
News and Views from the BIAZA Research Committee

BIAZA Zoo Research News

We are looking at revising the quarterly newsletter to make it more interactive and to fit in line with other recent BIAZA format changes. We would therefore like your views on how this could be changed to benefit the zoo and aquarium research community. If you have any thoughts or ideas please email the editor: lbell@myerscough.ac.uk.

To help you consider what research of yours would be suitable for submission to the newsletter please see the following guidance:

Guidelines for contributions to BIAZA Zoo Research News

All items should be about or directly relevant to research carried out within or by zoos or aquariums, including visitor and education studies as well as all types of biological research.

Types of article

1. News and Views

This is usually written by the BIAZA Research Committee but other relevant contributions are welcome. General guide is less than 100 words and these should be a report on recent events of wide interest.

2. Feature article

A standard research report including introduction, methods, results, discussion/conclusions and references. Can be up to 1500 words and include 2 figures or tables (or fewer words and more figures).

3. Research snippets

This should be very concise but include a rationale, brief methods, results (quoting statistics wherever appropriate) and conclusions and outcomes. Typical word count is about 300

4. Announcements

We are happy to advertise any appropriate event, vacancy or request for research help. Please be brief (less than 100 words).

All articles should include contact details for further information (preferably email) and should have the consent of all authors before submission. All articles will be subject to editing, a draft of the edited newsletter will be sent to all authors for approval before distribution.

16th Annual Symposium on Zoo Research, 7-8th July 2015

This year's symposium will be hosted by Dublin Zoo, Ireland on 7th and 8th July. As always the symposium hopes to showcase the work of researchers across BIAZA collections from zoo keepers, education staff to academic researchers. The call for abstracts for conference presentations and posters will commence shortly as the symposium is currently in the planning stages by the team at Dublin Zoo.

Further information, registration and presentation/poster applications will be available soon on the BIAZA website: <http://www.biaza.org.uk/news/2073/33/BIAZA-Research-Conference-2015/d.events/>.

Journal of Zoo and Aquarium Research

The current issue of the EAZA journal 'Journal of Zoo and Aquarium Research' (JZAR) Volume 3: No. 1 (2015) is now available online: <http://www.jzar.org/jzar/issue/view/9>. This issue includes interesting research on 'Birth sex ratio, infant mortality and rearing type in captive western lowland gorilla' carried out using the EEP studbook from 2012 and 'Faecal corticosterone responses of black rhino (*Diceros bicornis*) to a transfer between housing facilities within a zoo' carried out at Magdeburg Zoo, Germany. JZAR uses evidence-based research carried out at EAZA living collections presented via full research articles, reviews and technical notes. There is a particular interest for small scale studies and reports of evidence-based husbandry interventions, provided they are supported

by data. Potential authors are encouraged to support this initiative by submitting manuscripts on any area of zoo or aquarium-based research.

Please visit the website (www.jzar.org) for more details on scope and author guidelines.

BIAZA Awards 2014

This year sees a change to the BIAZA Awards where they are now judged in spring with the awards allocated at the BIAZA Awards and Annual Conference in the early summer. This year it will be held at Woburn Safari Park on 8th – 10th June 2015 with the aim of showcasing the outstanding work of the member zoos and aquariums across BIAZA. The Awards consists of 8 categories of which research is one with the opportunity of achieving a Bronze, Silver or Gold certificate. BIAZA collections are busy completing their Award applications with the closing date of Friday 27th February 2015. The Awards for the research category will be included in the July edition of the newsletter. Further information for BIAZA collections can be found on the member's area of the website.

BIAZA Research Committee Letters of Support

There were 22 applications for Research Committee support for multi-institution studies in 2014 showing that the number of multi-zoo projects being supported per year is consistent although an increase in applications was evident. We believe this is a valuable service both for the researchers and for BIAZA members but we would appreciate any feedback from either point of view that may help us improve the system. Please send any comments to Fatemah at the BIAZA office (ga@biaza.org.uk).

For information on applying for Research Committee support please see:

<http://www.biaza.org.uk/Research/general-guidance/>.

What's going on in zoo research?

What's new in zoo research – a quick look at recent publications

Prof Geoff Hosey, University of Bolton (gh2@bolton.ac.uk)

What's New in Zoo research?

