volume 2 2013

the dormouse monitor

the newsletter of the national dormouse monitoring programme

people's trust for **endangered species**

INSIDE

Welcome

Welcome to *the Dormouse Monitor*. We have plenty of interesing articles to keep you entertained over what we hear is going to be another long, cold winter.

Cheryl Mills reports on her three-year project in the south west looking at the genetics of the dormouse populations and the implications for their conservation.

Alison Peel, from the University of Cambridge, has been studying our dormouse data to see whether the length of time a species breeds for over the year - their birth pulse - impacts on their susceptibility to disease - and how that might change with a warming climate.

And finally we report on our conference that was held at the University of Reading and give you all the information you need to sign up to the next International Dormouse Conference which will be held in Denmark, September 2014.

In the meantime thank you for all your efforts in filling in the maps and woodland owner questionnaires we sent out to you recently. Please get in touch if you have any questions or need any help.

Best wishes

Nida Al Fulaij
& Susan Sharafi

Contents

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Lapse or Last? One approach to the problem

In the last edition of the *Monitor*, Stephen Carroll gave a review of the 40-odd NDMP sites in Devon. I found his results most interesting, and utterly frustrating. So here is my experience in Gwent, with a solution that works, so far, and could possibly be extended across England and Wales.

My involvement with the NDMP began eight years ago, through the Gwent Wildlife Trust, which had a site on one of its reserves. There were boxes on another reserve, but no one was monitoring them. The Wildlife Trust also knew that CCW (now Natural Resources Wales NRW) had boxes up in SSSIs, but what checking was done was a mystery.

The eureka moment came when I heard, via the (then new) Dormouse Forum that there was *another* NDMP site in Gwent, which the Wildlife Trust knew nothing about. I made contact with Brian Phillips, and invited myself on his monthly box checks. The history of this site was typical of what Stephen had found in Devon. In this instance, leaders of the *Ravine WoodLIFE Project* put up several hundred nest boxes in Derbyshire and the Wye Valley and advertised for local people to train for dormouse handling licences.

The project lasted just three years and, as far as we can establish, just two licence holders, including Brian, continued with their sites. The other boxes became the responsilbility of CCW, if they were in SSSI woods, otherwise the monitoring just lapsed. CCW staff attempted to continue a twice yearly check, but there was no reporting to the NDMP, and staff changes and lack of handling licences did not help.

Keen to sort things out, Brian and I took on complimentary roles. He liaised with CCW and tracked down the boxes, and I arranged licence holders and assistants to man the rounds. It has taken five years, during which we've gone from two sites in Gwent to 12. Three of the 'new' sites originate from the Ravine project, three from the Wildlife Trust, two from new licence holders who were so enthused from their training they made their own boxes, and a couple were resurrected.

As a member of the dormouse training team of Gwent Wildlife Trust (consisting of one staff member and one volunteer) I help to train about eight new handlers each year. The majority are young, professional ecologists, but there is also a sprinkling of keen amateurs. It is largely from these trainees that I glean one or two new licence holders each year to take on new sites or take over existing ones. Occasionally one will come via PTES, having moved into the area. Unlicensed assistants tend to be Trust volunteers, friends and relations of the licence holders. Each year the interest has slightly exceeded the number of sites available. This allows for stand-ins for illness, pregnancy and holidays, and as a last resort I know all 12 sites and could cover them.

My role involves sending emails, and maintaining a spreadsheet with details such as the site location, the lead monitor (ie who makes returns to PTES), active licence holder(s), trainee assistants, other regular assistants, no. of boxes, percentage of boxes occupied each year and whether or not the site is a Gwent Wildlife Trust reserve.

This information is sent to all of those involved annually in the spring. Usually people know by then if they will be available for the coming season. So following a further flurry of emails and updates, the Gwent NDMP site rounds are set up for another year.

I offer this as a model for the co-ordination of other nest box sites across England and Wales. Ian White, PTES Dormouse Officer, has proposed grouping sites into regions of about 40. I would suggest that if each region could then be split into four, on a geographical basis, then one co-ordinator taking responsibility for ten sites would not be too onerous or time consuming.

Finding the co-ordinators could be a problem. I stumbled into the role, and it dovetails nicely with my training activities. How to find the ideal candidates and working out how to recruit them would take some thought. However, I think that it is worth doing. Without the efforts of Brian and I we would only have half the number of sites in Gwent today, and a lot of unchecked, unmaintained boxes.

Keith Allen
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Susan Sharafi

Why are dormice found in certain nest boxes

Producing an accurate description of the habitat requirements of the hazel dormouse is key to producing effective conservation management for the species. I set out to examine nest box selection by dormice using long term monitoring data collected at two NDMP sites in combination with independently collected habitat data. I wanted to investigate the efficiency of 16-22 years-worth of NDMP data in combination with independent habitat data, which I collected in 2013, to yield efficient and accurate information regarding the status and habitat requirements of two Gloucestershire woodland dormouse populations.

In Midger Wood, dormouse occupancy levels have remained relatively stable so the areas surrounding the dormouse nest boxes are therefore likely to have retained favourable habitat for dormice. Unfortunately there was not enough adequate data to determine if there was any relationship between coppice and nest box occupancy, but the trend suggests this may be a possibility and warrants further investigation.

Conversely a significant decline in the occupancy rates of nest boxes was observed in Siccaridge Wood over the last 22 years. This decline in occupancy is likely localised to those areas with nest boxes and to be a consequence of inappropriate and/or lack of management leading to the habitat surrounding the dormouse boxes becoming increasingly unfavourable. An analysis of habitat variables in Siccaridge Wood supports this as the occupied nest boxes were found to have a significant positive association with proximity to woodland paths (due to active management), beech, field maple and high numbers of hazel stands. There was also a significant negative association with high numbers of conifers. The presence of conifers is found to have a significant negative association with oak, wild privet, birch and blackthorn and a significant positive association with beech, honeysuckle and sycamore. Whilst I was carrying out this study I came to the conclusion that the knowledge of habitat requirements for dormice is extremely important in determining the appropriate management that needs to be carried out. The NDMP currently lacks an efficient way of collecting adequate habitat data but it remains an important tool for monitoring and providing information on the status of dormouse populations.

A study of the dormouse population in Midger Wood, by Williams et al. (2013) demonstrated the importance of testing the assumption of active nest-site selection explicitly rather than solely examining the factors that might cause non-randomness. If nest-site selection was random then researching habitat variables which may influence nest-site selection would be meaningless. The results of this study show that the dormice of Siccaridge Wood did actively select nest boxes. This therefore, rendered research into the relationship of dormice with their surrounding habitat relevant and worthwhile, as well as allowing for the comparison of the data collected in Siccaridge Wood with that of Midger Wood.

