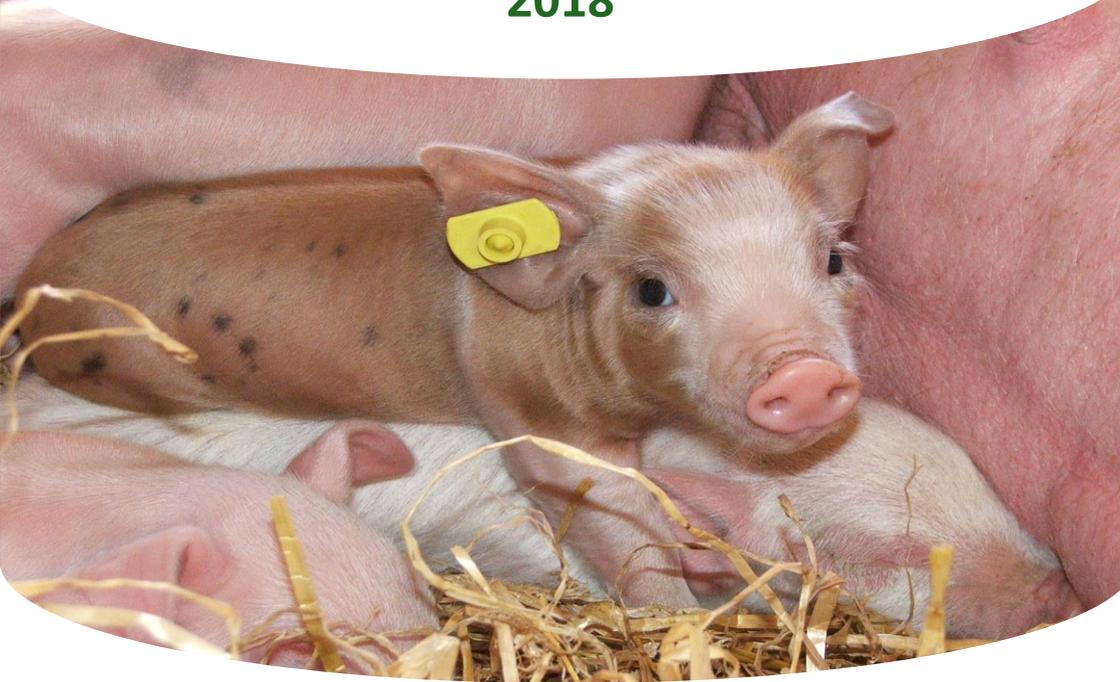




**ISAE
UK & Ireland Regional Meeting
2018**



University of
BRISTOL

Forward

We are delighted to welcome you to the University of Bristol for the 2018 UK and Ireland ISAE regional meeting.

Since the establishment of ISAE in 1966 ISAE has grown to be the foremost international society for professionals working in the area of applied animal behaviour, has a federal international structure, and regional representatives around the world. It provides a pool of independent experts for governments, international bodies, industry and NGOs (e.g. Council of Europe). The UK and Ireland region is the largest region worldwide, with 110 members.

We are delighted to have such a large attendance from both the UK and Ireland, from a number of different fields, institutions and organisations. We feel that attendance at the meeting is a unique networking opportunity for academics, industry representatives, and anyone with a professional interest in animal behaviour and welfare, and throughout the day we will showcase the most up to date applied animal behaviour research in the UK and Ireland.

We hope you enjoy today's meeting and the opportunity to network with colleagues and friends.

ISAE Regional Meeting 2018 Organising Committee

- *Dr. Amy Quinn – Teagasc & ISAE UK & Ireland Regional Secretary*
- *Dr. Simon Turner - SRUC & ISAE UK & Ireland Regional Secretary*
- *Dr. Joanne Edgar - University of Bristol*
- *Dr. Anna Davies -University of Bristol*
- *Dr. Stephanie Buijs - AFBI*
- *Dr. Carole Fureix - Plymouth University*

Conference Agenda

Time	Description
09.00 - 09.30	Registration (tea & coffee available)
09:30 - 09:40	Welcome – Prof. Mike Mendl
09:40 - 10.40	Oral presentations: Session 1
10:40 - 11:10	Tea & Coffee
11.10 - 12:45	Oral presentations: Session 2
12.45 - 13:45	<i>Lunch</i>
13.45 - 15:00	Oral presentations: Session 3
15.00 - 15.30	Tea & Coffee
15:30 - 16.40	Oral presentations: Session 4
16:40 - 17:00	Concluding remarks – ISAE UK/Ireland Regional Secretaries

Oral Presentations

Session 1

Going round in circles: is an altered ability to learn associated with an abnormal repetitive behaviour in dogs?

S. Hobbs, E. Blackwell, B. Loftus and R. Casey

A holeboard task to assess spatial working and reference memory in dogs:

M.I. Smith, J. Murrell and M. Mendl

Route-tracing in captive Carnivora: is natural foraging niche a risk factor?

E. Mellor, M. Mendl, M. Bandeli, I. Cuthill and G. Mason

Measuring keeper-animal relationships in zoos: how do they contribute towards positive zoo animal welfare?

S.J. Ward

Is time a great healer? From one trunk to another - a case study of zoo-housed Asian elephants

E. Williams, A. Carter, C. Hall and S. Bremner-Harrison

Session 2

The role of temperament during threat perception in paca (Mammalia, Rodentia)

S.S.C. Nogueira, S.L.G. Nogueira-Filho, V. Altino, S.G.C. Lima, D.E. Leonardo and M. Mendl

Conflict and post-conflict interventions in white-lipped peccary (Mammalia, Tayassuidae)

S.L.G. Nogueira-Filho; D.E. Leonardo; M. Mendl and S.S.C. Nogueira

Does the 'tickling' of adolescent male rats (*Rattus norvegicus*) share the rebound and contagion properties of play?