Well, it's a while since I last did one of these "What's New" items, so there are seven or eight months' worth of papers to catch up with. Let's start with people.

We are all aware of climate change issues and the impacts that they are already having on us, and will have in future years; though people differ in their knowledge and even their acceptance of these issues. Zoos are well placed to raise awareness of these things, as feelings about the natural world and environmental responsibility appear to be related. A survey of over 7000 zoo and aquarium visitors by Susan Clayton and colleagues from Wooster College and Brookfield Zoo shows that feeling connected to animals at the zoo is significantly associated with cognitive and emotional responses to climate change, as well as with other social groupings and social responses (*Environmental Education Research* 20: 460-475, July 2014; doi: 10.1080/13504622.2013.816267). A further survey of over 3000 visitors by the same team found that, compared to the general public, a greater proportion of zoo and aquarium visitors were "alarmed" and "concerned" (*Journal of Geoscience Education* 62: 502-510, August 2014; doi: 10.5408/13-078.1). And yet, according to Janet Swim and John Fraser of Pennsylvania State University educators in American zoos lack the knowledge and confidence to capitalise on these attitudes (*Journal of Geoscience Education* 62: 495-501, August 2014; doi: 10.5408/13-048.1). Sounds a bit like the familiar old "could do better" story, and it would be interesting to see whether the situation in European zoos is any different.

Still with visitors, but getting back to animal stuff as well, studies of visitor effects on behaviour and welfare continue to expand the field. Sally Sherwen and colleagues from the University of Melbourne and Zoos Victoria found that placing signage asking visitors to be quieter near the meerkat enclosure did indeed lead to a reduction in noise levels, but this appeared to have no effect on the behaviours of the animals (*Applied Animal Behaviour Science* 156: 70-77, July 2014; doi: 10.1016/j.applanim.2014.04.012). By contrast, Megan Larsen and colleagues, also from the University of Melbourne, found that koalas increased their vigilance in response to noise from nearby visitors (*Applied Animal Behaviour Science* 154: 76-82, May 2014; doi: 10.1016/j.applanim.2014.02.005). Indeed, Sandra Quadros and colleagues from two universities in Belo Horizonte found that noise levels had detrimental impacts across 12 species of mammals, and that the most popular animals at the zoo faced the biggest noise levels

(*Applied Animal Behaviour Science* 156: 78-84, July 2014; doi: 10.1016/j.applanim.2014.04.002). Copying natural social organisation doesn't necessarily help: a study by Martin Amrein and colleagues from the University of Zurich showed that both self-directed behaviours and faecal glucocorticoid metabolites were higher in orang-utans at Apenheul when visitor numbers increased, even though the animals were maintained in a simulated fission-fusion grouping (*International Journal of Primatology* 35: 509-528, April 2014; doi: 10.1007/s10764-014-9765-5). Between them these papers demonstrate some of the difficulties in interpreting papers on visitor effects: some species (indeed some individuals) appear unaffected, in some only one or two behaviours are affected, and even when there is an effect it is not at all clear whether it is a welfare issue.

So some animals in zoos prefer visitors not to be there, or at least not to be too noisy. What else do they like? Well, gibbons prefer vertical structures which allow them to get higher above the ground, according to Megan Anderson at the National Zoological Park in Washington DC (*Journal of Applied Animal Welfare Science* 17: 216-227, July 2014; doi: 10.1080/10888705.2014.916702). Nice paper, but what I find most surprising is not that gibbons prefer to be up there, but that providing high access is considered enrichment. Still on the subject of housing, tigers walk longer distances but pace less in large compared to small enclosures, according to a study by Grégory Breton and Salomé Barrot of Parc des Felins (*Applied Animal Behaviour Science* 154: 66-75, May 2014; doi: 10.1016/j.applanim.2014.02.007). And Sally Hunter and colleagues have found that African hunting dogs at San Diego and Bronx Zoo do not use all areas of their enclosure equivalently (*Journal of Applied Animal Welfare Science* 17: 98-110, April 2014; doi: 10.1080/10888705.2014.884401). Like the gibbon paper, these papers tell us something we think we already know, but it's important that we demonstrate with hard data, as these papers have done, that what we think we know is right.