In Midger wood, no significant association was found between nest box occupancy and time (years), suggesting that this population had been relatively stable over the 16 year study period. In Siccaridge Wood, however, a significant negative correlation was found between the number of nest boxes that were occupied and time (years), indicating an overall decline in the use of nest boxes by dormice over the last 22 years. There are a number of possible reasons for this decline, one of which is that the

BELOW: Siccaridge Wood, Gloucestershire, has been an NDMP site since 1990. The average number of dormice found every year has shown a long-term decline.

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population of dormice in the wood has declined. A population decline could be caused directly or indirectly by elements relating to dormouse ecology. These factors may be abiotic - such as fluctuations in temperature, rainfall and hours of sunshine - or biotic - such as inter and intra specific competition, disease and predation. All of these factors effect the availability of feeding and nesting resources for the animals. In Siccaridge Wood however, this long-term trend is not evidence enough, by itself, to indicate such a population decline because nest box occupancy is not a true representative of woodland dormouse population. The nest boxes are located in three, small selected areas of the wood, rather than being randomly distributed throughout it. There is active woodland management outside the areas where the nest boxes are situated but not within them. So, there is the possibility that a population decline has occurred but we cannot be certain. If there is a decline, it seems unlikely that abiotic factors relating to climate would be a leading cause because there was no indication of a decline in dormouse nest box occupancy in Midger Wood, which is only 13 miles away and is a similar woodland habitat type to that of Siccaridge Wood.

A more plausible explanation for the cause of decline in the use of nest boxes is just that: the dormouse population in the wood have stopped inhabiting those particular areas that contain the nest boxes. This suggests that, in the last two decades, the immediate habitat surrounding the nest box locations has gone from a favourable condition, to an unfavourable condition for dormice.

Dormice require a habitat that has a structural diversity as well as a diversity of plant species whose flowering and fruiting will, in combination, provide a continuous food supply throughout the year. They will rarely travel further than 100m from their nest sites, which further complicates what constitutes a suitable habitat.

This study suggests that dormice select nest boxes based on a combination of factors, many of which pertain to the requirement of suitable habitat. It is necessary to employ appropriate management techniques in order to maintain favourable habitat conditions not only for dormice but also for other species such as butterflies, birds and invertebrates. There are various generic management strategies in place to maintain suitable habitat for dormouse populations (which are likely to apply equally to natural nests and nest boxes), however, there may be ways in which individual woodland strategies can be amended in order to improve the provision of suitable habitats. Adequate habitat data acquired in combination with the NDMP data can provide the information needed to put these practices in place.

In Siccaridge Wood one particularly interesting factor was the positive correlation between dormice and the proximity to a path which I believe occurred as a result of the fact that the majority of habitat management takes place directly adjacent to woodland paths.

Ruud Foppen

One suggestion I made for further investigation into the effects of current habitat management in this woodland, is to erect a number of new nest boxes in areas that have been recently coppiced, or where there is knowledge of the coppicing dates, so that we can compare the dormouse occupancy of those boxes to that of the boxes in the unmanaged areas of the woodland.

Alternatively, one of the nest box block areas could be coppiced whilst leaving the other two blocks unmanaged. This would also allow for a comparison of nest box occupancy with unmanaged areas of the woodland and therefore an investigation of the effects of coppicing on dormouse populations.

For the future I would recommend the development of a habitat survey which shows how the habitat at individual sites is changing is over time. This would allow for a more detailed comparison between dormouse numbers and habitat quality, as well as considerably improving the interpretation of population data, especially if they are gathered at the same time as the population data. The information that would need to be collected for a detailed habitat survey to be carried out would include accurate spatial management data (e.g. where and how boxes are placed, the type of management, the proximity of management to boxes, the years that management has taken place) for each monitoring scheme, every year. Regardless of the current limitations of the NDMP, this study has highlighted the importance of its role in informing dormouse conservation management decisions and in facilitating the understanding of dormouse habitat requirements in any woodland.

Gemma Western
MSc student
University of Bristol

Population genetics of hazel dormice in so

The scientific study of wildlife is essential for informing effective and efficient conservation practice. However, observing animals in the wild can, obviously, be extremely difficult and costly. This is especially the case for rare and cryptic species, such as the hazel dormouse. Therefore, the employment of various, indirect tools to investigate a variety of biological questions, is vital to conservation. As technology advances, modern techniques are making an increasingly important contribution to conservation biology, such as GPS tracking, stable isotope analysis and - the focus of my work - genetics.

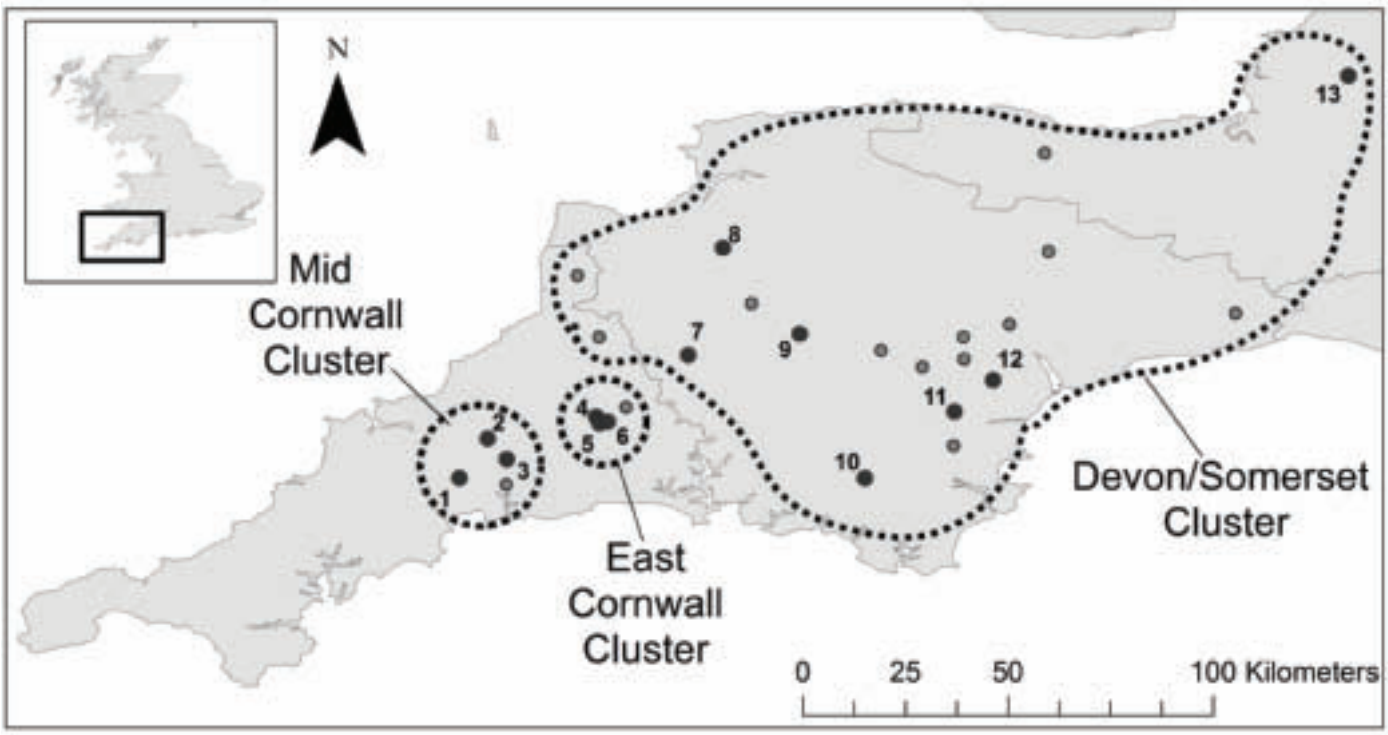
In this article I will report on the results of my population genetics research, which I undertook as part of a, now completed, PhD on the hazel dormouse. This was carried out at the University of Exeter, Cornwall Campus, under the supervision of Drs Dave Hodgson and Brendan Godley.

