British Veterinary Zoological Society

Proceedings
of the Spring Meeting 2016

11-13 March, 2016

Chester Racecourse
and Chester Zoo

BVZS SPRING MEETING

Editor: Stephanie Ridge
British Veterinary Zoological Society

BVZS is the specialist division of the British Veterinary Association (BVA) recognised as having responsibility for exotic pets, companion avian species and zoo animals. Founded in 1961, the BVZS nowadays has an international membership and finds itself involved in almost every aspect of the care and welfare of exotic pets, zoo animals and wildlife.

The aims of the society are to promote the advancement of veterinary knowledge and skill in the maintenance of the health and welfare of non-domesticated animals and to encourage proper housing and conditions for such animals; to encourage full use of veterinary services by wild animal establishments and by the owners of exotic animals; to promote the international exchange of veterinary knowledge of non-domesticated animals.

Information to the membership is provided by:

- Twice-yearly scientific meetings held at different venues throughout the UK e.g. university veterinary field stations and zoological collections. Proceedings from each of these meetings are published with hard copy for attending delegates and a CD with all Proceedings, 2001-2016, for all other members.
- For 6 years BVZS held a Satellite Day at BSAVA in Birmingham. All details of this along with Proceedings are on the BVZS website at www.bvzs.org, plus an exotics stream at LVS, November 2013, 2014 and 2015.
- BVZS website has a password-protected members’ only area for specific member information, student members and those electing to receive online publications access this for our publications.
- Quarterly Wild Times newsletter in the members’ area.
- Contact with individual veterinary surgeons and with recognised student branches in our veterinary schools.
- Specialist courses to aid in CPD.
- An e-mail list open to BVZS full and associate veterinary members only, plus email lists for Nurses and Wildlife.

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## PROGRAMME

### FRIDAY

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<th>Time</th>
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<tr>
<td>10:00-16.30</td>
<td>Chester Zoo&lt;br&gt;&lt;small&gt;Complementary tickets available at Guest Services at main entrance of zoo for delegates registered for zoo visit&lt;/small&gt;</td>
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### SATURDAY

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<tr>
<td>08:00</td>
<td>Registration</td>
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<tr>
<td>09:00</td>
<td>Welcome by the BVZS Junior Vice President Fieke Molenaar</td>
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<tr>
<td>09:15</td>
<td>Session 1&lt;br&gt;&lt;strong&gt;BRITISH WILDLIFE&lt;/strong&gt;&lt;br&gt;(Chair: Fieke Molenaar)</td>
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<tr>
<td>10:30</td>
<td>COFFEE BREAK</td>
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<td>11:00</td>
<td>Session 2&lt;br&gt;&lt;strong&gt;WILDLIFE TRADE&lt;/strong&gt;&lt;br&gt;(Chair: Stephanie Ridge)</td>
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<tr>
<td>12:10</td>
<td>BVZS GENERAL MEETING</td>
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<td>13:00</td>
<td>LUNCH</td>
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<td>14:00</td>
<td>Session 3&lt;br&gt;&lt;strong&gt;NOVEL TREATMENTS AND TECHNIQUES&lt;/strong&gt;&lt;br&gt;(Chair: Peter Kettlewell)</td>
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### BRITISH WILDLIFE

- Becki Lawson: Ten years of garden wildlife surveillance: what lessons have we learnt? (30 minutes)
- Jon Cracknell: Wildlife disease interface: tuberculosis outbreak linked to sylvatic vectors and subsequent management
- Liz Mullineaux: Trying to make sense of tuberculosis (<i>M. bovis</i> infection) testing in badger (<i>Meles meles</i>) cubs
- Brian Coles: Over fifty years as a wildlife vet

### WILDLIFE TRADE

- Grant Miller: UK law enforcement - enforcing CITES at the UK border (30 minutes)
- David Roberts: Wildlife trade over the clear and darkwebs (30 minutes)
- Matt Brash: Invasive alien species: where do we stand in light of the new EU directive?

### NOVEL TREATMENTS AND TECHNIQUES

- Tom Dutton: A randomised controlled trial into the effects of a deslorelin implant in female Grey Parrots (<i>Psittacus erithacus</i>) with hypercholesterolaemia
- Craig Hunt: Thyroidectomy in a garter snake (<i>Thamnophis marcianus</i>), bearded dragon (<i>Pogona vitticeps</i>) and matamata (<i>Chelus fimbriata</i>)
- Richard Saunders: Management and complications of unilateral ureteronephrectomy in a rabbit (<i>Oryctolagus cuniculus</i>) following ureterohydronephrosis
- Tai Strike: Comparison of isoflurane and sevoflurane induction and recovery in captive adult meerkats (<i>Suricata suricatta</i>) - are the benefits worth the costs in a zoo hospital?
- Tom Bailey: The use of dataloggers in zoos, breeding projects, field studies and exotic animal practice
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<td><strong>NURSING</strong></td>
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<td>(Chair: Karen Homer-Forbes)</td>
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<tr>
<td>Lauren Valentine</td>
<td>A beginner’s guide to conservation/volunteering abroad</td>
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<td>Susannah Peel</td>
<td>Evaluation of bird species admitted to CETAS, Vitoria da Conquista, Bahia, Brazil</td>
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<td>Shakira Free Miles</td>
<td>Current legislation for exotic pets— review and VN rôle</td>
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<td>Lauren Valentine</td>
<td>Our rôle in local and global wildlife crime</td>
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<td>Shakira Free Miles</td>
<td>Exotic pet welfare cases – a VN rôle</td>
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<td>TEA BREAK</td>
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<td>15:45-17:00</td>
<td>Session 4</td>
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<td><strong>DEBATE: ZOO ANIMAL INTERVENTIONS</strong></td>
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<td></td>
<td>(Chair: Mark Stidworthy)</td>
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<td>Phillipa Dobbs</td>
<td>The advantages of invasive health monitoring in zoos</td>
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<td>Steve Unwin</td>
<td>How best to decide where and when to intervene: does effective disease prevention require a culture change within the UK zoo system?</td>
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<td>Jim Mackie</td>
<td>The practical application of animal training to help reduce stress during planned veterinary interventions</td>
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<td>Jamie Craig</td>
<td>Zoo animal interventions: How often should we be interfering?</td>
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<td>20:00</td>
<td>DINNER</td>
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<td><strong>INFECTIOUS DISEASES</strong></td>
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<td>Daniela Denk</td>
<td><em>Yersinia pseudotuberculosis</em> – new variations on an old theme: Part II</td>
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<td>Tim Wallis</td>
<td>Autogenous vaccines in principle and practice</td>
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<td>Becki Lawson</td>
<td>Emerging infectious disease threats to amphibians in the UK</td>
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<td>Julian Chantry</td>
<td>Zoonotic agents in Congo rats and squirrels</td>
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<td>Ian Ashpole</td>
<td>The successful treatment of an adult giant anteater (Myrmecophaga tridactyla) with clinical orthopoxvirus infection</td>
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<td>09:15</td>
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<td><strong>INVERTEBRATE FIRST AID</strong></td>
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<td>(Chair: Lindsay Thomas)</td>
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<tr>
<td>Sarah Pellett and Marie Kubiak</td>
<td>Invertebrate critical care and first aid</td>
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<td>Vic Simpson</td>
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<td>Photoquizoo No. 2. Wildlife path to enlightenment: can you face the challenge?</td>
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<td>Richard Saunders</td>
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<td>Small mammals: hamsters to hedgehogs, an interactive session</td>
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<td><strong>SESSION 7</strong></td>
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<td>Andrew Routh</td>
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<td>Conservation and zoos – it’s not just about breeding</td>
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<td>Will Justice</td>
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<td>Practical tips for reintroduction projects: A veterinary perspective</td>
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<td>Ellen Holding</td>
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<td>Wildlife in the popular media – how it influences public perceptions of conservation</td>
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<td>Neil A Forbes</td>
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<td>What future for African vultures?</td>
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<td>Fiona Froehlich</td>
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<td>Health status, weight gain and nutritional support during the rehabilitation of African Penguin chicks (<em>Spheniscus demersus</em>)</td>
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<td>Both days</td>
<td><strong>POSTER SESSION</strong></td>
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<tr>
<td></td>
<td>Katie Beckmann</td>
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<td>Disease risk analysis for avian reintroduction projects</td>
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<td>Holly Asquith-Barnes</td>
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<td>Use of thermal imaging and mobility assessment to detect arthritis in non-human primates</td>
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15:15-15:30 **PRIZE GIVING AND FAREWELL**

CPD Certificates will be issued: Saturday=7 hours, Sunday=5 hours, total 12 hours
Ian Ashpole  BSc (Hons) BVSc MRCVS
Since graduating from The University of Liverpool in 2008, Ian has spent time working in mixed, small animal and exotic animal private practice in the UK and, most recently, in Australia. As well as completing a one-year clinical internship in ‘Wildlife and Conservation Medicine’ at Tufts University, USA, in 2009/10, he has spent varying amounts of time working with the veterinary teams at Johannesburg Zoo, Wildlife Reserves Singapore and Taronga Zoo in Sydney. In 2012, Ian covered a maternity leave position at The Aspinall Foundation (Howletts and Port Lympne wildlife parks), a fantastic experience which culminated in him spending four months working with Western lowland gorillas in the forests of Gabon and The Republic of Congo. Ian is now enjoying his second spell as a temporary veterinarian at Chester Zoo.

Holly Asquith Barnes  MEnvSci (Hons.)
Holly Asquith-Barnes is a final year veterinary student at the Royal Veterinary College. Prior to this she studied Environmental Science, specialising in biodiversity and ecology at the University of Southampton and graduated with a First Class Honours Masters degree in 2006. Holly then worked as a zoo keeper, most recently as Head Keeper of Monkeys, at Monkey World in Dorset. Since starting at the RVC she has continued to develop her interests in zoo medicine and specifically primates through zoo placements. She has published papers on primate development, behaviour and management, conducted studies on Woolly monkey social and physical development and run the RVC Zoological Society. Holly hopes to work as a zoo vet after graduation and further indulge her passions for both research and primates.

Tom Bailey,  BSc BVSc MSc PhD CertZooMed Dip ECZM(avian) MRCVS
RCVS Specialist in Zoo and Wildlife Medicine
Tom works with Lance Jepson who established Origin Vets, a veterinary service based in South Wales that deals exclusively with non-domestic species. Falcons, exotic pets, birds, zoological collections, wildlife and fisheries all come under the care of Origin Vets. After graduating from Bristol Vet School in 1991, Tom worked in a variety of free-living and captive wildlife projects and hospitals in Africa and the Middle East. Along with Dr Jaime Samour, Tom established the veterinary department for the National Avian Research Center, a large captive breeding and restoration project for bustards in the UAE where he was fortunate to do his PhD. Tom returned to the UK in 2001 to do the MSc in Zoological Medicine at the ZSL. After a year in the UK, the Middle East beckoned again and he worked at Dubai Falcon Hospital and the Wadi Safa Wildlife Center in Dubai until 2011. Tom holds a Diplomate of the European College of Zoological Medicine (Avian), has published some journal and book articles and edited newsletters on raptor conservation and wildlife conservation. From 2011-2014 Tom was Head of Aviculture and Health at International Wildlife Consultants, responsible for the veterinary care and aviculture programme of a large raptor conservation and falcon breeding project in the UK. In his spare time he is bringing up his family on an environmentally friendly small-holding on the Pembrokeshire Coastal National Park.
Katie Beckmann MA VetMB MSc DipECZM (Wildlife Population Health) MRCVS
Katie works part-time as a wildlife veterinarian at the Wildfowl & Wetlands Trust (WWT), and is also studying part-time for a PhD at the Royal Veterinary College, Zoological Society of London (ZSL) and WWT. She is particularly interested in wildlife health in the context of biodiversity conservation, and her PhD research concerns health management of wildlife conservation translocations. Katie graduated in 2001 and worked in mixed and equine practice before gaining an MSc in Wild Animal Health in 2007. She worked at the Institute of Zoology, ZSL from 2008-2012 and 2013-2014, on projects involving wildlife health surveillance, and disease risk analysis and health management for species’ recovery programmes. Katie’s been at WWT since 2012 (full-time from 2012-13, and part-time since 2013) and has been a member of BVZS Council since last autumn.

Matt Brash BVetMed CertZooMed MRCVS
Matt Brash qualified from the RVC in 1987. For the last twenty five years, or so, he has been the veterinary surgeon for Flamingoland zoo, the NVS for FERA and more recently for York University.

Julian Chantrey BSc BVMS PhD FHEA FRCPath DipECZM MRCVS
European Veterinary Specialist in Wildlife Population Health
Julian graduated from Edinburgh University in 1992 and received his PhD in wildlife epidemiology from Liverpool University in 1999. He studied anatomic veterinary pathology in a residency programme jointly at Cambridge University and the RVC and then went to Liverpool University as a lecturer in veterinary pathology specialising in wildlife and exotic animal species. Since 2003, he has been the veterinary pathologist for Chester Zoo. Julian works with a variety of animal species and their infectious agents, with emphasis on infections that switch host species, particularly in wildlife and exotic animal species. His research projects include: squirrelpox in squirrels, diseases of garden birds, the UK cetacean strandings programme and infectious bronchitis virus in birds. He currently is researching mycobacteriosis in badgers and infectious diseases in rodents. His research experience includes field and laboratory studies of infectious diseases in wild animals and domestic species with research outputs including 42 papers.