T.J. Hammond, S.M. Brown, S.L. Meddle, V. Bombail and A.B. Lawrence

Habitat, health and temperament of golden-headed lion tamarins (*Leontopithecus chrysomelas*) in Atlantic Forest

T.S.O. Costa, S.L.G. Nogueira-Filho, K.M. De Vleeschouwer, L.C. Oliveira, U.V. Oliveira, A.D. Munhoz, L.S. Catenacci; A.L. Melo⁶ M. Mendl⁶ and S.S.C. Nogueira

The welfare of game birds destined for release into the wild: A balance between early life care and preparation for future natural hazards

J.R. Madden, F. Santilli and M.A. Whiteside

How UK members can get more involved with a global ISAE

R. Sommerville¹

Gender equality and proportional representation at scientific congresses – a way forward?

B.L. Nielsen

Session 3

Like mother like piglet: A pilot investigation into the relationship between maternal and piglet traits

A. Courty and K. O'Driscoll

Is it possible to rear intact-tailed pigs on a fully-slatted floor with multiple point-source enrichment and does enrichment variety matter?

J.Y. Chou, C.M.V. Drique, D.A. Sandercock, R.B. D'Eath, and K. O'Driscoll

The effect of rearing strategy with or without a mineral supplement on gilt behaviour and welfare

P. Hartnett, L. Boyle, B. Younge, and K. O'Driscoll

The Defence Cascade as an on-farm measure of welfare

P. Statham¹, N. Campbell², S. Hannuna², O. Moolan-Feroze², B. Loftus¹, F. Monte¹, W.J. Browne and M. Mendl

Could paired housing be a positive step in UK calf rearing

S. Wood, R. Maddison and S. Held

Development of a multivariate analytical system to identify lameness in dairy cows

B Hewitt, J Hockenfull, C Bunce and HR Why

Session 4

Effects of rearing experience on the ability of layer pullets to negotiate a ramp transition, measured by behavioural observations

K. Norman, C. Weeks and C. Nicol

Laying hens behavioural and physiological responses to wearing automated monitoring equipment

F.Booth, S. Buijs, G. Richards, L. McGaughey, C. J. Nicol, Joanne Edgar and John F. Tarlton

The effect of different feeding strategies on female broiler breeder satiety

G.H. Cherrie, S. Avendano, I.C. Dunn, R.B. D'Eath and L. Dixon

Calls in socially isolated domestic chicks (*Gallus gallus*) are louder, longer and more 'degraded'

B. Brilot, J. Lee, K. Sufka, L. Asher, A. McEligott and S. Collins

Modifications to a standard multi-tier system: Effects on keel bone fracture prevalence and foot pad health in laying hens

N. Mackie, S. Buijs and J. Tarlton

Abstracts

Going round in circles: is an altered ability to learn associated with an abnormal repetitive behaviour in dogs?

S. Hobbs^{1,2}, E. Blackwell¹, B. Loftus^{1,3} and R. Casey^{1,3}

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Abnormal repetitive behaviours (ARBs) are often associated with poor welfare conditions. Other important factors may be considered in the development and performance of ARBs, e.g., it is suggested that animals displaying ARBs may be more likely to show perseverative characteristics.

This study aimed to compare dogs showing one ARB (spinning/tail-chasing) with an age, sex and breed matched-control group on a reversal learning task measuring perseveration. Dogs were recruited from rehoming centres (n=42) and an owned dog population (n=82). Each dog learnt a spatial discrimination task using food rewards. Trials to criterion were recorded. At criterion the spatial discrimination was reversed, with the food reward now in the opposite location. At criterion the discrimination was reversed back to the original location and trials recorded a third time.

Final analysis included 62 spinning (41 owned; 21 centre) and 62 control (41 owned; 21 centre) dogs. Comparisons of number of trials to criterion were made between matched pairs using a Wilcoxon Matched Samples Test. A Mann-Whitney U test was performed to compare populations. Dogs performing ARBs in the centre population took significantly more trials to learn the reversal when compared to non-ARB matched-controls ($p < 0.001$). There was no significant difference when comparing matched-pairs from the owned population on their ability to perform the reversal task ($p = 0.898$). Centre ARB dogs took significantly longer to learn all three phases of the task when compared to owned ARB dogs ($p < 0.001$).

Overall, centre dogs took longer to learn a simple task and reverse compared to owned dogs; ARB centre dogs took longer than those not performing ARBs. There are various reasons that may explain this difference, e.g., both stress in kennels and effects of stress on learning have been studied extensively. Further research is necessary to learn more about the potential effects of ARBs, and perseveration on learning.

A holeboard task to assess spatial working and reference memory in dogs:

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The modified holeboard task is a useful cognitive testing paradigm that makes use of natural appetitive behaviours without the need for prolonged training, and provides separate measures of spatial reference memory (RM) and working memory (WM). It is well established in rodents and has been used in pigs, but has not been adapted for use in dogs. In this study, ten pet dogs participated in six sessions (two per day) each consisting of ten three-minute trials, with each trial separated by a three-minute retention interval. In each trial, the dog entered an arena containing a grid of sixteen food-scented buckets, four of which contained a food reward. For sessions 1-4 the same buckets contained the food reward for each trial, and for sessions 5-6 a different “reversal” configuration of buckets was used. The dogs’ RM and WM scores were respectively calculated from their proportion of visits to baited buckets and the proportion of visits to buckets they had not previously visited that trial. Data were analysed via mixed ANOVA, with session and trial as within-subject factors and age group as a between-subjects factor. There was a significant effect of session on both RM ($F_{(5,35)}=10.549$, $p=0.000003$) and WM ($F_{(5,35)}=3.587$, $p=0.01$) scores, with both scores increasing between sessions 1 (RM score (mean \pm 95% confidence interval) = 0.301 ± 0.015 , WM score = 0.699 ± 0.033) and 4 (RM score = 0.353 ± 0.016 , WM score = 0.825 ± 0.034) and decreasing following the configuration change in session 5 (RM score = 0.271 ± 0.009 , WM score = 0.730 ± 0.034). This study shows that the modified holeboard task can easily be adapted for use in dogs in order to assess spatial reference and working memory. This has potential applications in canine models of age-related cognitive decline, assessing the effects of disease states, environmental or social enrichment or welfare-impairing factors on memory, and comparing the memory scores of different dog breeds or of dogs and wolves.

Route-tracing in captive Carnivora: is natural foraging niche a risk factor?