The hazel dormouse - with specialist habitat requirements, poor dispersal ability, and low reproductive potential, and low population densities compared to other small mammals - is particularly vulnerable to habitat loss, fragmentation and degradation. This is clearly of concern to dormouse conservationists, as comparably small, isolated, poor quality habitats will, in turn, support smaller populations of dormice. Such populations are clearly at increased risk of extinction, as a random event could simply wipe out the entire population. Additionally, these isolated habitat fragments are not easily recolonised and so, if extirpated of dormice, will more likely remain so into the future. Small populations may also suffer from a loss of genetic diversity, due to random evolutionary processes and inbreeding. Also of concern is that the impoverishment of genetic information in a population may reduce its ability to adapt to environmental changes in the future. Due to these concerns, genetic tools lend themselves particularly well to the study of ecological and evolutionary phenomena in wild dormouse populations, which will have important implications for dormouse persistence and conservation.

By collecting and analysing DNA, population geneticists investigate the genetic make-up (genotypes) of sampled individuals within a study area, in order to identify genetic similarities and differences amongst the group. The resulting dataset then provides information on population genetic patterns, such as defining the number and geographical distribution of distinct genetic populations in the study area. The data can then be used to analyse the level and direction of gene flow (a proxy for dispersal) between these different genetic populations. Those genetic populations that are isolated from each other, due to a dispersal barrier or habitat fragmentation, for example, will have low levels of gene flow and so show high genetic differentiation. The genetic "health" of the different genetic populations can be also investigated by calculating genetic diversity and levels of inbreeding within them.

All these results provide valuable information for ecologists and land managers that can inform best conservation practice. The identification of genetic populations that are at risk to extinction – those that are small, isolated populations with low genetic diversity - can be targeted for appropriate conservation management.

BELOW Figure 1. Geographical location of the three highest hierarchical genetic populations, as defined with no a priori spatial data by STRUCTURE analysis. The three clusters are encircled with dashed lines and labelled. The 13 populations (large black dots) with n>5 dormouse individuals samples are numbered (names not provided for confidentiality) and 14 populations with n≤5 (small grey dots) are not numbered.



uth west England

For example, populations which have been identified as isolated and/or have low genetic diversity may benefit from the construction of a dispersal corridor to increase gene flow and counter habitat fragmentation. This, however, must be undertaken in a manner that does not adversely affect the genetic make-up of the existing populations. Any populations that are significantly genetically distinct may confer special protection, as the resulting increased evolutionary potential may allow the species to better adapt and survive in the face of a changing environment. Therefore, conservation genetics results and applications need to be interpreted and implemented carefully.

In my study samples were collected from dormice across the south-west Peninsula of England, with samples from Cornwall, Devon and Somerset. I received the invaluable assistance of many volunteers to collect these samples, as I couldn't have done it alone – so much thanks to everyone! Primarily, DNA was obtained by very carefully plucking small clumps of hair from the rump of wild dormice, and then in the lab DNA was extracted from the few cells that are attached to the hair root, which is why the hair could not be simply cut. A pair of tweezers always seems safer and less precarious than a pair of scissors near a small mammal anyway! A genotype profile for each individual was determined from the DNA, and then the dataset comprising all sampled individuals was analysed.

The first stage in data analysis was to use the genotypes to identify the genetic population structure across the study site – in other words to see how many distinct genetic populations there were and what their spatial pattern was. This analysis is conducted using genetic data only, without any a priori information on geographical location of the individuals. The results indicated that there were three main distinct populations (or clusters) at the highest hierarchical level; a large cluster that spread across Devon and also included individuals sampled in west Somerset; and two much smaller clusters in east and mid Cornwall. (Figure 1). Within each of these three genetic clusters, there were further distinct genetic populations at a lower hierarchical level, and these also corresponded significantly to geography. The structuring of these genetic populations at both hierarchical levels was strong – indicating that there is little admixture (breeding between individuals from the separate populations). Whilst this pattern concurred with expectations, due to the low dispersal potential of the dormouse, the strength of the pattern was particularly striking.

Further analysis indicated that there was significantly more genetic differentiation amongst the populations in the mid Cornwall cluster, compared to those in the east Cornwall and Devon/ Somerset clusters, despite

ALL IMAGES LEO HENLEY-LOCK

Ruud Foppen

Population genetics of hazel dormice in so

the latter encompassing a significantly much larger geographical area. This highlights concerns for the dormouse populations in the mid Cornwall area, as the results indicate that they are likely to be highly isolated from each other, with little gene exchange, and thus at a greater risk of extinction.

Once the genetic population structure had been identified, the genetic data could also be used to compare the amount of genetic diversity amongst the genetic populations. This is of concern, as a low genetic diversity can indicate that the population is small and isolated, and possibly suffering from inbreeding; again highlighting any populations at increased risk. The measure of genetic diversity used was allelic richness – which is the total number of different gene types in the population. The results showed there was lower genetic diversity in the two clusters in Cornwall compared to the large Devon/Somerset cluster.

Further study and analysis is required (and underway) to determine the underlying cause of the identified pattern – as it could be due to a variety of historical and/or contemporary variables, which may or may not be driven by anthropogenic activities. For example, Cornish populations are likely to be isolated from those in Devon due to the River Tamar imposing a significant dispersal barrier to dormouse movement, but to what extent this is important needs to be quantified.

