



Spring 2019 - Issue 72

The Rehabilitator

B W R C N E W S L E T T E R



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Wild Animal
Health Special

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**Cover photo – a balmy lunch outdoors in February!
at The Lookout in Hyde Park at the 8th European Hedgehog Research
Group International Workshop**

(Photo: Terri Amory)



A word from the Chair

Welcome to this special 'Wild Animal Health' Spring 2019 edition of The Rehabilitator! Given the nature of rehabilitation work it is important that rehabbers are aware of emerging diseases in wildlife – in this edition we report on recent meetings around the UK that have highlighted some of these threats, and the organizations that are working to manage them.

Meetings and conferences since November include the 12th Garden Wildlife Health Forum meeting, the APHA's celebration of 25 years of UK disease surveillance, Secret World's Caring for British Wildlife conference and the 8th European Hedgehog Research Group Workshop!

In this edition we have a summary of a case study presented at the EHRG workshop by Janet Peto on improvements in lung health in overwintered hedgehogs. Thanks are due to Becki Lawson of IoZ and Martyn Wood of Gower Bird Hospital for their editorial support in the production of this edition.

As recent conferences mentioned included wider environmental issues, we would like to hear your ideas on how to reduce our impacts – for example – can we reduce consumption of single use plastics without sacrificing hygiene standards? Please post on Facebook or e-mail us.

If you have research, experience or concerns to share, please send articles and letters to BWRC at bwrcouncil@gmail.com or by post to PO Box 8686, Grantham, Lincolnshire NG31 0AG.

*Terri Amory
Editor & Chair,
BWRC*

Dates for your diary

BWRC is pleased to announce that Symposium 2019 in collaboration with Wild Things Rescue will take place at Nottingham Trent University on 16th & 17th November 2019. Members will be notified of further details as they are available by e-mail.





12th Garden Wildlife Health Forum Meeting

28th November 2018, ZSL London Zoo

by Terri Amory

Garden Wildlife Health (GWH) is a collaborative project between the Institute of Zoology (IoZ) Zoological Society of London, British Trust for Ornithology (BTO), the Royal Society for the Protection of Birds (RSPB) and Froglife which aims to monitor the health of, and identify disease threats to, British wildlife. Garden Wildlife Health forum meetings are held every six months. Members of the forum include a wide range of conservation and rehabilitation organisations and a number of universities, and all are encouraged to share news and research into UK wildlife health. BWRC have been forum members since summer 2017.

The meeting was opened with an update on the Garden Wildlife Health project, including recently published reports on skin lesions found on the legs of British wild finches, and Herpes virus in hedgehogs and amphibians. Scientific papers resulting from the project are published in open-access journals where possible and at

<https://www.gardenwildlifehealth.org/publications/>. Where a certain amount of information has been established on a particular topic Disease Factsheets are created and published at



<https://www.gardenwildlifehealth.org/garden-wildlife/>. Members of the public are encouraged to report sightings of animals via online Disease Incident Reporting at <https://www.gardenwildlifehealth.org/gwh-database/>.

It was reported that 667 disease incident reports had been submitted during the previous 5 months – mostly birds, 13% hedgehogs, 8% amphibians and 1% reptiles, and that 87 post-mortem examinations had been carried out on a variety of species. Following post-mortem examination samples from each carcass are added to a 25-year frozen tissue archive to help facilitate future research and collaboration.

In the next presentation, Katharina Moy from IoZ presented early (unpublished) findings from work on Pigeon Circovirus (PiCV) in British Columbiformes (pigeon family). Infection with PiCV is known to damage lymphoid tissues, potentially reducing the effectiveness of the birds' immune system. The study is using the GWH archive of frozen tissues to investigate whether PiCV is present in wild British pigeons and doves, to characterize the virus strains present, and to determine whether PiCV infection is associated with secondary infections that might indicate immunosuppression.

Approximately 90% of cadavers with leg lesions were infested with *Cnemidocoptes* mites, and three-quarters tested positive for the presence of *Fringilla coelebs* (chaffinch) Papillomavirus (approximately 70% were infected with both). It was not found to be possible to distinguish between causative agents of lesions by visible appearance alone. The full paper can be accessed via - <https://www.nature.com/articles/s41598-018-32255-y> or the disease factsheet can be found at <https://www.gardenwildlifehealth.org/portfolio/leg-abnormalities-in-finches/>

Andrew Cunningham, also from the IoZ, presented an update on variants of *Batrachochytridium* fungus (Chytrid fungi such as BSa1). The fungus has caused catastrophic population declines in wild fire salamanders on mainland Europe and represents a serious threat to British newt health and biodiversity. Concern is that disease will be introduced into the environment, where it particularly threatens the great-crested newt. It is hoped that the work will contribute towards the development of measures to protect wild newt populations, and the Garden Wildlife Health team are keen to receive further newt cadavers to add to their survey work. A factsheet on Chytrid diseases is available from <https://www.gardenwildlifehealth.org/portfolio/amphibian-chytridiomycosis/>.





