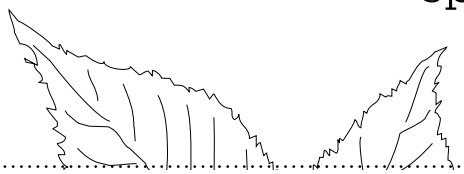
The Dormouse Monitor

SUMMER 2016

people's trust for endangered species



Do dormice use ultrasound to communicate?

A team of researchers investigated why hazel dormice use acoustics to communicate.

Tracking dormice Livia Haag & Regula Tester have been trialling footprint tracking tunnels to detect hazel dormice in Switzerland.

Dormice in Nottinghamshire Following three successive releases to the county we learn how hazel dormice are faring there now.

Learn more about dormice Jo Makin reports on the PTES training days being held annually on the Isle of Wight - come and gain plenty of hands on experience.

In this issue

Welcome

In this issue we take a look at a new method of detecting whether hazel dormice are present or not. Livia Haag and her colleagues in Switzerland have been trialling footprint tracking tunnels. Livia explains how they tested the method and how you can too.

Ian White reports on what the data from 2015 tells us about how the national population is faring. Unfortunately the decline continues. We have, however, three research projects underway that will hopefully shed some light on the ciritical combination of factors that impact dormice and what we can do to mitigate for them.

We also detail a study into ultrasonic communication and how and why hazel dormice might be using it. For a species that lives at low densities. predominantly in the trees and is active at night, this type of communication might be critical for them.

Nida Al-Fulaij & Susan Sharafi

Editorial team: Nida Al-Fulaij, Susan Sharafi, Zoe Roden
Illustrations: Hayley Cove
Print: 4-Print

Cover image: Hugh Clark

Contact us
The Dormouse Monitor
3 Cloisters House
8 Battersea Park Road
London SW8 4BG

www.ptes.org
enquiries@ptes.org
020 7498 4533

facebook.com/ptes.org
twitter.com/PTES

people's trust for endangered species

Hazel dormice back in Nottinghamshire

To date there have been three dormouse releases in the county of Nottinghamshire. Here Lorna Griffiths reports on the results of the dormouse box checks carried out during 2015.

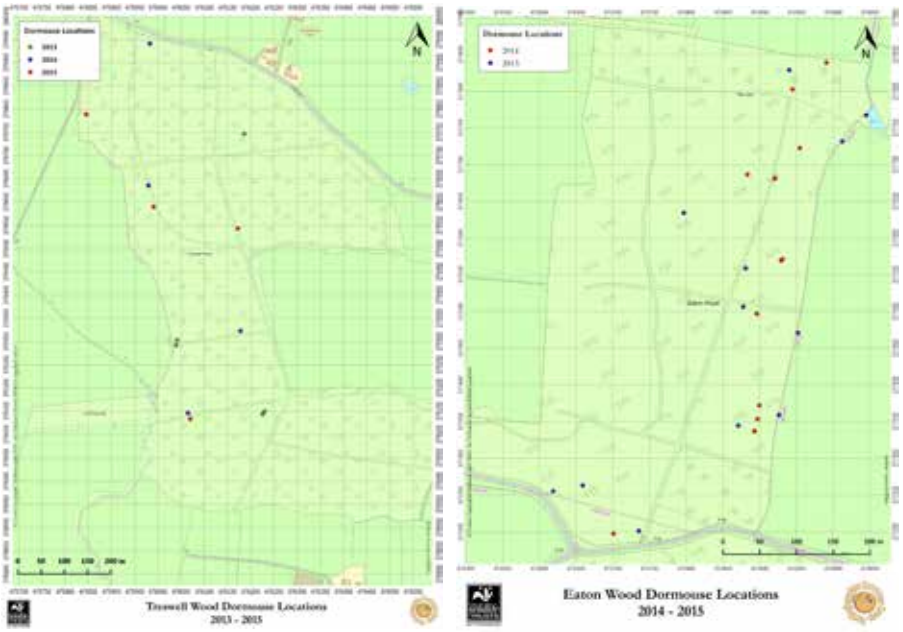
Historically hazel dormouse were found in Nottinghamshire, but over the last century they vanished from the county, as they did from many counties in the midlands and north of England. As part of the species recovery programme, PTES has been working with partners since the 1990s in a bid to return the species to those areas from which they have been lost.

Twenty years ago there was an attempt to return dormice to Nottinghamshire when a population of dormice was released in Treswell Wood. Unfortunately, the release was not successful. Although the woodland was chosen carefully and the local volunteers were ready and willing, the population did not take hold.

Historically dormice were found throughout Nottinghamshire

So in 2013 it was agreed that it was time to try again. A population of captive-bred hazel dormice was released in the summer, followed in 2014 with a further release of animals in nearby Eaton Wood and in 2015 with a third release in neighbouring Gamston Wood. The idea is that the three closely sited populations will stand a better chance of success. There is a plan to ensure that all three woodlands are well-connected with species-rich hedgerows. This will enable animals to move between populations, preventing genetic isolation.

Last year, in 2015, a total of 46 hazel dormice were recorded during the box checks at all three sites. Encouragingly at Eaton Wood, of the 14 animals found, ten were young born at the site whilst four original animals were also recorded a year after they were released. Six animals were found at Treswell Wood: three males and three females, all unchipped. And at Gamston, the wood where the 2015 release took place, 26 animals were recorded, 21 of which were young born at the site.



Chambers Farm Wood Dormouse Group

Returning hazel dormice to Yorkshire

Ian White, PTES Dormouse Officer, led a team of zoo keepers, willing volunteers and YDNPA staff whilst carrying out the 26th dormouse release in the UK.

This June saw the release of 38 hazel dormice into a secret woodland location near Aysgarth Falls in Yorkshire. The release marks the culmination of weeks of work by all of the partners involved in the different stages of the reintroduction process, which include the Yorkshire Dales National Park Authority, Paignton Zoo, Natural England, the Zoological Society of London, the Common Dormouse Captive Breeders Group, and the Bolton Estate.

This year marks the 26th dormouse reintroduction led by PTES, with more than 750 dormice released at 19 different sites across 12 English counties over the last two decades. The dormice that were released were captive bred by members of the Common Dormouse Captive Breeders Group. Prior to release, the dormice underwent a six-week quarantine at Paignton Zoo in Devon and the Zoological Society of London (ZSL), during which vets conducted a full health examination to check they were in top condition and reduce the risk of them passing on any non-native diseases, ensuring they have the best chance of forming a healthy population in the wild.