Brian Coles BVSc DipECZM(Avian) Hon FRCVS
RCVS Emeritas Specialist in Zoo and Wildlife Medicine
Brian qualified in 1956 from the Faculty of Veterinary Science, Liverpool University, and subsequently worked in general practice in Herefordshire and Devon between 1956 and 1961. He set up and ran his own practice between 1961 and 2005. In 1961 Brian joined BSAVA and has held positions as North West Regional secretary, Council member, Chairman of the Veterinary Nursing Committee and Chairman of the Avian Studies Committee. In 1975 Brian joined BVZS and received honorary membership in 1998. In 1993 Brian became a founder member and executive secretary of the European College of Avian Medicine and Surgery (now European College of Zoological Medicine). Originally an Honorary Diplomate ECAMS (now DipECZM (Avian), Brian became a Member of the European Board of Veterinary Specialists in 1998 and was treasurer for seven years. He was also a visiting lecturer in avian medicine at the University of Liverpool and MSc course in Wildlife medicine at the Royal Veterinary College as well as a wildlife inspector to the Department of the Environment.
**Jonathan Cracknell**  BVMS CertVA CertZooMed MRCVS  
Jonathan has had a varied career, having worked in general practice, as an emergency and critical care clinician, a resident in anaesthesia at the Animal Health Trust, and as a wildlife and zoological medicine clinician internationally. His primary interests are conservation-led initiatives, anaesthesia, conservation welfare, one health, tuberculosis and capacity and capability development for NGOs in Asia. He currently holds the post of Director of Animal Operations at Longleat Safari Park, Veterinary Advisor for the Polar Bear EEP, Veterinary Advisor to the AZA Elephant SSP EEHV Advisory Group, Trustee for Free The Bears, Wildlife Surgery International and is a member of the IUCN Wildlife Health Specialist Group. He is an RCVS recognised Advanced Practitioner in Veterinary Anaesthesia and Zoological Medicine.

**Jamie Craig**  
Jamie has been Curator at Cotswold Wildlife Park since 2008 and animal management consultant at Woburn Safari Park since 2010. Prior to this he worked at Blackpool Zoo, Omega Parque (Portugal), Howett’s Wild Animal Park and Drusilla’s Zoo Park. Jamie is a licenced Secretary of State Zoo Inspector (FdScZRM) and Species Committee member for 10 EEP species: scimitar horned oryx (*Oryx dammah*), wolverine (*Gulo gulo*), Pallas’ cat (*Octocolobus manul*), Asiatic lion (*Panthera leo persica*), clouded leopard (*Neofelis nebulosa*), giant anteater (*Myrmecophaga tridactyla*), crowned sifaka (*Propithecus coronatus*), greater bamboo lemur (*Prolemur simus*), belted lemur (*Varceia variegata subcincta*), and mongoose lemur (*Eulemur mongoz*). Jamie is also a Core Group member and husbandry advisor for the EAZA Prosimian TAG, has compiled husbandry guidelines for ground cuscus (*Strigocuscus gymnotis*) (2007) and is currently compiling husbandry guidelines for crowned sifaka (*Propithecus coronatus*) and guidelines for public walk through prosimian exhibits.

**Daniela Denk**  Dr med vet MRCVS DiplECVP  
RCVS Recognised Specialist in Veterinary Pathology (Zoo and Wildlife)  
Daniela joined International Zoo Veterinary Group Pathology in 2011, initially focussing on diseases of avian, mammalian and reptile species, with the subsequent addition of fish pathology. She graduated from Munich Veterinary School in 2006 and immediately joined the veterinary diagnostic pathology team. Daniela completed her pathology residency at Liverpool University and is a Diplomate of the European College of Veterinary Pathologists and, since 2016, is a RCVS recognised specialist in Zoo and Wildlife Veterinary Pathology. Daniela is a pathology advisor to the EEHV advisory group (http://www.eehvinfo.org) and has recently worked on an update of the pathology section of the EEHV website. She also continues to publish in the zoo and wildlife field.

**Phillipa Dobbs**  BSc (Hons) BVetMed (Hons) MRCVS  
Phillipa started her career in zoo medicine in 2003 at Paignton Zoo. During her 4 years at Paignton Zoo she worked as an animal keeper and assistant in the veterinary department helping with procedures and paperwork. During this time she undertook a degree in Animal Science at Plymouth University. Phillipa qualified in July 2011 from The Royal Veterinary College. She initially worked in small animal practice in Hertfordshire for one year. During this year she set up exotic clinics and saw many different small mammals and reptiles alongside cats and dogs. In September 2012 she started work as Veterinary Associate at Twycross Zoo. She is currently working towards her RCVS Certificate in Advanced Practice (Zoological Medicine). She is also a visiting lecturer in exotic species at the College of Animal Welfare.
**Tom Dutton**  BVM&S MRCVS CertAVP(ZooMed) Resident ECZM(avian)  
Tom is an exotic animal clinician at Great Western Exotics (Vets Now Referrals). Following graduation from Edinburgh University, he completed a year-long rotating internship at NorthWest Surgeons followed by an ECZM(avian) residency at Great Western Exotics. Tom is due to sit ECZM board exams in April.

**Neil A Forbes**  BVetMed DipECZM(Avian) FRCVS  
RCVS and European Recognised Specialist Avian Medicine  
Neil qualified from RVC in 1983. He gained his RCVS Specialist Status (Zoo and Wildlife [Avian]) in 1992, his FRCVS by examination in exotic bird medicine in 1996 and DipECAMS in 1997. Neil has lectured internationally and contributed to >30 books. Neil received the Mackellar Award in 1991, Dunkin Award in 2002, Dr TJ Lafeber Avian Practitioner Award in 2004, Hunting Award in 2005 and the first recipient of the Gerlach Senior Award for excellence in avian medicine in 2011. He is a past President of the ECZM and the European Board of Specialisation. Neil heads the avian and exotic department at Great Western Exotic Vets (part of the Vets Now group) in Swindon, where he runs the only ECZM approved avian residency in the UK.

**Fiona Froehlich**  Mag med vet GPCert(ExAP) Resident ECZM(avian) MRCVS  
Fiona graduated from the University of Veterinary Medicine in Vienna in 2010 with a final year focus on conservation medicine. She has completed placements at Vienna and Budapest Zoo and worked with wildlife projects in Austria and Indonesia. Fiona practised at a small animal clinic in Essex for over two years before starting an internship at Great Western Exotics in Swindon. She obtained her GPCert(Exotic Animal Practice) in 2014 and has commenced with the ECZM Residency in Avian Medicine. Fiona has attended several EAZWV and BVZS meetings and is regularly holding CPDs in exotic medicine. She has published articles in the Veterinary Nursing Journal, Vet Times and Parrot Magazine.

**Ellen Holding**  BVetMed MRCVS  
Ellen has worked full-time in zoo medicine since 2011, primarily with primates, carnivores and ungulates. She graduated from the RVC in 2007 and worked in mixed and exotic practice, with wildlife volunteer work in the UK and abroad. She works full-time at Howletts and Port Lympne Wild Animal Parks, involving veterinary care of the UK collections and the Aspinall Foundation overseas projects.

**Craig Hunt**  BVetMed CertSAM DZooMed MRCVS  
RCVS Recognised Specialist in Zoo and Wildlife Medicine  
Following graduation from the RVC in 1997 Craig worked for 5 years in mixed practice in East Sussex, followed by 3 years in small animal/exotic practice in Gloucestershire before settling at Chine House Veterinary Hospital in Leicestershire. His caseload is almost exclusively 1st and 2nd opinion exotic companion with a roughly equal proportion of avian, reptile and mammal patients.
**Will Justice BVSc MSc MRCVS**
Will graduated from the University of Bristol in 2003. After three years in mixed practice he gained his MSc in Wild Animal Health and went on to do voluntary work for the wildlife epidemiology department at ZSL while also helping to develop a first opinion exotic pet practice in London. He subsequently went on to work in an exotic animal referral clinic, covering several zoological collections, before eventually doing full time zoo locum work. Will became Marwell Wildlife’s full time employed Veterinary Officer in 2010 before eventually becoming Head of Veterinary Services at Marwell in 2013. Since January 2015 he has also taken up a joint position with the University of Surrey as a teaching fellow in Zoo and Wildlife Medicine at the School of Veterinary Medicine. His interests include zoo animal nutrition, welfare, behaviour and wildlife epidemiology.

**Marie Kubiak BVSc CertAVP(ZM) DZooMed MRCVS**
RCVS Recognised Specialist in Zoo and Wildlife Medicine
Marie graduated from Bristol University in 2006 and spent two years as a first opinion exotics vet in Kent, before undertaking a three-year residency in Avian medicine. She has completed the RCVS certificate in Advanced Veterinary Practice with distinction in the Avian, Reptile, Wildlife and Zoo species examinations and a credit in small pet mammals. In 2013 Marie also obtained the RCVS Diploma in Zoological medicine and is an RCVS Recognised Specialist in Zoo and Wildlife Medicine. She currently heads up the five vet zoo and pet exotics team at Manor Vets in Birmingham and has a wide caseload covering captive birds, reptiles, exotic mammals, aquatic and zoo species.

**Becki Lawson MA VetMB MSc PhD Dip ECZM (Wildlife Population Health) MRCVS**
Becki is a Research Fellow in the Wildlife Epidemiology Research Theme at the Institute of Zoology. After qualifying from Cambridge in 1997, she began working with treatment and rehabilitation of British wildlife casualties and went on to work with disease investigation and national surveillance for various terrestrial and marine species. She completed the MSc in Wild Animal Health in 2000 and her PhD on the ‘Emerging and endemic diseases of British garden birds’ in 2010. She currently co-ordinates the Garden Wildlife Health project, a national disease surveillance programme for amphibians, reptiles, garden birds, birds of prey and hedgehogs, in partnership with the RSPB, British Trust for Ornithology and Froglife. Her research interest focuses on the effects of disease on free-ranging wildlife populations, particularly where pathogens have significant welfare or conservation implications.

**Jim Mackie**
Jim was appointed ZSL’s first Animal Training and Behaviour Officer in 2012 after beginning his zoo career training animals in live animal demonstrations for visitor education. Jim realised that the positive reinforcement techniques used could be transferred to the animal and veterinary departments to assist with medical and husbandry procedures. To enable this, Jim helped to form ZSL’s Behaviour Management Committees, at both London and Whipsnade Zoos, and the BIAZA Animal Training Focus Group, which he chairs. In 2014, ZSL was the recipient of a BIAZA gold award for its work in establishing a collection-wide animal training programme for veterinary and husbandry care. Jim regularly lectures on the use of animal training to improve welfare in captive exotic animals and recently worked with India’s Sakkarbaug Zoo and the Wildlife Institute of India providing behavioural management for a captive population of Asiatic lions as part of the conservation breeding programme.
Grant Munro Miller
Grant has worked within Border Law enforcement for over thirty years (from HM Customs and Excise to now Border Force). He has held roles in Intelligence, Investigation and in uniformed anti-smuggling. Grant now leads the CITES enforcement team based at Heathrow Airport. This team has a national remit and deploys to ports and airports on a risk basis to control both live and derivative CITES products on importation, exportation and transhipment. The team have been recognised as being world leaders in the field of wildlife crime enforcement. In 2014 and again in 2015 the team won the WWF wildlife crime enforcement operation of the year award. In 2013 Grant took on the chair of the UK law enforcement CITES priority delivery group and became a member of the UK wildlife crime tasking and co-ordination group.

Shakira Free Miles RVN BSc
Shakira works at the Beaumont Animal Hospital in Camden (part of the RVC). She is a member of the RCVS, All-party parliamentary group for animal welfare, Animal welfare party and World Veterinary Society. Her qualifications include NVQ levels 203 in veterinary nursing and a bachelor’s degree in veterinary health (2009). Her achievements and highlights include published articles for the VN times, VN online and Our Dogs. Shakira was a speaker for the ZEVN (zoo and exotic vet nursing) conference in 2015 and has worked aboard at various wildlife organisations. She was also the finalist for the CEVA animal health, welfare veterinary nurse of the year award 2015 and has got through to the final list this year as well. Shakira is the founder of a veterinary lead campaign group known as The SaveABulls to lobby against breed specific legislation.

Elizabeth Mullineaux BVM&S DVM&S CertSHP MRCVS
Liz worked in mixed practice, overseas and in the UK, before settling in Somerset as a director of a small animal veterinary hospital. Having developed an interest in British wildlife, in 2011 she completed a clinical doctorate investigating the factors influencing badger rehabilitation and release. She now works as Scientific Advisor to Secret World Wildlife Rescue, a charity specializing in badger rehabilitation, alongside small animal emergency medicine and academic part-time roles. Her main interest is the appropriate clinical care of British wildlife casualties. She is co-editor of the BSAVA Manual of Wildlife Casualties.

