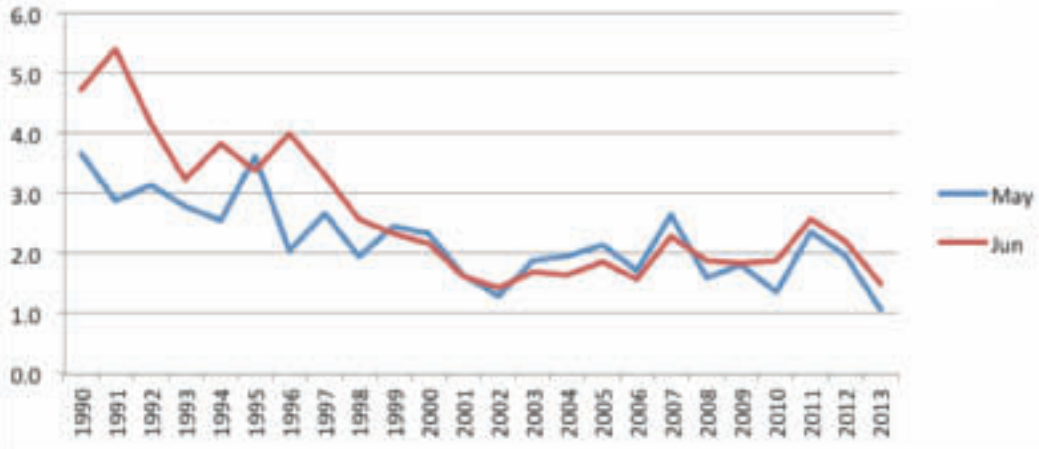
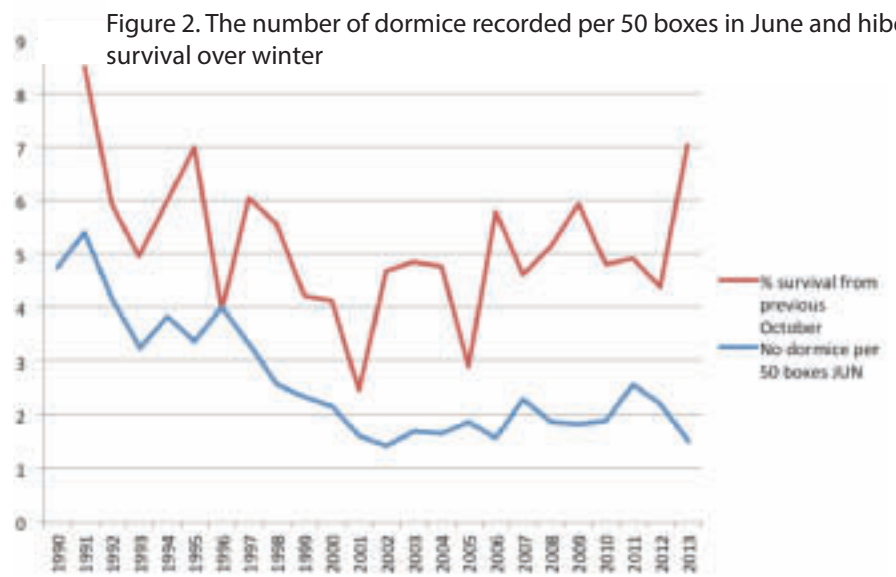


Figure 2. The number of dormice recorded per 50 boxes in June and hibernal survival over winter



The occurrence of a low spring population may be disappointing but tells us little about how well the animals survived hibernation in the winter of 2012/13 or their breeding success in 2013. The NDMP was set up to look at long-term population trends but with such a long and large dataset it is possible to compare year on year activity.

It is impossible to separate adults and juveniles (where adults are animals that have survived a winter hibernation and juveniles are post weaned young of year) from weight alone. The two combined age classes are referred to as adult/juvenile or mature. If we look at the size of the mature population in October, this can be considered as the maximal mature population that will be recorded in the boxes during a year and this population, or a proportion of it, will be the one that enters hibernation. The following year it is relatively easy to identify adults by weight in both May and June (by definition there are no juveniles this early in the year) as any young of the year will have a low bodyweight or will be recorded as young. If we compare the adult population in June with the mature population from the previous October we should get an indication of the hibernal survival by year (Fig. 2).

It appears that hibernal survival during the winter of 2012/13 was about 70% and conversely hibernal mortality during the winter of 2012/13 was about 30%. The only other years when winter mortality was similarly low was in 1991 and 1995 and although the Met office is lacking data for the winters

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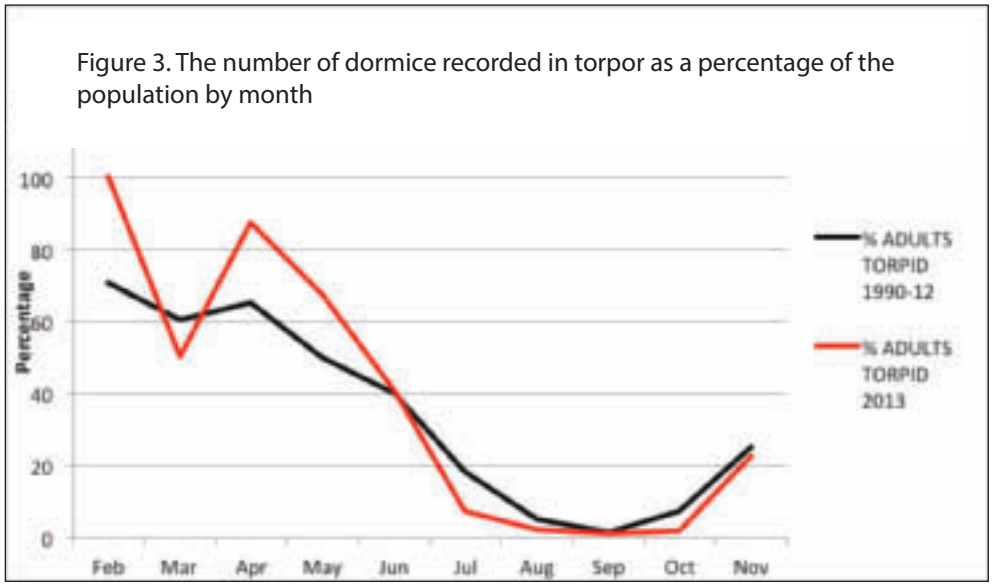
of 1990/91 and 1994/95 they both appeared to have had abundant snowfall across large parts of the country. Winter mortality was investigated by Juskaitis at a large site in Lithuania, using marked dormice and he demonstrated that on average between 64% and 72% of all dormice died during hibernation (Juskaitis 1999). Data from the NDMP suggests that hibernal mortality in the UK may be less with an average of 48% of animals dying over winter although in some years it can be as high as 70% of the animals entering and going into hibernation.