38 hazel dormice were released into a woodland near Aysgarth

Following the health checks, the dormice were released on-site in breeding pairs or trios in their own wooden nest box fitted inside a mesh cage secured to trees. The mesh cages, filled with food and water, helped the dormice adjust to their new home in the wild. The cages are eventually removed once the animals have settled into the wood.

Once a familiar sight throughout much of England and Wales, over the past 100 years dormice have suffered from the loss of woodlands and hedgerows, as well as changes to traditional countryside management practices. As a result, and as part of the Species Action Plan, PTES has been working with partners for many years in a bid to return populations of dormice to parts of England from where they had previously become extinct. Part of that plan

is to group populations in these areas to give them a more robust chance of establishing themselves across counties. The reintroduction follows a similar event in 2008, when dormice were returned to a nearby woodland after a century's absence from the Yorkshire Dales. Ian White, Dormouse Officer at PTES, explained that, "The two reintroduction sites are close enough that the separate dormice populations will eventually be able to meet up and breed, creating a self-sustaining population. In addition, the programme of habitat management in the area will have great benefits for a number of other species too such as birds and bats."

Ian Court, the National Park Authority's Wildlife Conservation Officer, adds: "It is fantastic that we are undertaking this additional release that will help build on the original successful reintroduction in the heart of Wensleydale.

"We look forward to working with landowners and managers to help create a network of managed hedgerows and woodlands within the lower Wensleydale area that will look to re-establish a species back into the Yorkshire Dales that has been missing for many generations."

Susannah Penn & YDNPA

Tracking tubes to detect dormice - a case study from Switzerland

Livia Haag and Regula Tester have been testing whether they can effectively use footprint tracking tubes to detemine whether hazel dormice are present in an area or not. Here they describe how they went about it.

Switzerland lacks the long tradition of dormouse conservation known in the UK. Information about the distribution of the dormouse in Switzerland was and partly still is quite scarce. Therefore, the national conservation organisation "Pro Natura" launched a Great Nut Hunt in 2010 where some valuable data was gathered. In order to update the red list of mammals in Switzerland, Simon Capt from the CSCF (Centre Suisse de Cartographie de la Faune) organized a nationwide mammal monitoring event using wooden tracking tubes. This method was known to work well for mustelids like weasels and martens. Soon he discovered that dormice were also using the tracking tubes when they were set up in bushes instead of being placed on the ground. Hazel dormice, edible dormice and garden dormice all left footprints and valuable new information about their distribution.

Since wooden tracking tubes are quite big, heavy and comparably expensive we decided to simplify, optimize and customize this monitoring method using smaller lighter tubes made of old milk and juice cartons (Tetra Paks). In 2013 we set out to test if our self-made tracking tubes worked as well as the proven wooden ones. We hung up 20 Tetra Pak and five wooden tubes each on four different sites. The tubes were checked weekly for footprints and if necessary the tracking paper was changed and the inkpad wetted.

After three weeks we had tracks from hazel dormice

We were very happy to discover that our Tetra Pak tubes worked as well as the wooden ones. After three weeks we had tracks from hazel dormice in three locations and after seven weeks we had positive results from all sites. Since it was much easier to hang up Tetra Pak tubes instead of the heavy wooden tracking tubes – not only because Tetra Pak tubes are easily self made and cheap, but also because it was hard to find shrubs big and stable enough to sustain a wooden tube – we had many more Tetra Pak tubes than wooden tubes in the woods.

We learned that we could gain presence/absence data on hazel dormice much more quickly with a higher number and a greater density of tubes. We were unable to determine a minimum density and a minimum number of weekly controls to gain a 99% certainty level for presence/absence data. But with a density of 25 tubes per location and positive results from three quarters of all sites after three weeks we assume the method to be efficient. During the study period all sites were checked for gnawed hazelnuts too. Interestingly,

Hugh Clark

because 2013 was a year with very scarce hazelnut production in Switzerland, we found no signs of gnawed hazelnuts at any of the sites.

So we were encouraged to use Tetra Pak tubes to detect dormice in various contexts and on different sites over the following two years. We initiated a conservation project in 2013. Together with the local forestry department we manage a site specifically for dormice. The site is made up of different patches of woody habitat like conifer plantations, mixed and deciduous woodland. It also includes patches of dense shrub, ideal for the dormice.

Interestingly we found no evidence of gnawed nuts at any of the sites

After a preliminary search for dormouse footprints in previous years, in 2015 we drew a 25m^2 grid of the whole site and placed one tube in each square. This time we used 80 plastic tunnels (the kind used for nest tubes) inserting a tracking board with inkpad and paper instead of the wooden board. The tubes were put up in mid-May and checked twice, after one week and again after two weeks. During the second check we were very happy to find hazel dormouse tracks in over 40% of the tunnels! During the same check we replaced the tracking board with the wooden board and herewith changed the tracking tubes into nest tubes. The nest tubes were checked twice over the summer and at the end of August we changed them back into tracking tubes. We found nests in about 9% of the tubes. The tracking tubes were again checked twice and tracks were found in about 25%.

Our findings of tracks and nests correspond with our estimation of the woodland concerning the habitat quality for dormice. In patches where we considered the wood to be good for dormice, we found tracks in spring and autumn as well as nests in summer. In locations where we assumed the wood to be suitable but not very good, we found tracks in spring and a few in autumn, but no nests. In our conifer plantations hazel dormice neither left tracks nor built nests. With this method we can determine in which patches we need to increase habitat quality. We hope to be able to show in a few years that the new habitat management has turned unsuitable patches in good dormouse woods!

Tracking tubes are also a brilliant tool for educational purposes. Primary school classes built Tetra Pak tubes and hung them out in the woods close to their schools. Tracking tube checks can be very exciting and many children were thrilled to discover footprints of mice, birds and dormice in their very own tubes. The search for footprints is an excellent opportunity to teach children about their own surroundings, showing them which habitats are close to nature and rich in biodiversity and which are less so.

The work with tracking tubes is also suitable for high school classes. In groups the students learnt how to conduct a small research project on their own including field work, data evaluation and the design of posters or the writing up of short papers.