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Many species from the order Carnivora are charismatic, so popular in zoos. Some of these species fare well in captivity, living long, healthy lives, breeding readily, with few or no behavioural problems. However, others do not adjust as well, with signs of compromised welfare such as elevated infant mortality rates, and prevalent repetitive behaviours such as route-tracing. One long-standing hypothesis for welfare problems in Carnivorans is that it reflects restriction of hunting behaviour. Support for this hypothesis includes that route-tracing is usually most intense immediately prior to feeding; compared with other mammalian orders, more prevalent in mainly carnivorous Carnivora; and that Carnivorans with long chase distances in the wild may spend the most time route-tracing in captivity. Using phylogenetic comparative methods (PGLS) our study further explores relationships between the diverse foraging niches occupied by these species, and their typical welfare. We analysed data on route-tracing and other abnormal repetitive behaviours from ~2,300 individuals across 56 Carnivora species. As a second welfare indicator, we also analysed infant mortality (IM) rates from ~24,500 births in these species in zoos. Next, we investigated the predictive power of aspects of foraging niche on captive welfare: dietary classification, reliance on hunting, hunting strategy, prey selectivity and chase distance. No aspect of foraging niche significantly predicted captive welfare. For instance, species with primarily meat-based diets, and thus reliant on hunting, did not route-trace more or have higher IM than omnivorous or herbivorous species (dietary classification: PGLS $F_{2, 24}=0.69$, $P=0.51$, $\lambda=0.98$; $F_{2,51}=0.05$, $P=0.95$, $\lambda=0$); and within predatory species, chase distance no longer predicted route-tracing (PGLS $F_{1, 6}=0.16$, $P=0.71$, $\lambda=0$). These results therefore indicate that other aspects of carnivore biology have more influence on their welfare in captivity. Implications of the current study's findings for captive carnivore welfare, will be discussed.

Measuring keeper-animal relationships in zoos: how do they contribute towards positive zoo animal welfare?

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The scientific study of human-animal relationships (HAR), which are a development from multiple human-animal interactions is one of the most significant recent contributions to zoo animal welfare science. Despite research interest on HAR, few studies have considered keepers as the humans (keeper-animal relationships; KAR) rather than visitors, where much of the research has focussed to date. One reason for this may be due to the lack of a standardised method to reliably measure and assess KARs in zoos. Numerous methods had been used to measure HAR in other animal industries and three methods were recently highlighted as potentially viable to assess KAR in a zoo environment; 'latency' (L), 'qualitative behaviour assessment' (QBA) and 'voluntary approach test' (VA).

For this research, these three methods were tested on a range of species, in different enclosure designs Asian Elephants (*Elephas maximus*), Asian small clawed otters (*Aonyx cinerea*), Giraffe (*Giraffa camelopardalis*), Ring tailed lemur (*Lemur catta*), Meerkat (*Suricata suricatta*), and Humboldt penguin (*Spheniscus humboldti*). 11 hours of data per method, per species (a minimum of 10 replications) were collected *ad lib* during keeper-animal interactions (L: n=201, QBA: n=249, VA: n=85). Method reliability, robustness, practical application, accuracy, validity and feasibility for use in a zoo environment were each scored out of 20. Final scores were, L: 108.5/120, QBA: 109/120 and VA: 98.5/120. Results revealed that although not initially designed for measuring KAR, QBA was the most successful method according to the sum of scores, to assess KAR in zoos closely followed by L. Results highlight the benefits of conducting methodological studies to ensure the most appropriate and effective methods are utilised to enable robust comparative research. Research into KAR in zoos can now be conducted systematically enabling species and zoo comparisons, and the effects of KAR on zoo animal welfare.

Is time a great healer? From one trunk to another - a case study of zoo-housed Asian elephants

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The loss of a conspecific in intelligent zoo-housed social species such as elephants can impact on group dynamics and individual behaviour. Following the death of an elderly female elephant at Belfast Zoo in August 2013 the social dynamics in a group of three female Asian elephants changed markedly. Levels of aggression between two individuals (E1 and E2) escalated to the point that for safety the elephants were physically separated. Limited physical contact was possible through steel posts. At the onset of this study the elephants had been separated for approximately three years, however early signs of behavioural change were becoming evident. The aim of this study was to investigate changes in type and frequency of social interactions over ten months. Data were collected using 30 second scan sampling over five days at four time points from 2016 to 2017 (May 2016 (P1): 28 hrs 19 minutes; August 2016 (P2): 24 hrs 15 minutes; December 2016 (P3): 20 hrs 55 minutes; February 2017 (P4): 21 hrs 55 minutes) during zoo opening hours. Differences between recording periods were analysed using a Friedman's test with a Kendall's post hoc test. Despite making up a relatively small percent of daily activity social interaction frequency changed significantly. No negative interactions were observed during the study. Proportion of time spent engaging in positive physical interactions changed over time: P1 = 0.09%, P2 = 1.25%, P3 = 9.55%, P4 = 4.6%. Positive physical interactions were significantly lower in P1 than P3 ($p < 0.05$) for both E1 and E2. Individual differences were observed in interaction types. E3 showed no behavioural change. The results of this study provide evidence to suggest that relationships may change over time. Crucially they demonstrate the fluidity of elephant social behaviour and highlight the need to conduct longer-term monitoring before making irreversible management decisions.