Susannah Peel BSc
Susannah Peel, Zoology BSc, graduated from the University of St Andrews in 2011, and is currently a student veterinary nurse with the College of Animal Welfare, with a view to specialising in the veterinary nursing of exotic species. While training as a nurse with a clinical placement at Goddard Veterinary Group, Wembley Branch, she volunteered at the Wildlife Aid Foundation hospital, Leatherhead as well as more recently volunteering at the Scottish Exotic Animal Rescue in Inverness. Over the past few years, Susannah visited Brazil, with particular interest in research into the illegal wildlife trade and its impacts on conservation. This broadened her experience, and lead to her work on a study at CETAS, the organisation which coordinates wildlife rehabilitation facilities in various regions where animals are given initial assessment.
Sarah Pellett  BSc(Hons) MA VetMB CertAVP(ZM) MRCVS  
RCVS Advanced Practitioner in Zoological Medicine

Sarah graduated from the University of Cambridge in 2006. After graduating she spent three years working at a first opinion and referral exotic animal practice in Manchester where she completed the RCVS Certificate in Advanced Veterinary Practice (Zoological Medicine). Sarah now works at Animates Veterinary Clinic, Thurlby, in Lincolnshire, seeing a wide range of first and second opinion exotic animal cases. She is a veterinary advisor for the BIAZA Terrestrial Invertebrate Working Group and secretary for the Veterinary Invertebrate Society. She is currently studying for the RCVS Diploma in Zoological Medicine.

David L. Roberts  BSc(Hons) MA MPhil PhD

David completed a PhD at the University of Aberdeen on the conservation of orchids of Mauritius, before moving to the Royal Botanic Gardens, Kew in 2001. During this time he spent a year at Harvard University as the Hrdy Fellow in Conservation Biology researching the role of museum specimens in conservation assessments. In 2010 he moved to the Durrell Institute of Conservation and Ecology at the University of Kent where he is a Reader in Biodiversity Conservation. His research ranges from extinction modelling to wildlife trade in a variety of taxa including elephants, rhinos, Uroplatus geckos, chameleons, and ornamental fish. Current work focuses on illegal online wildlife trade, including developing software to detect it, and investigating anti-poaching and traceability technologies.

Andrew Routh  BVSc CertZooMed MRCVS

In over 30 years as a veterinary surgeon Andrew has been lucky enough to work with wildlife, on conservation projects and in zoological collections on four continents. He is currently the Head of Veterinary Services for the Durrell Wildlife Conservation Trust and is based on Jersey in the Channel Islands.

Richard Saunders  BSc(Hons) BVSc FRSB CBiol CertZooMed DZooMed (Mammalian) MRCVS  
RCVS Recognised Specialist in Zoo and Wildlife Medicine

Richard graduated from the University of Liverpool in 1994, also obtaining an intercalated degree in Zoology. He worked in general small animal practice for 2 years before joining the RSPCA at Norfolk Wildlife Hospital, working with British wildlife. After that, he worked in increasingly exotic animal practice, obtaining his CertZooMed in 2001, and his DZooMed (Mammalian) in 2010. He joined Bristol Zoological Gardens as a resident in 2008, and Staff Vet in 2011. He works part time for Bristol Zoo, consults in private referral practice in Bristol and teaches at the University of Bristol. He is the RWAF Veterinary Adviser.

Vic Simpson  BVSc DTVM FRSB Hon FRCVS

Vic qualified in 1964 and, after a period in mixed practice, spent nearly ten years working in Africa. He worked in the MAFF/VLA Veterinary Investigation Service in Nottingham (1973-4) and Cornwall (1979-2001). His main interest had always been wildlife and in ‘retirement’ he set up the Wildlife Veterinary Investigation Centre. Main career achievements include the first diagnosis of lead poisoning in swans due to anglers’ weights (1970s), investigations into marine mammal mortality (1980s-2001) and studies of the health status of otters (1980s-2010) and red squirrels (2001-present). He has also made long term studies (1980s-present) of causes of mortality in bats and birds, notably mute swans, garden birds and birds of prey. Ongoing projects include an investigation in to diseases of polecats, stoats and weasels.
Taïna Strike  BVSc MSc(WAH) MRCVS
Taï graduated in South Africa in 1992 and has worked as a veterinary officer for ZSL at London and Whipsnade Zoos since 2000 after gaining her MSc in Wild Animal Health. Besides clinical work involving all zoo species, she also teaches postgraduate and undergraduate veterinary students. Taï is particularly proud to be part of the team involved with ZSL’s wildlife reintroductions. She is also involved in ZSL’s in situ programmes in Indonesia providing training for veterinarians working with Sumatran tigers, and tiger GPS collaring projects; and in India, helping to build veterinary capacity for free-living Asiatic lions in Gujarat. Her clinical research work ranges from various aspects of wildlife reproduction and contraception to nutritional, anaesthesia and clinical pathology investigation and validation. She has presented papers at many national and international conferences and as multiple publications. Taï is the European Taxon Advisory Group veterinarian for ramphastids and hummingbirds; a founder and executive member of both the EAZA Group on Zoo Animal Contraception (EGZAC) and the International Primate Heart Project (IPHP). Taï is an honorary lecturer at the Royal Veterinary College in London and a member of the Veterinary Record Case Reports Editorial Board (Zoo and Wildlife).

Lauren Valentine  RVN SQP
Lauren has been in veterinary practice since 2008. After registering as a veterinary nurse in 2012 she moved South taking a position at the RVC’s first opinion practice, Beaumont Sainsbury Animal Hospital, as their GP nurse. Since then Lauren has trained as a SQP and clinical coach, completed Edinburgh’s online Animal Behaviour and Welfare Course and is currently studying towards a Diploma in Zoology. Lauren took the opportunity in 2014 to follow her lifelong dream of visiting Africa for conservation purposes. Due to her new found love for all things wild she returned to Africa in 2015 to continue her education in the areas of wildlife, conservation and ecotourism. Lauren has a particular interest in the human-animal conflict and rehabilitation. She is also an ambassador for Malawi’s only wildlife sanctuary, Lilongwe Wildlife Centre. Lauren hopes to continue working overseas promoting the One Health vision.

Tim Wallis  BSc PhD
Tim studied Microbiology at Leeds University and then a PhD at Birmingham University studying the pathogenesis of salmonellosis. Post-doctoral positions at Leicester University involved the molecular basis of capsule expression in Neisseria meningitidis and the pathogenicity of Brachyspira hyodysenteriae for pigs. In 1992 he moved to the Institute for Animal Health, Compton to head the mammalian enteric pathogens groups and spent a happy 13 years studying the molecular basis of infection and immunity of Salmonella and E.coli infections in cattle, pigs and poultry. In 1999 he established Ridgeway Biologicals Ltd, a company specialising in the development, manufacture and supply of autogenous vaccines for food-producing animals. In 2005 he left the Institute to focus on developing the business into the UK’s leading autogenous vaccine manufacturer. When not studying bacteria, Tim enjoys climbing Scottish mountains, cycling and playing tennis. This when not juggling the demands of one wife and four daughters.
TEN YEARS OF GARDEN WILDLIFE SURVEILLANCE: WHAT LESSONS HAVE WE LEARNT?

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SUMMARY
The ecology of wildlife diseases is highly dynamic. Longitudinal surveillance integrating the study of infectious and non-infectious disease can identify threats to wild animal welfare and conservation, some of which may also adversely impact public and domestic animal health. Utilising citizen science enables large scale monitoring of wildlife health, facilitates rapid identification of emergent conditions and assessment of their significance.

REVIEW
In 2005, the Garden Bird Health initiative (GBHi) was set up to investigate causes of mortality in garden birds across Great Britain (GB). Two independent surveillance approaches were employed. Opportunistic reports of garden bird mortality incidents were solicited from the public. Systematic surveillance was undertaken by participants in the British Trust for Ornithology’s Garden BirdWatch network. These participants reported whether or not they had seen evidence of sick or dead birds in their garden on a weekly basis across the calendar year. Post mortem examinations were performed on a subset of incidents following a standardised protocol and set case definitions. In 2012, funding was secured for the Garden Wildlife Health (GWH) project to expand the GBHi. This involved a shift to reporting of wildlife mortality incidents via a dedicated website www.gardenwildlifehealth.org and expansion of the species’ range to include amphibians, reptiles and hedgehogs. GWH partners include the BTO, Froglife, RSPB and ZSL. Wildlife disease surveillance can detect threats to wild animal welfare and conservation, in addition to those that adversely impact public, companion animal and livestock health. Developing a fuller understanding of disease epidemiology enables practical measures for threat mitigation to be identified and communicated.

Over the past decade, > 3200 post mortem examinations have been performed on over 60 wild bird species, contributing to over twenty peer-reviewed publications covering a range of infectious and non-infectious diseases. These have demonstrated various patterns of disease epidemiology and significance; examples in GB include the following:

1) Emerging disease causes wildlife population decline
*Trichomonas gallinae* is a protozoan parasite that is historically known to cause trichomonosis in pigeons and doves and can also affect birds of prey that predate or scavenge on other birds that are infected with the parasite. Trichomonosis was first seen in British finch species in summer 2005 and is thought to have originated from sympatric British columbiforms. The disease has marked seasonality with a peak during the late summer to autumn months, although incidents occur throughout the year (Robinson et al., 2010). Parasite transmission occurs via fresh saliva, when birds feed one another during the breeding season or through shared food or water sources. Affected finches develop necrotic inluvitis and exhibit nonspecific signs of systemic disease (i.e. lethargy and fluffed up plumage) sometimes with
dysphagia. The greenfinch (*Chloris chloris*) and chaffinch (*Fringilla coelebs*) are most commonly affected by trichomonosis; however, many other passerine species are also susceptible.

Epidemic mortality due to this emerging infectious disease led to the decline of 35% (circa 1.5 million birds) of the UK greenfinch population within a 4-year period (Lawson et al., 2012a). This represents the largest scale mortality event of British wild birds due to infectious disease on record. Mortality incidents and the population decline are ongoing.

Finch trichomonosis was subsequently detected in Fennoscandia in 2008 (Neimanis et al., 2010): analyses of epidemiological data and ring recovery records support migrating chaffinches as the most likely vector of parasite movement (Lawson et al., 2011a). The disease continues to spread within mainland Europe, having reached as far east as Austria and Slovenia in 2013 (Ganas et al., 2013). A single clonal subtype (A1 epidemic strain) has been isolated from European finches (Chi et al., 2013; Ganas et al., 2013).

(2) Emerging disease adversely impacts wild animal welfare

Avian pox is an endemic viral disease of several British wild bird species (e.g. house sparrow (*Passer domesticus*), starling (*Sturnus vulgaris*), dunnock (*Prunella modularis*)) causing sporadic cases of disease at low prevalence. Routes of transmission include direct and indirect contact, typically via abraded skin, or through biting insect vectors. Paridae pox was first seen in south-east England in 2006 (Lawson et al., 2012b) and is associated with the development of severe skin lesions, often very large, affecting the head and body. Lesions can interfere with feeding, sight and locomotion, leaving birds vulnerable to predation, or overwhelming secondary bacterial infection. Whilst various species in the tit family are affected, there is strong evidence for differential species susceptibility with the great tit (*Parus major*) more commonly affected than the blue tit (*Cyanistes caeruleus*) or coal tit (*Periparus ater*). Cases can occur year round, but there is again marked seasonality with a peak in the early autumn months each year. The disease’s range has spread northward and westward over the past decade and it is now well established across England and Wales, as far north as the Scottish Borders. Great tit pox has been reported in Scandinavia since the 1950s and a cluster of incidents was seen in central Europe in the mid-2000s (Literak et al., 2010). Disease emergence in GB is considered likely to have occurred as a result of introduction of a novel avian poxvirus from Scandinavia or central Europe. This is likely through movement of an infected vector, via wind-borne or anthropogenic means, since great tit migration is limited.

Detailed surveillance of an outbreak of Paridae pox that began in Wytham Woods in 2009 found that the disease in great tits is not invariably fatal, and recovery can occur. However, the condition significantly reduces individual survival, particularly in juvenile birds, and their reproductive success. Nevertheless, modelling does not predict the impact will be sufficient to cause population decline based on the prevalence of disease observed in the field (Lachish et al., 2012).

(3) Marked fluctuation in prevalence of known endemic disease

Passerine salmonellosis is a bacterial disease frequently reported as a cause of mortality in gregarious and granivorous finch and sparrow species in Europe and North America since the 1950s. Affected birds show non-specific signs of ill health. The disease typically causes disseminated granulomatous infection. Transmission is through the faeco-oral route. Whilst
there are many species of *Salmonella* bacteria, British passerines are most affected by particular strains of *Salmonella* Typhimurium (phage types 40, 56v and 160) that are believed to be host-adapted (Lawson et al., 2011b). Incidents typically occur during the colder winter months. Long-term monitoring has revealed that the absolute number of salmonellosis incidents varies between years and that the predominant phage types vary in time and space (Lawson et al., 2014).