Tracking tunnels have not only been used by school children and students, but also by local conservation groups and other interested people. Since tracking paper with footprints can easily be sent to an expert for verification, everybody can use this method to detect dormice without any specific training. New findings of dormice by local conservation groups are very valuable since these groups often know local landowners and foresters. Therefore, they have the ideal background to implement new conservation measures for the local hazel dormouse population and to create awareness about this little endangered creature, which lives close-by in the local woods, needs our protection.

We are very glad, that we could achieve our aims to...

Simplify – Tetra Pak tubes are easily built out of a waste product at very low costs

Optimize – the light tubes can be positioned on small branches and put out in the field in high numbers

Customize – Tetra Pak tubes can easily be made and handled by school children and people without training

...the survey method of using wooden tracking tubes to detect dormice.

And we are happy to see that the method is now being used in various contexts including Citizen Science Projects.

Tracking tubes to detect dormice Switzerland, continued

How to build Tetra Pak tubes

Tube:
Take two washed milk or juice cartons and cut them open at both ends. Cut one carton slightly open at one end and put this carton over the end of the other one. Tape them together. Cut two rectangles (about 10cm x 18cm) out of a plastic sheet and fix them with tape on either end of the tube. The rectangles form rain shields.

Tracking board:
Out of a third Tetra Pak cut a tracking board that is the same length and width as the tube (tape two pieces together). Take a cleaning rag (e.g. something made of 80% viscose and 20% polypropylene) and cut out a piece 5cm x 8cm. Fix it in the middle of the board using glue. Apply plenty of glue around the edges of the rag. The rag will be used as an ink-pad and the ink should not flow out of the rag. Alternatively you can also use a small vessel. Glue it on the board and fill it with a cleaning rag.

Ink:
Ingredients: *80g Ferrum(III)-Nonahydrat, 120g Makrogol (= Polyethylenglycol 300/400), 40g Nonidet P40 Substitut (or 40g dishwashing detergent), 30g water.* Warm the chemicals slowly stirring continuously until the mixture is homogeneous. Cool it down and store it with an open lid. Gases can be formed during the storage of the ink. If you close the lid, the inkbottle may burst.

The ink and tracking paper are made following a recipe from King, C.M. & Edgar, R. (1977). *Techniques for trapping and tracking stoats* (Mustela erminea); *a review, and a new system.* New Zealand Journal of Zoology, 4 (2), S. 193-212

Tracking paper:
Ingredients: 25g Tannin, 1l Alcohol 63% and paper

Mix tannin and alcohol together and put it in a flat vessel. Dunk paper in the mixture and hang it on a washing line to dry. If you use DIN A4-paper, cut it in 8 pieces (5,25cm x 14,85cm).

Alternative ink mix

- Mix one part black poster paint powder with two parts vegetable oil (e.g. sunflower oil), so it forms a smooth black ink. This is safe for mammals to lick off their paws, and stays damp for several nights. One teaspoon of powder and two of oil will be enough for your tunnel for several nights. If you make up more than that, keep the excess in a sealed jar until you need it.
- Place two sheets of paper at either enf of the tracking plate.
- Put two strips of masking tape across the tracking plate, just after the end of each sheet of paper.
- Apply a layer of 'ink' to the two strips of masking tape.
- If needed place bait in the centre of the plate to entice visitors.

The rag is used as an inkpad and needs to be glued securely around the edges

By using a higher number and density of tracking tubes we gained better results

- a case study from

Using Tetra Pak tubes in the field

Fix the tube with tape or cable tie above or below branches at a height of about 1-1m. Take care that the rain shields do not prevent animals from entering the tube. Wet the inkpad with water. Then apply some ink and spread it evenly over the pad using a knife or a scraper. Fix tracking paper on either side of the inkpad using paper clips. Finally insert the tracking board into the tube and fix it once again with paper clips.

We recommend checking the tubes weekly. Our experience shows that under hot conditions the inkpad dries out within a week and under wet conditions the tracking paper can turn black from too many tracks, if you leave them in the field for two or more weeks. If you have too many tracks, the footprints become hard to read. Sometimes snails like to eat the tracking paper in rainy weeks.

If you don't get any positive results sooner, we recommend leaving the tubes in the field over a period of at least 4 to 6 weeks.

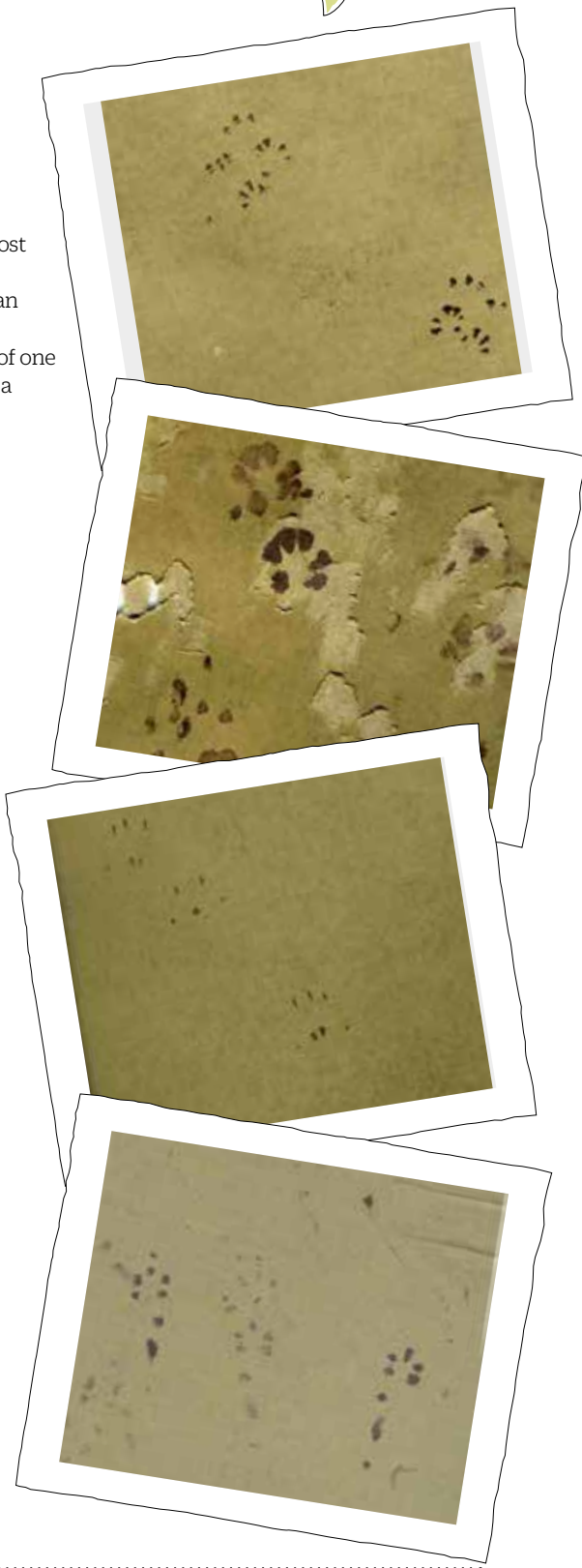
Who left their footprints?