The role of temperament during threat perception in paca (Mammalia, Rodentia)

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Threat perception can trigger defensive behaviors, which likely reflect fear or anxiety-like states. These responses may vary between individuals and here we aimed to evaluate the relationship between ratings of temperament (individual automatic responses to a stimuli) in one context (see below) and responses to threat in adult male pacas (*Cuniculus paca*, N=8). We recorded defensive responses using the Mouse Defense Test Battery (MDTB) adapted for paca with four tests (novel environment, chase, forced-contact, and foraging-eating-test). Subjective rating scales (cf. Qualitative Behavioral Assessment) were used to assess temperament in one context (novel object-ball) by three judges. Using a PCA we analyzed the ratings and determined each individual's Temperament Index (TI). We also determined fecal glucocorticoid metabolite concentrations (FGMC) before/after MDTB. There was consistency between judges ($Kappa > 0.75$, $P < 0.05$) allowing us to identify differences in temperament traits on two axes: TI_1 factor scores ranging from -3.22 (agitated/fearful/tense) to 2.26 (calm/relaxed) and TI_2 factor scores ranging from -1.65 (bold) to 2.51 (shy/anxious). Individuals judged as agitated, fearful, and tense (low TI_1) spent more time 'redirected eating' (eating substrate that they would not normally feed on) during novel-environment test (Spearman-correlation- $r_s = -0.71$, $P = 0.05$) and escaping during foraging-eating test ($r_s = -0.72$, $P = 0.04$). Individuals judged as calm and relaxed (high TI_1) spent more time exploring ($r_s = 0.86$, $P = 0.01$) and standing up ($r_s = 0.80$, $P = 0.02$) during novel environment test. Individuals scored as shy and anxious (high TI_2) showed higher flight speeds ($r_s = 0.79$, $P = 0.02$) during the chase test and higher flight distances ($r_s = 0.76$, $P = 0.03$) during the forced contact test. Most pacas showed an increase ($266 \pm 227\%$) in FGMC across the MDTB and this was correlated with vocalizations during the chase test ($r_s = 0.86$, $P = 0.01$), possibly an indicator of extreme fear. Our results showed agreement between subjective ratings made in one context and standard ethological measures taken in other tests. Therefore, pacas showed consistency in behavioural responses across tests, which may reflect underlying differences in temperament.

Conflict and post-conflict interventions in white-lipped peccary (Mammalia, Tayassuidae)

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In social groups there are mechanisms that regulate conflicts and help to reduce aggression and promote cohesion. Little is known about such mechanisms in white-lipped peccary (*Tayassu pecari*), which live in mixed-sex groups of hundreds of individuals in Amazon forests. Here we describe conflict and post-conflict interactions in three captive white-lipped peccary groups (Group A, six females and six males; Group B, six females and five males; Group C, one female and five males – all adults between the ages of 2 and 8 years) and their relationship with dominance hierarchy. Twice a day at feeding time at 8.00 am and 4.00 pm, one observer using all-occurrences sampling and a camcorder camera recorded the identities of individuals involved in conflict and post-conflict interventions during 1h observation sessions (30h data per group). We identified the winners and losers of each agonistic social interaction and determined linearity indices (h') of dominance hierarchies (1= top rank) in each group and tested by Spearman correlations between rank and performing or receiving interventions. A strict linear hierarchy ($h' > 0.9$, $P < 0.03$) described the social structure of all groups. We observed two types of conflict-interventions (partial and impartial), as well as post-conflict consolation. All involved a third-party intervening into a conflict between two contestants. In partial-interventions, a third-party gave agonistic support to one of the contestants, while impartial-interventions never included aggression directed at one of the contestants. During post-conflict consolation, the third-party showed affiliative behavior towards the conflict loser. We recorded 111 conflict-interventions: 76 impartial-interventions (A:35; B:32; C:9) and 35 partial-interventions (A:20; B:10; C:5); and 36 consolations (A:22; B:14; C:0). Conflict and post-conflict intervention rates (occurrences/individuals*observation hours) were similar among groups ($X^2=0.12$, $P=0.56$). In the three groups, high-ranking individuals performed or tended to perform more impartial (G1: $r_s=-0.76$, $P=0.004$; G2: $r_s=-0.69$, $P=0.02$; G3: $r_s=-0.85$, $P=0.03$) and partial-interventions in conflicts (G1: $r_s=-0.82$, $P=0.001$; G2: $r_s=-0.60$, $P=0.05$; G3: $r_s=-0.72$, $P=0.07$). Therefore, dominant individuals appear to play a more active role in moderating social interactions between other members of white-lipped peccary groups. Moreover, the species shows peacemaking social mechanisms like ones observed in higher primates.

Does the 'tickling' of adolescent male rats (*Rattus norvegicus*) share the rebound and contagion properties of play?

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The tickling paradigm was developed to mimic social play in rats. This study investigated whether tickling shares properties of conspecific play, namely rebound and emotional contagion. 64 adolescent (28 days) male Wistar rats, split into two batches, were housed in pairs and assigned to treatment (tickling) or control (neutral handling). One animal within each cage ($n = 32$, 16 per batch) was handled. During handling, frequency modulated ultrasonic vocalisation (FM USV) production and hand-following (HF) was measured. To study rebound, animals were given a two-day break from handling. Emotional contagion occurs when an individual acquires the emotional state of another via social cues. To see if the positive affective state induced by tickling is contagious, cage mates were subjected to a handling test on the final day, after the handled animal had been returned to the home cage. If contagion was present, a correlation between both individuals in behavioural responses, as well as a matching treatment effect would be expected. There were significant batch effects in FM USV response but not in HF response. In batch 1 (B1), tickled animals produced more FM USVs ($F_{1,89.1} = 36.18$, $p < 0.001$) and showed increased HF compared with controls ($F_{1,88.7} = 16.46$, $p < 0.001$), both measures indicating that tickled animals were in a more positive emotional state. In batch 2 (B2), treatment had no effect on FM USVs ($F_{1,94} = 0.44$, $p = 0.508$). However, treatment had the same effect on HF ($F_{1,188} = 0$, $p = 0.948$). Irrespective of batch effects, there was no significant rebound effect in USVs or HF, as neither measure significantly increased after the two-day non-handling period (USVs; $F_{1,188} = 1.08$, $p = 0.303$; HF; $F_{1,188} = 0.98$, $p = 0.325$). There was evidence of contagion on HF as overall, cage-mates of tickled animals hand-followed for longer ($F_{1,9} = 11.59$, $p = 0.002$). This study suggests that tickling induced a behavioural change in the cage-mate although this was independent of changes in anxiety and of other changes in positive affect.