Katharina from IoZ went on to introduce a new campaign to combat the release of exotic pets (and their associated diseases) into the environment called “Think Outside the Box” which can be viewed at <http://unboxingdiseases.eu/>. Posters and materials from the site are freely available to be displayed on premises or through social media.

A video animation entitled “The Ultimate Fate of Jeremy Fisher” is accessible at <https://vimeo.com/293313275> reflecting on Beatrix Potter’s unpublished work in mycology in light of global amphibian declines and species extinctions that have occurred in the last few decades as a result of chytrid fungal infection. The tree frog posed as Mr. Jeremy Fisher is re-animated from images of the last Rabbs’ fringed-limbed tree frog, named Toughie, which died in 2016. The animation shows poor Jeremy fishing from a lily pad, exhibiting clinical signs of Chytridiomycosis, the disease caused by infection with chytrid fungi, which is often fatal in many species of amphibian.

Vicky Wilkinson from IoZ described recent findings in British hedgehogs, including the recently published “Guidance for releasing hedgehogs that have been rehabilitated – A collaborative view” published by BHPS, BWRC, ZSL, RSPCA and [Vale Wildlife Hospital](#), available to download through our website <http://bwrc.org.uk/#/leaflets/4593479634>. Vicky also drew attention to a new paper concerning the detection of *Listeria monocytogenes* in a small number British Hedgehogs, in press at the time of the meeting in the *Journal of Zoo and Wildlife Medicine*¹.



In the next presentation, Katharina Moy from IoZ presented early (unpublished) findings from work on **Pigeon Circovirus** (PiCV) in British Columbiformes (pigeon family), as multiple strains of this disease have been reported in Europe. The disease damages the lymphoid tissues, potentially reducing the effectiveness of the birds' immune system, and so the study is using the GWH archive of frozen tissues to investigate whether the disease is present in British birds, and whether its effects on the immune system make birds more susceptible to secondary infection.

The penultimate presentation was given by Claire Boothby, Garden Birdwatch Development Officer from the British Trust for Ornithology (BTO) who have been working with Senior Curator of Birds at the Natural History Museum Hein Van Grouw to study plumage abnormalities in birds since 2011.



Above: Blackbird with abnormal plumage (from <https://www.bto.org/volunteer-surveys/gbw/about/background/projects/plumage/gallery>)

Using 4,350 records from over 70 bird species the project distinguishes between albinism (lack of an enzyme involved in making pigment), melanism (over-production of the pigment melanin) and a number of different forms of leucism (where pigment cells are lacking) - such as dilution and progressive greying. If you are interested in finding out more, these are explained in an article in Bird Table Magazine, accessible online at

https://www.bto.org/sites/default/files/u23/images/about_gbw/plumage_survey/bt69_lr_14-15.pdf.

Sightings of abnormal plumage can be reported via <https://www.bto.org/volunteer-surveys/gbw/about/background/projects/plumage>.

¹ Helle B. Hydeskov, Corinne F.L. Amar, Julia Rodriguez-Ramos Fernandez, Shinto K. John, Shaheed K. Macgregor, Andrew A. Cunningham, Becki Lawson, (2019) *Listeria monocytogenes* infection of free-living western European hedgehogs (*Erinaceus europaeus*). *Journal of Zoo and Wildlife Medicine*: March 2019, Vol. 50, No. 1, pp. 183-189



20 Years of National Wildlife Disease Surveillance



5th December 2018, APHA Weybridge

by Terri Amory

The Animal and Plant Health Agency (APHA) was formed in 2014 with the mission of safeguarding animal and plant health for the benefit of people, the environment and the economy. It merges the former Animal Health and Veterinary Laboratories Agency (AHVLA) with parts of the Food and Environment Research Agency (FERA) to create a single agency responsible for animal, plant and bee health.

Stakeholders were welcomed to APHA headquarters at Weybridge in Surrey for a day of presentations by Professor Tony Fooks, leader of the Wildlife Zoonoses and Vector-Borne Diseases Research Group at the Animal and Plant Health Agency. Tony highlighted the pivotal role that wildlife populations play in the epidemiology of disease, with 72% of zoonoses originating from wildlife.

Paul Duff, Veterinary Investigation Officer at APHA Penrith and Chair of the APHA Wildlife Expert Group and Diseases of Wildlife Scheme (DoWS), gave the first presentation, describing the history of the **Diseases of Wildlife Scheme** which was launched in 1998. The scheme was set up to investigate new and emerging or re-emerging diseases in wildlife, particularly those which can be transferred to humans (zoonoses) affect farm animals or may affect biodiversity. A result of this was the development of the **England Wildlife Health Strategy** (EWHS) adopted in 2009 as a framework for decision-making within and outside government when dealing with wildlife health issues.