A conceivable explanation of the pattern of increased isolation and reduced genetic diversity in the more western populations in Cornwall, may be due to the suitable habitat being more fragmented and generally of lower quality compared to the habitat in Devon. Further study is needed to determine if this is true, and if so, quantify to what extent this is due to recent human activity. It is of note that historically dormice have been recorded in west Cornwall, but there are few recent records (despite myself conducting a full season of nest tube surveys with 1,000 tubes, at 20 sites in west Cornwall during the season of 2008 and not finding so much as one dormouse). This, along

The gentics study carried out by Cheryl Mills highlighted the importance of connectivity across the countryside.

outh west England cont.

with these genetic results, may be an indication of a contracting range from west to east. This study provides an important baseline in which to gauge potential future loss.

Whilst at this stage much care must be taken in interpreting the results, this study highlights some important considerations:

1. Clearly the Devon/ Somerset population has comparably high genetic diversity and gene flow, and as such should continue to be monitored and protected as an important area for dormice.

2. The Cornish populations are at a higher potential risk of extinction, as they are more genetically isolated and are of lower genetic diversity. There should be increased monitoring of Cornish populations to determine if these results are a sign of declining population sizes and increased habitat fragmentation/degradation. This is extremely important, not just for the Cornish populations, but also to monitor a potential range contraction that may be moving towards the core range in Devon.

3. Habitat management on a landscape scale is recommended to connect populations within Cornwall, such as by the construction of hedgerows. This would provide dispersal corridors as well as provide potential habitat in its own right, for dormice and other wildlife.

4. Conservation managers should be aware that Cornish populations may have evolved distinct genetic characteristics to adapt to their specific environment and so introducing animals from further afield, or connecting the landscape to the Devon populations, may not be beneficial, as these adaptive genes may be swamped out of the population.

Cheryl Mills

This research was funded by PTES and the Natural Environment Research Council (NERC), UK. The laboratory work was performed at the NERC Biomolecular Analysis Facility at the University of Sheffield. Samples were collected and stored under license from Natural England. We thank all the many dormouse volunteers for their invaluable help in collecting dormouse samples and Paignton Zoo for providing additional samples. I also thank my PhD supervisors, Drs Dave Hodgson and Brendan Godley.

PTES

Baby boomers: Investigating seasonal birt

As recently portrayed in the Hollywood movie *Contagion*, there is growing concern amongst scientists and the general population alike about the potential for new infections to be transmitted from wildlife to human populations. This concern has stimulated the use of mathematical models to help scientists understand the dynamics of infectious diseases within wildlife populations, and also the dynamics of 'spillover' from wildlife populations into human populations. However, one factor that has been largely ignored in these models to date, but is expected to be important, is the marked seasonality in life history traits and behaviour frequently observed in wildlife. For example, the timing of birth is usually tightly controlled by seasonal cycles in resource availability or climate.

This gap in understanding of wildlife disease dynamics motivated our study investigating the effect that a seasonal birth pulse might have on disease dynamics within wildlife populations, and whether species with birth pulses were more or less likely to be able to host a range of pathogens (e.g. viruses). While our project was largely looking at this problem from a theoretical standpoint, we required actual data to ensure that we used reasonable values to describe the characteristics of the birth pulse for our model. In addition to some published studies from a range of species, the People's Trust for Endangered Species kindly provided 10 years worth of data collected for the National Dormouse Monitoring Programme.

We analysed the nest box count data from over 350 sites over 10 years, and were able to tabulate the number of births occurring per month across all of the monitoring sites (Table 1). Plotting this data indicated a strong seasonal birth pulse in dormice, and an overall increase in annual

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Monthly total
Apr	0	0	0	0	0	0	1	0	1	1	3
May	0	0	2	19	12	4	26	10	10	5	88
Jun	5	37	17	93	26	128	81	64	110	80	641
Jul	75	106	105	250	48	148	74	128	239	270	1,443
Aug	100	153	182	139	151	247	333	274	325	456	2,360
Sep	180	186	252	375	214	656	686	466	716	779	4,510
Oct	69	58	65	147	87	330	199	187	314	577	2,033
Nov	0	0	0	1	2	3	3	2	5	13	29
Totals	**429**	**550**	**623**	**1,024**	**540**	**1,516**	**1,403**	**1,131**	**1,720**	**2,181**	

Table 1 Dormouse births recorded per month from 20012-2012 in the National Dormouse Monitoring Programme


Ruud Foppen

h pulses in dormice

births from 2001 to 2010 (Figures 1 & 2), though the latter was not corrected for observer effort. We were able to fit our model to this data and estimate that 95% of dormouse births occur within 4.5 months (which was a relatively 'wide' birth pulse compared to other species such as the Alaskan moose (*Alces alces*) in which 95% of births occur within 21 days).

It is well known that pathogens are more likely to persist in larger populations than smaller populations. The overall results from our study indicated that increased birth pulse synchrony (i.e. concentrating the births over a shorter time period) tends to decrease the probability that a pathogen will be able to persist within a population. In some cases the population size required to maintain a pathogen can even increase by a factor of 40 compared to having a constant birth rate (Figure 3).

These findings offer new insight into the relevance of seasonal birth pulses to wildlife disease, and specifically for the dormouse, indicate that the seasonal birth pulse that they experience means that fewer pathogens are able to persist within their populations than if they bred constantly throughout the year. Additionally, if anything were to extend the duration of their birthing season (for example, climate change), more pathogens might be able to persist within their populations.

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FIGURE 1 RIGHT: Dormouse births per month, 2001-2010.

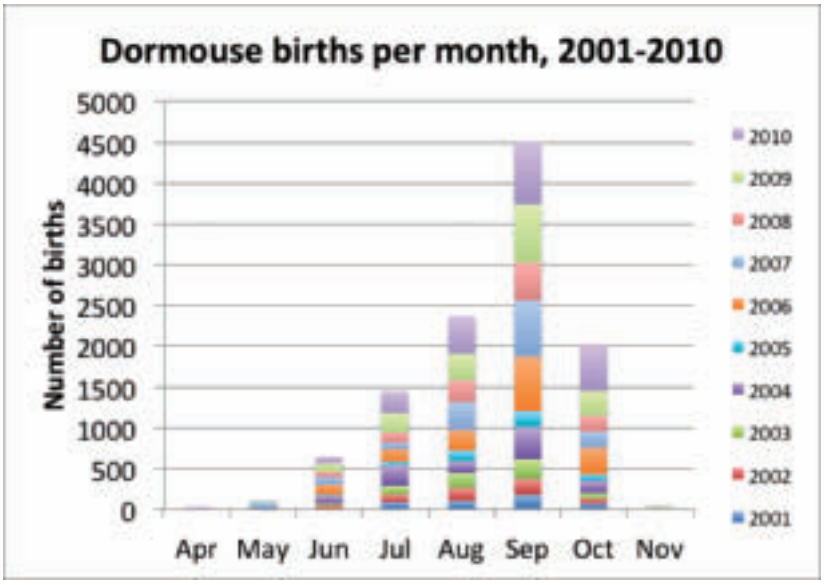


FIGURE 2 RIGHT: Dormouse births per year.