A good proportion of the dormouse population might have survived the winter of 2012/13 but did they come out of hibernation early or at an increased weight? If spring weights were good, this may have had the effect of encouraging early breeding or ensuring a high number of litters throughout the year .

It is very difficult to tell from the NDMP when dormice come out of hibernation as there are few box checks carried out in the early part of the year and consequently the number of animals recorded is very low. But one comparison that may give an indication is by looking at the proportion of animals that are recorded in torpor against the long-term average (Fig. 3).

Figure 3. The number of dormice recorded in torpor as a percentage of the population by month



ALL GRAPHS CREATED BY IAN WHITE

In 2013 a few more animals were recorded in torpor in April and May than usual and this may have been a consequence of the chillier than usual spring. The number of animals recorded in April is usually quite low (n=55 in 2013; n=1,417 in 1990 – 2012) although it increases substantially in May (n=1,687 in 2013; n=6,572 in 1990–2012). Those animals that were recorded and weighed did appear to be heavier than usual (Table 1 overleaf).

In April the average weight of adult females was 18.63g compared to the long-term average weight of 16.63g; the average weight of adult females was also heavier in both May and June relative to the long-term average. The males were also heavier in April and May compared to the long-term average and more closely approximated the mean weight in June.

With heavier than usual females recorded in April it would have been reasonable to expect some early litters in the year. The earliest litter ever recorded in the

Ian White - PTES' Dormouse Officer - on a box check at Briddlesford Woods, Isle of Wight.

CLARE PENGELLY

...a closer look at how our dormice fared in

Month	Average female weight 2013 (g)	Average female weight 1990-12 (g)	Average male weight 2013 (g)	Average male weight 1990-12 (g)
April	18.63 (n=12)	16.63 (n=455)	18.39 (n=39)	18.12 (n=761)
May	16.90 (n=150)	16.33 (n=2,648)	17.68 (n=206)	17.27 (n=2,973)
June	16.99 (n=269)	16.43 (n=3,392)	17.15 (n=246)	17.19 (n=3,180)

Table 1. (LEFT) Average weight of adult dormice recorded in spring months.
Table 2. (RIGHT) Average litter sizes of different ages classe of young, by year, from the NDMP. (*These averages only include data on litters that recorded two or more young.)*

Figure 4. The number of pink dormouse litters recorded per 50 boxes in May and June

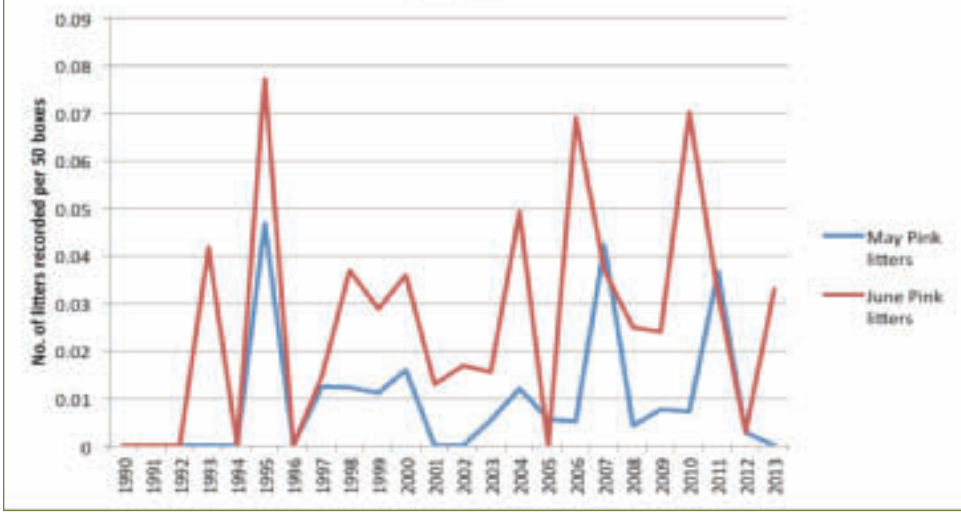


Figure 5. The number of eyes open unweaned litters expressed as a percentage of June adultsand June

NDMP was at Merbach Hill in Herefordshire on the 12 May 2012 but this was not to be matched in 2013. The first litter of pinks was found at Heslett and Peter Wood in North Yorkshire on the 1 June; further litters were recorded a little later in the month at Priestley Wood in Suffolk, Little Linford Wood in Buckinghamshire and Freeholders Wood, also in North Yorkshire. Interestingly all these sites are dormouse reintroduction sites. Also in June two litters of six pinks were recorded at Polstead in Suffolk and at MOD Carwent in Monmouthshire. Although the dormice were in good condition to breed in the spring of 2013, breeding did not start early, litters started to appear in June but compared to other years it was not exceptional (Fig. 4). For early breeding the best years appear to have been 1995, 1997 and 2011. Without considering the size of the adult breeding population in spring however and the survival rate of the young, it is impossible to ascertain breeding success throughout the year.