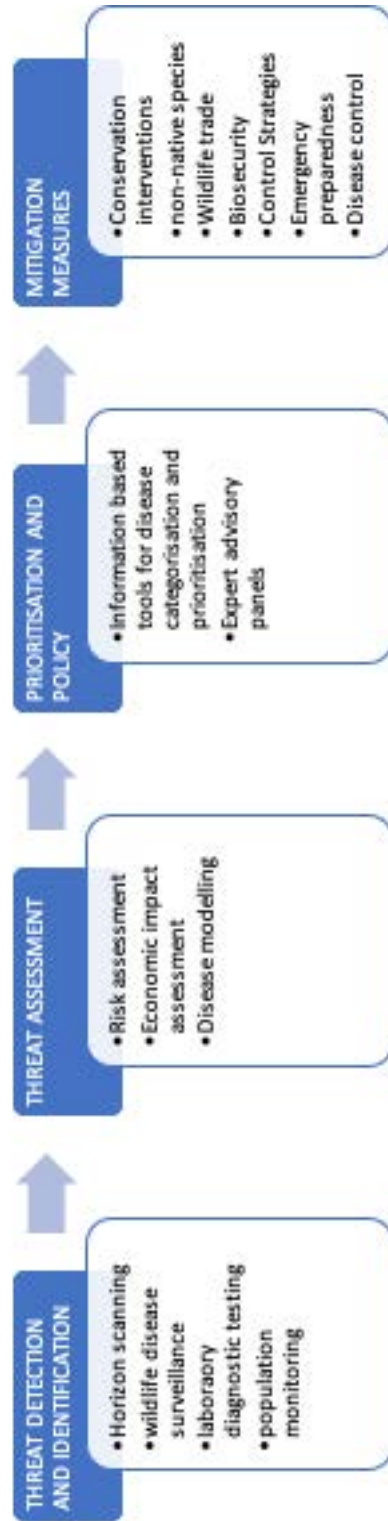


Fig. 1. The four-stage approach of the England Wildlife Health Strategy



Surveillance for terrestrial vertebrate disease in British wildlife became the responsibility of the Great Britain Wildlife Disease Surveillance Partnership, under the Chair of the APHA DoWS. (The partnership was discussed in more detail later in the day). APHA considers wildlife disease surveillance to be an important tool to pick up significant environmental change – such as the emergence of antibiotic resistance in diseases of seals. APHA may be receptive to wildlife carcasses to use for disease monitoring.

The next speaker was Alex Barlow, who reviewed **'highlights' from twenty years of the Diseases of Wildlife Scheme**, related to zoonoses, farm animals and biodiversity. (Alex led post-mortem examination workshops for us at BWRC Symposium 2016, held at Langford Veterinary Services, The University of Bristol). His examples included tapeworm (*Echinococcus multilocularis*) he found in a female beaver – wild caught in Germany and translocated as part of a reintroduction scheme to Devon. This parasite had not previously been found in British wildlife, but the carcass was serendipitously given to Alex after the finder had decided to keep the cadaver in their freezer 'just in case'. Normally ending up in foxes, dogs and cats, *E. multilocularis* causes severe hepatitis with over 90% mortality in humans.

Alex also described how **White-Nose Syndrome** (WNS) caused by the fungus *Pseudogymnoascus destructans*, was found in Daubenton's bat carcasses provided by the Bat Conservation Trust's (BCT) National Bat Monitoring Programme in 2013. Further sampling of live animals in the south east of England also produced positive results but suggests that the infection is indigenous and of no threat to UK bat populations. The disease has, however, caused mass mortality amongst North American bats – possibly because it disturbs the animals' hibernation - causing them to use more of their energy reserves during the winter months and die from starvation and dehydration. It was suggested that the fungus may have been transferred from Europe through human traffic. Further information is available on the BCT website -



Little Brown Myotis (*Myotis lucifugus*) with visible white-nose syndrome fungus (*Pseudogymnoascus destructans*). Photo Larry Master (www.masterimages.org)



<https://www.bats.org.uk/news/2013/08/are-uk-bats-immune-to-white-nose-syndrome-which-is-killing-millions-of-north-american-bats>

Jolianne Rijks from Utrecht University in The Netherlands then delivered the **keynote presentation** entitled “World and Dutch Wildlife Disease surveillance; scoping perspectives”. She described the work of the Dutch Wildlife Health Centre (DWHC), opened in 2002, on a range of emerging European diseases in wildlife with potential impacts on human and animal health and biodiversity.

Paul Holmes from APHA went on to present the **Great Britain Wildlife Disease Surveillance Partnership** (GBWDSP) as a legacy of the England Wildlife Health Strategy (adopted in 2009). As well as APHA, the Partnership includes the following organizations:

- [SRUC Veterinary Services](#)
- [Centre for Environment, Fisheries and Aquaculture Science \(Cefas\)](#)
- [Forestry Commission England](#)
- [Institute of Zoology](#)
- [Wildfowl & Wetlands Trust \(WWT\)](#)
- [Natural England](#)
- [Garden Wildlife Health \(GWH\) project](#)