Habitat, health and temperament of golden-headed lion tamarins (*Leontopithecus chrysomelas*) in Atlantic Forest

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The golden-headed lion tamarin lives in high impacted areas of Atlantic Forest. Temperament traits influence how individuals cope with challenging impacted environments and may influence their health. We aimed to compare the association between the temperament of free ranging tamarins and their parasitic status in two habitats with different levels of human disturbance [land clearing: cocoa agroforestry system-cabruca (N=10) and forest in recovery: secondary forest (N=10)]. To characterize temperament, we set up a flag (novel object) in front of an individual's sleep site (tree hole) and observed the animal's response to the flag. Subjective rating scales (cf. Qualitative Behavioral Assessment) were used to assess temperament in this context by one primatologist. Using a PCA we analyzed the ratings and determined each individual's Temperament Index (TI). Additionally, each group was followed for 22 hours per month during six non-consecutive months to collect behavioral data (focal sampling-10 min/animal). We weighed the tamarins and collected fecal samples for parasite analysis using Ritchie's technique. We compared how behavior, mean weight, and parasite data (egg count/g) differed between the two habitat types, and tested for correlations between TI scores and parasite infection. PCA identified a temperament factor (stressed/tense/fearful to bold/relaxed/calm) with individual variation in tamarin factor scores occurring in all groups. Tamarins from secondary forest spent more time eating ($F_{1, 16}=31.89$; $P=0.0001$) and less time traveling ($F_{1, 16}=16.21$; $P=0.001$), were lighter ($F_{1, 16}=11.85$; $P=0.001$), and had higher fecal parasite loads than those of cabruca, where no-parasites were found ($F_{1, 16}=11.76$; $P=0.004$). There was no correlation between temperament and parasite load. Overall, we found health differences between the two habitats. Tamarins in secondary forest spent more time eating and were lighter, possibly due to higher parasite load. These results indicate that the cabruca environment was less damaging to tamarin welfare and health quality.

The welfare of game birds destined for release into the wild: A balance between early life care and preparation for future natural hazards

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Each year over 110 million game birds are reared in captivity and released into the wild in the UK, USA and France. Gamebirds are artificially reared for their first 6-12 weeks in environments that offer warmth, protection and an unlimited nutrient-rich diet. Therefore, extremely high standards of welfare can be implemented and monitored, resulting in the production of a large number of ostensibly 'healthy' individuals. The birds are then released into the wild; an environment where the ethical obligation of care remains but the ability to intervene is restricted. Game birds suffer from high post-release mortality, substantially more than their wild-born conspecifics. The reason for this is that the released birds have morphological, cognitive and behavioural characteristics that differ from wild-reared conspecifics as a consequence of being reared in a non-naturalistic environment. Maximising lifetime welfare of an animal that is reared in captivity and released into the wild requires a resolution of trade-offs between pre-release and post-release welfare. In some cases the provision of a more naturalistic environment may improve both (e.g. provision of perches). Alternatively, pre-release and post-release welfare may conflict, particularly when the naturalistic manipulations are stressful (e.g. predator presentation, food unpredictability). We highlight the current practice adopted by game managers, focussing on five key areas likely to influence both current and future welfare: 1) absence of parents; 2) unnatural rearing density; 3) spatially simple environment; 4) monotonous diet; and 5) absence of predators. Gamebird welfare should be considered a balance between maximising pre-release welfare but releasing individuals without the characteristics to survive, and exposing individuals to dangers, stress and discomfort early in life to better prepare them for natural conditions in the wild. This poses novel welfare considerations for care of reared gamebirds and other species destined for release into the wild.

How UK members can get more involved with a global ISAE

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The ISAE wants to become a truly international society, with promotion in all corners of the globe. New efforts are underway to link people beyond Europe and North America, where the society originated from and therefore a strong membership base exists, to regions and countries that are under-represented. UK members of ISAE could benefit from making more of the international side of the society, to grow their own networks, collaborations and horizons. In 2017, the first Developing Countries Congress Attendance Fund supported 14 individuals to join the annual congress in Denmark. This included scientists, government vets and students from countries with the potential to move towards intensified farm animal production, or where animal welfare science is relatively new and less well funded. A lunch event was also held for attendees from Africa, Asia, Latin America, the Middle East and Eastern Europe, which helped to identify how people could be supported and connected. New Country Liaison positions have been created and filled by highly motivated members in Brazil, India and Serbia to promote ISAE in their country. Exciting opportunities which UK members could get involved with internationally include calls for collaboration on the website, sharing their expertise with the World Organisation for Animal Health (OIE) and their focal points, giving talks at institutions in other countries, nominating people for future travel grants, increasing networking and sharing learning materials. Other regional meetings in 2018 will include East Central Europe and West Central Europe (June in Poland), for India in the lead up to the 2020 congress (December in India), for Latin America (December in Chile) and a joint meeting for East Asia and Australasia-Africa. You are welcome to come up with suggestions for activities or ways to better connect with people interested in applied ethology further afield.

Gender equality and proportional representation at scientific congresses – a way forward?

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Delegates at scientific congresses represent a cross-section of the people working in the scientific discipline(s) covered by the congress in question. This may not be a representative sample of this type of population, as more affluent universities are often able to send more staff and students to more meetings. However, in terms of gender balance among delegates, one would expect a fair reflection of the proportion of women and men working in the subject area. But is that always the case? And when it comes to plenary and keynote presentations at scientific congresses, are we seeing (and hearing) the right proportion of male and female speakers? What *is* the right proportion? And why does it matter? Surely we are all selected based on our skills. Or aren't we?

I will present some of the available evidence from ISAE and its congresses of the relative representation of the sexes. As we are not the only scientific society to raise this issue, different ways to address potential problems of disproportional representation has been proposed. These will be presented, together with some concrete examples with a view to initiate a discussion on the subject of gender equality and proportional representation, not only at congresses, but in the world of science in general.