Hazel dormouse (*Muscardinus avellanarius*)
Footprint characteristics:
- triangular palmar/plantar pads
- normally no print of the sternmost palmar pad
- palmar pads form a ¾-circle (or an upside down "L"-Shape)
- often split digital pads (instead of one print per digital pad, you can see a bigger and a smaller one)
- entire footprint about 8mm

Fat dormouse (*Glis glis*)
Footprint characteristics:
- drop shaped palmar/plantar pads
- entire footprint bigger than 1cm

Mice (various species)
Footprint characteristics:
- prints of pads shaped as dots
- digital and palmar pads of the forepaw are arranged in equilateral triangles
- entire footprint smaller than 1cm

Birds (various species)
Footprint characteristics:
- footprints only rarely shown entirely
- mostly only recognizable as lines sometimes with circular structures on top (digital joint)
- entire footprint often longer than 2cm



Training days on the Isle of Wight

Jo Makin travelled down to the Isle of Wight to help Ian White from PTES run his annual dormouse training courses, and reports back on how successful they were.

PTES ran two Dormouse Ecology, Conservation and Habitat management courses last autumn at their reserve Briddlesford on the Isle of Wight. The three day long courses ran during September and October. Ian White, PTES' Dormouse Officer ran the courses and I was there to help out. The courses are primarily aimed at consultants who require an understanding of the ecology, conservation and legislation of hazel dormice. Each course was attended by six people.

Monday

We met at the Black Hut in Sandpit Copse at the Briddlesford Reserve where the course was based. After introductions, the morning started with lectures on dormouse ecology and conservation. Over lunch we studied chewed hazelnuts, and learnt how to identify whether a hazelnut has been opened by a dormouse, a wood mouse, a bank vole or a squirrel. This was followed by a trip into the nearby hazel copse to practise the dormouse nut search methodology, where some great examples of dormouse chewed nuts were found under the masting hazel. Whilst in the copse we also practiced the placement and set up of dormouse nest boxes and nest tubes which had been covered earlier in the lectures.

That afternoon we ventured to Stocker's Hole within the Briddlesford Estate to practice checking dormouse nest boxes. The Isle of Wight is a stronghold for hazel dormice and Briddlesford is currently only one of two sites on the island where dormice are being regularly monitored. There are approximately 560 dormouse boxes at Briddlesford Woods that form two NDMP sites. In addition there are a further 80 boxes sited in the wood that are being used for training purposes, so a huge opportunity to practice checking boxes!

Working in pairs, we approached the boxes quietly with our bungs in hand. The entrance holes to the boxes were bunged to ensure that no animals escaped whilst we checked whether anything was using the boxes. The lids were carefully opened and we looked for evidence of nesting dormice. Boxes were gently taken off the trees and placed into large weighing bags where dormouse nests and the animals themselves were found. By the first afternoon we were lucky to have seen several dormouse nests and dormice too.

Tuesday

The second day of the course began with lectures and discussions regarding woodland management and its potential impact upon dormouse populations. We also studied the different types of dormouse survey tools available and how to successfully monitor the species, before heading out to the first of a range of different sites. The variety of sites we visited helped highlight the broad range of woodland types that hazel dormice are found in and the different types of management that are undertaken and need to take this European protected species into account.

The first site that we visited was Haseley Wood, a young plantation. Haseley was a good example of how to set up a regular monitoring site as it has only recently become part of the NDMP. It was also a chance to see how habitat creation and management can be targeted to benefit hazel dormice. We worked in pairs again to check the boxes and there were plenty of opportunities for people to begin training for their dormouse licences and practice handling dormice. Where nests were found we examined their material and structure in detail to determine whether the nests were those of dormice or other species. Tightly woven structures and green leaves were

good signs of a dormouse nests. The nests were inspected by gently placing a finger in the corners of the box around the nest and within the nest chamber, whilst not destroying the integrity of the nest itself. Where adult dormice were present, the participants practised handling dormice, transferring them between hands and sexing them.

That afternoon we paid a visit to Firestone Copse, a Forestry Commission site, which is a woodland dominated by scots pine with areas of scrub understory. Here we found a group of pinks as well as adult dormice, which gave everyone the opportunity to learn and discuss how to check boxes with young present. It was important to work quickly to count the minimum number of pinks, so as to cause the least disturbance to them, and all the course participants had the opportunity to work with this life stage.

Wednesday

The final day began with lectures covering the licensing procedure and the

requirements to obtain a disturbance licence and a mitigation licence and the difference between them. The rest of the day was spent checking dormouse boxes to maximise the opportunity for handling practice before the end of the course. This time we checked the dormouse boxes at Great Copse in the Briddlesford Estate, part of the Briddlesford Wood SSSI. In the practical session the participants were given the opportunity to work more independently and demonstrate what they had learnt. Everyone had a chance to handle dormice in different life stages and the number of dormice we found in each box varied, offering a chance to practice working with multiple individuals.

The day and the course were both concluded with a meeting at the Black Hut, where we had a small quiz and the opportunity to ask any further questions. There was a lot of discussion about dormouse handling, ecology and conservation and the participants appeared confident as a result of the experience they had gained. Overall, the course was a huge success with all who attended gaining a better understanding of hazel dormice and how best to work with their conservation in mind. Thank you to all those who came,

Dormouse ecology courses

For more information about the various courses running this year and next, as well as dates and prices, please visit www.ptes.org/dormouse.

Hazel dormouse winter nests

Paul Chanin, a Devonshire ecologist, put out a request on the dormouse forum for records of dormouse hibernation nests. Here, he describes what he discovered.