And finally.....did you know that all mammals above 3 kg in weight empty their bladders over nearly constant duration of 21 ± 13 s? No, I didn't either. Go and read the paper by Patricia Yang and colleagues of Georgia Institute of Technology (*Proceedings of the National Academy of Sciences* 111: 11932-11937, August 2014; doi: 10.1073/pnas.1402289111).

For those of you who read these ramblings of mine, can I suggest (if you haven't already found it) that you also start looking at the BIAZA Research Committee's Facebook page (<https://www.facebook.com/biazaresearch>), which regularly points out new publications relevant to zoo science.

For more information contact: Geoff Hosey, University of Bolton, gh2@bolton.ac.uk

Research snippets

Do zoo managers use scientific evidence to support their decision-making?

Virginia Woollven¹ and Amy Plowman^{2, 1} Plymouth University, ²WWCT Paignton Zoo

In many fields of practice there is a gap between relevant evidence gathered by researchers and actual management practices, referred to as the research-practice divide. Within zoos, formal zoo-based research is believed to play an increasingly integral part of successful zoo management; however this may not be the case as studies have found that most recommendations are based on current or traditional practices and not supported by empirical scientific evidence. To assess the level of scientific evidence used to help inform every-day decision processes within all aspects of zoo management, participants were asked to summarise their overall experience using a questionnaire dealing with employee experience/background, frequency of decision making or compilation of management plans, information sources utilized, information deficit, monitoring and evaluation of actions. Responses were received from 52 individuals from 20 zoos which were a mixture of BIAZA, EAZA and AZA affiliated. Results indicate that decision processes in zoos only occasionally involve the use of scientific evidence. A large number of decisions are based on anecdotal sources with over half of respondents using existing plans to compile new ones and the majority completing management plans alone. Not only was sourcing scientific evidence sporadic, the monitoring and implementation of actions from these plans also varied widely. The majority of respondents replied that monitoring only occurred sometimes and only occasionally could resultant new actions required be identified. When knowledge gaps were identified just over half of respondents stated that subsequent research was carried out at least some of the time. From this research only one third said it was published and a quarter of respondents did not know what was done with any research initiated.

For more information contact: Amy Plowman, Whitley Wildlife Conservation Trust, Amy.Plowman@paigntonzoo.org.uk

The acceptance of a novel diet for sugar gliders (*Petaurus breviceps*)

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Sugar gliders (*Petaurus breviceps*), are small, omnivorous marsupials which are currently increasing in popularity as pets and within animal collections such as zoos. The current range of captive diets is limited and is often unsuitable with regards to nutritional content which may lead to a wide range of nutritional disorders including nutritional osteodystrophy and malnutrition. This study aimed to look at the acceptability of a novel feed item produced by Dodson and Horrell Ltd® to a group of eleven sugar gliders. A comparison was made between the original diet, consisting of a Leadbetters / marmoset gum morning feed and a fruit / insect afternoon feed, and the trial diet, where a novel gel-based feed designed to deliver similar nutrient profiles was used in the morning presentations. No significant difference was found with regards to intake of either feed mass or nutrients ($P > 0.05$) following the diet change. However, the frequency of approaches to feed and latency of approach were both significantly different following the change ($P < 0.05$), decreasing when transitioned to the trial diet. Using a faecal scoring system, a significant change was seen on the trial diet with faecal pellets being drier ($P < 0.05$). Anecdotal feedback from the animal technicians caring for the sugar gliders supported the use of the novel feed as being easier to prepare and store, as well as maintaining cleanliness in the enclosure. This study supported the novel feed being nutritionally well balanced and acceptable to sugar gliders as well as having a positive influence on faecal scores. This will act to widen the currently limited range of captive diets available to sugar gliders and may reduce risk of nutritional disorders.

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How stressful is meeting a mate?: Using behaviour and faecal corticosterone to determine stress levels following the social introduction of Amur tiger (*Panthera tigris altaica*) – study update

Louise Bell^{1,1} Myerscough College & Blackpool Zoo

The story so far...