Like mother like piglet: A pilot investigation into the relationship between maternal and piglet traits

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Maternal stress during pregnancy can have significant effects on the resulting progeny's growth performance, stress reactivity, and behaviour. Thirty-two group housed pregnant gilts which farrowed in two batches (1, n=20, 2, n=12) three weeks apart were studied. Each gilt underwent a human approach test (HAT) four times between d104-d111 of gestation, carried out by the same person. Gilts were categorised overall as 'friendly' (calm, not aggressive) or 'Fearful' (flees contact) if they behaved in this manner in at least 3 of the 4 tests, and consistently so if their responses were the same in all 4. If they were friendly or fearful in 2 tests each, they were considered 'neutral'. Salivary cortisol was collected weekly between d90 and d110 of gestation, and gilts were also assessed for maternal behaviour during lactation. The pre-weaning growth, behaviour in an open field test, and back-test responses of piglets from each gilt category were compared. There tended to be an effect of category on salivary cortisol levels ($F_{2,31}=2.6$, $P=0.09$), with fearful gilts having highest levels (0.467 ± 0.042 vs 0.329 ± 0.061 ; $T_{1,31}=2.25$, $P<0.05$). Fearful gilts also tended to take longer to nurse their piglets after a separation (63 ± 15 vs 102 ± 15 sec; $F_{1,30}=3.38$, $P=0.08$). There was no effect of gilt category on piglet weight during lactation, or average daily gain. However, piglets from gilts which were consistently fearful tended to have a lower back-test score (i.e. less reactive) than those which were consistently friendly ($P=0.09$). Piglets from the consistently friendly gilts also tended to take less time to touch an observer in a HAT than those from consistently fearful gilts ($P=0.06$), and spent less time frozen in an open field test ($P<0.05$). This pilot data suggests that the responses of piglets to behavioural tests are somewhat related to the behavioural traits of their mothers.

Is it possible to rear intact-tailed pigs on a fully-slatted floor with multiple point-source enrichment and does enrichment variety matter?

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In fully-slatted systems tail-biting is a difficult issue to manage when pigs' tails are not docked, because loose enrichment material can obstruct slurry systems. This pilot study seeks to determine whether: a) intact-tailed pigs can be reared with a manageable level of tail biting by using multiple enrichment sources compatible with fully-slatted systems; and b) whether variation of enrichment provision has an effect. Ninety-six undocked pigs were given the same multiple enrichment items from one week after birth until weaning. At weaning, four different combinations of 8 enrichment items were selected based on the following traits: rootable or not, deformable/destructible/renewed, chewable/ingestible, moveable/attached/suspended, soft/hard/loose, and eye/floor level. These were randomly assigned to 8 pens (n=12 pigs/pen), so there were two pens per combination. Four pens had the same combination (SAME) from assignment to finish and four pens switched combinations every two weeks (SWITCH). Individual lesion scores and behaviour observations of enrichment use and harmful behaviours were conducted every two weeks. Preliminary results from the weaner stage showed that the average tail damage score was low (0.93 ± 0.02 ; on a 0-3 scale where 0 is no damage and 1 is bite marks), but SAME pigs had a slight tendency to have fresher blood on tails than SWITCH pigs (0.57 ± 0.04 vs. 0.46 ± 0.04 respectively; $p = 0.07$; analysis at a group level). Only one severe tail biting event involving a single victim was recorded in a SAME pen; at the end of weaner stage there were 94% curly tails, 3% intermediate tails, 2% tucked tails and 1% amputated tails. Pigs interacted with a rack of loose material most frequently, followed by floor toys. SAME pigs consumed more materials in the rack than SWITCH pigs ($p < 0.001$) when given grass; the highest interaction with the rack was also observed when grass was present, compared to straw, shredded paper or sawdust. The study is on-going and complete results will be finalised in early 2018.

The effect of rearing strategy with or without a mineral supplement on gilt behaviour and welfare

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The lifetime performance of commercial sows relies on longevity, which is dependent on good health and reproductive performance. In Ireland, replacement gilts are often reared with finisher animals, including male pigs. A finisher pig diet however is not designed to meet the needs of a developing gilt, and may not supply the necessary minerals to promote longevity; Moreover, female pigs reared with males are exposed to higher levels of mounting and aggression which may affect stress levels. This experiment consisted of a 2 × 2 factorial design with 384 animals (32 pens, 12 animals per pen) investigating the effect of single (SS) or mixed sex (MS) rearing, with or without supplementary minerals (Cu, Zn and Mn), on the behaviour, salivary cortisol levels, and locomotion scores of replacement gilts, from weaning to slaughter age. Direct all occurrence behaviour observations were carried out at pen level for 5 × 5mins/day, every two weeks. Saliva samples were taken from 4 focal gilts/pen on 4 occasions during rearing (n=240 analysed). We hypothesised that separating replacement gilts from males during development would reduce exposure to sexual and aggressive behaviours, and consequently reduce stress levels. Data were analysed using SAS v 9.4. There was no effect of diet on aggression. However there tended to be less aggression in SS than in MS groups (P=0.06), and aggression increased over time (P<0.05). There was very little sexual behaviour in SS groups. Pigs in the MS treatment performed more play behaviour than those in SS (P<0.01). Gilts reared with males had higher cortisol levels at the end of the finisher stage (P<0.05). However, there were no effects on locomotory ability. The results will help to identify whether separate sex rearing, and/or mineral supplementation can improve the rearing environment to optimise gilt health and welfare.

The Defence Cascade as an on-farm measure of welfare

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An ideal measure of on-farm welfare would quantify the affective state of the animals. In humans and rodents, the 'Defence Cascade' (DC) response to a startling stimulus has been shown to reflect affective valence. Previously presented work indicated a similar relationship in pigs and that DC reactions could be accurately measured using automatic image analysis (IA) for both individuals and small groups. This study investigated whether IA measurement of DC could be applied on commercial farms and reflect independent assessments of welfare.

Twenty-one farms were visited, with up to seven pens of pigs sampled per farm (132 total), representing the pigs and housing present. An overhead camera and sound level meter were used to record the pigs' reaction to a standardised startling stimulus. Pen level background variables were recorded (e.g. light levels), and a combination of direct observations and farmer questionnaire were used for welfare assessments, which were based on the Welfare Quality protocol. These included measures relating to good feeding, good housing, good health and appropriate behaviour. Videos were examined by eye to record position and behaviour of pigs at testing and IA measures of startle magnitude and freeze duration produced.