**(4) Appraisal of zoonotic infection risk**

The biotypes of *S.* Typhimurium that affect passerines have the potential to affect humans (and domestic animals e.g. cats), typically causing gastroenteritis. Monitoring over a 20-year period identified similar temporal and spatial trends of infection with *S.* Typhimurium phage types (40, 56v and 160) in both garden birds and humans, supporting the hypothesis that passerines are the primary source of these zoonotic bacteria. However, the public health risk is low and should be kept in perspective since these cases represented only 0.2% of all *Salmonella* infections from humans in England and Wales, 2000-2010 inclusive, and there is no evidence of antibiotic resistance in the garden bird-derived isolates tested to date (Lawson et al., 2014). Sensible hygiene precautions are recommended when feeding wild birds and particularly when handling sick birds or carcasses.

**CONCLUSIONS**

- Disease trends are highly dynamic and unpredictable. Long-term national surveillance schemes are required to differentiate endemic and emerging disease trends and rapidly detect novel threats.
- Collaboration is paramount. Veterinarians should work with national conservation NGOs, governmental animal and public health agencies, industry (e.g. wild bird food, pet trade), wildlife rescue and rehabilitation centres and research organisations to maximise outputs and their impact.
- Opportunistic disease surveillance can be achieved through promoting awareness of the need for vigilance for wildlife mortality incidents amongst the general public and related large welfare and conservation NGOs. This approach maximises the likelihood of detection of emergent conditions at an early stage, and the occurrence of sporadic conditions that occur infrequently.
- Tracking the spread and impact of diseases requires systematic surveillance, with standardised effort to identify both occurrence and absence, and to minimise bias. Systematic surveillance relies on partnership with existing volunteer networks with an interest in the species groups being monitored.
- Integration of wildlife disease investigation and surveillance programmes with species’ population monitoring schemes is essential to establish the impact of a disease at the population level and therefore its conservation implications.
- Sample archives are invaluable since they enable retrospective studies for specific pathogen testing, and prospective studies that aim to establish inference over a wide geographical region.

**ACKNOWLEDGEMENTS**

The GWH project has received financial support from the Esmée Fairbairn Foundation, the APHA Diseases of Wildlife Scheme (funded by Defra through the Scanning Surveillance Programme), Defra’s Strategic Evidence Fund and the Universities Federation for Animal Welfare.
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WILDLIFE DISEASE INTERFACE: TUBERCULOSIS OUTBREAK LINKED TO SYLVATIC VECTORS AND SUBSEQUENT CLINICAL MANAGEMENT

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Tuberculosis is the clinical manifestation of disease caused by members of the Mycobacterium Tuberculosis Complex (MTC). The role, especially of *Mycobacterium bovis*, is well established within the UK and is of particular note in southwest England. However, direct clinical evidence of sources of infection and spatial epidemiology is rarely documented, even when suspicion is high that wildlife vectors are the source. This case report outlines the preventative measures deployed in preventing a tuberculosis outbreak in the southwest of England, the reported failure with the occurrence of clinical tuberculosis cases and the subsequent management of the collection with a focus on environmental assessment and management, as well as selection of appropriate diagnostic modalities. The clinical case highlights the importance of the development of appropriate disease risk assessment tools, consideration of specific environmental factors and co-morbidities relevant to each individual situation, and the importance of the use of multi-modal diagnostics in conjunction with multiple stakeholder assessment and interpretation of data on the ground to achieve agreed end points in the case of removal of tuberculosis restrictions.

References
TRYING TO MAKE SENSE OF TUBERCULOSIS (\textit{M. bovis} INFECTION) TESTING IN BADGER (\textit{Meles meles}) CUBS

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Badgers (\textit{Meles meles}) are frequently presented to wildlife centres in the UK. Following treatment and rehabilitation, suitable cases are released back to the wild. Badgers are a maintenance host for bovine tuberculosis (\textit{Mycobacterium bovis} infection) and pose a potential zoonotic risk during captivity and a possible risk to livestock upon release. Discussions between wildlife charities and government agencies in 2000 resulted in a voluntary policy for the management and serological testing of badgers for \textit{M. bovis}.

The diagnosis of \textit{M. bovis} infection in badgers, as in other species, is limited by the sensitivity, specificity, practicality and availability of suitable diagnostic tests. Antigen tests are most useful for live testing of badgers, these typically have low sensitivity (around 50%) but high specificity (around 90%) (Chambers et al., 2008). At present the only commercial test is the Dual Path Platform (DPP\textsuperscript{®}) VetTB assay which is available through the Animal and Plant Health Agency (APHA) at Starcross.

Adult badger casualties are not routinely tested for \textit{M. bovis} infection, but are instead maintained in strict isolation during captivity and released exactly where they were found. Badger cubs are grouped and released at a location remote from where they were found. Cubs are tested on three occasions, with multiple testing improving overall test sensitivity (Mullineaux and Kidner 2011). Cubs testing positive are euthanased and necropsied using a detailed protocol (Cranshaw et al., 2008), with tissues submitted for \textit{M. bovis} culture. Badger BCG vaccine has additionally been use in rehabilitated badgers since 2010.

From 1996-2015 Secret World Wildlife Rescue tested 690 badger cubs on at least one occasion. 93 of 690 cubs (13%) tested seropositive and were euthanased. Subsequent necropsy and culture of 87 of these animals found 13 (15%) to be \textit{M. bovis} culture positive. Possible reasons for the low detection of \textit{M. bovis} in seropositive animals require further investigation, but may include: limitations of the available diagnostic tests, presence of maternal antibodies, infection with other \textit{Mycobacteria} species (in particular \textit{M. microti}), administration of BCG.

References
OVER FIFTY YEARS AS A WILDLIFE VET

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Although generally regarded as purely an avian veterinary specialist, initially the author was not particularly interested in birds, just fascinated since childhood with all animals. The author kept tortoises, rabbits, white mice, green tree frogs and grass snakes. As a boy, the author was taught how to find and collect birds’ eggs and to set snares for rabbits: the former activity now illegal. Now acting as a government wildlife inspector, the author has been involved in detecting such criminal activities. As a student, the author saw practice with Bill Jordan practicing in the Chester area and servicing Chester Zoo. At that time Chester Zoo had no in-house permanent veterinary staff. It was during this period that the author became much more interested in the pathology of all animals. Post mortems were often carried out with the author opening up the carcass and Bill Jordan seeing what he could find. Sometimes specimens were sent to the University of Liverpool for histological examination. However no in-depth investigation was carried out as it is today. The author still retains an interest in this activity, reading and discussing the in-house and University reports during the Zoo’s Animal Health Committee meetings. This includes the mortality of all animals from tiny fish to reptiles and elephants.

During the 1980s, the author became a wildlife inspector for the Department of Environment. This involved much travelling anywhere from South Wales to Essex to North Lancashire, supporting the police and local authorities and keeping careful notes suitable for production in the criminal courts. Apart from checking bird identification rings, there was the identification and legal possession of some species of invertebrates, reptiles and other species non-indigenous to Britain. Although often rather frustrating, this work was sometimes quite interesting, occasionally exciting, and on a few occasions downright dangerous.

Apart from zoo work, the author owes his interest in birds primarily to two naturalists: the late Jane Ratcliff who was interested in rehabilitating British owls to and the late Dr. David Cooke, a local GP, keen ornithologist and very good wildlife photographer. A third person who stimulated the author’s interest in wildlife was RSPCA chief inspector Tony Crittenden who brought the author a variety of injured creatures.
UK LAW ENFORCEMENT - ENFORCING CITES AT THE UK BORDER

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The Convention on the International Trade in Endangered Species (CITES) wild flora and fauna has been in existence for over forty years. Its aims are to control the impact on endangered species by trade. The United Kingdom has a long history of being a leading member of this convention. This presentation will introduce CITES enforcement in the United Kingdom, and articulate its collaborative approach to tackling enforcement. It will look in detail at the rôles and responsibilities of the law enforcement partners and their inter-dependencies. The command and control structures and function of the National tasking and co-ordination process will be explained, and the process for the setting of the UK wildlife crime priorities. The work of the CITES priority delivery group will also be covered including its action plan to tackle ivory and rhino horn smuggling, the trade in reptiles (both wild-caught and ranched), medicinal and health supplements, the illegal trade in raptors and the control of CITES listed timbers. Recent case studies of how the illegal wildlife trade presents itself in the UK and its scale will also be presented. We will finish with an explanation of the specific rôle carried out by Border Force and its growing International engagement through capacity building around the world.
WILDLIFE TRADE OVER THE CLEAR AND DARKWEBS

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The illegal wildlife trade, in particular the online trade (Hinsley et al. 2015), is receiving unprecedented attention at the local, national and international level. Due to the global reach that the internet provides buyers and sellers, billions of transactions now take place on a daily basis of which millions represent illegal trade, including the illegal trade in wildlife. As a result, identification of illegal online trade in wildlife is extremely time-consuming. Here we discuss the use of machine learning to identify potentially illegal online trade using the trade in elephant ivory as a case study. First attempts using metadata have achieved 93% accuracy (Hernandez-Castro and Roberts 2015); however this could be improved upon through the analysis of title and description text often used by experts and the application of Deep Learning to recognise elephant ivory images. Beyond the ‘clear’ web, with the increased focus on illegal wildlife trade, there are concerns that the illegal wildlife trade may have moved onto the anonymous networks, the darkweb. However, a recent study (Harrison et al. in revision) and further unpublished research suggests that there is very little trade. This lack of trade over the darkweb is likely due to insufficient incentive for trades to make the technological leap from the clear web on to the darkweb. Finally, there has been considerable campaigning to get clear web market sites to ban the trade in certain items. While illegal trade is moving on to social media platforms (Hinsley et al. in revision), such bans could be the stimulus required for illegal wildlife traders to move onto the darkweb. Such a move would make the work of law enforcers considerably more difficult.

References

Acknowledgements
The authors would like to thank T. McCrea-Steele, of the International Fund for Animal Welfare for sharing the keywords in their studies of illegal online wildlife trade on the clear web. Further the authors also thank the help of a number of students for help with data collection. Parts of this work were possible thanks to the generous research grants from Chester Zoo, NERC and the University of Kent.
Invasive alien species are considered to pose one of the greatest threats not just to biodiversity but also to the economic well-being of our planet. In Britain alone, invasive non-native species (plants as well as animals) cost the economy approximately £1.7 billion every single year. The real cost is likely to be greater as the ‘indirect costs’ associated with invasive species, such as damage to ecosystem service provision, is not accounted for in this figure.

The cost in the EU is also very large – estimated to be in excess of €12 billion per annum, not to mention the environmental damage they cause. The EU has been developing legislation on this for several years and in 2013 proposed a Regulation. This Regulation – called the Invasive Species Regulation - came into force in January 2015. Much of the Regulation is related to a list of species known as ‘IAS of Union Concern’ which are species whose adverse impact is such that they require concerted action at an EU level.

The first list of 37 species including 14 plants and 23 animals (Figure 1) was proposed by the European Commission in September 2015 and voted on and approved at a meeting of EU member states in December. This means that the provisions relating to the species on the list come into force shortly – likely in March 2016. It is anticipated that this list will be regularly updated, with new species added once they have been assessed as meeting the listing criteria set out in the EU Regulation.

So what does this mean in practical terms?

Zoos
- If you hold these animals then you will need to apply for a permit to keep them. This is likely to be from APHA in Bristol.
- A permit will be species and institution specific (i.e. if a zoo keeps ten specimens of one animal on the list and ten of another, it will require two permits). The permit can specify the maximum animals that can be kept.
- The animals in question do not need to be individually identified on the permit, but they do need to be marked or microchipped so that they can be identified and proven to belong to the institution when it is inspected or should they escape.
- It will be an offence to intentionally breed these animals.

Pet shops
- They will only be able to sell existing legitimate stock that is held or has been ordered on the day the law comes into force.
- They will be able to sell these animals to a member of the public within one year of the law coming into effect. But not after that.
- They will still be able to sell/donate these animals over the next two years, but only to other establishments that already have a permit (i.e. zoos).
• After two years the animals cannot be kept, other than as companion animals.
• Records of the provision and holding of each animal should be kept as in the normal course of business, just in case their origins are challenged. However, no such records need to be passed to DEFRA.

The public
• If you already own one of these animals as a pet, then you may keep it until the end of its natural life.
• It will be an offence to intentionally breed the animals.
• The animals cannot be transported or moved from their home, other than to a vet practice for medical treatment, or if you move house or want to go on holiday and the animal goes to another secure establishment for boarding.
• You will not be able to sell the animal. If you can no longer look after the animal you can seek a rehabilitation centre or refuge that is prepared to take it from you and keep it secure. A centre that receives such animals will need to prove that they were handed to them as unwanted companion animals in accordance with article 31(4) or have a permit under article 8. Article 31(4) provides flexibility to “establish” such refuges without the need for an article 8 permit.

Vets
• If you are an S-of-S zoo Inspector the presence of an IAS of union concern will be an additional consideration when you inspect a zoo or a zoos permit, or check the number and species of animals held.
• If you are an LA vet looking at a pet shop then we would recommend that you ensure that you inform the pet shop of their legal obligations, and note the presence and number of any animals on the list.
• If an animal on the list comes in to the vets, then you can treat these as normal. NB they do not have to be identified. The obligation to transport them to and from their secure location will rest with their owner. However, if they need to be kept overnight by you, you should take all reasonable precautions to ensure they do not escape.
• There will be no legal obligation for a vet to report anyone to DEFRA.