In the *Handbook of British Mammals* (2008), dormouse litter size is given as an average of 4.6 (range 2-9) in the UK and 3.7 in Germany. This can be more accurately measured by looking at long-term data in the NDMP (Table 2). It would appear that litter size increases from the pink stage (3.60 animals), to the later grey eyes open and eyes open

2013

Year	Average litter size pink	Average litter size GEC	Average litter size eyes open
1990	4.60	4.27	3.93
1991	3.75	4.56	5.75
1992	4.80	4.27	1.00
1993	4.00	3.80	4.22
1994	4.26	4.17	3.61
1995	4.51	4.22	4.16
1996	4.30	4.07	3.63
1997	4.57	3.64	3.85
1998	4.62	4.39	3.85
1999	4.61	4.41	3.94
2000	4.17	4.21	3.89
2001	4.03	3.71	3.78
2002	3.64	3.73	3.90
2003	3.98	3.96	3.54
2004	4.27	3.98	3.85
2005	3.86	3.30	3.33
2006	3.87	4.01	4.31
2007	3.84	4.55	4.34
2008	3.64	3.74	3.80
2009	4.25	3.66	3.73
2010	4.20	3.51	3.29
2011	4.15	3.96	3.82
2012	4.04	3.55	3.55
2013	4.12	4.00	3.83
	4.17 (n=1,040)	3.99 (n=1,205)	3.79 (n=2,697)

stage, but this could be a recording anomaly. When people record litters of dormice they are often reluctant to disturb the nest when the litter is very young. This is not wrong. While litter size information is useful, the welfare of the animals is paramount. Hence young litters often get recorded in the NDMP as only a single individual. If these single animal pink litters are removed, the average litter size increases to 4.17

The litter counts for the grey eyes closed and eyes open stages are likely to be more accurate as people are generally more confident recording older young stages. In these stage the litters are 3.99 and 3.79 respectively. There is no significant difference between the litter size of pinks and grey eyes open but there is a significant difference between the size of grey eyes closed and eyes open (Mann-Whitney $z = 3.314$ $p<0.01$). This suggests that the average number of young born is 4.17 but there is a 9% mortality as the litter ages and the number of young dormice weaned in a litter is 3.79. Infant mortality in mammals has rarely been measured and it requires a long dataset of regular nest monitoring in which litter size is counted and which the NDMP can provide.

The highest number of dormice that are known to be adults are recorded in June and a proportion of this population can be considered to be those that will breed and produce litters over the summer and early autumn. To get an indication of the breeding success in any one year we can compare the total number of litters of each stage (this assumes that a litter of pinks recorded one month will not be recorded as a litter of pinks the following month although it may be recorded as a litter of grey eyes open) with the adult dormouse population in June. We know the pink stage is probably under-recorded and that there is a 9% mortality between pinks and eyes open, which suggests that the optimal indicator of dormouse breeding success is the number of litters of eyes open recorded between June and October which are the young most likely to be weaned (Fig. 5) .

This suggests that 2013 was a very successful breeding year, comparable to 1998, 2000, 2004 and 2010, and only surpassed in the year 2006. It also suggests that dormouse breeding success is cyclical with a good breeding year following a previously poor year, although the actual number of litters produced will be dependent on the number of adult females available to breed. As an ecological adaptation it would make sense, if dormice have a good breeding year one year, why invest energy and resources producing more young the following year when, for a slow dispersing animal, many of the available ranges could be filled. It is possible to see how this could be implemented at an individual level but the data appears to indicate that this phenomenon is occurring at a population level. It is well known that a close relative of the hazel dormouse, the fat dormouse, reacts to the future presence, absence or reduction in the amount of beech mast that will be available in any year by adjusting their breeding in that year accordingly. In some years fat dormice do not breed at all. Are there similar environmental factors affecting the breeding of hazel dormice?

Ian White, PTES

Is the national population of dormice still de

The NDMP was set up to monitor the trend of the dormouse population in the UK. The analysis is undertaken each year by Steve Langton, an independent statistician, who looks at the number of sites monitored and the number of dormice found at each box check to create an annual population trend so that we can monitor how dormice are faring. This trend is based on the number of live dormice that we find during our box checks. Unfortunately the news has not been good with statistically significant declines over the months and years.

There has been a steady increase in the number of sites from which we received data each year. The number of sites that have been

Table 1. Number of years of data from each site in each key month showing the number of sites, percentages of the total for the month, and cumulative percentages (e.g. 75.3% of May sites are recorded for 6 years or less).

	May			June			September			October		
years	sites	%	cum %	sites	%	cum %	sites	%	cum %	sites	%	cum %
1	119	24.9	24.9	108	21.5	21.5	113	22.6	22.6	120	23.2	23.2
2	85	17.8	42.7	93	18.5	40.0	95	19.0	41.6	89	17.2	40.3
3	58	12.1	54.8	63	12.5	52.6	61	12.2	53.8	68	13.1	53.5
4	45	9.4	64.2	47	9.4	62.0	38	7.6	61.4	42	8.1	61.6
5	35	7.3	71.5	28	5.6	67.5	38	7.6	69.0	36	6.9	68.5
6	18	3.8	75.3	30	6.0	73.5	24	4.8	73.8	22	4.2	72.8
7	12	2.5	77.8	23	4.6	78.1	22	4.4	78.2	23	4.4	77.2
8	22	4.6	82.4	13	2.6	80.7	19	3.8	82.0	19	3.7	80.9
9	14	2.9	85.4	16	3.2	83.9	16	3.2	85.2	11	2.1	83.0
10	20	4.2	89.5	14	2.8	86.7	9	1.8	87.0	17	3.3	86.3
11	9	1.9	91.4	8	1.6	88.2	10	2.0	89.0	12	2.3	88.6
12	6	1.3	92.7	13	2.6	90.8	17	3.4	92.4	17	3.3	91.9
13	12	2.5	95.2	16	3.2	94.0	13	2.6	95.0	7	1.4	93.2
14	4	0.8	96.0	5	1.0	95.0	7	1.4	96.4	9	1.7	95.0
15	3	0.6	96.7	5	1.0	96.0	3	0.6	97.0	8	1.5	96.5
16	3	0.6	97.3	6	1.2	97.2	3	0.6	97.6	6	1.2	97.7
17	5	1.0	98.3	5	1.0	98.2	6	1.2	98.8	2	0.4	98.1
18	5	1.0	99.4	5	1.0	99.2	1	0.2	99.0	5	1.0	99.0
19	1	0.2	99.6	1	0.2	99.4	3	0.6	99.6	2	0.4	99.4
20	1	0.2	99.8	3	0.6	100.0	0	0.0	99.6	0	0.0	99.4
21	1	0.2	100.0	0	0.0	100.0	2	0.4	100.0	3	0.6	100.0
	478	100.0	200.0	502	100.0	200.0	500	100.0	200.0	518	100.0	200.0

eclining?