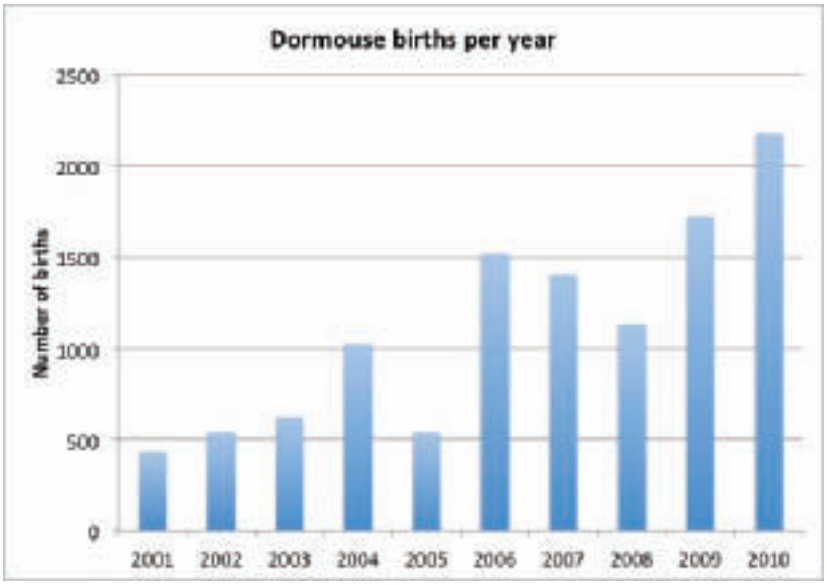
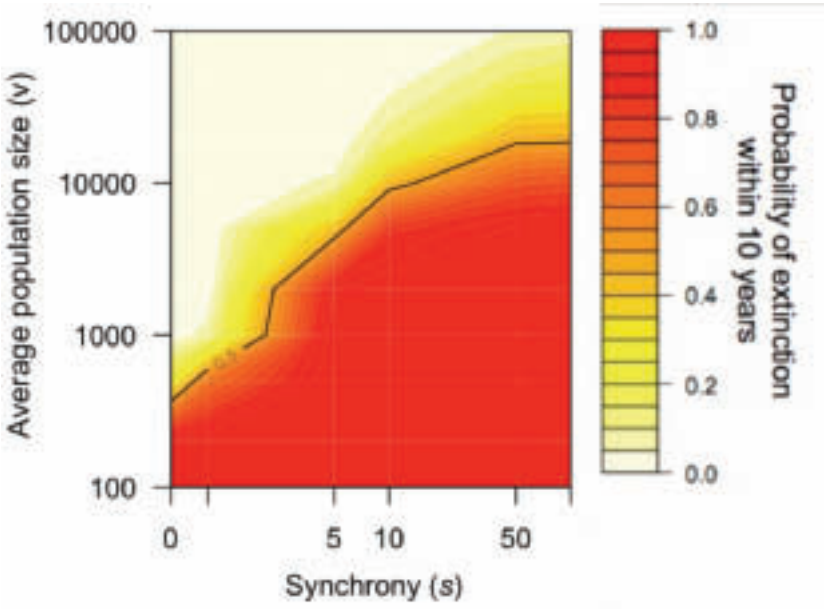


Figure 3: Effect of birth pulse synchrony on the persistence of infection, showing the probability of pathogen extinction within 10 years of introduction. The degree of birth pulse synchrony is shown on the x-axis, from 0 (constant births throughout the year) to 100 (representing 95% of births occurring within 33 days). The s-value for dormice is 7.



A Danish-German cross-border project to s

Biodiversity in cross-border corridors (BioGrenzKorr) is a EU-INTERREG 4A project across the Danish-German border. Habitat connectivity plays a vital role for the survival of small mammal species in a strongly fragmented landscape. The main project objective is to develop corridors in the matrix between woodlands and small habitats in the open landscape as well as corridors between habitats inside forests - focusing on the hazel dormouse, which has become rare and very isolated in the border region. Project areas were selected here and on the island of Funen. Relatively stable populations are found on Funen and approximately 100km south of the border.

The only recent evidence of hazel dormice on the whole Danish-German peninsula north of the Kiel Canal is in the forest of Gråsten directly north of the border. There is an urgent need to safeguard this population, as natural recolonisation from the Danish islands or the German mainland would be impossible. As our knowledge was poor at the the beginning of the project, a lot of questions had to be answered:

Are there still dormice? If yes, where and how many? An intensive monitoring programme had to be conducted in the project area in and near the known distribution of dormice in Southern Funen, Southern Jutland and Northern Schleswig-Holstein as a basis for a management plan.

Is this isolated population too genetically unique? One idea was – if necessary - to boost the local population by reintroducing other dormice, but the genetic status needed be clarified before that could happens.

Are core habitats still suitable? If necessary, habitat quality should be improved and habitat management methods within forests, specifically for dormouse conservation, should be tested.

Are core habitats connected well enough? The management and quality of hedgerows as habitats and connecting elements for the dormouse population should be safeguarded, improved or at least a discussion about their importance should be initiated.

Do landowners know and consider enough about what dormice need? Management guidelines, which are both ecologically and economically sustainable, should be developed and recommended.

Do the general public know enough about dormice? Awareness about the species and its conservation needs should be increased.

Monitoring was conducted in all three main project areas on both the German and Danish side of the border and on the Island of Funen .

In Germany 500 nest tubes were put

up in potential habitats south of the border. Though historical records were known, no animals were detected here. Additional searches for nests were also carried out but without success.

In Southern Jutland, prior to the project, there was recent evidence of dormice in two Danish forests directly north of the border. In order to gain more knowledge about the population status an intensive survey was initiated using more than 400 nest tubes and 100 nest boxes. Interestingly nest tubes have not been used in Danish dormouse monitoring before.

Disappointingly, the 400 nest tubes

Karsten Hviid, Naturama

upport the hazel dormouse

didn't reveal any signs of dormice. Again we carried out a search for free-hanging natural nests. Rewardingly, six nests – without any animals present - were found, including two breeding nests. This scant and scattered evidence of the hazel dormouse - despite an intensive survey effort – proves that the size of the remaining dormouse population on the southern Danish mainland must be extremely low. It must be emphasized here that the surveyed woodlands cover a large area (compared to other regions on the Danish-German peninsula) and that they represent a fairly good quality habitat for dormice.

On the Island of Funen we also put up nest tubes and confirmed the existence of a relatively stable and well-known population.