Normal response multilevel models were used to account for the data structure, Wald test statistics are presented. The final models included some factors which needed to be controlled for, such as the age of the pigs or average sound levels. Once these were accounted for, pigs housed on straw showed a decreased freeze response ($\chi^2 = 10.927$, $p < 0.005$). Higher magnitude of startle was associated with an increased percentage of pigs retreating in a human approach test ($\chi^2 = 12.405$, $p < 0.001$) and more faeces on pigs ($\chi^2 = 16.465$, $p < 0.001$).

These findings indicate that DC responses may be linked to on-farm pig welfare. Further refinement of recording and analysis methods is needed to allow this approach to be deployed quickly and effectively on farms.

Could paired housing be a positive step in UK calf rearing

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Individual housing of dairy calves from birth to weaning is commonplace in European and UK dairy farms, where 60% of calves are housed singly. This literature review explores whether paired housing could benefit welfare whilst maintaining the benefits of individual housing. Given the high levels of morbidity and mortality in the pre-weaning period, individual housing is perceived to give benefits of disease control. Calf rearers aim to maximise growth rates, making the most of this period of optimal feed conversion from milk, and individual housing gives benefits in management and monitoring of nutrition. Additionally, the single housing of calves prevents competition for food, ensuring even growth across calves. However it is this lack of exposure to social competition which may be detrimental to calves once moved into a group as these calves are more stressed and take longer to feed in a group situation. It is acknowledged that individually housed calves must (by EU directive) have sight, sound and tactile access to other calves, recognising that social interaction is important. Paired and small group housing has been shown to benefit positive behaviours such as feeding, exploration and play behaviour, and reduce fear, frustration, anxiety and agnostic behaviours. Social learning and behavioural flexibility are both known to be important outcomes of group situations, calves reared socially have been shown to be less fearful in adulthood. Whether paired housing could offer the welfare benefits from social interaction without detriment to growth and disease status has been researched by groups in Canada and now the UK. A review of the literature finds varying effects on feed intakes and daily live-weight gain, likely to be a key driver on selection of housing system. Welfare benefits have been shown through increased activity and play behaviour in paired calves, as well as less vocalisations at weaning. This literature review and subsequent study investigates whether this system could ultimately be transferable to commercial herds in the UK and potentially provide a happy medium between disease control and social interaction.

Development of a multivariate analytical system to identify lameness in dairy cows

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Despite extensive research efforts, lameness remains a key welfare issue in the dairy industry. With around a third of all dairy cows in the UK experiencing lameness at any one time, it poses serious economic losses to the farmer. While policy exists to manage the associated risk factors, such as farm management and nutrition, the problem still persists. This project hypothesises two reasons for this persistence: the varied approach to defining the issue, with disagreement among research about the scoring system used; and the tendency for observers to misdiagnose mildly lame cases. As the disease has the potential to cause chronic pain, which is difficult to treat, it is important for a universal identification system to diagnose the disease early, before the cows experience long-term suffering. This project aims to use historical data on dairy cows' behaviour and physiology, to develop a new multivariate analytical system. The variables; locomotion score, milk yield, body condition score, fertility and somatic cell count, will be used to determine the severity of lameness in an individual cow. The variables will be normalised and combined (using MATLAB) to generate an overall lameness score. This score will sit within a spectrum, allowing researchers to identify each cows' severity of lameness and also the distribution of the disease among the herd. This method simply requires farmers to electronically enter the recordings into a database, where a code will automatically calculate the lameness score; an efficient and cost-effective solution. By understanding the varied pathology of lameness, and identifying the mildly lame cases, researchers can determine the progressive stages of the disease and begin to understand when it becomes a chronic problem. With a greater understanding of how the disease develops we can better determine an effective treatment protocol.

Effects of rearing experience on the ability of layer pullets to negotiate a ramp transition, measured by behavioural observations

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In commercial situations birds must negotiate levels to reach resources such as food, water and litter. Providing ramps reduced keel bone fractures in adult birds kept in aviary systems. More research is needed to look at whether providing ramps during rear can improve the ability of birds to transition between levels. Two different rearing experiences were studied. One where chicks were reared with ramp access from three weeks of age and one where birds had no ramps. A ladder ramp (e.g. wooden rungs) and a grid ramp (a commercial poultry slat) were used. At 10 weeks of age, 32 young pullets from each group were trained to run to a food reward. During testing the pullets accessed the food reward by moving up or down a ramp. The birds' behaviours and time taken to complete the task were recorded. In the ramp reared group 52% of birds reached the food reward, compared to 13% in the control group for upward ladder ramp transitions. Similarly, for the upward grid ramp transitions 74% of the ramp reared group compared to 42% of the control group succeeded. Exploratory statistics were performed using a Mann-Whitney U test. The ramp-reared group took significantly less time to complete an upwards transition ($68.8s \pm 49.3$) compared to the control group ($100s \pm 37.6$) ($p=0.001$). In addition, the control group showed more behaviours indicative of hesitancy before transitioning and difficulty when making upward transitions. In summary, this suggests there are positive effects of providing ramp experience during rear shown by differences between the rearing groups behaviours and time taken for upward transitions. We suggest laying hens should be provided with ramps during the rearing stage to facilitate movements when moved to the laying house.

Laying hens behavioural and physiological responses to wearing automated monitoring equipment

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Automated monitoring of behaviour can offer a wealth of information in circumstances where observing behaviour is difficult, but attaching devices can alter behaviour and invalidate data collected. We studied the behavioural and physiological response of 20 hens to backpacks containing monitoring devices fastened with elastic loops around the wing base.

Thermography (eye and comb) after fitting backpacks, direct continuous focal observations of behaviour (5min during isolation and after placing back into group, and 10min/hen/day on days 2,3,5 and 7 days after backpack fitting), and weighing before and after each 7-day experimental period was used to test the hypothesis that wearing backpacks would decrease peripheral temperature, increase preening and aggression from conspecifics, and reduce bodyweights.