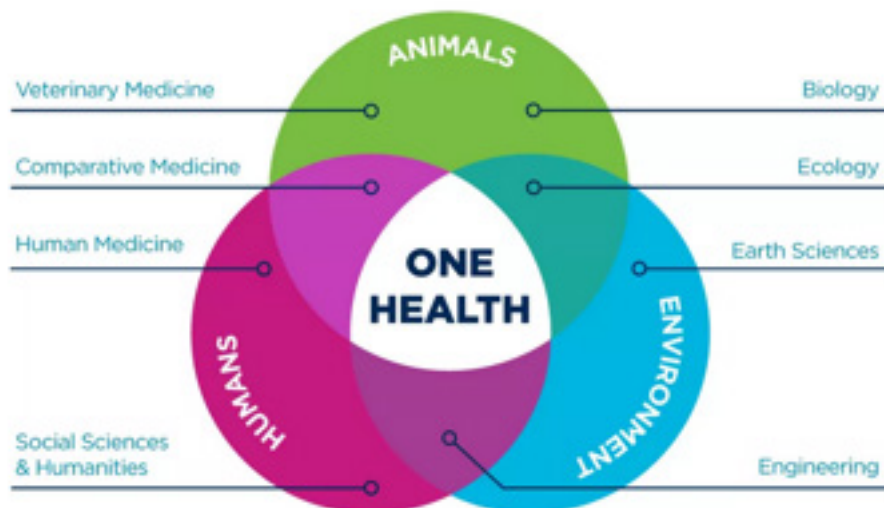
The aim of the partnership is to promote collaboration between stakeholders to reduce the impacts of wildlife disease on human and livestock health and biodiversity. The scope of the partnership’s responsibilities includes all free-living vertebrate animals, both infectious and non-infectious disease and coordination of threat detection through scanning and surveillance across organizations that had previously worked independently. The output from this partnership is a quarterly report, available to download from <https://www.gov.uk/government/collections/animal-disease-surveillance-reports#wildlife>.

Freya Smith from the APHA then presented a UK-focused update on emerging amphibian pathogen *Batrachochytrium salamandrivorans* (BSaI). (We have reported news on this topic previously from Garden Wildlife Health Forum meetings – see previous article).



After the break, Professor Richard Kock from the Royal Veterinary College described how national wildlife disease surveillance is informing “One Health” – a new transdisciplinary platform promoting collaboration between workers on animal, human and ecosystem health, which arose from recognition of an increase in disease levels driven by environmental degradation as a result of human activity. Richard expressed the need for a move away from a narrow vision focused on minimizing the global impact of epidemics and pandemics in human and animal populations towards a more holistic approach encompassing:

- Public and animal health and food safety
- Food security and improved nutrition
- The livelihoods of poor and vulnerable people
- Balanced investment between human, animal and environmental health



Fin Twomey (Head of Animal Public Health for DEFRA) spoke about animal disease surveillance carried out by the Surveillance Intelligence Unit (SIU) at APHA in 2018. Surveillance is defined as ongoing systematic collection of data to analyse, interpret and share with decision makers.

Indicators from the Diseases of Wildlife Scheme (DoWS) of relevance to One Health might include:

- Surveillance of bird flu in wild birds as a warning of potential spread to domestic poultry flocks



- Antibiotic resistance in common seal pathogens as an indicator that residues from human sewage are affecting marine environments
- Wild bird sensitivity to vector-borne zoonoses such as West Nile Virus (WNV), Usutu virus, Crimean-Congo haemorrhagic fever (CCHF) and Chikungunya virus
- Cetaceans Stranding Investigation Programme (CSIP) is providing evidence of the effects of PCBs (Polychlorinated biphenyls - once widely deployed as dielectric and coolant fluids in electrical apparatus, carbonless copy paper and in heat transfer fluids, banned in the 1970s) on marine health
- Mass mortality events can be indicators of environmental shifts – for example persistence of DDT in Scottish wildlife 30 years after it was banned

One Health surveillance could also include topics such as soil fertility, air and water quality, global temperatures, biodiversity, pollution (including light and noise) changes in microbial populations and the global burden of disease. However, the approach requires a cultural shift in order to appreciate the importance of the connection between humans, animals and ecosystems, before elements such as cooperation and funding can be targeted.

'One Health' requires a culture change to appreciate the importance of the connection between humans, animals and ecosystems

Types of **New and Re-emerging Threats (NRTs)** which are monitored include existing notifiable diseases (e.g. rabies), changes in patterns of endemic diseases, exotic diseases not previously found in GB, newly discovered diseases or strains, new resistance to veterinary medicines and zoonoses and toxins which may affect human health. The APHA carries out scanning surveillance through its network of laboratories, overseen by the Surveillance Intelligence Unit (SIU).

Fin also introduced the **APHA's Science Strategy for 2015-2020** (<https://www.gov.uk/government/publications/apha-science-strategy-2015-to-2020>), giving the example of 79 potential threats that were identified and assessed in the first six months of 2018. From these, 19 were eventually raised to the appropriate national advisory groups (such as the Veterinary Risk Group).

Susanna Williamson from the APHA then spoke about the spread of **African Swine Fever (ASF)** in wild boar, a tick-borne disease which initially spread across the Caucasus region into Russia, but has since jumped to northern European countries probably due to human activities. While not



zoonotic, ASF causes 100% mortality in pigs and therefore poses a serious threat to pig farming.