An important part of the project was to carry out habitat improvement. In the forests on both sides of the border, core habitats have been developed mainly by introducing a higher diversity of trees and shrubs, some of which are managed as coppice. The "green infrastructure" inside the forest was improved by developing habitat corridors along inner and outer forest edges. Methods included heavy thininng to allow more light to the forest floor in order to promote a more diverse flora including more bush species. This was sometimes combined with the planting of bushes, if possible allowing and encouraging the natural succession on the outside forest edges.

Planning and planting new hedgerows was another important objective aimed at creating connectivity between habitats. The situation relating to planting by land owners differs in Denmark and Germany.

Thomas B. Berg, Naturma

In Schleswig-Holstein hedgerows are protected by law. Therefore the incentives for planting new hedgerows are very limited. The farmers are not interested in locking land into hedges and then not being able to bring the land back into agricultural production. However, due to the regulation the network of hedges is probably denser compared to that in Denmark.

The project partners on Funen have worked with a local planting cooperative and its farmers in order to bring nature conservation into the planning and establishment of new hedgerows. Denmark has a long tradition of cooperative planting of hedgerows with a focus on cost effective planning and coordination and less on nature conservation. To raise awareness of the importance of corridors for connectivity between habitats was an important aspect of this work.

Also on Funen a demonstration area has been established for best practice of hedgerow management. It shows 2km of newly planted hedgerows improving the local hedgerow network. Work has also included the coppicing of 2km of older hedgerow in order to show how hedgerows develop after coppice management. Also a collection of the main 42 local bush and tree species found in the area serves as inspiration for farmers, hunters and others who want to plant up the open land.

One of the key project targets is a cross-border corridor between the Danish hazel dormouse population and a German population in order to link the two. It was originally the plan to establish a mirror population south of the border with animals originating from the northern population. But as the Danish population was too small, a new strategy had to be found. Together with Pat Morris and Sven Büchner the project group met with experts at PTES working on reintroductions in England. Additionally, after the 8th International Dormouse Conference in Görlitz, Germany, a joint project was set up with Alice Mouton (University of Liege), to clarify the genetic status of the Danish and German populations. Alice found a strong genetic relationship between the population on Funen and one big but isolated population in the centre of Schleswig-Holstein. Interestingly the two neighbouring main Schleswig-Holstein populations had a much weaker relationship with each other! Based on this new knowledge, animals were collected from these two related populations in order to initiate a breeding programme. And in the summer of 2013 the first litter of Danish-Derman dormice were born.

Mogens Krog & Bjorn Schulz

www.naturstyrelsen.dk
www.biogrenzkorr.dk
www.stiftungsland.de
www.biogrenzkorr.de

The main project work was carried out by Ehlers, Herty, Krog, Reimers, Schulz, Vilhelmsen.

BioGrenzKorr: A Danish-German INTERREG-project as an example for the cross-border conservation of hazel dormouse.

Time-share in the woods

One hundred and fifty hand-crafted, luxury, self-catering units have been discreetly sited in local woodland. Time share of these secluded, rural retreats with breathtaking scenery was arranged by private invitation only. Interest in these idyllic properties, for single or family occupancy, was overwhelming and they proved immensely popular with many different, even quite unexpected, residents seeking security and tranquillity in an area with good amenities.

I am, of course, talking about the dormouse nest boxes in Blackmoor Copse. This oak over hazel coppice wood, owned by Wiltshire Wildlife Trust, lies in South Wiltshire. The nest boxes have been monitored every year since 1990.

Apart from the delights of seeing rotund, torpid, pre-hibernation adult dormice; tiny, squeaky pink new-borns and sleek, lightning-fast juveniles; and also learning to recognise the differences between temporary overnight bachelor nests and magnificent, insulated breeding nests, we have peeked into the wonderful world of time-share.

The boxes of course have their entrance holes at the back to make access for dormice easier, and more difficult for tits, but no-one seems to have told the tits. By April some 20% of boxes have mossy nests, and up to 15 eggs. If a tit is on eggs or new chicks she often sits tight, peering up at us peering in through the opened lid, but her nerve may go at the last second and then she explodes out through the top of the box, petrified, yet terrifying to the human observer.

The entrance hole size favours occupancy by blue tits but we do see some great, and even marsh, tits. By May about 30-50% of boxes have mossy or feathered evidence of tit nesting. One area of the copse has a population of wrens who repeatedly nest in particular boxes, filling every last cubic inch with tightly-packed moss and dead leaves through May and June. After the bird-nesting season we usually try to discard all birds' nests but some have to stay because we find dormice have dropped off to sleep in one or they've built their honeysuckle nest on top. So, quite a lot of birds fledge successfully and our dormice don't seem to mind the timeshare principle.

What about creepy crawlies? Many boxes are home to numerous slugs, millipedes, woodlice and earwigs, with the occasional spider, centipede or even beetle. We once came across a failed tit brood, covered in brightly coloured sexton (burying) beetles.

Every May and June we gently probe box entrance holes with great trepidation in case there are bumble bees or hornets in residence. The bumble bees (often white-tailed in the past but more often tree bees these days) use loose moss or a bird's or dormouse nest and their angry, high-pitched whining buzz warns us to back off swiftly and leave well alone until they are good and ready to vacate.

Queen hornets build a tiny, delicate paper parasol, hanging from a box lid. Our inspections do seem to disturb some of them and they abandon the box, but others lay eggs and bring up a little group of workers before the colony moves (in July) to more spacious accommodation such as tree holes. This year was very strange because two hornet colonies stayed in their nest boxes, enlarging their paper nests until they overflowed out of the entrance hole and down through the drainage hole, like weird, anaemic monsters. We only realised that there were scores of hornets zipping in and out of the first box when a fellow monitor, Sarah, innocently went to inspect it as usual in July and ended up being pursued by angry hornets

A wood mouse occupying an old bird's nest, lined with moss, fur and feathers.

PTES

and then stung by one of them. We were more careful at the second box and gave both a very wide berth from August to October, watching the paper extensions grow and grow and the hornet traffic get busier and busier until, after a frost in November, all was silent and the paper carbuncles were broken and crumbling.

A number of boxes in favoured areas of the copse conceal roosting copper underwing and Svensson's copper underwing moths in August and September. These large moths roost, singly or in groups up to eight-strong, on the inside walls and suddenly drop to the box floor, feigning death, as we open the lid and let some light in. So, the boxes give shelter to masses of creepy crawlies and it may well be that dormice occasionally snack on some of them. Another successful timeshare!