Following a request to members of the NDMP for any records they might have gathered of hazel dormouse hibernation nests, I received replies from several monitors. Many of them filled in a brief questionnaire providing information on where and when the hibernation nests had been found. I deliberately left the questions open-ended to allow for personal descriptions although in my analysis some simplification has occurred to facilitate summarising.

I received 37 records, most of which (25) came from the period 2012-2014. Only three records were from pre-2007, two of which were from the 1990s and one of uncertain date. Hibernating dormice were recorded in their nests in all months from November through to April. All but four nests were recorded in counties south of the Thames catchment. One of those was from Gloucestershire and three from Carmarthenshire.

Twenty three nests were found during systematic surveys in connection with development or land management. It is important to note that these are more likely to include concealed nests than those found accidentally, which will be biased towards more conspicuous sites. Some of the systematic surveys were connected with road works, which will lead to a bias towards roadside habitats.

Twenty two of the nests were occupied by hazel dormice and possibly one other which was not investigated closely so as to minimise disturbance. Identification of unoccupied nests was based on prior experience.

Most nests (15) were found in deciduous woods, with the rest being found in coppice (4), grass verge and molinia tussock (5),

PTES

Surrounding habitat	Ground cover	Nest concealment
Clearing in scrub	Ivy, leaves	Not very well concealed (saw it from 5m away
Deciduous woodland	Leaves, moss, exposed tree roots, bluebell leaves emerging	None, it appeared to have rolled down from the tree roots.
Deciduous woodland	Leaves, moss, ivy	Rolled out from shallow hollow
Deciduous woodland	Bracken and grass	Very little nest material - fur was visible
Grass verge	Grass- some Ivy	Edge of grass/ in a slight hollow
Hedge	Moss, leaves & ivy on the bank	None
Sweet chestnut coppice	Ivy with dog's mercury	Nest in open ground not in one of the stools

LEFT: Table 1. Unconcealed nests locations and surrounding habitat.

BELOW: Table 2. Concealed nests locations and habitat.

hedges (5), blackthorn, hawthorm, bramble and gorse scrub (6) and a garden (1). One other nest was recorded in an area with a mosaic of habitats including woodland, scrub, hedgerows, bramble and marshy grassland most of which are dominated by or contain Molinia.

Eleven nests were found on flat ground, 26 on a slope. The risk of flooding was assessed as none in 28 cases and as unlikely, low or very low at eight. One site was described as 'very wet' but the nest was above surface water in a Molinia tussock. One other site was dry but described as being very vulnerable to spray from the adjacent trunk road.

As would be expected in the habitats described the ground cover included fallen leaves (including gorse needles), grass, forbs, ivy, and moss.

I probably should have been more explicit here and asked 'How well concealed was it'? Based on the descriptions given, I concluded that seven (19%) were not concealed and 30 were. Predictably, the majority of concealed nests (22) were found by people carrying out systematic surveys.

Two of the seven unconcealed nests were occupied, whereas 20 of the concealed ones were. This might be taken to indicate

Surrounding habitat	Ground cover	Nest concealment
Blackthorn and scrub	Leaves	Ivy covered hollow at base of hawthorn
Bramble Scrub (2 occurrences)	Bramble and Ivy	-
Bramble scrub	Bramble and ivy	Just below surface of leaf litter
Deciduous woodland	Grass	Grass nest within long grass habitat
Deciduous woodland	Bracken and grass	Under bracken
Deciduous woodland in central reservation	Leaf litter	Under leaves
Deciduous woodland with coppice	Leaves on otherwise mostly bare ground	Yes inside the cavities of big old coppice stools
Gorse scrub	Gorse needles	Middle of gorse bush
Grass verge	Frequently mowed grass	Pile of cut grass
Grassland	Grassland	In Molinia tussock
Grassy roadside verge	Grass, forbs, madder	Woven into underside of madder
Hazel coppice (2 occurrences)	Leaves	Base of hazel
Hazel hedge	Ivy and moss	Under moss
Hedgerow	Leaves and ivy	Quite deep underneath leaf litter
Hedgerow	Leaves, some moss	Leaves
Large stand of bamboo In ornamental garden	Leaf cover from nearby trees but not over nest.	Amongst roots/base of bamboo
Mixed roadside woodland	Ivy, leaf litter	Leaf litter
Mixed roadside woodland (6 occurrences)	Moss/ivy/leaf litter	Moss
Molinia grassland	Molinia grass	In a Molinia tussock
Mosaic, dominated by Molinia: woodland, scrub, hedgerows, bramble and marshy grassland	un-grazed marshy grassland with Molinia	Deep within a Molinia tussock
Planted roadside woodland	Moss, leaf litter, bramble	Well hidden
Planted roadside woodland	Ivy mostly	Moss and ivy
Tree guards within a thick hedge	Leaves, grass, ivy, moss etc	Well hidden at the base ofthe tree guards

Hazel dormouse winter nests cont.

that unconcealed nests were more likely to have been abandoned but the difference is not statistically significant. Only one of the 23 nests found during systematic searches was unconcealed compared with six of the 14 found by chance. This difference was statistically significant. The nature of the surrounding habitat and extent of concealment for unconcealed and concealed nests varied considerably (see Tables 1 & 2 on previous page).

The most common materials used were grass (in 74% of nests), moss (in 30%) and leaves (in 24%). All of these were presumably collected on the ground. Honeysuckle and bark may have been collected from nearby trees and were found in 16% and 11% of nests respectively. Roots (of fern) and ivy were each recorded once. The most unusual nest consisted of "stripped leaves of bamboo woven together".

I received information (but not a completed questionnaire) on two hibernation nests at the bottom of old tree guards in Kent. They were unoccupied but the identification was confirmed by Hazel Ryan and Ken West. This report also referred to three other instances of dormouse nests in tree guards but it is not clear whether these were winter or summer nests.

Harriet Webb reported finding ten nests (over a number of years) on roadside verges, one under a hubcap and one under a traffic cone. Other interesting sites included under a reptile tile, under a pile of log brash and in sedge. Harriet also reported hibernation nests in the same place in her garden, in bramble scrub, in two consecutive years. It sounds like my kind of garden!

The most common materials used were grass, moss and leaves

Jen Bousfield also reported two garden nests. One had a dormouse in it (early March) and "the nest was just a few leaves in a hollow under a clump of geranium, no structure to speak of." She also passed on a record of a dormouse found in a field about 2m away from a hedge where the nest was in a hollow in the turf.