Figure 1. List of 23 animal species proposed as alien invasive species in September 2015

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common name</th>
<th>Scientific name</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Callosciurus erythraeus</td>
<td>Pallas's squirrel</td>
<td>Percottus gleni</td>
<td>Chinese/Amur sleeper</td>
</tr>
<tr>
<td>Corvus splendens</td>
<td>Indian house crow</td>
<td>Procambarus clarkii</td>
<td>Red swamp crayfish</td>
</tr>
<tr>
<td>Eriocheir sinensis</td>
<td>Chinese mitten crab</td>
<td>Procambarus sp.</td>
<td>Marbled crayfish</td>
</tr>
<tr>
<td>Herpestes javanicus</td>
<td>Small Asian/Javan mongoose</td>
<td>Procyon lotor</td>
<td>Raccoon</td>
</tr>
<tr>
<td>Lithobates (Rana) catesbeianus</td>
<td>North American bullfrog</td>
<td>Pseudorasbora parva</td>
<td>Stone moroko</td>
</tr>
<tr>
<td>Muntiacus reevesii</td>
<td>Muntjac deer</td>
<td>Sciurus carolinensis</td>
<td>Grey squirrel</td>
</tr>
<tr>
<td>Myocastor coypus</td>
<td>Coypu</td>
<td>Sciurus niger</td>
<td>Fox squirrel</td>
</tr>
<tr>
<td>Nasua nasua</td>
<td>Coati</td>
<td>Tamias sibiricus</td>
<td>Siberian chipmunk</td>
</tr>
<tr>
<td>Orconectes limosus</td>
<td>Spiny-cheek crayfish</td>
<td>Threskiornis aethiopicus</td>
<td>Sacred ibis</td>
</tr>
<tr>
<td>Orconectes virilis</td>
<td>Virile crayfish</td>
<td>Trachemys scripta</td>
<td>Red-eared terrapin</td>
</tr>
<tr>
<td>Oxyura jamaicensis</td>
<td>Ruddy duck</td>
<td>Vespa velutina nigrithorax</td>
<td>Asian hornet</td>
</tr>
<tr>
<td>Pacifastacus leniusculus</td>
<td>Signal crayfish</td>
<td></td>
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</tr>
</tbody>
</table>
A RANDOMISED CONTROLLED TRIAL INTO THE EFFECTS OF A DESLORELIN IMPLANT IN FEMALE GREY PARROTS (*Psittacus erithacus*) WITH HYPERCHOLESTEROLAEMIA

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The prevalence of atherosclerosis is high in captive female Grey Parrots (*Psittacus erithacus*) (Levine, 2003). The genera *Psittacus* are predisposed to atherosclerosis compared to other commonly kept psittacines (Beaufrère and others 2013). Elevated blood cholesterol level has been demonstrated as a risk factor in the development of atherosclerosis in psittacine birds (Beaufrère et al., 2014). In a prospective, randomised, negative-controlled, research study, five female Grey Parrots, previously diagnosed with hypercholesterolaemia, were implanted with a 4.7mg controlled release deslorelin acetate implant (Suprelorin, Virbac). A blood lipid panel was analysed prior to and three months after implantation of deslorelin acetate. A statistically significant reduction in blood total cholesterol was identified following implantation compared to a control group. Deslorelin acetate implantation could be included as part of preventative medicine to reduce the risk of atherosclerosis in female birds suffering from hypercholesterolaemia.

**References**


THYROIDECTOMY IN A GARTER SNAKE (*Thamnophis marcinanis*), BEARDED DRAGON (*Pogona vitticeps*) AND MATAMATA (*Chelus fimbriata*)

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An adult female garter snake (*Thamnophis marcinanis*) of unknown age was presented with a recent history of dysphagia, regurgitation and increased agitation. Clinical examination revealed a swelling in the region of the heart. Radiography and ultrasonography confirmed the presence of a large, ovoid soft-tissue, cystic mass cranial to the heart. The mass was excised via a left ventrolateral approach over the swelling; histology confirmed it to be a thyroid adenocarcinoma (Hunt, 2015).

An aged long-term captive, reproductively active, female matamata (*Chelus fimbriata*) presented moribund after a recent history of dysphagia. A large, cystic mass 8cm in diameter cranial to the heart base was identified during routine investigations. Following successful stabilisation with fluid therapy and oesophagostomy tube-feeding the mass was subsequently excised via plastronotomy. The size and position of the plastronotomy incision was determined from preoperative ultrasound examination of the mass. Histology confirmed thyroid hyperplasia with colloid goitre; the Matamata made an uneventful recovery and the dysphagia resolved.

Two unrelated bearded dragons (*Pogona vitticeps*), one male and one female belonging to the same owner presented at different times with similar signs of dysphagia, lethargy and marked swelling of the ventral neck. In both cases the masses were successfully excised via a ventral, midline incision extending from just caudal to the mandibular symphysis to the thoracic inlet. Histology of the mass in the female confirmed thyroid hyperplasia and colloidal goitre and in the male a well differentiated thyroid carcinoma.

All patients recovered well from surgery and all except the garter snake returned to normal activity and behaviour with no clinical signs of hypothyroidism for several months following surgery. The garter snake developed signs consistent with hypothyroidism (increased frequency of ecdysis) which resolved following thyroid hormone supplementation (0.025mg/kg PO SID reducing to 0.025mg/kg PO q5-7 days by week 12 post-thyroidectomy) (Hunt, 2015).

Disease of the thyroid gland is rarely reported in reptiles and does not appear to have previously been reported in the above species.

**References**

MANAGEMENT AND COMPLICATIONS OF UNILATERAL URETERONEPHRECTOMY IN A RABBIT (*Oryctolagus cuniculus*) FOLLOWING URETEROHYDRONEPHROSIS

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A two and half-year old male English Spot rabbit was referred for investigation of a 13-month history of intermittent urinary disease. Case workup lead to a diagnosis of unilateral ureterohydronephrosis following obstructive ureterolithiasis. A urine protein to creatinine ratio was performed to confirm the viability of the contralateral kidney. Ureteronephrectomy was performed without major complications. Tissues were submitted for histopathology and histological examination revealed unilateral chronic interstitial fibrosing lymphoplasmacytic nephritis with tubular and glomerular changes consistent with ‘end-stage’ renal changes. In addition, there was marked pelvic dilation and chronic lymphoplasmacytic urethritis consistent with prolonged urinary tract obstruction and its sequels. Despite initial remission of all clinical signs, the patient was frequently re-presented due to bouts of abdominal pain. These were initially treated symptomatically but due to ongoing recurrence of clinical signs an exploratory laparotomy was performed to investigate potential surgical complications. An adhesion of mesenteric adipose tissue to the caecum was identified and resected. The patient is still alive and healthy one year following initial surgery. The good results from this and similar case reports may indicate a more favourable prognosis for rabbits with unilateral ureteronephrolithiasis and/or ureterohydronephrosis than is historically proposed. Rabbits with renal stones are usually seropositive to *Encephalitozoon cuniculi*. The aetiology for the disease described in this case report remains undetermined but is most likely multifactorial. The negative *E. cuniculi* status of this animal is of further relevance to renal and ureteral pathology in rabbits.
COMPARISON OF ISOFLURANE AND SEVOFLURANE INDUCTION AND RECOVERY IN CAPTIVE ADULT MEERKATS (Suricata suricatta) - ARE THE BENEFITS WORTH THE COSTS IN A ZOO HOSPITAL?

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Meerkats (Suricata suricatta) are routinely anaesthetized with isoflurane in zoo and field settings. Sevoflurane is used with increasing frequency in small animal veterinary practice, it is more costly than isoflurane. Twenty adult meerkats of mixed age and sex held in the ZSL London Zoo collection were anaesthetized for routine health examinations with isoflurane. The procedure was repeated six months later in the same group of animals utilising sevoflurane. None of the animals were showing any sign of clinical disease at the time of anaesthesia. The speed and quality of masked induction and recovery was compared between the two volatile anaesthetic agents. Preliminary results reveal no statistically significant difference in the speed or quality of induction. A significant difference was found in the speed of recovery, but not in the quality of recovery. The mean anaesthetised heart rate was significantly higher with sevoflurane. Rapid return to normal behaviour after anaesthesia is regarded as important in all zoo species but particularly so in animals with a complex social and hierarchical structure such as meerkats. For this species, the advantage afforded by the speed of recovery with sevoflurane may offset the cost.
THE USE OF DATALOGGERS IN ZOOS, BREEDING PROJECTS, FIELD STUDIES AND EXOTIC ANIMAL PRACTICE

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Accurate information on the temperature and humidity within the captive environment is essential to ensure that the welfare of zoological species is not compromised. Suboptimal temperature and humidity are important contributing factors to a variety of health issues in ectothermic species such as reptiles and amphibians. Suboptimal temperatures and humidity can directly cause incubation failure in avicultural facilities.

Dataloggers are readily available and represent an inexpensive and versatile tool that can be used by vets and animal keepers to monitor and manage the captive environment of a variety of species and facilities (e.g. incubation units) within a zoological facility.

We will present examples of how information from temperature and humidity dataloggers can be used to monitor avian incubators, reptile vivaria, animal nurseries, transport boxes, avian nests and for field studies of free-living reptiles. This information can be vital when investigating mortality incidents, suboptimal health and poor productivity. Analysis of environmental data assists in improving productivity of equipment such as incubators and can improve the welfare of captive animals by correcting sub-optimal environmental conditions. Sometimes data can show danger points that occur during important events such as the transportation of animals between collections.

For example it is known that extremes of environmental conditions can cause morbidity and mortality during transportation of birds. Hyperthermia is probably the greatest risk to birds when they are transported and in the care of transportation companies. Temperature monitoring dataloggers (DS1921 ibutton, Revolution Education Ltd., www.rev-ed.co.uk) were fitted to transportation boxes of falcons being exported from the UK to the Middle East. Retrospective assessment of the environmental conditions that occurred during transportation was carried out. This information demonstrated that during the loading and unloading periods environmental temperature was uncontrolled and the birds were at risk of developing hyperthermia. Liaison with the airlines enabled better care of the transported falcons at these danger points in subsequent years.
A BEGINNERS GUIDE TO CONSERVATION/VOLUNTEERING ABROAD

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Following the recent “Blood Lions” exposé on the “hunting” industry, this presentation will discuss the pros and cons of volunteering abroad and how to pick a reputable and ethical volunteer project (Blood Lions, 2015). This presentation will include tips on finance, handy hints, cultural differences and ethics, equipping volunteers with the knowledge to make a more informed decision about the first trip or continued trips abroad. Volunteering abroad is linked to the One Health concept and by offering our skill set to projects in developing countries we can have an impact on conservation, human and animal welfare and veterinary medicine in these parts of the world. The speaker will reflect on her own experiences abroad from a non-veterinary and veterinary point of view. By the end of the discussion, prospective volunteers should have a better understanding of what makes a beneficial trip for the volunteer, organisation and the community where the project is located.

References
EVALUATION OF BIRD SPECIES ADMITTED TO CETAS, VITORIA DA CONQUISTA, BAHIA, BRAZIL

Susannah Peel

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CETAS (Centro de Triagem de Animais Silvestres) provides initial quarantine and triage for wild animals seized from the illegal trade by organisations such as IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis), from members of the public, rescued, and from other CETAS centres (Vilani, R. 2006).

Most data regarding the illegal wildlife trade relies on estimates or records collected by law enforcement organisations (Preuss, J. & Schaedler, P. 2011). Using data from CETAS in Vitoria da Conquista, Bahia state, species admitted from January 2000 to November 2015, and the sources of admission, were evaluated.

89.3% of admissions were birds, consistent with evidence that birds are the most widely trafficked (Alves et al. 2013). Twenty bird species were selected as a representative sample. 92.7% of animals admitted were seized from the illegal trade. The 3 most commonly admitted species were S. flaveola, (23.6%), P. dominicana, (12%), and Sporophila sp (11.2%). This is reflected in studies coordinated by IBAMA (Destro, G et al, 2012), and by Regueira, R. & Bernard, E. 2012. Ara sp. made up just 0.4% of admissions, however psittacine birds are the second most threatened bird species in Brazil (Alves, R. 2013), despite being listed as least concern on the IUCN Red List of Threatened Species. Brotogeris sp., just 0.41% of admissions, is also listed as least concern (IUCN Red List Website, 19/12/2015). Further independent studies are necessary to quantify the problem and species affected.

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DESTRO, G ET AL (2012), Efforts to Combat Wild Animal Trafficking in Brazil, in Biodiversity Enrichment in a Diverse World, vol. 1, Edited by Lameed, GA, Brazil.
REGUEIRA, R & BERNARD, E (2012), Wildlife Sinks: Quantifying the Impact of Illegal Bird Trade in Street Markets in Brazil, Biological Conservation vol 149, Issue 1, p. 16-22
CURRENT LEGISLATION FOR EXOTIC PETS - REVIEW AND VN RÔLE

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This presentation will provide an insight into current UK legislation protecting or not protecting the long list of exotic pets kept in the UK. The speaker will give a brief overview of the laws that affect our patients in practice and how the legal protection for pets should be encouraged.