Ash Banyard from the APHA gave further detail about **targeted wildlife disease surveillance schemes at APHA**, including:

- **Passive surveillance** (of wild bird carcasses submitted speculatively) for avian influenza (HPAIV) with a view to identifying High Risk Areas (migration routes, suitable habitat and proximity to domestic fowl holdings)
- **Active surveillance** (through a formal sampling scheme) of bat carcasses for rabies accompanied by education programmes and mandatory vaccination of licensed bat workers
- **Surveillance and research** into the epidemiology of a newly published list of vector-borne viruses produced by the World Health Organisation (WHO).

The morning session was rounded up by Professor Andrew Cunningham from the Zoological Society of London who spoke about the history and value of citizen science in wildlife disease surveillance. **The Frog Mortality Project**, established in 1992, was set up in response to public pressure and was the first citizen science project to be launched on a national level. Since then a series of projects have been established by ZSL in collaboration with other partners, including a red squirrel mortality project, Garden Bird Health initiative, and more recently the Garden Wildlife Health project (which includes birds, hedgehogs, reptiles and amphibians), of which BWRC is a forum member. (Regular reports on this work are provided in The Rehabilitator.)

After lunch Becki Lawson from ZSL presented a review of the **European Wildlife Disease Association (EWDA)** network. The Wildlife Disease Association was formed in America in 1952, but there are now six sections covering different geographical regions – including Europe (formed in 1993). The EWDA Network was founded in 2009, with the aim of enabling scientists to identify others with similar interests and promote collaboration across the region and working towards more comprehensive and consistent wildlife disease surveillance. Further information is available on the EWDA website - <https://ewda.org/>.

Jolyon Medlock from Public Health England then spoke **about future vector-borne disease threats to the UK** such as West Nile Virus, Lyme disease, Blue Tongue, Schmallenberg virus,



Denge fever, Chikungunya virus and Babesiosis. Part of the threat comes from mosquitoes which can be accidentally introduced with traded goods and in vehicles. There have been outbreaks of some of these diseases across Southern Europe since 2007. As a result of global climate change the UK will become increasingly able to support mosquitoes previously designated as tropical species.

“We should all be more vigilant about protecting ourselves from invertebrate vectors”

Jolyon described several diseases in more detail - one example of successful surveillance described the value of vehicle tyre checks carried out in UK ports, and more recently in truck stops in Kent. From these, three incursions of eggs of the ‘Asian tiger’ mosquito *Aedes albopictus* (which transmits WNV and Denge fever) have already been detected.

Unfortunately some of our conservation activities may also serve to promote the survival of invading diseases – for example the creation of wetland habitat by nature conservation organizations serves to provide more breeding habitat for mosquitoes, while conservation grazing - moving animals from pasture to pasture - could potentially increase the spread of ticks and consequently Lyme disease or Borreliosis. Jolyon recommended that we should all be more vigilant about protecting ourselves from invertebrate vectors in the future!

Julie Newth, Wildfowl & Wetlands Trust gave her presentation entitled “From the post-mortem bench to Westminster: the story of **lead poisoning from ammunition sources**”. Recently published surveillance work examining cadavers and live-trapped birds since the 1970s across 10 nature reserves has shown that lead poisoning continues to affect wetland bird populations today. The primary cause is thought to be lead shot that has been fired, missed its target and fallen to the ground – it is estimated that 10,000 tons of lead shot has been released



Image - <https://www.youtube.com/watch?v=haVil-2rK3II>



into the environment in the UK in this way. While concerns over the poisoning of swans by fishing leads (weights) led to the banning of their import and sale in 1986 (The Control of Pollution (**Anglers' Lead Weights**) Regulations **1986**, made under sections 100 and 104(1) of the Control of Pollution **Act** 1974), the shooting legislation - Environmental Protection (Restriction on Use of Lead Shot) (England) Regulations 1999 - only prevented lead shot being used over wetlands, so it is still legal to use it in other areas. Further information on the WWT's work in this area is available on their website - <https://www.wwt.org.uk/our-work/projects/tackling-lead-ammunition-poisoning/>

John Spiropoulos from the APHA then spoke about the issue of **Chronic Wasting Disease** (CWD) – a transmissible spongiform encephalopathy (TSE) or 'prion disease' – in deer species. Infected animals release prions into the environment (there are four known variants, all which are persistent in the environment) and their potential for zoonosis or transmission to other species is currently unknown.

In Norway in 2016 a wild female reindeer was diagnosed positive for a strain of the disease previously restricted to North America. One of few possible explanations for this geographical jump is the import of a spray product containing the urine of does in oestrus (Jackie's Deer Lures) used by hunters to lure bucks into range for shooting.

Subsequent surveillance of European deer for TSEs has revealed a small number of positive tests, but these have not been confirmed to be of US origin. The UK has a surveillance plan but this has not yet been implemented (because UK laboratories are not yet ready to carry out the tests).



Graham Smith, Lead scientist in Wildlife/TB for the APHA's **National Wildlife Management Centre** then spoke about the challenges of getting representative wildlife population and disease data. This can be used for modelling population distributions across the UK and attempts to predict how introduced diseases might behave. Challenges include doubt about the number of samples needed to establish that diseases like CWD in deer and *Echinococcus multilocularis* in foxes and voles are not present in the UK.