David Wells described a nest in a clay flowerpot in a shed, and a dormouse which hibernated in a basket of wool, stored in a spare room in a house. Access was via an extensive growth of Virginia creeper and a slightly open window.

Given the range of habitats that dormice are now known to exploit, none of these circumstances is surprising. There have been occasional reports of hibernation nests being found in the open and the fact that nearly a fifth of the nests reported here were of this nature shows that it is not a rare phenomenon. However only one of the 23 nests found during systematic searches were unconcealed indicating that it is not normal behaviour either.

Locations and nesting materials seem to be based very much on what is available locally and the best evidence of site selection is that nests seem unlikely to be found where flooding is probable – though this could be an artefact of the sites selected for searching. Despite this, selection of sites in wet areas is not avoided where Molinia tussocks are present, both within a woodland mosaic and in open grassland.

While we will never know how many nests are missed, there is clear evidence from these records that dormouse hibernation nests can readily be detected during systematic searches and this should give encouragement to those who need to carry out searches in areas where dormice might be affected by development or management of their habitats. Ecologists undertaking such searches need to be wary about making assumptions about where dormice might or might not build hibernation nests. Even where there is lying water, dormouse hibernation nests might be found in small, elevated areas such as Molinia tussocks.

Acknowledgements
I am extremely grateful to the following for providing information, filling in forms and providing pictures: Jen Bousfield, Jacqueline Hartley, Harriet Webb, Peter Newbold, Henry Andrews, Deborah Sazer, Jennifer Clarke, Li-Li Williams, Corey Cannon, Mark Champion, Steve Whitbread, Jane Brinkley, David Wells, Leonardo Gubert and Sue Smallshire.

NDMP results from 2015 - how did our dormice fare?

Ian White takes a closer look at the data you helped to gather throughout 2015 and how our dormice fared througout the year, compared to previous ones.

The National Dormouse Monitoring Programme (NDMP) was set up to monitor the population trend of hazel dormice in the United Kingdom and currently the indication from the statistical analysis of the data is that the decline in the species continues. From such a large dataset there is annual variation in the data that is interesting to look at even without applying statistical rigour.

Many dormouse monitors and consultants will be familiar with the nest tube survey methodology that is acceptable to Natural England to demonstrate presence (or possible absence) of dormice using nest tubes. The nest tube methodology uses 50 dormouse tubes and a monthly index of probability so that a suitable level of survey effort can be calculated. Evidence of dormice either from nests or live animals provides evidence of dormouse presence. At present use of dormouse boxes is not acceptable to demonstrate dormouse presence and possible absence but there is substantial data within the NDMP so I thought I would take a closer look to see if nest box data could be used. Data on nest presence within the NDMP is not always reliable, so I decided to look at records of mature animals by month. The results are not surprising. The months you are most likely to find mature dormice are September and October with other months between May and April having an approximate equal weighting (Table 1). It is noticeable that the probability of recording dormice in any one month does vary by year. It is also clear that adult dormice are often found in greater numbers in October than in September. This has implications for how long nest tubes should be left out for during the year to confirm dormouse absence at a development site.

The probability of recording dormice in any one month varies

We have been encouraging more accurate recording of dormouse age classes in the NDMP and it would appear that monitors are responding and we are getting better data. We can separate out the mature age classes (adults and juveniles) and look at the maximum number of animals recorded in either May or June to give an indication of the size of the potential breeding population. We can also look at the same age class recorded in autumn and take the maximum number recorded in either September or October to give an indication of the likely size of the population that will go into hibernation.

Dormouse numbers

By any account 2015 was not a great year for dormice. Once the figures had been

NDMP results from 2015, cont.

	Index of probability (Nest tubes)	2009	2010	2011	2012	2013	2014	2015	Average from NDMP
April	1	1	0	1	1	1	1	1	1
May	4	3	2	3	4	2	3	3	3
June	2	3	3	3	4	3	3	3	3
July	2	3	2	3	4	2	2	3	2.5
August	5	2	3	3	3	3	3	3	2.5
September	7	5	5	5	5	4	4	4	5
October	2	7	8	6	4	7	7	7	7
November	2	1	2	2	0	5	2	1	2
TOTAL	25	25	25	25	25	25	25	25	

Table 1. The Index of probability of survey effort needed using nest tubes and recording nests compared to a similar index of probability of survey effort needed using dormouse boxes and recording mature dormice by year and by national average.

standardised to the number of mature dormice recorded per 50 boxes, the spring records were one of the lowest since 2005. The only time in the past ten years that spring numbers were even lower was in 2013. The autumn records were better, suggesting that either 2015 had been a good breeding year or that there had been a higher success of young animals making it through to maturity (see Table 2 below).

Dormouse weights

The lightest dormouse recorded in spring was a 11.5g female at Mallydams in mid April. This suggests that if she had lost approximately 30% of her bodyweight during hibernation she would have been approximately 16.5g the previous autumn. The average weight of dormice recorded in March and April was 17.1g and there were a few heavier animals at 24–25g.

There were 5,229 dormice recorded in the NDMP during 2015 but only 97 (1.85%) were heavier than 30g. At the Lower Lewdon Reserve in Cornwall two animals were recorded at 35g and 38g in July but most of the heavier dormice were seen in September or October. The heaviest dormouse of the year, at 40g, was recorded at the PTES Briddlesford Reserve on the Isle of Wight.

Difference between the sexes

2015 followed the usual pattern of the males emerging earlier than the females and going into hibernation earlier. In April 61% of dormice recorded were male, in May, June and July the proportion was fairly equal and by September 57% of animal's recorded were male and only 43% female.

Table 2. The number of mature dormice (standardised to dormice recorded per 50 boxes) recorded in spring and autumn and the years ranked since 2005. The ranking ranges from 1 being the highest, to 11, being the lowest.