Legislation such as the Animal Welfare Act 2006 and the Dangerous Wild Animals Act 1976 play an important role in the keeping of exotic pets. However the RCVS code of conduct for veterinary nurses states some vital guidance, such as our responsibility to animal welfare and breaking the data protection act, if animal welfare may be compromised (RCVS, 2016). Is this necessary and when? How can we as veterinary professionals protect our patients? The speaker has experienced concerning welfare issues within her rôle and will briefly share individual cases with the delegates.

Recent research found that 75% of reptiles in the UK die prematurely in their first year (Toland et al., 2012). The speaker will suggest how we can have an impact on this worrying statistic for the UK’s exotic pets.

References
OUR RÔLE IN LOCAL AND GLOBAL WILDLIFE CRIME

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In this presentation the speaker will focus on the role of veterinary professionals in the animal industry and how they can impact on wildlife crime in the UK (e.g. habitat destruction of UK bats) and overseas (e.g. illegal ivory trade). Wildlife crime will be defined in UK and global terms, a topical summary of the types of wildlife crime will be given and methods by which people can become involved in its reduction will be suggested. The speaker will review previous methods to reduce the ivory trade and the concept of ecotourism and will highlight the organisations involved in the regulation and investigation of illegal activities involving wildlife. The speaker hopes to increase delegates’ awareness of the battle to protect Earth’s natural beauties from criminal activity.
THE ADVANTAGES OF INVASIVE HEALTH MONITORING IN ZOOS

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Working as a full time vet for a medium sized UK zoological collection, the author has been heavily involved in the preventative health regimes. These regimes include non-invasive monitoring such as biannual faecal sampling and behavioural observations. However this only gives a small indicator of ‘herd health’.

In order to gain further understanding of the health of the animals in our collection we carry out regular invasive health monitoring. The frequency of this varies depending on the age of the individual animal and the species. Elderly animals have a full health check every twelve months, young and non-elderly animals have a full health check every two years. There are exceptions to these rules but each case is discussed with the relevant team leader prior to any health check being carried out. The benefits of invasive health monitoring in a medium sized collection with an on-site veterinary team outweigh the costs but this will not be the same for every collection.

Invasive health monitoring involves a significant amount of money and time but is an extremely valuable tool for zoo vets. It is also beneficial to the animals as it enables a health picture to be generated which can help during periods of illness of an individual or group.
HOW BEST TO DECIDE WHERE AND WHEN TO INTERVENE: DOES EFFECTIVE DISEASE PREVENTION REQUIRE A CULTURE CHANGE WITHIN THE UK ZOO SYSTEM?

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Prevention of pathogen spread and disease within a zoo is the responsibility of all staff. Integration into the management system has proven vital at Chester Zoo to allow the following process to occur. While many zoos may follow the programme below, we hope review of Chester Zoo’s robust and externally audited programme will generate discussion:

CHESTER ZOO PREVENTATIVE MEDICINE PROGRAMME

Goals
1. Prevent disease entering animal collection
2. Maintain health of collection
3. Prevent dissemination of disease to other institutions / release programmes

Importance
1. Difficulty of diagnosis and treatment of overt disease
2. Often too late once show signs of overt disease
3. Difficulty in eliminating many organisms once established in the collection

KEY ELEMENTS

Stock selection: Pre-import testing requested as per BIAZA and Chester Zoo guidelines. Weekly meeting with curators to discuss imports and exports and trust between parties on reasonable import requirements. Ability to refuse imports based on pre-import findings.

Quarantine and biosecurity procedures: For imports and isolation of resident diseased animals. Procedures agreed on jointly by vets and senior animal husbandry staff ahead of a disease outbreak, with dedicated staff to lead quarantine implementation, to enhance communication with all staff involved and biosecurity enforcement. These procedures are integrated with zoonotic disease control and an employee health programme.

Monitoring of health and welfare of the collection: Regular discussion of current and potential health issues with keeping and curatorial staff, including a weekly clinical briefing.

Health screening and routine/preventative treatments: Implementation of an infectious disease surveillance programme based on species susceptibility, and informed by regional and onsite pathogen findings.

Quarterly husbandry, health and welfare audits: External experts from Liverpool and Nottingham Universities, as well as exotic and zoo specialist vets, join with Chester Zoo directors, vets, curators and scientists to prioritise actions to improve health and welfare. This may be via changes in husbandry practices and/or facilities. The committee maps clinical, pathological, dietary and behavioural trends to highlight health and welfare issues. Recommendations are made on the risk management of diseases of strategic significance.

By combining these processes we are able to spot potential poor health and welfare issues in species and enclosures early and respond in a co-ordinated, timely multi departmental fashion.
THE PRACTICAL APPLICATION OF ANIMAL TRAINING TO HELP REDUCE STRESS DURING PLANNED VETERINARY INTERVENTIONS

Jim Mackie

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At ZSL we are fortunate to have a vet department comprising full time veterinary and nursing staff who are on call at all times to provide emergency care for the living collections at both sites.

In addition to the emergency care, part of the department’s work involves preventative health programmes including vaccinations and general anaesthesia for health monitoring, both during the quarantine period for new arrivals at the vet department, and beyond into the wider collection.

The rôle of Training Officer was, in part, established to help provide animal carers and veterinary staff with viable alternatives to the traditional techniques of manual and chemical restraint. Trained behaviour is one way of achieving these aims and is also used in a wide range of other applications, including emergency recall and shifting, stationing for physical examination, blood draws, urine collection and co-operative transportation.

Although it is possible to reduce stress through encouragement of voluntary participation via positive reinforcement training during invasive veterinary procedures, it does not mitigate entirely against the negative behavioural and physical repercussions of these procedures.

ZSL behaviour policy states that each non-emergency veterinary or husbandry procedure should be evaluated for the least intrusive method. When assessing the pros and cons of continuous health monitoring, one should remember the highest level of behaviour intervention cannot always be attained which can lead to a compromise in animal welfare. For example, a gorilla conditioned to voluntarily give blood through trained behaviour could be considered a stress free scenario for that animal. However, if anaesthesia is required for the same procedure, even if anaesthesia is achieved through a voluntary hand injection, the impact on that animal and the rest of the group during the procedure could be significant.

This presentation aims to offer further examples and to offer an overview of the current use of animal training to improve husbandry and welfare in captive exotic animals, with a focus on the use of trained behaviours in the field of veterinary intervention.
ZOO ANIMAL INTERVENTIONS: HOW OFTEN SHOULD WE BE INTERFERING?

Jamie Craig

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Although it is easy to see the potential benefits of invasive health monitoring of species kept in zoos and of furthering our knowledge of these species, there are many factors that have to be taken into consideration when deciding when and how often veterinary procedures should be carried out on what appears to be healthy animal populations. Whilst research is certainly an important responsibility of any modern zoo, it is by no means the only responsibility and conservation efforts, education, and ensuring high standards of animal welfare also require consideration and funding. The resources of each zoo, in terms of staff and finances are only finite and careful resource allocation is needed to ensure that all aspects of running a modern day zoo, as set out in the Secretary of State’s Standards of Modern Zoo Practice, are adhered to.

Many smaller collections work on very limited budgets and if significant amounts of money are having to be spent on health monitoring, this diverts money away from other things such as exhibit renovations/improvements, enrichment, improved diets, extra staff, as well as veterinary treatment for unwell animals when this is required. For collections that do not have their own on-site veterinary team it would almost certainly be cost prohibitive, as well as impractical, to have external veterinary surgeons regularly performing invasive monitoring procedures on the animal collection as a whole. A further management consideration is staffing levels and whether smaller collections, without an extensive on-site veterinary department, have adequate staff, with the required skill set, to assist in these procedures. There is always a large amount expected of a keeper’s time on a day-to-day basis and management need to rationalise time spent assisting with veterinary procedures against all their other expected duties.

There is also the question of individual animal welfare and whether anaesthesia and invasive health monitoring of apparently healthy animals is the right thing to do, even if collections do have the resources to support it. Whilst it may benefit the species as a whole to collect a database of knowledge and reference parameters, is it in the interest of the individual animal who is regularly being separated, darted and “tested”? For social animals with complex hierarchies the effects of removing one individual, even for a short period and then returning it covered in unfamiliar smells may be very significant both in the short-term and the long-term for that individual’s welfare. Even when attempts are made to be minimally invasive, such as training animals to accept conscious blood sampling, the very act of training the animal impacts on its ability and time-budgets to perform natural behaviours and so what is gained in knowledge of haematology and biochemistry may be lost in understanding of the animal’s natural behaviours or conservation breeding efforts.

Though there is clearly much to be gained from furthering our knowledge of the normal physiology of animals kept in zoos, and the benefits to individuals of catching disease processes early by regular monitoring cannot be questioned, many other factors need to be considered, on a collection to collection basis, when designing and implementing health screening protocols for zoological collections.
Yersinia pseudotuberculosis – NEW VARIATIONS ON AN OLD THEME: PART II

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Yersiniosis, primarily caused by Yersinia pseudotuberculosis, is an important and frequently fatal disease of zoo primates, birds and mammals. Its prevalence is highest during the winter months, when asymptomatic carriers searching for food and shelter congregate in enclosures. An initial survey of archived material submitted to IZVG pathology between 2010 and 2013 demonstrated an increase in case numbers with an unexpected occurrence of cases in warmer months. As part of this ongoing study, 59 Yersinia isolates (Y. pseudotuberculosis n=58, Y. enterocolitica n=3) were serotyped since 2010. This subsequent review summarises data on affected animals and highlights particular species’ susceptibility, organ systems most frequently involved and evaluates the geographic, species and organ distribution in correlation to isolated Yersinia strains.

Twenty-one avian and forty mammal cases, twenty-five of which were detected in non-human primates, were included in the study. Amongst avian species, birds of the orders Psittaciformes (52%) and Musophagiformes (19%) were most frequently affected. Non-human primates made up 63% of mammal cases with 44% of cases in the family Callitrichidae and 24% in the family Cebidae, respectively. The majority of remaining mammal cases belonged to the orders Rodentia and Chiroptera (17% and 12%, respectively).

Submissions derived from 29 collections and serotyping data of 21 collections were included in the geographic review. Six collections had Yersinia outbreaks with four or more cases in the same collection. Tissues most frequently exhibiting Yersinia lesions comprised liver and spleen in 44% of cases, the intestinal tract in 16% and mesenteric lymph nodes in 13% of cases. The prevalence of different serotypes is summarised in Figure 1. A geographic evaluation demonstrated geographic correlation of serotype occurrence and the presence of more than one serotype in the same collection. No significant correlation could be made between lesion distribution and Yersinia serotype.

Figure 1: Prevalence of Yersinia pseudotuberculosis and Yersinia enterocolitica serotypes from 21 zoological collections

<table>
<thead>
<tr>
<th>Species</th>
<th>Yersinia tuberculosis</th>
<th>Yersinia enterocolitica</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serotype</td>
<td>Ia</td>
<td>IIa</td>
</tr>
<tr>
<td>Prevalence</td>
<td>23</td>
<td>8</td>
</tr>
</tbody>
</table>

Yersinia isolates were sensitive to a wide range of antibiotics, with the exception of clindamycin, which all tested isolates were resistant to. However, antibiotic treatment can often not prevent fatalities. Strain specific vaccination incorporating one or several strains is available and may be beneficial as a preventative measure.
Environmental factors, which include the immune status of animals, can lead to divergent evolution of pathogenic bacteria resulting in strain variation. This can result in outbreaks of disease in vaccinated animals. Autogenous (bespoke) vaccines, derived from outbreak strains, can provide a rapid solution for the control of disease without the long term dependence on antibiotics. Similarly, for diseases of minor species for which fully licensed vaccines are unavailable, autogenous vaccines can be used as part of a disease control program. For some pathogens, so many variants exist that it has not been possible to develop vaccines which can confer immunity against all variants. As autogenous vaccines only need to be able to confer immunity against local strains they can be effective where fully licensed vaccines are unavailable.

Autogenous vaccines are derived from farm/zoo specific isolates and can be used in animal populations within the same epidemiological group. When collecting isolates, ideally a number of isolates should be collected and subjected to typing (molecular and/or serotyping) to assess strain variation within the collection.

Autogenous vaccines must be manufactured using Quality Assured procedures in a facility licensed by the Veterinary Medicines Directorate. Before release, batches of vaccine have to be safety-tested in the target species. As these vaccines are bespoke, planning is required as it takes 7-8 weeks to manufacture, QC test and supply a batch of vaccine. We have supplied autogenous vaccines to a number of zoological collections for the control of infections due to *Yersinia pseudotuberculosis*. Autogenous vaccines are widely used in food-producing animals. These included vaccines based on: *Mycoplasma gallisepticum, M. synoviae, E. coli, Salmonella* sp, *Pasteurella multocida, Mannheimia haemolytica, Erysipelothrix rhusiopathiae* and *Ornithobacterium rhinotracealae* in poultry; *Haemophilus parasuis, Streptococcus suis, Salmonella* sp, *E. coli, Actinobacillus pleuropneumoniae, Mycoplasma hyosynoviae, Staphylococcus aureus, Staphylicus, Yersinia enterocolitica* and *Brachyspira hyodysenteriae* in pigs; *Yersina ruckeri, Flavobacterium psychrophilum, Photobacterium damseliae, Aeromonas salmonicida, Tenacibaculum maritimus* and *Vibrio* sp for fish; *Pasteurella multocida, Mannheimia haemolytica, Streptococcus uberis, Salmonella* sp and *Mycoplasma bovis* in cattle.