As part of an ongoing study determining the usefulness of using behaviour and physiological indicators to monitor 'stress' in captive big cats (namely *Panthera*) this study aimed to address the social introduction of a mate as a potential stressful event. Introducing captive carnivores to other individuals within the zoo environment can be a potentially dangerous and stressful event for both animal and keeper. *Panthera*, or 'big cats' as commonly known, are no exception and thus, introducing a new individual into a pre-established 'territory' can be hazardous. Monitoring the potential stress of an introduction is thus important to ensure the animal's safety and wellbeing. In this instance an individual's stress response can be observed via behavioural observations and



Plate 1: Alyona & Zambar, week 2
'introduction outside' (Phase 3).
Image taken by Lynne Gorrie

monitored endocrine changes (glucocorticoids excreted by the individual). Determining baseline levels of both allows you to consider changes following a specific 'stressful' event such as the introduction of a new mate and thus, provides the opportunity of intervening where necessary to reduce the potential impact of the stressor. As part of EAZA EEP breeding recommendations, an Amur tiger, Alyona (female), was introduced to Zambar (male) at Blackpool Zoo in September 2012 (Plate 1). The introduction consisted of four phases including separation, introduction via dens and traps, den introduction and total access within their enclosure (Plate 2). Behavioural and faecal corticosterone data were collected throughout the introduction phases to determine any potential stress response.



Plate 2: Alyona and Zambar, week 2 ‘introduction outside’ (Phase 3)
Image taken by Lynne Gorrie

Measuring stress – is it as easy as it seems?

Behavioural and physiological indicators including abnormal behaviour, in particular stereotypic pacing and glucocorticoids (referred to as GC herein), namely corticosterone, are often used to assess the level of stress encountered. When faced with an environmental stressor the animal’s physiological ‘fight or flight’ response occurs in which GCs are released from the hypothalamic-pituitary-adrenal (HPA) axis. These are excreted by the animal as a mechanism for influencing short-term survival opportunities. Along with behavioural changes, heightened levels of GCs can be measured non-invasively in faeces to indicate a stress response. Both are used within the zoo environment to monitor carnivore stress (Howard and Wildt, 2009).

How stressed are tigers?

In a previous study conducted on Zambar and other *Panthera*, corticosterone response to transport as a stressor varied between subjects although no significant differences were found ($P > 0.05$) (Bell, 2010). There was inter-animal variation within the time taken for corticosterone levels to reduce following the stressor with no animal returning to baseline during this study. When considering individual behavioural response, specific days following the stressor reflected elevated corticosterone levels for three animals supported by an increase in pacing behaviour which is perceived as a stress response (Bell, 2010). Building on from this the aim of this study is to determine how stressful the social introduction of a male and female Amur tiger is by utilising behaviour and faecal corticosterone.

Stress indicators

Both tigers were observed using a focal-individual continuous sampling method with a self-devised ethogram for 5h per day (3 AM and 2 PM), 25h per week throughout the introduction cumulating in 250h data per individual. Faecal samples ($n=52$) were collected from both individuals prior to Alyona’s transfer to the UK from Holland and were continually collected throughout the introduction period to determine elevated levels. All samples were frozen upon collection and analysed using a standard ELISA test at Chester Zoo endocrinology laboratory. For analysis, behavioural observations and faecal corticosterone were grouped into four phases between August 2012 and March 2013 including; ‘baseline’ (Phase 1), ‘separated’ (2), ‘introduction’ (3) and ‘mating’ (4).

Was the introduction stressful?

Both cats appeared to be ‘more stressed’ when they were first introduced to their outdoor enclosure (Phase 3) than any other study phase despite peaks to be expected during the ‘separated’ phase (Phase 2) immediately following transfer. Behavioural indicators reflect a significant difference between ‘resting’ and ‘resting awake’ during the four study phases (Table 1). Zambar’s activity levels increased following Alyona’s introduction with a reduction in stereotypic pacing behaviour potentially indicating a reduced stress response. Furthermore, Alyona’s ‘resting’ behaviour peaked during ‘introduction’ phase (Phase 3) with Zambar’s remaining constant between ‘separations’ (Phase 2) and ‘introduction’ phases (Phase 3).