YEAR	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Max. no. of mature dormice per 50 boxes in May/Jun	2.11	1.67	2.59	1.85	1.82	1.90	2.55	2.23	1.48	1.89	1.62
RANK	4	9	1	7	8	5	2	3	11	6	10
Max. no. of mature dormice per 50 boxes in Sep/Oct	2.83	5.19	3.70	3.05	3.89	5.22	5.29	2.60	3.88	3.86	3.35
RANK	10	3	7	9	4	2	1	11	5	6	8

Activity

The data of dormice in torpor in the NDMP hasn't been specifically investigated but there does appear to be variation in both annual and regional data. Fig 1 shows the trend from all the NDMP data compared with the data from 2015. More dormice were recorded in torpor in both spring and summer than average and the spring and autumn months (with the exception of June) were also wetter than average, suggesting that dormice are more likely to be conserving energy during inclement weather.

No of litters

The young dormouse classes are pinks, grey eyes closed and eyes open; these are all unweaned young of year. It is assumed that if young are recorded at a site in one month it is highly likely that they will have matured by the next visit and will then be recorded as juveniles. Few litters are born in the early part of the year with only 1% of litters recorded in May and 6% in June. 15% of litters are found in July and the key months when they are recorded are August 30% and September 35%. They are still found in October 12% and even November 1% but it is highly unlikely that those born in the later part of the year will survive.

Numbers of litters recorded has not previously been used as a measure of dormouse success but even by this measure 2015 was not a particularly good year (Table 3). The worse two years since 2005 were 2012 and 2005 but in 2015 there were still only approximately half the number of litters recorded than in 2006 and 2011.

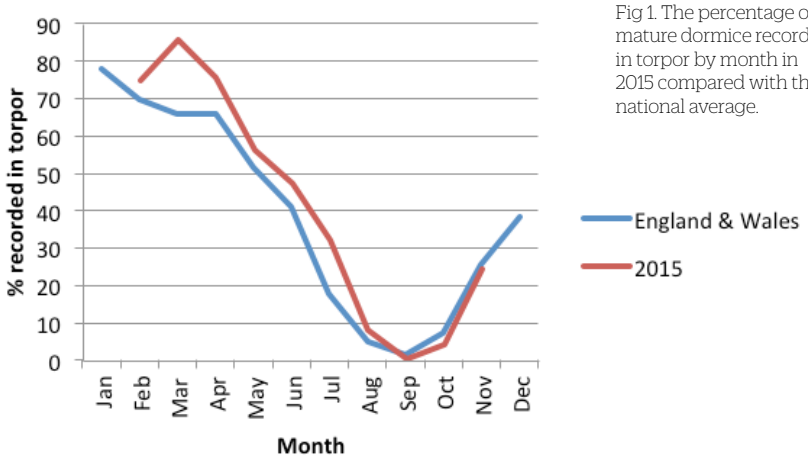


Fig 1. The percentage of mature dormice recorded in torpor by month in 2015 compared with the national average.

Table 3. Number of litters (adjusted to number of litters recorded per 50 boxes) recorded by year between 2005 and 2015 and ranked.

YEAR	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
No. of litters per 50 boxes	0.13	0.25	0.20	0.15	0.22	0.24	0.28	0.12	0.21	0.17	0.13
RANK	10	2	6	8	4	3	1	11	5	7	9

Do hazel dormice use ultrasound to communicate?

Leonardo Ancillotto, Giulia Sozio, Alessio Mortelliti & Danilo Russo decided to investigate how and why hazel dormice use ultrasonic communication. Is it part of their social behaviour, is it part of their courtship rituals, is it an intergral part of their lives in the trees? Here, we learn more about what they found out.

Ultrasonic vocalizations (USVs) have been discovered in a range of small mammals. These vocalizations are not only associated with social behaviour – such as sexual behaviour and aggression – but also with echolocation and as a by-product of respiration. The Gliridae family is known to broadcast a range of signals but why they do so is poorly understood. So a team of scientists from the University of Rome, the Australian National University, the University of Naples Federico II and the University of Bristol, undertook a study to see if they could find out more.

Working with captive hazel dormice, the team identified six different vocalizations and provided contextual evidence to show that such sounds are largely used for social communication.

Acoustic communication is really useful in that animals can use it to communicate over longer distances than by using visual communication. It can be used in low light conditions as well as during daylight hours and across dense habitats. However the disadvantages include the fact that eavesdropping might occur – either by competitors, or by prey or predators. High frequency USV cannot travel very far but consequently isn't so easy for predators to hear, and therefore might be safer.

Little is known about the social behaviour of hazel dormice. And although there have been a few studies into their communication vocalizations, the functions of their signals had not been investigated. So the team gathered a group of captive bred animals: two males, two females and a female with three pups about three weeks old. Each individual was housed in a glass tank with wire mesh windows (45cm x 40cm x 45cm). Twigs, branches and a wooden nest box were provided and the dormice were fed seeds, acorns, hazelnuts and fresh fruit, as well as water. The animals were then subject to natural daylight cycles and temperatures.

Automatic ultrasound recorders were place 15cm above the tanks' wire mesh covers, set to record continuously any sounds between 1 and 190khz to capture

Ruud Foppen

both USV and audible sounds. Each recording session was assigned to one of three different social conditions: solitary (either a male or female alone), pair condition (one male and one female together) and brood (the female with her young). Apart from the female with young, all animals were tested in both solitary and pair conditions. Recordings took place over a total of ten nights between 19.30 and 07.30. The animals were also filmed to match acoustic communication with individual behaviour. In the "male–female" condition, the team moved a male and its own nest box inside a female's tank, and the two individuals were left together for 24 hours to acclimatize before the recordings started. Recording took place in a separate room where the focal subjects and their tanks were isolated from the other dormice. During "pair condition" sessions, they assessed the emitter's identity from video recordings: the dormouse emitting a sound was seen to open its mouth and/or visibly vibrate whiskers. All vocalizations for which a clear emitter was not identifiable were discarded.

Two additional animals – one female and one male – were selected and recorded (audibly and visually) in order to make an ethogram – a table of all the different kinds of behavior or activity observed in an animal. The behaviours that the team observed included both exploratory (alert and crawling) and social interactions (courting, mating, chasing and snout-to-snout touch). They did not take into account 'maintenance' behaviours such as feeding and self-grooming, as they didn't record any vocalizations when these activities were performed.

Each sound was considered a separate vocalization if it was at least 1,000ms apart from the next one. All the vocalizations recorded were categorized into six different types. In total the team obtained 156 hours of recordings which included 294 vocalistions. All types of vocalizations except one ranged between 18.1 and 52.1 kHz and were ultrasonic.