Autogenous vaccines are quality products which can be a valuable resource for veterinary surgeons as part of an infectious disease control plan. They are not an alternative to good management, nutrition and other prophylactic measures.
EMERGING INFECTIOUS DISEASE THREATS TO AMPHIBIANS IN THE UK

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In recent decades, infectious disease has caused amphibian species’ declines and extinctions at national and continental scales (e.g. Batrachochytrium dendrobatidis in Australasia and the Americas, and Frog Virus (FV)3-like ranavirus in GB (Teacher et al. 2010)). Two novel pathogens have recently been detected in mainland Europe:

(1) Batrachochytrium salamandrivorans (Bsal) emerged in the Netherlands and Belgium in 2013 (Martel et al. 2013) and has caused epidemic mortality leading to dramatic reduction of wild fire salamander (Salamandra salamandra) populations. Caudate amphibians are susceptible to experimental infection while anurans appear resistant. Challenge studies have shown that Bsal is lethal to the great crested newt (Triturus cristatus), a protected European species of conservation concern. Bsal has been detected in captive amphibians in the UK (Cunningham et al. 2015). National surveillance and screening of archived newt samples have found no evidence of Bsal to date. This supports current thinking that wild amphibians in GB are currently free of this pathogen and vulnerable to its incursion.

(2) Common midwife toad virus (CMTV)-like ranaviruses have caused mass mortality of multiple and diverse amphibian host species in northern Spain over the past decade (Price et al. 2014). Screening of archived tissues from amphibian disease investigation in GB collected since the early 1990s is underway. Our aim is to detect and characterise the Ranavirus present and confirm whether the isolates are FV3-like as suspected, in order to inform the GB disease status and risk of CMTV-like virus incursion.

There is an urgent need for increased vigilance and threat mitigation to safeguard the health of British native amphibians from novel threats. Biosecurity guidance relevant to those with amphibians in captivity and field workers is available at www.gardenwildlifehealth.org.

References
ZOONOTIC AGENTS IN CONGO RATS AND SQUIRRELS

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There is a lack of data regarding the zoonotic agents of many exotic animals. The trade in wildlife for bush meat and exotic pets represents a risk of infection from emerging zoonoses, such as monkeypox, for local and global populations. This study sought to test a selection of rodent genera (*Cricetomys*, *Funisciurus* and *Graphiurus*) that have been proposed as reservoir species for monkeypox virus in the Democratic Republic of the Congo. These wild rodent species are frequently caught for bush meat so represent a zoonotic hazard for the local human population. The study also aimed to describe other zoonotic endoparasites found in these animals. Two of the *Cricetomys* specimens examined were positive for orthopoxvirus DNA by nested PCR (prevalence: 9.52%) from splenic tissue, which is noteworthy given that this species has been proposed as a less important host species in the Congo Basin compared to squirrels. Four zoonotic endoparasites were also identified, of which the most significant, *Angiostrongylus cantonensis*, was identified in both the *Cricetomys* rats (21% prevalence) and *Funiscuirus* squirrel (9%). This nematode has substantially increased its distribution and is the main causative agent of eosinophilic meningitis in humans. This paper is the first record of this zoonotic species from the DRC.
THE SUCCESSFUL TREATMENT OF AN ADULT GIANT ANTEATER

(*Myrmecophaga tridactyla*) WITH CLINICAL ORTHOPOXVIRUS INFECTION

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Cowpox virus belongs to the genus *Orthopoxvirus* within the family, *Poxviridae*, and is known to naturally infect a range of mammalian species, including wild rodents, which are considered to be the main reservoir hosts. Cowpox virus is endemic in Europe and captive elephants and felids are most often associated with clinical disease and mortality. Two giant anteaters were diagnosed with cowpox and subsequently died during an outbreak at Moscow Zoo in 1973.

An adult female giant anteater (*Myrmecophaga tridactyla*) became inappetent (Day 0) and rapidly developed multifocal vesicular and ulcerated lesions on her tongue and rostrum plus similar multifocal lesions on the skin of her limbs, underbelly and perineal region. Polymerase chain reaction (PCR) testing confirmed the clinical suspicion of orthopoxvirus infection. Due to the geographical location and the history of cowpox within the zoological collection, ‘cowpox’ was considered to be the most likely aetiology.

The anteater showed significant malaise and an inability to extend her tongue and ingest food so an intensive treatment plan was initiated including the administration of pain relief, anti-inflammatory agents, antibiosis and interferon omega (Virbagen Omega). The anteater also received parenteral nutritional support and fluid therapy under repeated general anaesthetics. Due to her continued loss of weight and body condition, maintenance volumes of her normal ‘Termant’ slurry (Mazuri Zoo Foods) plus probiotics were administered directly via a stomach tube on two occasions, under endoscopic guidance.

After two weeks of aggressive therapy the specimen had improved sufficiently to reduce the intensity of the treatment. At this time, although some new lesions where still developing, older lesions were clearly healing. Over the following week, the anteater showed a clinical improvement: brighter demeanour and an increasing appetite. At this time, she was still not able to extend her tongue fully but she could prehend her diet using her lips, allowing the administration of oral medications. By Day 21, the giant anteater was ingesting her normal daily food ration; she was able to extend her tongue fully and the skin lesions on her tongue and rostrum appeared fully healed. The anteater was considered to have made a full clinical recovery and treatment was stopped on Day 24.

During the animal’s convalescence, her weight decreased from an average of 42-44.0kg when in good health, to a nadir of 35.6kg, before steadily increasing to reach her ‘normal’ weight and body condition approximately two months after the treatment regimen was ended.

This presentation will discuss the treatment plan that was implemented after the anteater was diagnosed with poxvirus infection, as well as the unique difficulties that are posed when anaesthetising and treating giant anteaters.
INVERTEBRATE CRITICAL CARE AND FIRST AID

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SUMMARY
Invertebrate keepers, both in private settings or zoological collections have expressed the need for veterinary surgeons to show an interest, be able to treat and to prevent diseases in these animals.

The keeping of invertebrates in captivity is increasingly becoming popular either as pets, for education in schools, for research laboratories, for exhibitions and in many parts of the world as a source of food for other animals and humans (Cooper, 1998).

The basic principles of critical care in invertebrates are similar to the principles followed when treating more familiar species. Stabilisation and supportive care are essential and this involves maintaining the animal at its preferred body temperature, administering fluid therapy and housing the animal in a stress-free environment. Specific therapy may urgently be required, such as preventing further leakage of haemolymph, often due to trauma which has caused perforation of the exoskeleton or partial amputation of a trapped limb (Pellett and Bushell, 2015).

The aim of this session is to discuss and demonstrate six first aid techniques that can be applied to invertebrates. These include ectoparasite removal, haemolymph loss, dysecdysis, autotomy, wound repair and snail shell repair.

REVIEW
A detailed history, focusing on husbandry and observation of the animal or colony is essential. The first thing noticed may be a change from normal behaviour such as reluctance to move, remaining in an abnormal posture and/or anorexia. History should also include whether the animal was wild caught or bred in captivity, when it last ate and when it last moulted.

Gross examination of the invertebrate is fairly simple by placing the animal in a clear-walled container and viewing it from all sides. More docile species can be examined by careful handling but gloves should always be worn for this. Check the whole body surface looking for signs of disease, masses, ectoparasites, wounds, fungal infections (usually visualised at the opening of the book lungs in theraphosids) and dehydration (Pellett and Cooper, 2015).

TRAUMATIC INJURIES
Damage to the exoskeleton and control of haemorrhage
Damage to the exoskeleton can occur in arthropods if they are dropped or are handled during a moult; even a small defect can lead to loss of haemolymph and prove fatal. This is commonly seen in species such as phasmids and theraphosids which are often used in handling demonstrations or are frequently kept within the pet trade. If haemorrhage has occurred
then gentle pressure should be applied with a cotton-tipped applicator and the area repaired with tissue adhesive. Small wounds can also be dried using pure talcum powder (with no added perfume or additive). Alternatively, a drape can be made by cutting a small hole in a piece of cardboard to allow application of spray-on plaster over the wound and away from the spiracles.

Fluid replacement may be necessary depending on the volume of haemolymph loss. Damp paper towel with de-chlorinated or distilled water should be used as the substrate to reduce evaporative fluid loss. Rehydration in theraphosids can be achieved by placing the cephalothorax (taking care not to submerge the book lungs on the ventral abdominal surface) into a shallow dish of water. Most spiders will hydrate within a few hours. As extension of limbs is dependent on haemolymph pressure, severely dehydrated spiders will be unable to move. Fluids can be administered directly into the heart in the dorsal midline of the opisthosoma with isotonic fluids, using a 30 gauge insulin needle and syringe. If the heart is missed then fluids will still be effective as tarantulas have an open venous and closed arterial system. After injecting the cuticle must be closed with tissue adhesive to prevent further haemorrhage.

**Autotomy**

Limbs can be damaged easily due trauma, dyedcysis or from incorrect handling. Terrestrial theraphosids have fine hairs on their feet and these can be caught and trapped on clothing resulting in complete autotomy or damage to the limb with loss of haemolymph from the joints. If this occurs limb removal is necessary and this is usually performed conscious. More fractious species will require anaesthesia to allow treatment such as exoskeleton repair and autotomy. Volatile organic anaesthetics are the method of choice for anaesthetising theraphosids and both isoflurane and sevoflurane are suitable. Induction can be slow, taking as long as 20 minutes before there is a loss of righting reflex. To maintain anaesthesia the delivery of gas needs to be directed to the respiratory openings and in tarantulas the book lungs are located on the ventral abdomen. Once adequately restrained the damaged limb is held with forceps at the femur and is then pulled upwards and away from the body. Haemolymph leakage from the break point is stopped by applying fragrance free talcum powder to the area with a cotton-tip applicator. The animal should be placed on a paper towel substrate afterwards for 24-48 hours to monitor any continued leakage of haemolymph. By using paper towel as a substrate it allows observation of any loss of the pale coloured haemolymph which would be easily missed on normal substrate. Regeneration of the limb will take place and this will return to normal size within the following two to three moults (Pizzi, 2010).

**Shell Repair**

In captive terrestrial land snails, most commonly the giant African land snail, trauma can result in damage to the calcareous shell. The severity of injury needs to be assessed and the snail kept hydrated if repair cannot be performed immediately by placing the animal in a very shallow bowl of water. Fracture of the shell does not necessarily cause loss of haemolymph but may result in dehydration due to exposure and desiccation to underlying tissues. Small deficits in the shell can be covered with an adhesive drape and sealant, providing initial protection and allowing time for regeneration and some healing. Plaster of Paris or epoxy resin can be applied to the area, over the plastic dressing. Once this is dry, clear nail varnish
can be used as a waterproof layer of the repair. Damage to the tissues of the mantle (near the opening) can lead to shell growth deformities (Zwart and Cooper, in press). Damage to the lip of the shell, unless severe, will often heal with no intervention.

ECTOPARASITES
This may be a problem and can be observed in some captive invertebrates, such as millipedes. It is common to see some mites on them and saprophytic mites have beneficial effects. If there are high burdens of mites a fine paint brush dampened and blotted so excess water does not enter spiracles can be used to remove parasites. The environment must be addressed before placing the animal back into the enclosure.

DYSECDYSIS
This is a common problem seen in captive invertebrates causing morbidity and mortality, especially in phasmids, theraphosids or mantids. Dyecdysis is often caused by environmental factors such as low humidity or too high ambient temperatures, or animals that have fallen during a moult. In some species, such as stick insects, if there is insufficient height, they show difficulty in moulting and are often found on the floor of the enclosure. The fallen animal can be suspended from a shelf or high branch by placing clear tape to the back limbs covering the moult. This method allows the animal to emerge from its moult. Assisting with the removal of the old cuticle must be avoided as this may result in tearing of the new fragile cuticle underneath. The new cuticle is initially soft, to enable body expansion, and then will harden over a few hours to a few days depending on the species. Environmental parameters must be corrected.

Adult tarantulas usually moult once a year and owners should be encouraged to record this so that future moulting times can be predicted. Some owners will call the surgery for advice, concerned that the spider has died. Dead spiders are normally found in an upright position with the legs flexed beneath them. Dysecdysis is a common presentation in theraphosids and optimal husbandry, with the provision of good nutrition and hydration, is important in order to minimise this. If limbs are trapped in the moult, once the cuticle has hardened autotomy may be needed to release the spider (Pellett and Bushell 2015b).

ORGAN PROLAPSE
Snails can present with prolapse of organs through their mouthpart. Euthanasia is advised.

CONCLUSION
Critical care for invertebrates is still in its infancy but there are indications for examination and treatment when dealing with these animals. More interest in this field is essential to expand our knowledge and understanding of invertebrate care.
References
PHOTOQUIZOO Nº. 2.
WILDLIFE PATH TO ENLIGHTENMENT: CAN YOU FACE THE CHALLENGE?