In questions at the end of the conference the issue of discontinued funding, by Defra, for rabies testing for bat workers was raised – Helen Roberts answered that as a public health issue, this work should actually be funded by the Department of Health, and not Defra.



SWWR Caring for British Wildlife Conference

9th & 10th February 2019

By Dr Lucy Bearman Brown

This two-day conference provided a discerning range of speakers, considering management of British wildlife in the wild on day one and caring for rescued British wildlife – what’s new in treatment, rehabilitation and release on day two. Speakers from a variety of backgrounds including veterinary, ecology, academia, rescue centres and NGOs took to the stage to provide thought-provoking updates on the work they have been undertaking. A selection of the presentations from the two days have been provided here, to give an insight into the range of topics covered.

Alick Simmons (naturalist and former deputy Chief Veterinary Officer for England) started the event by exploring “**The state of British wildlife, a personal perspective**”, discussing how wildlife abundance and welfare are closely tied and identifying a need to consider both when managing wildlife. This started with a consideration of some of the recent good news stories in conservation, such as osprey re-colonization following local extirpation of species. Re-emergence was first seen in the 1950s, with 150 pairs now breeding across Scotland. Through protection of habitat, some species have made a comeback, shining a positive light on conservation efforts. Whilst formal reintroductions have had some success over the years, less formal programmes such as those for the Eurasian beaver (some of which were undertaken officially, but other populations have established as a result of private ownership) – have led to several well-established populations, which may have significant conservation benefit.

However, it is not all positive news for conservation. Alick discussed the ongoing habitat loss leading to substantial and sustained loss of biodiversity in the UK. There is ongoing debate as to whether species such as wolves and brown bears could ever be successfully reintroduced due to changes in land structure and usage, especially in light of current human density and habitat



quality; however, Alick stressed the importance of using evidence to support such debate so that all options are adequately explored.

Alick explored multiple challenges related to management of wildlife, including variations in legal protection and status between species. For example, the legal protection afforded to polecats is very effective, whilst their close cousins the stoats are widely persecuted and have very little protection. Similarly, attitudes differ widely towards closely related species such as red and grey squirrel: we work to conserve red squirrel whilst greys are often controlled, and yet red squirrels were once widely culled to protect new forestry plantations.

The seven principles for ethical wildlife control were discussed (as reported by Dubois et al., 2017) as a tool to help inform the decision-making process. This includes considering how management practices can be justified through scientific evidence and prioritizing animal welfare.

Later in the day Daniel Hargreaves (bat conservationist) provided an entertaining insight into **Bats – their ecology & conservation**. Whilst bats are often the victims of opinion and fear, Daniel explored this misguided rationale, and just how fascinating bats are. With 1386 species, bats are hugely diverse, exploiting every continent except Antarctica. They are the only known mammals capable of powered flight, and new species are found almost every year. They are



Infographic shows the seven principles for ethical wildlife control described in Dubois et al. (2017) International consensus principles for ethical wildlife control. Conservation Biology. <https://doi.org/10.1111/cobi.12896>



variable in structure, the largest being the giant golden-crowned flying fox weighing up to 1.2kg whilst the smallest is Kitti's hog-nosed bat weighing in at just 2g.

Bats never fail to impress. Both the fastest and loudest mammal are bats, and bats exploit a wide range of diets, including insects, fish, mice, lizards, birds, blood and even other bats. They are crucial as natural pest controllers for many of our favourite crops including coffee plantations and vineyards, whilst the Mexican long nosed bat pollinates agave plantations for tequila.

All eighteen species of UK bat are insectivorous, they all echo-locate and all are legally protected. Daniel shared a range of particularly stunning photographic portraits of UK bats, highlighting variations in facial structure, body shape, size and colouration, all related to their ecology.

As with many other taxa, bat populations are subject to threats including habitat and roost loss, predators, fly paper, barbed wire, disease, lighting (which creates a barrier as some species don't like flying through light patches) and roads which also create a barrier through areas of suitable habitat. Thankfully, our understanding of British bat populations is rapidly increasing through an extensive network of bat volunteers such as the National Bat Monitoring Programme run by the Bat Conservation Trust.

[Bats] are crucial natural pest controllers for many of our favourite crops including coffee plantations and vineyards, whilst the Mexican long nosed bat pollinates agave plantations for tequila.

Daniel concluded with consideration of what members of the public can do to help bats, such as volunteering for the NBMP, gardening for bats by planting night pollinating plants, and installing ponds and bat boxes.

To continue the wildlife in the wild theme, Geoff Edmonds, inspector for the RSPCA for 26 years, provided an update of **Wildlife crime in 2019**. He provided a review of the challenges with wildlife crime, highlighting the role of the RSPCA in bringing about prosecutions and raising public awareness, as well as caring for sick and injured wildlife.