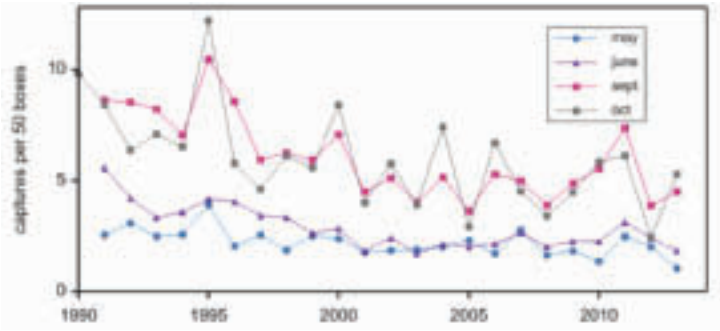


Figure 1 (LEFT): The dormouse counts for each month per 50 boxes checked
Figure 2 (BELOW TOP): GAM curve for standardised dormouse counts in June
Figure 3 (BELOW BOTTOM): GAM curve for standardised dormouse counts in October

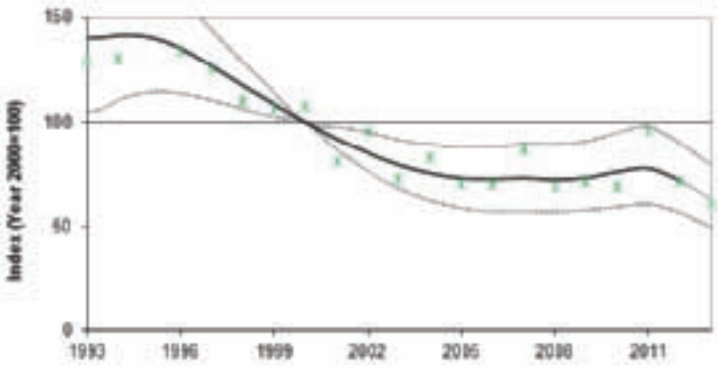
contributing data to the NDMP each year is shown in Table 1. Some monitors have been submitting data from their sites for over 20 years. A large proportion of the sites have only returned data for a few years so far – this is mainly due to the number of sites increasing, so many of these are new sites, but there are also lots of sites where monitoring has stopped for various reasons. It is important that PTES is notified if a site will no longer be monitored so we can try to keep it in the programme if at all possible.

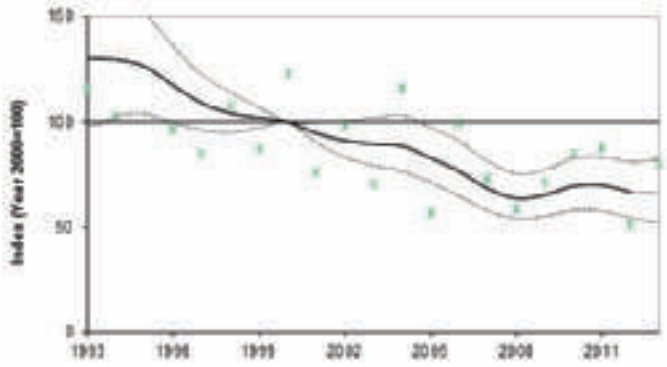
The usual standard measure within the NDMP is the number of dormice recorded per 50 boxes. This measure fluctuates greatly by month, and also by year too. Figure 1 shows the data for the key months we analyse up to 2013 (May and June = pre-breeding, September and October = post-breeding).

Steve analyses data from sites that have submitted at least five years worth of data and have at least 20 boxes (although the standard 50 is preferred). Generalised Additive Model (GAM) curves are then fitted to the data with an adjustment being made to take account of the fact that there are different numbers of boxes up at different sites.

The GAM method is designed not to respond to a single extreme year but indicates the longer term trend with a smoothed line. A few years ago it appeared that the population decline was slowing as the trend line was levelling off. Unfortunately though, the 2012 and 2013 counts were poor compared to 2011 and so now the curves for May, June and September are not looking so good. Figure 2 shows the decline in dormouse numbers for the June counts. Numbers of dormice recorded in October 2013 were higher and have resulted in a levelling off of the October curve as shown in Figure 3. It is important to note, however, that the graphs indicate a long-term trend and the most recent data in the GAM models cannot be given too much weight. We must hope that a high proportion of animals that boosted the population in October have survived hibernation and that we will record good numbers in 2014.

Ian White & Lauren Alexander, PTES





CLARE PENGELLY

Volunteering for the weekend at Briddlesford

Last weekend I joined other volunteers and members of the People's Trust for Endangered Species (PTES) for a practical work weekend at their reserve at Briddlesford, on the Isle of Wight. I first joined in with dormouse monitoring with PTES last September and from that point on I was hooked.

No matter that it's a three hour drive to Portsmouth, or that with fuel and ferry costs plus a delicious pub meal I could go on some European city break for three days instead; it's great to be volunteering, the people who volunteer are so friendly and lovely, and it feels like another world while you are in the middle of the woods scrambling around. Plus, and this is the best part for me, you are outside in the fresh air with very little phone signal, so internet access is largely a no. There is such a wonderful feeling of freedom in not being able to randomly check Facebook, or emails, and instead really look at the world around you and socialise and actually talk with others who have similar interests to yourself.

On the drive down this time I stopped off just before Portsmouth to pick up a fellow volunteer and food supplies for the weekend. We had never met before, so the rest of the journey to Winchester House at Shanklin was spent getting to know one another, albeit in slightly cramped conditions thanks to boxes of fruit and vegetables, and with our stomachs rumbling thanks to the delicious smells coming from the numerous cake tins.