Eye temperature was higher in backpacked hens (No backpack: 30.2 °C (IQR:29.0–30.6) vs. Backpack: 0.9 °C (IQR:30.0–32.0, $P<0.001$), and in hens wearing a backpack, was strongly correlated to the time spent preening ($r_s=0.8$, $P0.001$). Aggressive behaviour was rare, and no effect of the backpacks was seen. Backpacks increased preening on the day of fitting, when isolated (No backpack: 0% preening (IQR:0–1) vs. Backpack: 22% preening (IQR:1–43), $P<0.01$) and when put back in the group (No backpack: 0% (IQR:0–27) vs. Backpack: 43% (IQR:5–77), $P<0.001$). No effect on preening was observed 2–7 days afterwards. Other behavioural changes suggested that on the day of fitting hens prioritized attempts to (re)move the backpack and were less attentive to their surroundings. Only equipment pecking (i.e., pecks to backpacks from equipped hens and non-equipped conspecifics) was still affected 2–7 days after fitting (No backpack: 0 pecks/hen/minute (IQR:0–0), vs. Backpack: 0 (IQR:0–0.07), $P<0.05$). We found no effect of our backpacks on bodyweight.

In conclusion, our backpacks seem suitable to attach monitoring equipment to hens with only a very minor effect on their behaviour after acclimation (≤ 2 days).

The effect of different feeding strategies on female broiler breeder satiety

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The feed intake pattern of broiler breeders during the rearing period is controlled to adapt their growth; allowing maintenance of health, welfare and reproductive efficiency. Although birds moving to adulthood will naturally limit their intake, it is important that the growth pattern and level of feed control provides a sufficient degree of satiety. This has led to the trialling of different feeding strategies. For this study we assessed standard (pellet and mash), decreased protein, decreased protein and energy diets (all pellet), all of which were fed to a standard growth target, a decreased protein diet fed to a plus 20% growth target and two *ad libitum* treatments which were fed the standard and decreased protein and energy diets respectively. There were five treatment replicates with twenty-four birds per treatment, a total of one-hundred and sixty-eight female 308 broiler breeders were used.

Instantaneous scan sampling was performed on video of home pen behaviour between seven to eleven weeks of age. Improved satiety was hypothesised to result in reduced activity, reduced pecking and increased comfort behaviours. Analysis of behaviour frequency using ANOVA indicates that birds fed *ad libitum* diets spent more time non-active than all others (15.25 ± 3.84 and 11.38 ± 5.26 , $p < 0.001$), suggesting satiety. The birds fed standard mash were more active than all other treatments (25.25 ± 6.59 , $p < 0.001$). Those fed the standard pellet or decreased protein and energy diets showed more drinker directed pecking (13.75 ± 7.51 and 10.75 ± 10.69 , $p < 0.001$). Further work will be carried out focusing on positive welfare indicators to assess if frequency and bout length of preening and dustbathing could be used as indicators of satiety. Overall, although *ad libitum* fed birds were less active, there were no clear differences between the remaining dietary treatments which could be interpreted as an improvement of satiety and welfare.

Calls in socially isolated domestic chicks (*Gallus gallus*) are louder, longer and more 'degraded'

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The ability to 'read-out' affective state, live, from a freely behaving animal is a clear goal of animal welfare science. One promising potential behavioural read-out exists in the form of spontaneously-produced vocalisations and variation in those vocalisations with context (with associated affect). However, establishing the validity of any manipulation is key to ensuring the correct mapping between affect and vocalisation variability. We used a system where the affect and behaviour link have been previously well-validated both physiologically and pharmacologically: vocalisations in domestic chicks placed in social isolation. Previous work by others has shown that chicks in social isolation demonstrate an elevated CORT stress response and a higher rate of calling; these effects are ameliorated through the use of anxiolytic drugs. We continuously recorded and analysed the quantity and acoustic quality of vocalisations from legbar chicks (4-7 days old) that were placed either in social isolation for 30 minutes (distressed, n=19) or were in isolation save the presence of a mirror (control, n=19). A GLMM analysis (including age, weight and sex) revealed that chicks in the 'distressed' condition called at a higher rate ($p=0.03$), produced louder calls ($p<0.001$), of a higher frequency ($p<0.001$), with calls that were individually longer ($p=0.006$), and most importantly, were more 'degraded' (higher entropy ($p<0.001$) and lower harmonics-to-noise ratio ($p=0.002$)). The findings of the GLMM were confirmed by a PCA analysis ($p<0.001$) which reflected the importance of those same acoustic parameters. This points to the possibility of a live (and potentially automatable) system of monitoring affect in the domestic chick.

Modifications to a standard multi-tier system: Effects on keel bone fracture prevalence and foot pad health in laying hens

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Keel bone fractures are highly prevalent in multi-tier housing systems and cause pain, creating a welfare issue. In the current study, modified multi-tier systems were designed and compared to a standard multi-tier system. The treatment groups were made to aid movement, prevent falls and collisions, and thus reduce keel bone fracture prevalence. One commercial layer house was split into ten compartments, each contained either a standard multi-tier system or a modified version of the same system and housed 3,600 Lohmann Brown Lite hens. Treatments consisted of; a control group, a treatment with extra mushroom perches on the top tier (EP), a mushroom shaped perch treatment, an extra nest box perch treatment (NBP) and a ramp treatment. Each treatment group was replicated twice. At 19, 25, 33 and 48 weeks of age, 150 birds were palpated in each compartment. Foot pad health was scored on the same 150 hens at 33 and 48 weeks of age. The data was analysed using generalised linear mixed models, with a binomial distribution. Fracture prevalence was higher in the mushroom shaped perch treatment and the EP treatment than in the control treatment: 37.9%(±2.1%) ($P=0.007$), 35.4%(±1.8%) ($P=0.03$) and 29.7%(±1.8%), respectively. Footpad dermatitis was more prevalent in the EP treatment than in the control treatment 43.7%(±3.0%) ($P<0.001$), but less prevalent in the ramp treatment 18.0%(±2.0%) than in the control 27.5%(±2.5%), ($P=0.002$). Treatment affected bumblefoot prevalence at 48 weeks of age only, when it was higher in the EP treatment than the control, 22.1%(3.3%), 5.3%(1.4%) ($P=0.006$). The data suggests that the addition of extra structures into multi-tier housing systems increases fracture risk. Mushroom shaped perches appear to be more damaging to foot pad health than standard round perches.