A wide range of species-focused examples were discussed; for example badgers, which continue to suffer as a result of baiting, birds of prey which are being shot, bats that fall victim to roost de-



struction and the illegal hunting of hares, deer and foxes with dogs. Throughout all case studies, inaccurate reporting and data collection were a concern; there is very little clarity with regards to incidence, and there may be little correlation between actual incidence and that which is reported; particularly within rural areas where police coverage tends to be minimal.

It is encouraging to hear the National Police Chiefs' Council has recently published the National Wildlife Crime Policing Strategy and the Rural Affairs Strategy, both of which are available online, to emphasize the need for organizations to work together. Rural crime includes wildlife crime, and by working together we can promote understanding, gain greater awareness of what is happening, and build a better future for wildlife.

Tom Dutton, of Vets Now Referrals (Swindon), discussed the use of modern **falconry techniques to improve survival rates in wild injured birds of prey** to support the development of balanced, persistent flight. About 40% of birds of prey that make it into rehabilitation reach a stage where they can be released, so there is considerable focus on how practice can be improved to increase survival post-release. With birds of prey it is particularly important to return animals to the site of origin, as soon as possible, so releasing within 14 days is key to support successful reintegration to the wild.

For those individuals that have recovered to the point at which they can be assessed for flight capacity, round aviaries may be a useful addition in rehabilitation centres. These aviaries can be set up with minimal perching opportunity, promoting continuous circular flight. This can be very useful with regards to increasing pectoral (flight) muscle mass prior to release, however, it is important to use these aviaries for short periods at a time –forcing the bird to fly in circles or ground themselves will increase stress and may exacerbate the injury they are recovering from. Once birds are able to fly in the aviary, progressing on to flight in the field is important to effectively assess birds ready for release. It is at this stage where modern technology can be particularly beneficial.

The use of traditional lure flying is used to help improve flight although Tom discussed how this can be limited in the amount of work it requires of the bird. It can also lead to an association between food and falconer, which could be dangerous both for the bird and the unfortunate members of the public it may approach after release. It is also one dimensional in terms of flying style and so isn't ideal for birds that will soon be fending for themselves. However, it is relatively



cheap and easy to implement whilst also being effective for developing stamina and assessing flight ability.



Peregrine falcon hunting 'Rocrow'
www.rofalconry.com

Tom discussed how he uses Roprey - radio-controlled model birds - to help develop flight style prior to release to overcome challenges with traditional falconry techniques. The association between humans and food is removed, and the consistent flight that is encouraged closely emulates that which is expected of a wild-living bird, so fitness, aerial agility and hunting technique can all be developed. Attaching cameras to the Roprey can also be used to monitor flight style and progress prior to release, from a prey's-eye view. However, this technique is of course only relevant to raptors that predate other birds, and so not the most common species rehabilitated.

With many other talks, a range of stands, and a BWRC presence, this event was an excellent opportunity to meet with a wide range of wildlife carers, practitioners and academics. Hopefully this will become a regular feature of the conference timetable, giving a broad insight into a variety of topics affecting wildlife in a captive and wild setting.



8th International Workshop of the European Hedgehog Research Group

22nd & 23rd February 2019

By Terri Amory



Hosted by The Royal Parks at The Lookout in Hyde Park, this 8th meeting of the European Hedgehog Research Group (EHRG) was attended by scientists, rehabilitators and others from England, Wales, Denmark, Germany, the Czech Republic and The Netherlands.

The meeting was organized by Dr Nigel Reeve and Janet Peto, in collaboration with Tess Pettinger and others from The Royal Parks. The workshop was opened with a keynote speech from Pat Morris, MBE, entitled “Hedgehog research in Britain: looking back, looking around and looking forward”. Presentations on the first day were generally concerned with hedgehog ecology and survey techniques.

The keynote speech on the second day was given by BWRC Chair Terri Amory under the title “What has research ever done for us? and what do we still need it to do?” – highlighting the lack of peer reviewed publications directly related to hedgehog rescue and rehabilitation practice. Presentations on day two covered a wide range of topics including the article on the next page.

Abstracts of all of the conference presentations are available to download from The Royal Parks website -

https://www.royalparks.org.uk/data/assets/pdf_file/0020/101972/EHRG-Abstract-Book-FINAL.pdf



Rehabilitator's case study

Regeneration of Pulmonary Tissues during Hibernation

– a small pilot study of three hedgehogs

By Janet Peto, Hedgehog Welfare, Lincolnshire

The following was presented at the 8th European Hedgehog Research Group workshop at The Lookout in Hyde Park on 22nd & 23rd February.

Three adult hedgehogs were brought into Hedgehog Welfare, between 29th October and 26th November 2017, all from different areas, weighing 300g-360g and presenting with poor body condition. Two were males (Kenny and Hughie) and one was female (Ellen) - who was observed to have had at least one litter that year.

All the hedgehogs were cold and slightly dehydrated. 10mL of warm fluids were given sub-cutaneously on admission, and each animal was placed in an intensive care box, each of which contained newspaper-strip bedding and was placed on top of a heat pad under the box, in a centrally heated room.