On Friday evening we all met up at the youth hostel to offload the supplies before heading to the Crab Inn at Shanklin for some much needed food and to meet everyone in the party. We all turned in early that night to be up and ready for practical woodland management the next day.

On Saturday we were split into different work groups; some were checking and repairing dormouse boxes, others cleared woodland rides, whilst I was in the coppicing and layering group. After a brief talk on health and safety we went off to the area of woodland we were coppicing. Every year different sections of the woods at Briddlesford are coppiced for conservation, to improve habitat for dormice and to open up the canopy to allow more light through to the woodland floor. Its also improves the age structure of the woodland, which in turn provides more varied habitats.

Armed with hand saws, bow saws and loppers, our group moved through the woodland coppicing and cutting down most of the trees, leaving young hazels (these could be used to layer up later on) and a few mature and older trees such as oaks, ash and elms. The cut down trees and vegetation were used to create dead hedges along the woodland edges, to provide additional habitats and to discourage access into the woodland from the bridle path.

After a yummy lunch around a camp fire and ample cups of tea, and a shorter work session in the afternoon in which we finished the coppicing, we all met up for a walk around the woods. The PTES dormouse officer described various bits of current and on-going management and features of interest, including my first ever sighting of butcher's broom *Ruscus aculeatus*, an ancient woodland indicator species and member of the lily family.

Back at the youth hostel, we all chipped in to help prepare fajitas and nachos for 30+ people. Myself and a few others ended up chopping the onions and all of us, including some of those NOT chopping onions, had tears running down our cheeks. I never want to chop another onion again. Still, the food was delicious and was finished off with apple crumble and custard while people mingled and chatted and generally had fun. All of us were in bed fairly early though after a tiring day, and we had to be up and ready in the morning to tidy up and pack everything.

ALL IMAGES RACHEL BATES

Woods, Isle of Wight

On Sunday morning, after helping to tidy up the breakfast things and packing my stuff, I took a few minutes to sneak off and walk along the pathway behind the hostel – we were right on the coast, so how I could I not take a peek? As an added bonus, it was a beautiful morning and I reached the path as the sun was rising, which cast a beautiful golden light over Hope Bay and the cliffs beyond. It was so relaxing to listen to the waves gently crashing onto the beach, while dogs ran after their balls on the beach below and blackbirds chirped away in the shrubs.

Although our ferry was booked for 3pm, we managed to get a lot more work done; this time layering the young hazel left alone from the coppicing work the day before. Layering encourages hazel stems to regenerate naturally by nicking the stems and planting them in the ground to hopefully take root and create new stands - think strawberry runners.

After a leisurely lunch and tea and cake around another campfire, we tidied up and sorted through the tools and equipment before leaving to catch the ferry. It was a wonderfully warm day, and we sat waiting for the ferry with our windows down! It was a nice drive home too with a colourful sunset, although the temperature dropped to three degrees by the time I arrived home in the evening; not quite spring just yet!

What a wonderful weekend. I didn't want it to end, but there are future trips to look forward to.

Rachel Bates, NDMP monitor

Boxing clever: home improvement of old bird

We had finished checking our twelfth negative nest box. The thirteenth revealed a shapeless mass of moss, clearly an old bird nest which should probably be cleared out. However best first to check properly; and just as well we did, for curled up in the middle…

Our April - June box checks often encounter high proportions of great tit or blue tit nests. Further into the season however, with birds long since fledged, we'd discover apparent modifications to these old nests, with moss canopy pulled over the top, added leaves, or interwoven chunky strands of honeysuckle bark. Some of these later developed into fully finished and occupied dormouse nests. As birds' nest records had been made and kept for the last six years, I reviewed the history of individual boxes to see how commonly old bits of birds' nest were recycled, from titmouse to dormouse nest.

This has not especially been by design: in early months of the season once we identify current bird nesting in a dormouse box, we leave it undisturbed, as one should (nesting birds are legally protected). But in the 2-3 following checks, it becomes more ambiguous whether nests without sitting birds have truly been aborted or might still be active; at the same time we start to see our mammally modifications. Hence unless obviously abandoned, soggy, soiled or harbouring parasites, old birds' nest material has tended to be left, particularly if there were signs of home improvement by a prospective furry new tenant.

A question hangs over these species interactions. As Nida reported in summer 2007 issue and in Rimvydas and Sven's wonderful new book, there is strong and highly statistically significant evidence, over a huge dataset and timescale, that nesting hazel dormice and tits actively compete for nest boxes in Lithuania; dormice seldom used great tit nests, and vice versa, and in Mediterranean and Czech studies, dormice excluded nesting blue tits. Suggested reasons were that, unlike blue tits, sitting great tits are combative enough to defend their eggs against intruders, while the inner nest structure, typically a deeper, densely matted layer of hair, wool and other materials, is found unsuitable by dormice. Exceptions were when great tit nests were in early phases prior to construction of the inner lining, or when there was a dearth of other available nesting sites.

M.C. HARRIS

The results here (Table 1) are offered as no more than incidental observations from my main NDMP site in Devon. They comprise counts of different boxes with known old birds' nests either i) found with dormouse occupants, or ii) unoccupied but obviously dormouse-modified and active (any indeterminate nests have been omitted). With some annual fluctuation, approximately half our dormouse nests originated via former birds' nests. Adoption of old bird nests seemed to take place mostly in the latter part of the season, after birds had finished nesting.

Conversely I'd also note that approximately half of our dormouse nests had nothing to do with birds' nests. If comparing solely boxes with

Table 1. Bird (great and blue tit *Parus major* and *P. caeruleus*) and dormouse nests 2008-2013 at a NDMP site in Devon.