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30 slides will be presented at 25 second intervals by automatic timer. Your answers will be marked by someone else so add a personal identifier (nickname or silly password) at the foot of the page. DO NOT USE YOUR OWN NAME! (NB. This page will be provided separately in your delegate pack)

| 1. Scientific name of organism responsible? | Genus species |
| 2. Common name for causal organism? |  |
| 3. Likely composition of the calculi? |  |
| 4. Likely genus names for parasites A & B? | A B |
| 5. Genus name for causal organism? |  |
| 6. Genus name for causal organism? |  |
| 7. Scientific name of organism responsible? | Genus species |
| 8. Common name for species responsible? |  |
| 9. Genus name for causal organism? |  |
| 10. Aetiology of lesions? |  |
| 11. Scientific name of causal organism? | Genus species |
| 12. Common name is? |  |
| 13. Common name for disease (2 words)? |  |
| 14. Common name for disease? |  |
| 15. Scientific name of organism in liver? | Genus species |
| 16. Common name for disease? |  |
| 17. Common name for disease? |  |
| 18. Name of organs? | Black arrows Green arrows |
| 19. Scientific name of parasite? | Genus species |
| 20. Common name for disease? |  |
| 21. Common name for disease (2 words)? |  |
| 22. Genus name of parasite? | Genus |
| 23. Scientific name of causal organism? | Genus species |
| 24. Organism associated with lesions? | Genus species |
| 25. Scientific name of causal organism? | Genus species |
| 26. Common name for disease? |  |
| 27. Common name for disease? |  |
| 28. Scientific name of causal organism? | Genus species |
| 29. Scientific name of causal organism? | Genus species |
| 30. Common name for disease? |  |

Your personal identifier:
Your handicap:
SMALL MAMMALS: HAMSTERS TO HEDGEHOGS, AN INTERACTIVE SESSION

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This interactive case-based session will cover a few common and not so common conditions, in common and not so common small exotic companion mammals including African pygmy hedgehogs, chipmunks, degus, ferrets, guinea pigs, gerbils, hamsters, mara, prairie dogs, rabbits, rats, raccoons, skunks, tamarins and wallabies. A range of cases and situations, diagnostic, behavioural, medical and surgical, will be discussed.
CONSERVATION AND ZOOS – IT’S NOT JUST ABOUT BREEDING

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The raison d’être for many zoological institutions is usually, broadly, defined referencing “conservation”, e.g. the Durrell Wildlife Conservation Trust’s mission is, simply, “Saving Species From Extinction”. And, invariably, it is the zoological “living” collections that are the most visible manifestations of any conservation work being done. Though all are required to have (often excellent) educational programmes, many collections are managed as income streams and to underpin an institution’s mandated conservation work. Thus they have to be “visitor attractions” (Weller, 1980); attractive to donors and financial sponsors. Proof of conservation success is often presented as captive, zoo, breeding of key species.

True conservation success stories can be cited, e.g. the Arabian oryx (Oryx leucoryx) and the ne-ne (Branta sandvicensis), but zoological collections have finite capacity. They have to rationalise what they hold, exhibit and, critically, breed – and many breeding programmes are too successful. Captive populations, including the “conservation species”, are often managed through the use of contraception, single-sex groups and culling surplus stock. Conversely, many species that could benefit from captive management are not held. For example, endangered amphibians are poorly-represented (Dawson et al., 2015).

Expertise from within the zoo community, including veterinary expertise, should be utilised to a greater degree in developing projects involving bio-secure units, in-country facilities, supported release programmes and active management of in-situ populations at an ecosystem level. Projects cannot be limited to the “charismatic mega-fauna” – otherwise we will lose a myriad of “little brown jobs”. Robust results are often not apparent within time-frames defined by e.g. institutional five year collection plans (Young et al., 2015). All this work needs philosophical revision of how zoos should act as conservationists (e.g. Tapley et al., 2015), money and thus, critically, how they present this to their supporters and visitors.

References
PRACTICAL TIPS FOR REINTRODUCTION PROJECTS: A VETERINARY PERSPECTIVE

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Reintroductions are just one type of conservation translocation. Others include reinforcements (usually grouped with reintroductions as population restoration translocations) and introductions (assisted colonisation and ecological replacement). All types of translocation involve several stages: Planning, Feasibility & Design, Risk Assessment, Release and implementation, Monitoring and continuing management and Dissemination of information (IUCN 2013).

Conservation translocations are often complex operations that need veterinary input at each stage of the process. Despite careful planning, significant problems are often still encountered requiring difficult decisions to be made. These decisions can easily influence the success or failure of a project. As projects tend to be expensive, time-consuming, often involving multiple parties and centred round a unique window of opportunity, there tends to be added pressure for key decision-makers to avoid any mistakes.

Many of these problems can be avoided by involvement of veterinarians early in the planning process, as veterinary expertise should be available to advise on areas such as animal welfare, disease and certain aspects of legislation. Disease risk assessment is of particular importance from a veterinary perspective. This should be carried out at the planning stage with assessment in proportion to risk of occurrence and severity of impact and reviewed during implementation.

References
IUCN (2013) IUCN Reintroduction Guidelines.
WILDLIFE IN THE POPULAR MEDIA – HOW IT INFLUENCES PUBLIC PERCEPTIONS OF CONSERVATION

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Images of wildlife and exotic species are everywhere – used in adverts, in TV shows and shared online. How these animals are portrayed influences public perception of those species, and therefore conservation funding and policy.

There are two ways that people’s perception could be altered by seeing exotic animals in non-natural environments or portraying non-natural behaviours. The familiarity hypothesis predicts that if animals are depicted as human-like, we will empathise more with them, and are more likely to take an interest in their conservation. On the other hand, the distortion hypothesis predicts that if animals are shown in human settings then people will get the impression that they’re not that rare, which could hinder conservation efforts.

There have been several chimpanzee studies which support the distortion hypothesis; Schroepfer et al. (2011) demonstrated that after members of the public were shown pictures of chimpanzees in offices or wearing human clothing, they were less likely to rate chimps as endangered, showed less concern for the welfare of the chimps, and were much more likely to think that a chimpanzee would make a good pet.

CGI and ‘Photoshop’ now allow us to depict animals however we like without dressing an actual chimpanzee in a suit and tie – but even though there are no individual welfare concerns, such images can still be detrimental to conservation efforts. We can use studies like the ones discussed to design guidelines for images that will help promote conservation aims.

References
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SCHROEPFER KK, ROSATI AG, CHARTRAND T, HARE B (2011) Use of “entertainment” chimpanzees in commercials distorts public perception regarding their conservation status. PLoS ONE 6(10)
WHAT FUTURE FOR AFRICAN VULTUREs?

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The Asian vulture crisis resulted in losses of >98% of the population between 1992 and 2007 due to diclofenac (Cuthbert et al., 2009). Press and conservationists have been concerned with “sexy” threatened species in Africa (rhino, lion, elephant), forgetting “nature’s clean up team” - the vultures (playing a vital role in clearing away carcasses, anthrax, rabies, tuberculosis and botulism). In 2015, six of Africa’s eleven vulture spp. had an upgraded risk of extinction (Birdlife International, 2015). African vulture populations (outside protected areas) have declined by 98% in the last 30 years (Thiollay, 2006). In Africa there is not a single attributable cause so control is challenging. A recent review of vulture losses reported the use of vulture body parts in traditional medicine (‘muti’) accounting for 29% of losses (Ogada, 2015). Accidental poisonings resulted in loss of 94 vultures a year between 1970 and 2011, (3967 in total), the greatest increase was seen in deliberate targeting by poachers (681 vultures per year 2012-2014 (2044 in total), with average fatalities of 186 per incident, ranging from 1 to 700). Carbamate pesticides are being misused by livestock owners to poison predators such as lions and hyenas, causing a reduction of crushed bone in vulture diets, leading to calcium deficiencies in developing chicks (Ogada, 2014). Vulture deaths were caused by malicious or accidental poisoning (61%), traditional medicine (29%), food (1%) i.e. 91% were avoidable, with 9% caused by trauma, electrical supply or infra-structure. Vulture restaurants have proven popular, but research has shown a vulture home range of 30,000 to 80,000 Km², travelling up to 250km a day so poisoning still looms large (Kendall and Virana, 2012). Vultures are vital to the eco-system consuming 70% of all meat in the Masai Mara.

References
**HEALTH STATUS, WEIGHT GAIN AND NUTRITIONAL SUPPORT DURING THE REHABILITATION OF AFRICAN PENGUIN CHICKS (Spheniscus demersus)**

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The African Penguin (Spheniscus demersus) is listed as endangered due to a rapid population decline, presumably as a result of commercial fishing and a shift in prey populations (Birdlife International 2015). Wildlife rehabilitators are faced with the seasonal challenge of caring for a large number of orphaned African Penguin chicks within a short period of time. Reasons for abandonment include a lack of natural resources, oiling, relocation, disturbances and moult of parent animals (Sherley and others 2014).

The following study took place at the Southern African Foundation for the Conservation of Coastal Birds (SANCCOB) and aimed to compare the currently used handmade rearing diet with a commercially available critical care diet (Emeraid Piscivore). A clinical examination was performed before and after the two-week trial period and several parameters such as weight, WBC (white blood cell count), PCV (packed cell volume) and TP (total protein) were established. Weight was recorded daily and BCS (body condition score), hydration and habitus were assessed throughout the study period.

Results show that the absolute and percentage change of the median weight did not differ significantly between the two groups, indicating that both diets lead to an appropriate weight gain and may be successfully used in the rehabilitation of African Penguins.

References


DISEASE RISK ANALYSIS FOR AVIAN REINTRODUCTION PROJECTS

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Ambitious interventions for wildlife conservation, such as reintroductions, have had relatively low success rates to date, and further research into their limitations and methods is needed in order to improve outcomes. Disease is one of the potential constraints on successful reintroduction. Guidelines for disease risk analysis (DRA) and health management for reintroduction of specific taxonomic groups would be beneficial.

This PhD project is using reintroduction projects for the Eurasian crane (Grus grus) and corncrake (Crex crex) as case studies by which to review, and further develop, DRA and health management strategies for avian reintroductions, and comprises:
1. A literature review, to identify the DRA methods and diseases encountered in avian reintroduction projects to date;
2. Risk factor analyses, to determine factors affecting a) survival of corncrake chicks to the point of release, and b) incidence of specific non-infectious disease conditions (in corncrakes and cranes);
3. A retrospective critical review of the DRA for crane reintroduction in light of disease outcomes;
4. Leading from the above, development of DRA and health management guidelines for reintroductions.

Both infectious and non-infectious disease conditions have been significant threats to crane and corncrake reintroductions. Husbandry modifications were required to reduce the prevalence of non-infectious diseases during both projects. Strict biosecurity measures and prophylactic medication successfully prevented infectious disease outbreaks during captive rearing for crane reintroduction.

Disease threats (including those relating to husbandry) need to be factored into project planning at an early stage, in order to maximise animal health and welfare, and reintroduction success.
USE OF INFRARED THERMAL IMAGING AND MOBILITY ASSESSMENT TO DETECT ARTHRITIS IN NON-HUMAN PRIMATES

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This project aimed to determine whether infrared thermography (IRT) is a useful tool in identifying arthritis in non-human primates. Arthritis encompasses a variety of conditions affecting joints, all with an inflammatory component. The most common form is osteoarthritis (OA) which often results from joint trauma or the ageing process. As zoo-primate care has evolved, animals are living longer and age-related health conditions are becoming more common. Arthritis is painful, leads to stiffness and lameness and is consequently a welfare concern. IRT is able to map skin surface temperature and so can be used to visualise inflammation in underlying tissues. It has been used to investigate arthritis in humans and zoo species such as elephants but has never been used for this purpose in primates.

Thermal images were taken of 105 primates of 16 different species at four BIAZA-member zoos and one primate rescue centre. The primates were divided into three groups; Confirmed Arthritic (CA), for primates with arthritis diagnosed by radiography; Suspected Arthritic (SA), for primates exhibiting clinical signs of arthritis but which had not been definitively diagnosed with radiography and No Arthritis Suspected (NAS), for primates exhibiting no clinical signs of arthritis. Mean minimum and maximum temperatures and temperature difference across joints were compared between the three groups. A mobility assessment was carried out on all individuals imaged. It assessed perceived stiffness and pain on movement and at rest, symmetry of limb use, range of motion, physical function, impact on quality of life and the presence of clinical signs. Mobility assessment scores were compared between the three groups of primates.

IRT was found to be ineffective in recognising spinal OA and arthritis in joints covered by thick fur. Tarsal arthritis was successfully recognised by IRT and there was evidence of IRT recognising greater temperature differences across other CA joints than NAS joints but insufficient case numbers prevented statistical testing. Mobility assessment was successful in recognising arthritic animals and there was a significant difference in mobility scores between CA and NAS groups (P=0.0001). Mobility assessment was more consistently successful in recognising arthritic animals than IRT. In the future a combined method using both tools may provide a diagnostic approach which allows diagnosis of arthritis in non-human primates with greater confidence, without the need for physical contact and potentially allowing earlier treatment. For collections not in a position to invest in infrared thermography technology, the mobility assessment developed can be used to improve identification of arthritis patients and allow objective monitoring of a patient’s condition over time.
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(Last updated: February 2016)

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