Finally, what about mammals other than dormice? During winter we remove all nests, and repair boxes, and sometimes come across boxes stuffed full of caches of nice, plump acorns – storerooms for wood mice or their heavyweight cousins, the yellow-necked mice. Other boxes are full of dead oak leaves (mouse duvet) and reek of ammonia from the mouse wee inside and then we fight to NOT be the one who pokes the leaves to see if anyone is home. Friendly, big-eared, long-tailed wood mice may pop out but sometimes it's a gargantuan yellow-neck – big enough and mean enough to scare a grown dormouse monitor, and the size of a rat pup on steroids. We often try to sex them but don't usually weigh them as our jeweller's scales only go up to 50g and many are pretty close to that, especially in the autumn and winter. Wood mice are quiet, reserved and delicately hop away when released. Yellow-necks are more vicious and theatrical, with a tendency to bite, squeak as though being murdered, to outbounce Tigger when confined in a plastic bag, to burst out of the nest box like the Alien out of John Hurt's stomach and to leap away just like a red kangaroo. We all have an increased heart rate after a yellow-neck encounter! Wood mice and yellow-necks are found mostly between November to March, but they do also turn up in spring and summer. We usually find them in ones or twos but three or even four can sometimes share a box (extra scary). My favourite time-sharer is the pygmy shrew, a tiny brown, myopic, wobbly-nosed creature which eats for England to stay alive. Found hunting creepy crawlies, mainly from September to March, they don't seem afraid of humans. In fact, I'm not convinced they even notice us peering in at them as they viciously pounce, overpower and munch on some poor unsuspecting woodlouse. We have weighed a few shrews and they hardly registered on the scales, mostly 1 or 2g with one heavyweight of 4g.

Finally, it was very exciting indeed to discover a male long-eared bat roosting in one part of the copse three times. Could it be the same bat trying out boxes in his neck of the woods?

So 23 years of continuous monitoring of a large number of dormouse nest boxes has given us a lot of information about not only dormice but birds, insects and other small mammals, too. We now know that an intricate time-share goes on in the woods, on a grand scale, and we've also had a lot of fun learning about it.

Dr. Sue Walker, on behalf of the current Blackmoor Copse Team (Phil Smith, Tony Goddard, Mark Hill, Peter Docherty & Sue).

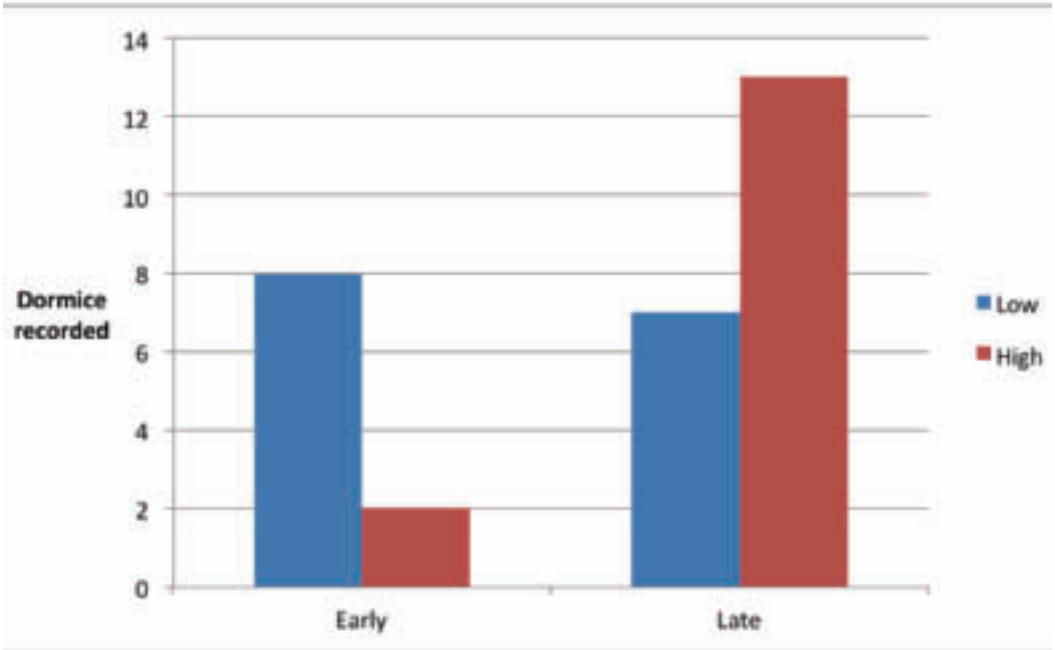
Pygmy shrews are also found in dormouse nest boxes.

Sorrel Renton-Green

Surveying for dormice in the woodland canopy

Being a professional arborist, a licensed dormouse handler and a student looking for a dissertation topic, it seemed logical to combine the three, and investigate the value of placing artificial nest tubes at heights not usually used to survey for dormice. Thanks to radio tracking studies published by Paul Bright and Pat Morris in the early 1990s, it has long been established that dormice are capable of using the entire canopy of a woodland during their active season and I wanted to establish whether or not there would be any advantage to ecological consultants or their clients in placing survey tubes higher in the canopy than is usually recommended.

Originally I planned to climb the trees using a rope and harness in order to place the tubes in the higher reaches of the canopy, but on reflection this was ruled out as I wanted the method to be repeatable for the average non tree-climbing dormouse surveyor or consultant. With this in mind I opted for my sturdy 6.7 metre ladder.



ABOVE: Graph 1. Seasonal difference in dormice using high tubes and dormice using low tubes.

All images Dave Smith & Haugh

The study took place in three separate Herefordshire woodlands in the summer of 2012. I put up an equal number of high tubes (between 5-7m) and low tubes (between 1-2m) in each wood. The tubes were set out at approximately 20m spacings as is usually recommended, but alternating high, then low. All three woods surveyed were known to support dormice and had ongoing NDMP schemes. The tube transects were placed in parts of the woods away from the box schemes, so as not to influence any results. In two of the woods I placed 100 tubes each, and in the third 86, giving a total of 286 tubes to check monthly, 143 high and 143 low.

The summer of 2012 turned out to be a very wet one and the results from the box schemes in these woods was considerably down compared to previous years. This seemed to be reflected in the results from the tube surveys with very low numbers of dormice being recorded each month.

A total of 30 dormouse nests were recorded throughout the summer across all three sites, which was far fewer than I had hoped to find. The nests were distributed evenly between the high and the low tubes with 15 in the high tubes and 15 in the low.

Despite there being no overall difference found between dormice using the tubes at different heights, further investigation revealed that there was a seasonal difference in the selection of tubes at different heights. This has been simply displayed in the graph above, where 'Early' is May-July and 'Late' is August-October (Graph 1).

The occurrence of dormice in the low tubes was fairly even throughout the year, with a slight peak in June and another in September. However, the distribution of nests in the high tubes

was different, with only two found in the early season and the remaining thirteen found in the late season, eight of these being recorded in October.