Year	No of dormouse boxes (out of 50) with bird nests	No of boxes with dormouse nests of bird nest origin	No of boxes with dormouse nests not of bird nest origin	Comments
2008	16	0	8	
2009	16	2	3	
2010	19	6	5	Not incl. one moss nest found in April
2011	16	3	4	Warm spring: recorded instance of known active bird nest taken over and modified into dormouse breeding nest found in May
2012	24	8	8	
2013	21	8	6	Cold spring: bird nesting delayed so greater overlap of dormouse and bird nesting periods

ls' nests

dormouse nests, this would not account for active discouragement or exclusion of dormice from boxes by birds. From looking at months of first occupation of individual boxes, there may have been some mutual avoidance early in the season. Would more dormice have used boxes if old birds' nest remnants had been fully removed? Many (33-66%) of the 16-24 old bird nests in any one year did not later become dormouse nests; but neither were there indications that, once old nests were removed, boxes were then immediately taken up by dormice. Finally there were many boxes without either bird or mammal nests, home only to moths, earwigs, woodlice and slugs.

Were dormice and birds competing for nest boxes? Bird nesting at the site usually began earlier than dormouse emergence and breeding at the site, which might reduce the overlapping of nesting periods. We also noticed that bird nests generally did not contain a deeply matted inner layer, but were predominantly moss interspersed and lined with small amounts of down, horse hair, and stripped bark threads, in which the nest cup itself was a concave compressed saucer in the top where birds had been sitting (we sometimes found old dormouse nests with signs of having been sat upon in this way).

More speculatively, I wonder if the south-west wet and mild climate may play a part. Our woodland site is damp and abundant in moss flora most of the year, and it's not unusual to find moss-rich dormouse nests. Indeed moss might be the most commonly available material, particularly early in the season; maybe birds' nests are not so unfamiliar. Does the presence of ready-collected material in a mossy flat pack encourage dormice to move in? Otherwise our records show repeated use of certain boxes or groups of boxes from year to year; maybe there is some fidelity to known nest sites, regardless of prior bird nesting. Intermittent occupancy of these boxes suggests alternative nesting sites are present elsewhere, as might be expected in a SSSI ancient woodland.

M.C. HARRIS

Wider questions would be: are similar species interactions taking place over natural nest sites in tree holes? If availability of nest sites can affect population density, what about that of nesting material itself? How are other factors involved, such as natal dispersal, territoriality, food availability, or habitat connectedness, in influencing whether or not an individual nest box is a dormouse des res?

There are immediate implications for nest box monitoring too. If nesting birds can deter use of boxes by dormice, and half or more of boxes are used by birds, what impact might this be having on results? Understanding nest box competition with other species is included in the latest Natural England list of priority research actions for hazel dormouse (October 2013). Beyond this mini-investigation at a single site, the NDMP might be well placed to collect such data towards a fuller study project.

Stephen Carroll, Devon Dormouse Group

CLARE PENGELLY

An ever-changing climate: potential influences on

Climate change is one of the world's most highly discussed and controversial media topics. The increase in the global climate has led to a growing concern of the vulnerability of the natural environment, and the species which it supports. Evidence suggests that there has been an increase in the global temperature of 0.6°C in the past century, and this is only expected to continue. This has therefore highlighted a need to further investigate the ecological impacts that this ever-expanding problem will have on our native flora and fauna, such as our beloved hazel dormouse.

Mammals have proven to be an extremely diverse and adaptable group of animals, existing and surviving in a wide variety of habitats, and demonstrating a huge amount of physical and ecological diversity. A prime example of their adaptable nature is in the form of hibernation as a mechanism to overcome unpleasant and cold conditions during winter. As well as being able to avoid the winter blues, many hibernating mammals, such as the hazel dormouse, are also able to get around the issue of unexpected, and unfavorable conditions, a frequently encountered problem for a British resident, by entering a temporary state of hibernation known as torpor. Both of these physiological functions act to reduce the organism's metabolic rate and core body temperature to save energy.

Many environmental factors have been found to influence hibernation and torpor in mammals, particularly changes in air temperature and food availability, which are heavily influenced by a changing climate.

The hazel dormouse is a European protected species, a priority in the UK Biodiversity Action Plan, and a known hibernator. It has been shown previously that the species exhibits torpor as a response to changes in air temperature and is specifically sensitive to climate and weather. These factors all make for an ideal study subject when looking at the responses of an organism to varying environmental factors.

This article represents a brief summary of the research that was completed during my MSc in Biological Sciences Research at Royal Holloway, University of London. During this time I was fortunate enough to study under Dr Paul Bright for both my undergraduate degree and Masters, where I gained a great knowledge and passion for the charming hazel dormouse. My thesis focused on the influences of environmental factors on torpor behaviour in hibernating mammals. The main study, which will be the focus of this article, was an investigation into the environmental factors that influence torpor bout duration in the hazel dormouse, highlighting the significance of this function.

Torpor bout duration (TBD) refers to when the organism, in our case the dormouse, re-warms at spontaneous intervals, for periods lasting days or even weeks. The lengths of these bouts will differ between species and are influenced by changes in the environment. During unfavorable conditions, such as low temperature or low food availability, torpor duration may be longer than usual. Though there are obvious benefits to entering torpor and reducing energy expenditure during these challenging periods, there are costs to entering this state, which could potentially reduce the overall fitness of the individual. The more time spent in an inactive state means that less time is spent finding food and gaining the vital extra grams needed for hibernation over winter, as well as making them more at risk to predators, reducing synaptic efficiency and building up sleep debt.

During the study torpor was recorded in hazel dormouse populations in three sites: Cheddar Gorge, Somerset; Bramley Frith, Hampshire; and Ulpha, south-west Cumbria. All sites have existing nest boxes for monitoring purposes, and the temperature of the dormouse nests were recorded using a probe thermometer. TBD was measured by looking at the slow cooling and spikes in increased temperature in the nest, which indicate that the dormouse is re-warming from torpor. The environmental factors measured during the study included: air temperature; rainfall; and food availability in the form of fruit, flowers and insects. We also noted how season; site; mass of the individual and sex of the individual impacted the length of torpor.

The results of the study showed that there were a number of factors that influenced the length of torpor in the study subjects. As expected, daytime air temperature had a noticeable affect on TBD, where the warmer it was during the day the shorter the length of torpor. This implies that the dormice are taking advantage of the warmer weather and therefore better conditions for finding food. Other temperature measurements showed no affect on the torpor length, but this is perhaps due to the small variation in air temperature during the study. Other studies have found that torpor is sensitive to changes in air temperature, so more research is needed for a better idea of the scale of impact on dormice.