Table 1: Significance of the main behaviours observed during all four study phases

| Behaviour | P value | Significance level |
|---------------|---------|--------------------|
| Locomotion | 0.050 | >0.05 |
| Pacing | 0.064 | >0.05 |
| Resting | 0.004 | <0.05 |
| Resting awake | 0.016 | <0.05 |
| Standing | 0.195 | >0.05 |

Table 2: Significance levels of Mean faecal corticosterone (ng/g faeces) (CC) for Zambar and Alyona

| Factors | P value | Significance level |
|---------------------------|---------|--------------------|
| CC and study phase | 0.110 | >0.05 |
| CC and individual | 0.667 | >0.05 |
| Zambar CC and study phase | 0.001 | <0.05 |
| Alyona CC and study phase | 0.676 | >0.05 |

No significant difference in mean faecal corticosterone (CC) was found between study phase and individual (Table 2). Mean corticosterone for Zambar and Alyona pre-transfer (baseline, Phase 1) were 211.46 (ng/g faeces) and 135.69 (ng/g) respectively with Zambar having a higher baseline level. This decreased post-transfer (Phase 2) to 121.06 (ng/g) for Zambar and 165.93 (ng/g) for Alyona. Peak mean levels were recorded for Zambar during the inside stage with access to both dens (Phase 3) with a mean corticosterone of 346.93 (ng/g) and Alyona 757.87 (ng/g). When using faecal samples only this phase appears to be the most

‘stressful’ phase of the introduction. Both cats had returned below baseline by week 6 when the introduction phase was complete. During this phase Zambar’s corticosterone decreased by 58% from Phase 1 and Alyona 57%.

So what does this tell us?

The findings so far show that the introduction of a mate may not be as stressful as considered. Results suggest that a social introduction could in effect be a ‘novel’ experience and therefore, is not necessarily stressful. It is important to determine how the individuals stress response changes over a longer period and thus, whether or not this affects breeding success. It is fair to suggest that behaviour and faecal GCs are useful indicators of stress within the zoo environment. Factors influencing the collection of both indicators can be influential in its analysis and interpretation, thus have to be considered in light of many factors. Further areas of study are currently being explored to prove or refute this aspect to thus allow sufficient interpretation of whether transport or an introduction of a new mate is as stressful as anticipated. Limited analysis has been carried out to date on this study and thus, complex statistical analysis is yet to be used. It is hoped following further data collection 12 months after introduction and pre/post the social introduction of their two offspring born June 2014 that findings are valid to make recommendations for planning and managing the social introduction of *Panthera*.

References:

- BELL, L. (2010) *The use of faecal corticosterone and behavioural observations to determine levels of experienced stress in captive Panthera species*. Unpub. Thesis, University of Leeds.
 HOWARD, J.G. & WILDT, D.E. (2009) Approaches and efficacy of artificial insemination in felids and mustelids. *Theriogenology*, 71:130-148.

For more information contact: Louise Bell, Myerscough College, lbell@myerscough.ac.uk

Announcements

For further information on the BIAZA Research Symposium see the BIAZA website. Others events include:

Course: Statistical and research methods for Natural Scientists – 18th – 22nd May 15

This course will introduce participants to commonly used methods for designing sampling schemes, managing data and performing statistical analyses. The module is taught primarily using computational software called R, which is freely available and becoming the prominent software choice of natural scientists. This five day statistics course is being held at The University of York 18th-22nd May 2015 and aims to provide an introduction to commonly used methods for designing sampling schemes, managing data and performing statistical analyses.

For more information on the course or how to enrol please see: <http://www.york.ac.uk/business/cpd/statistical-methods-for-natural-scientists/>

Love your Zoo 2015 – 23rd -30th May 15

At multiple BIAZA collections, open to BIAZA members and the public, this is an opportunity to enjoy what your local BIAZA collection offers and to see what goes on in your local and national zoo community. More details of specific collection dates etc to follow.

Please see: <http://www.biaza.org.uk/news/1726/33/Love-Your-Zoo-2015/d.events/>

BIAZA Big Bug Bonanza – 3rd – 9th August 15

Open to BIAZA members and the public, this is an opportunity to explore invertebrates at their best and learn a little bit more about our important species that help formulate the world's greatest ecosystems.

For more information please see: <http://www.biaza.org.uk/news/1813/33/BIAZA-Big-Bug-Bonanza/d.events/>

Further information on all BIAZA events can be found on the BIAZA website at: <http://www.biaza.org.uk/public-events/>

Your contributions are needed

Please send articles, announcements, comments or other feedback for the next issue by the end of March/early April to: Louise Bell, Animal Studies Department, Myerscough College, St Michaels Road, Bilsborrow, Preston Lancs, U.K. Tel: 01995 642222 ext. 2029, email: lbell@myerscough.ac.uk