The team described six different types of vocalizations in total. Two of these were associated with mating and courting. Ultrasonic "courtship songs" have been rarely identified in rodents, and this is the first report of courting behaviour by a glirid. One of these vocalizations was characterized by a high number (up to 62) of notes, and was emitted by males while courting females. In these instances, the male closely chased the female, continuously circling around her and touching her body with his whiskers, sometimes standing on his hind legs, while producing this ultrasonic tweet. Mating generally occurred after 3–15min of this "circling" courtship. The courting song of hazel dormice is composed of at least two different "phases": an introduction made of a higher number of notes, and a "coda" ending the behavioural pattern and formed by longer notes.

Despite the limited sample size, the team's results suggest that there might be differences in the vocalizations between sexes and in different behavioural contexts, and so they may well play an important role in social and reproductive behaviour.

One kind of vocalization was only produced by the mother with a brood. This is the only vocalization in the human hearing range emitted by hazel dormice that the team recorded. This "clucking" was associated with snout-to-snout physical contact between the mother and her young, and was probably a social call used for mother–pup reunion, i.e. during the first phase of weaning, when juveniles start to explore autonomously the surroundings of the nest but are still dependent on their mother. The lower frequency of this vocalization is probably due to the urge of a female to rapidly locate and retrieve her offspring, as lower frequency sounds are more effective over long distances.

Six unique types of vocalizations were identified

No sounds were recorded during, and therefore associated with, aggressive behaviour. The remaining three types of sound all occurred during generic exploratory behaviour and might well be a means for hazel dormice to communicate over a medium distance. They were generally emitted by solitary animals and used to signal their presence. Although hazel dormice are considered solitary, observations of stable male-female pairs or groups at nests indicate an under-estimated social dimension to this species. This was corroborated by the range of vocalizations performed in different social situations that the team found, as the complexity of rodent vocal repertoires is linked with more structured social systems.

The fact that hazel dormice are usually found in closed habitats, have small home ranges and generally tend to be reluctant to cross unsuitable habitat, may have favoured the evolution of a medium-range communication system, as has been found in other species which share similar ecological traits. Other species use this type of communication to defend their territories, attract potential mates and co-ordinate group movement. The team concluded therefore, that the existence of an ultrasonic vocal repertoire in hazel dormice is used for communication from a distance, as it may serve for territoriality, mother–infant reunion and sexual behaviour, all activities involving individuals that are presumably out of mutual visual contact. Further studies testing different social contexts both in nature and in captivity and confirming our results with more replicates and larger sample size are needed for a more complete assessment of the vocal repertoire of this species and its functions.

Thank you very much to the authors for this interesting study:

Leonardo Ancillottoa , Giulia Sozioa , Alessio Mortellitiab & Danilo Russocd
a Department of Biology and Biotechnology "Charles Darwin", University of Rome "La Sapienza", Rome, Italy
b Fenner School of Environment and Society, ANU College of Medicine, Biology and Environment, The Australian National University, Canberra ACT 0200, Australia
c Wildlife Research Unit, Laboratorio di Ecologia Applicata, Dipartimento di Agraria, Università degli Studi di Napoli Federico II, Portici, Italy
d School of Biological Sciences, University of Bristol, Bristol, UK
Published online: 27 Sep 2013.

Any inaccuracies in translating the paper into this article are the fault of the transcriber, Nida Al Fulaij. The reference for the full article is: Leonardo Ancillotto, Giulia Sozio, Alessio Mortelliti & Danilo Russo (2014) *Ultrasonic communication in Gliridae (Rodentia): the hazel dormouse* (Muscardinus avellanarius) *as a case study, Bioacoustics*: The International Journal of Animal Sound and its Recording, 23:2,129-141, DOI: 10.1080/09524622.2013.838146

What impacts does the weather have on hazel dormice?

In the 1990s Paul Bright, Pat Morris and N.J. Wiles undertook a study to see what effects weather and season had on hazel dormice.

The ability of dormice to reduce their activity to compensate for adverse weather conditions suggests that their activity patterns are likely to be strongly influenced by summer weather conditions. Little research has been carried out on free-ranging dormouse activity in relation to weather, despite its potential influence on their life history. It's likely to be particular impactful here in the UK on the edge of their range.

The nocturnal activity of the hazel dormice was monitored within 4.5 ha of a deciduous, low growing woodland in Somerset. Nest box monitoring indicated that dormice were living in the wood at a density of one animal per 10 ha. The boxes were monitored monthly or fortnightly between May and November during 1987 and 1988 and individuals were sexed and then individually marked using semi-permanent fur-clips.

During the study the ambient temperature of the nest boxes was monitored using thermistors which indicated whether the animals were present or absent during nocturnal foraging hours, thereby enabling the team to see how long they were out foraging for. The assumption was made that activity records per nest box related to the same dormouse each time and that when dormice shared a nest box, any temperature changes were related to either individual. The ambient air temperature at 00:0h was recorded near nest boxes at 1.5m above ground and data on rainfall and cloud cover were obtained from external weather stations 4.5km and 10km from the study site. Nocturnal hours, moon phase and moonlight were also recorded.

The team discovered that dormouse activity was closely correlated to sunset and sunrise, with activity starting approximately 30 minutes after sunset. However there was variation between individuals. The activity schedules of male and female dormice appeared identical in all seasons and individuals rarely returned to their nest boxes during foraging hours.

A high ambient temperature increased the length of time dormice were active in May-June and September-November, but did not influence activity length in July-August.

Rainfall reduced the length of time that dormice were active for and also influenced their activity start time in May-June but in no other month. In general diurnal activity lasting over 30 minutes occurred when nocturnal temperatures fell below 9°C and the length of time dormice were active was positively influenced by lower nocturnal temperatures. This happened most frequently in September until early November.

There were significant differences in activity schedules between years, which was related to ambient midnight temperature and rainfall. Dormice were more active as the amount of rainfall decreased.

It is clear that hazel dormice may be particularly vulnerable to climatic changes in England and Wales, and in prolonged wet summers they may have highly reduced activity, which would in turn reduce reproductive output and survival. PTES is currently funding two studies looking into what impacts climate and woodland management might be having on our UK population. We hope to find out enough to help us put in place measures to assist our vulnerable hazel dormice in periods when they might be struggling.

Bright, P., Morris, P., Wiles, N.J., 1996. *Effects of weather and season month summer activity of dormice* Muscardinus avellarius. J. Zool. 238, 521–530.