Season also had a strong influence on TBD, with dormice spending more time in torpor in spring, than in summer or autumn. The season determines what food can be found, and in the spring and early summer dormice move from tree species to tree species in order to keep up with different flowering cycles, and rely on insects when the other food stocks are low. The fruiting period begins in August with berries and nuts making up the autumn diet, a higher energy, and more valuable food source. This study demonstrated that if fewer flowers were available for feeding during the spring, then more time was spent preserving energy in torpor, supporting evidence for more time spent in torpor during this season. The season is usually responsible for differences in climate and weather, which as well as influencing food availability, also influences torpor length directly through changes in air temperature, making conditions less ideal for foraging.

This particular study only found that flower availability influenced the length of torpor in the hazel dormouse, not fruit or insect availability. This could be explained by the lack of urgency to gain weight in

torpor in hazel dormice

the spring with two seasons still to go before hibernation; this may therefore make energy conservation a higher priority. As flowers are not as nutritionally valuable as fruit and nuts, when the fruiting period begins in August there may be a greater advantage in feeding more frequently over entering torpor, even if the conditions are poor, to gain the required weight to survive hibernation over the fast-approaching winter.

Interestingly there was also a difference in the length of time that dormice would enter torpor between the three sites. Dormice from the Cumbria site on average spent the most amount of time in torpor, around 9.3 hrs, compared to around 7.8 hours in the Somerset site and around 5.9 hours in the Hampshire site. This could again be related to the climate and weather conditions, as generally the more northern sites may have poorer weather conditions and lower average temperatures, potentially resulting in less food available. The Somerset dormice may spend longer bouts in torpor due to being more exposed to the elements at the Cheddar Gorge site, with its limestone hills and cliffs, making for less suitable conditions for food resources and foraging.

There was no difference in torpor length found between males and females, and the variation between the body sizes of individuals was too small to indicate any significant impact on TBD.

It is very rare, and some may say impossible, to come across the "perfect" conditions in nature, making torpor a useful tool for energy preservation, to supplement a years successful foraging during more suitable conditions. Torpor behaviour is strongly influenced by air temperature and food availability, factors that are controlled by the climate, suggesting that predicted increases in global climate may influence this behaviour. Though useful in moderation during the active months, an increase in frequency of torpor and torpor length could be detrimental to the overall fitness of the individual and potentially the species. More time in torpor means less time gaining the essential weight needed to last out the long hibernation period during winter, making the species more vulnerable.

Torpor is an important function for the hazel dormouse as a response to periods of environmental stress, but is most beneficial to the individuals when used in moderation along with frequent foraging on the appropriate food supplies, in order to overcome the challenges faced during winter hibernation. Overall it is apparent that the ever-increasing global climate will have multiple negative effects on the natural flora and fauna, and could encourage negative changes in their physical functions.

Claire Neale
Royal Holloway, University of London

RUUD FOPPEN

Learning more about our woodlands

Towards the end of last year we sent those of you who are NDMP volunteers a questionnaire and maps relating to the woods that you monitor for dormice.

We have more than 600 sites registered within the NDMP across the UK, of which over 350 are currently being monitored. Since we know very little about these sites, we sent out these questionnaires to help inform us what type of habitat is being monitored for dormice. Apart from the fact that the majority of sites are woodlands and that most of them are in the south, we have very little other information about them such as the habitat composition, any management regimes and the ownership.

In order to make better use of the trend data that we collect annually on our dormouse populations we would like to see if there is any correlation between the types of habitat and management and whether dormice are faring well or poorly in a particular type of area or due to certain types of management. And by getting details on who owns the wood we hope to be able to communicate with them and encourage them to take dormice into consideration if they are not already.

So far you have sent back information on almost 270 of the sites. We have had two dedicated volunteers coming into the office - Keiron and Stephanie - who have diligently been logging all the information from the questionnaires into a spreadsheet for us.

They have also been looking at the maps that you sent back with the locations of your dormouse boxes marked on them. Some nest box schemes have boxes erected up across whole woodland areas but others are only up in sections of a site and therefore monitoring just a part of a wood. Knowing what proportion of woodland sites are actively being monitored for dormice will give us a better understanding of the data we are collecting for the NDMP. In particular for sites where dormice appear to have been lost, we can assess whether they might have just moved out of a certain part of a woodland when the habitat has become less suitable for them.

Thanks to all of you who have completed and returned the forms. If you haven't yet had a chance to - please send them back as soon as possible. If you have any questions about the work, queries on how to fill in the forms or would like us to send them to you again please get in contact. All the evidence to date is that dormouse populations benefit from sympathetic ongoing woodland management and with this information we should be able to target it, right where it is most needed.

Nida Al-Fulaij, PTES
nida.al-fulaij@ptes.org

CLARE PENGELLY

Targetting land management practices - such as coppicing and hedge planting, will really benefit dormice.

Danish dormouse conference September

Hot on the heals of the Eurovision Song Contest, Denmark is warming up to host the next most important international meeting in Europe of 2014. This September will be the ninth International Dormouse Conference and it will be held in Denmark. Calls have gone out to researchers and conservationists to register their talks and posters and a timetable will shortly be drawn up.

In the meantime the organising committee - which includes Thomas Bjørneboe Berg from the Danish Mammal Society, and Helle Vilhelmsen of Dormiceconsult.dk - have been arranging a couple of exciting trips to the local area.