Our vet prescribed broad spectrum antibiotic Amoxicillin trihydrate (Synulox or Noroclav) at a rate of 0.7ml/kg sub-cutaneously (s/c) for 14 days and a dose of anti-inflammatory/painkiller (Metacam, 0.1ml/kg s/c). They were also given bromhexine hydrochloride (Bisolvon powder) on food to thin and loosen mucus in the respiratory tract.

All animals ate well and were fed on raw minced turkey thigh a mixture of cat and kitten biscuits. All produced droppings overnight, which were stringy, smelly and pale in colour and almost unformed but not liquid.



The droppings of all animals were sampled and low burdens of lung worm eggs and larvae (*Crenosoma*) and roundworms and eggs (*Capillaria*) were present in all. A prescription was made for a broad spectrum anthelmintic (Levacide 0.35ml/kg s/c for 3 days, repeated after 13 days). Two days after the first course of Levacide, each animal was also treated with broad-spectrum wormer Ivomec Super (0.4ml/kg s/c).

The heat pad was removed once the animals were warm and eating and drinking well but they remained in intensive care boxes in a centrally heated room, so that they were breathing warm air.

After 8 days all animals were eating well and putting on weight, but as respiratory symptoms were not improving the vet was consulted again and further courses of amoxicillin were prescribed, with additional courses of Trimethoprim (Tribrissen) to one animal and Enrofloxacin (Baytril) to the other two. Pain relief (Metacam) was continued, as was the mucus thinner Bisolvlin. The female was also prescribed a spot on anthelmintic (Profender spot-on) as tapeworm infection was suspected.

All animals were considered for euthanasia after showing no improvement in respiratory symptoms after the second course of antibiotics. However, as both the rehabilitator and vet suspected that they had previously seen improvements in lung health over a period of hibernation, it was decided that no further treatment would be administered, but that these animals would be over-wintered, and x-rays used to compare the condition of the lungs before and after hibernation. Animals would then be assessed by the vet for fitness for release.

All three hedgehogs were anaesthetized using Isoflurane Inhalation Anaesthetic in an induction chamber. Each animal was x-rayed twice - once on their front and once from the side, between 29 and 39 days after admission. Initial x-rays showed considerable clouding of the lungs. The animals were then acclimatized to outdoor hutches via sheltered outdoor accommodation. Bedding was changed to a 50/50 mixture of long hay and torn newspaper strips. Feed was provided for animals should they wake, whilst weights were monitored, and amounts adjusted to avoid overeating.



The female (Ellen) hibernated for 3-5 days at a time through mid-December 2017 and on 24th December 2017 she went into hibernation until April 2018, waking for one or two nights approximately every two weeks to feed. Her nest was not disturbed when she woke. Her breathing was still audible when she was active.

By April her weight had increased to 649g. Further x-rays showed approximately 90% improvement to her pulmonary tissue during the hibernation period, although breathing was still audible when she was active. She was given a general health check by the vet and was deemed fit enough for release. Since release she has been seen circling with a large male and with young and was last observed in late summer 2018.

The male (Kenny) increased in weight from 330g on admission to 563g prior to the autumn x-rays, but as this animal showed signs of cage stress he was moved to a larger cage in a shed after the day 8 veterinary check. Kenny did not hibernate for more than two-three days at a time with as much as five to seven days of feeding in between hibernation periods over the winter. His weight was monitored during the waking periods and his food restricted to prevent obesity. He was an extremely dirty hedgehog and so his nest area was cleaned out during his waking periods.

In April Kenny's weight had increased to 659g, and x-rays showed approximately 40% improvement in pulmonary tissue integrity had been achieved during the rest over the hibernation period, although his breathing was also still audible when active. Since release he has been seen circling with other medium-sized hedgehogs and was last observed (recorded on camera) in November 2018.

The bodyweight of the third hedgehog (Hughie) increased from 310g to 520g- prior to the initial x-rays. He hibernated for periods of 5-7 days throughout winter, getting up for food in between for 1 to 2 nights. In April x-rays showed approximately 30% improvement to the bronchial patterns compared with those taken before the hibernation period, although breathing was still audible when he was active. Hughie has not been observed post-release.





Autumn (above) and Spring (below) x-rays of male hedgehog (Hughie).



While this study was conducted on a small scale, there is evidence to suggest that hedgehogs are capable of some pulmonary regeneration during periods of hibernation. We stress that all hedgehogs should be fully assessed prior to a release back into their natural, free-ranging environment.

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Sally Key (Hedgehog Welfare main carer) who helped care for one of these hedgehogs and helped put this article together, and Jayne Porter, Mary Atkin and Margaret Anderson who cared for these animals once they had had their first x-ray.

Vale Wildlife Hospital for the list of drugs we refer to all the time.

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Editor's note – the failure of worming treatments observed in this work supports the concept that anthelmintic treatment is not always effective or necessary. At the Hedgehog Carer's Conference in February 2019 Martyn Wood, representing Gower Bird Hospital, questioned the need to treat hedgehogs with low parasite burdens and suggested that pathology can be worsened by the overuse of anthelmintic drugs. Underweight animals can suffer seizures, discoordination and even death as a result of treatment with Ivermectin. (The Rehabilitator, Issue 70, Summer 2018, p8-9).





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