The total number of nests found between August and October was double that found between May and July. This can be attributed to the increase in occupancy of the high tubes.

Due to the low data set, and the number of uncontrollable variables in this type of experiment, it was difficult to draw any conclusions. However, if there was a need to prove presence of dormice quickly with a survey starting late in the season then these results would suggest that there would be an advantage in placing some tubes higher in the canopy. If no dormice were found this would not prove absence and a full season's survey would need to be continued the following spring.

Despite this survey being incredibly hard work at times, it was very rewarding and informative and increased my knowledge of dormice and other woodland fauna which I found occupying the tubes. I would like to thank the staff at the University of Worcester, all the woodland owners and managers, Swift Ecology and Herefordshire Mammal Group (HAM) who loaned me the tubes and last but not least, the small army of volunteers who gave up their time to help me with this project. If anyone would like a copy of the full results please feel free to contact me.

Dave Smith
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In memory of Edwin Johnson

Edwin Johnson, skilled woodcarver, carpenter and outstanding contributor to dormouse conservation in Somerset, sadly died in September 2013. He worked closely with the late Doug Woods to design the dormouse nest box which we all use today. He then spent his retirement making thousands of nest boxes for all kinds of mammals and birds, but his main interest was in dormice. He monitored dormice in Black Rock, near Cheddar Gorge, for many years, only retiring in 2007 when the steep slopes became too much for him. Donations rather than flowers were given at his funeral and these have gone towards dormouse conservation, as he would have wished. His kindness and wry humour will be very much missed by all who knew him. Janet Boyd.

The staff at PTES would like to send our sincere wishes and thoughts to Connie Johnson and all of Edwin's family for this kind gesture. Without the dedication and hard work of wonderful people like Edwin, the NDMP - and consequently our knowledge and conservation of dormice - would not be what it is today.

Hazel dormouse collages

Ian White, PTES' Dormouse Officer, spent a day teaching school children in Warwickshire about hazel dormice and the importance of preserving their habitat on a Natural England farm day. Here are some of the enchanting pictures they created.

Monitoring dormice at Rhos Cefn Bryn

Last year, 2012, was an exceptionally wet year with above average rainfall, which led to low numbers of dormice being recorded in the NDMP. We found just four adult males, four adult females, one juvenile male and two juvenile females. In June a failed brood of four young greys was found dead in a drainpipe nest box.

Spring came early this year with a mild spell in March. I undertook the first box check on the 9th March and there were both unoccupied wood mouse nests and evidence of possible dormouse hibernation emergence activity in one nest box.

The icy grip of winter reclaimed the mild early spring with plummeting temperatures. The prolonged winter freeze continued, not relenting until the very end of April. I think this set back the timing of flora and fauna activities by a month (maybe more) throughout 2013. However, I believe that for the local dormouse population, it proved to be a serious set back indeed. The early mild period in March would have encouraged dormice to emerge from hibernation, then the low temperatures and snow will have sent them back into hibernation. It is possible that many dormice, adults and juveniles, must have perished in the harsh conditions, due to depletion of body fat reserves.

In May we found our first juvenile male who weighed a respectable 21g, and in June a juvenile female of just 14g was found. We installed new nest boxes, supplied by PTES, in July and hoped for better results as the old ply boxes were wet inside and generally dilapidated.

In June, as the volunteer reserve warden, I conducted a walk and talk through the wood but we didn't see any dormice in the hot early afternoon although the marsh fritillary butterflies were flying in high numbers, which was absolutely magical!

This year's dormouse numbers in nest boxes have certainly been lower than those in wet 2012. It is an accepted fact that the natural population fluctuates but I am concerned that a localised dormouse population crash occurred in April…

On Saturday 19th October we began to notice dormouse nests of poor construction with whole loose leaves in quite a few nest boxes. I commented that it was probably juvenile activity from late breeding, and thankfully I was proved to be correct!

We went on to record three maternity nests containing mothers and juveniles and a total of thirteen dormice. The breeding must have occurred in natural nest sites, and then the females moved their pups to nests in the boxes. Late breeding at Rhos Cefn Bryn saves the day!

Richard Pond

Ann Weddle

ABOVE: Dormouse nests confirm the animals' presence at a site even if the animals themselves aren't found.

BELOW: Monitors at Rhos Cefn Bryn are delighted to find a dormouse.

Richard Pond

9th International Dormouse Conference 2014

The next International Dormouse conference will be hosted by Denmark in September 2014. The hazel dormouse is the only representative of the Gliridae family in Denmark. On the southern part of the central Island of Funen, a relatively stable population occurs, whereas populations on Zealand and in southern Jutland are small and very isolated. The conference will take place on southern Funen close to known hazel dormouse habitats and several project areas.

Svendborg is the host town, a picturesque harbour town in the southeastern corner of Funen. A lot of information is available about the city - in English and German - at www.visitsvendborg.com/ln-int/svendborg/visitsydfyn.

The venue will be the Naturama: the Museum of Natural History, a modern museum with dynamic and interactive displays. There is a café and a shop, as well as a conference room where all the talks and discussions will take place. Please read more about it at www.naturama.dk

The museum is situated in the city centre, in convenient walking distance to the station and several hotels and hostels. Travellers can reach Svendborg by train from Odense. There are regular train connections from the international airport in Copenhagen to Odense where you can get a train to Svendborg. (Copenhagen is 170km from Svendborg). Or alternatively you can fly to the international airport in Billund (Billund is 143km from Svendborg). We can organise lifts for you, if needs be. A post-conference excursion will be offered to

Karsten Hviid, Naturama

The Wadden Sea in south western Jutland.

Please register you interest and sign up to the mailing list by contacting tbb@naturama.dk. If you would like to present a paper or a poster at the conference please let us know. The conference has its own website where you will find more information. www.dormouseconference.net

We are looking forward to seeing you in Denmark. Best regards, Dormouse Conference 2014 Organising committee.

Dormouse monitoring 2013: UK conference

And finally, a big thank you to all of those who came to our November 2013 UK conference in celebration of the NDMP. The hundreds of sites and thousands of volunteers who monitor them monthly across of the UK are the envy of our European and worldwide colleagues. So to celebrate the huge efforts that you all commit to dormouse monitoring and conservation we were delighted to host 200 monitors for the day at the University of Reading.

We had a wonderful panel of speakers covering a variety of topics such as managing volunteers, co-ordinating the NDMP on a county level, coppicing management at a release site, taking domice into consideration in conifer woodlands, and of course a look at how it all began by Dr Pat Morris.

There were several stands and posters to spark discussion and enliven the day. New nest box models were on display and The Woodland Trust gave away free hazel saplings to all the delegates.

For those of you unable to make it, we hope to put videos of the talks up on the PTES website, And please try to make the Danish conference next year instead.

Nida Al Fulaij

PTES