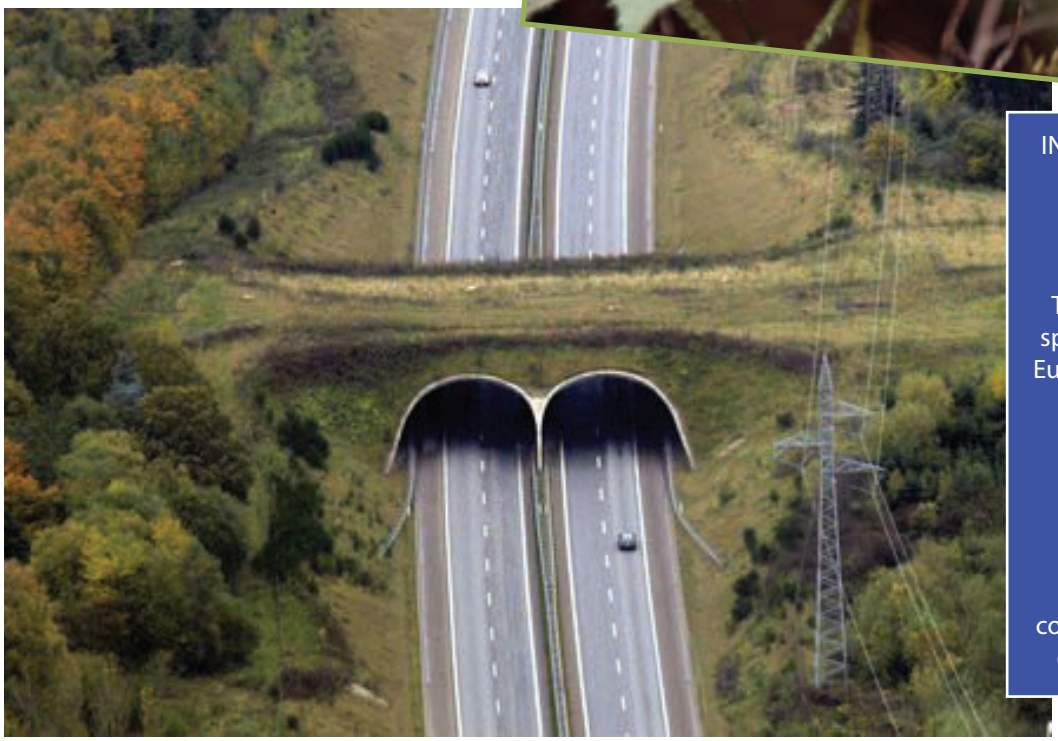
Firstly, on 20 September, there will be an opportunity to visit a fine example of what can be achieved when wildlife is taken into consideration during development. A new fauna bridge has been established north of Svendborg. In one years time this will connect the dormouse populations on either side of the highway.

Then on 21 September a full day trip is being arranged to another dormouse location, a picnic lunch and then a visit to the historical part of Odense, the birth place of Hans Christian Andersen.

Ian White, PTES' Dormouse Officer, and I look forward to seeing you there!

Nida Al-Fulaij
PTES

BELOW: A green wildlife bridge - or fauna bridge as it's known locally - has recently been built north of Svendbord where the conference is taking place.



INTERNATIONAL DORMOUSE CONFERENCE DENMARK

18-23 September 2014

Three days of lectures from speakers who will come from Europe, and around the world.

Two field trips

2,565 DKK

For more information and to contact the organising committee please visit: http://dormouseconference.net/

Training courses & other news

HOW TO MANAGE WOODLANDS FOR DORMICE

Dormice need well managed woods to thrive. The British weather doesn't help dormice with the variability in winter temperatures, westerly weather (cold, wet) in summer and the uncertainty about the start, end and duration of the British summer. So habitat management becomes even more critical. And what's good for dormice is also good for many other species too.

PTES will be running its *How to Manage Woods for Dormice* course taught by dormouse expert Dr Pat Morris at Ipplepen, near Newton Abbot in Devon on Friday 24 October 2014. For further details and a booking form email Susan Sharafi susan.sharafi@ptes.org or call her at the office on 020 7498 4533.

Linda Lowther, Alan Jones

The cost for the day is £45 for dormouse monitors, individuals £55 and for organisations £75.

PTES WOODLAND AND DORMOUSE COURSES 2014

In 2014 PTES will be delivering a range of courses to help people manage and maintain woodlands in a sustainable and environmentally-friendly manner. They will guide participants on how to identify a range of species, how to monitor those species in woodlands, how to create a management plan that directs practical woodland management, and how to make woodland management sustainable. We are also running a one day course on analysing monitoring data and a three day course on dormouse ecology, conservation and woodland management, designed for those working towards their dormouse licence.

PTES owns and manages Briddlesford Nature Reserve which is a 158ha site comprising woodland and farmland. The reserve is not open to the public although it is bisected by a single bridleway and a steam railway line. Briddlesford is a Site of Special Scientific Interest (SSSI) for its flora and mammal assemblage (including hazel dormouse and red squirrel) and is a Special Area of Conservation (SAC) for the bat interest. The woodland represents the most varied area of ancient broadleaved woodland on the Isle of Wight and the woodland flora is among the richest in England.

Please contact Ian.white@ptes.org for more information. We are able to recommend local accommodation if required.

Course	Date	Cost	Location
Identification of Key Woodland Species	Mon 12 & Tues 13 May	£150 for 2 days (plus travel and accommodation if required)	Briddlesford Nature Reserve; Isle of Wight
Monitoring Key Woodland Species	Weds 14 & Thurs 15 May	£150 for 2 days (plus travel and accommodation if required)	Briddlesford Nature Reserve; Isle of Wight
Monitoring Key Woodland Species	Mon 2 & Tues 3 June	£150 for 2 days (plus travel and accommodation if required)	Briddlesford Nature Reserve; Isle of Wight
Management Planning and Funding	Weds 4 & Thurs 5 June	£150 for 2 days (plus travel and accommodation if required)	Briddlesford Nature Reserve; Isle of Wight

Course	Date	Cost	Location
Woodland Management	Thurs 1 May	£75 for 1 day (plus travel and accommodation if required)	Briddlesford Nature Reserve; Isle of Wight
Analysing Monitoring Data	Tues 8 July	£75 for 1 day	15 Cloisters House, 8 Battersea Park Road, London SW8 4BG
Dormouse Ecology, Conservation and Woodland Management	Mon 6 , Tues 7 and Weds 8 October	£450 for 3 days (plus travel and accommodation if required)	Briddlesford Nature Reserve; Isle of Wight