Association of British and Irish Wild Animal Keepers

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The Association of British & Irish Wild Animal Keepers (ABWAK)

ABWAK is a non-profit making organisation catering for those interested in and involved with the keeping of wild animals. The aim of the association is:

"To achieve and advance the highest standards of excellence in wild animal care"

We believe that:

• We are the professional association representing animal keepers in Britain & Ireland for whom excellent animal welfare is the highest priority

• We can have a significant impact in welfare issues by bringing keepers and stakeholders together and by being a strong representative & consultative body

• We can make a significant contribution to the training & development of animal keepers thus raising standards and increasing the recognition of wild animal collections

• By developing the skills & expertise of our members we can make a unique contribution to conservation

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red crested turaco at the Living Rainforest
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abwak
Association of British and Irish Wild Animal Keepers

Join ABWAK COUNCIL

The Association is a not-for-profit membership association and is run by a team of volunteers - the Council. ABWAK Council is elected by the membership, each Council member is elected for 3 years and is eligible for re-election. The Executive may co-opt members onto Council and such co-opted members are put up for election at the next AGM.

We are looking for up to 6 new people to join the Council and help develop and progress the mission and aims of the Association. Council meets four times a year (in different locations) and does some of its work by e-communication, in addition to specific activities such as workshops and symposia.

Do you have a passion for developing the profession of zookeeping?

Can you offer some of your time and expertise to support the Association?

Do you want to develop your own career and skills?

Do you have experience of any of these areas: networking? taxon specialism? training programmes? website management? social media? report and article writing? sponsorship and fundraising? marketing and communications? husbandry and enrichment?...

If you are interested in joining ABWAK Council please contact us. You can see some of our activity via our website **www.abwak.org** and at our annual symposium and our workshops.

Email: info@abwak.org title your message 'ABWAK Council' - tell us who you are, where you work, and what you think you can offer to the Association.

From the editor

The 2013 ABWAK Symposium hosted by Edinburgh Zoo, in its centenary year, was a great success. It was a beautiful weekend - T shirt weather (for Scots) on the Saturday. Over 100 delegates attended and there was a strong programme of talks and activities. And nearly 60 people took the optional trip to the Highland Wildlife Park on the Monday. Feedback received was overwhelmingly positive - thank you.

A selection of photos from the Symposium is given opposite. The full set of presentations that were given at the Symposium is now available on a CD for just £5. Email **publications@abwak.org** to make an order.

CALL FOR PAPERS for SYMPOISUM 2014: Our annual symposium is our flagship networking and training event, and we are already looking for speakers and activities for our 2014 symposium at Chester Zoo 1-2 March. Please contact us on **admin@abwak.org** with offers to speak/do a workshop, giving us your name, title/place of work, and a short description of the talk topic.

As this editorial is being written final preparations are underway for our **giraffe keepers workshop** on May 11th at Chester Zoo, and we are also now taking bookings for our '**Animal Training & Rope Splicing**" workshop on **8th June at Chessington** World of Adventures. See website www.abwak.org for details.

Council Members Neeed: ABWAK has grown and developed significantly over the past few years, and we are delighted that our membership is growing and that our membership services, such as workshops, symposia and RATEL are giving keepers opportunity to gain professional development cheaply and effectively. At the same time, we have to remember that ABWAK is a subscription non-profit organisation and all of its work is carried out by volunteers (the Council), and this entails personal investment of time and energy, which is difficult to fit into our busy lives and demands of paid employment. We are seeking committed individuals to join ABWAK Council and help us keep the Association fresh and current, as well as to ensure the 'cogs' of day to day operation move smoothly. Please contact us on admin@abwak.org to volunteer your help.

This edition of RATEL features some articles submitted by students and by keepers. RATEL is recognised for carrying interesting and useful articles on a diversity of zoo related topics, especially husbandry, breeding, enclosure design and enrichment. Furthermore, we are one of the few publications to give the opportunity of publication for reports on the work of keepers and student keepers/animal carers. This edition includes articles on health, breeding and enclosure design. I'm pleased to publish some student's work in this issue - students often get the chance to pursue things that keepers want to know and investigate but don't have the time to do so. Obviously, there is a lot of merit in the practical experience that keepers themselves have - as demonstrated in the articles on breeding narrow striped mongoose (Newquay) and red crested turaco (The Living Rainforest).

This edition ends with an 'opinion' piece by one of the volunteers at Edinburgh Zoo (a member of ABWAK, and winner of our Christmas quiz). If you would like to submit an 'opinion' or 'thought from the zoo', or a full article, please contact me - I'm always looking for articles and the next issue deadline is 23rd July (publication September) and following that our December issue will feature the winners of the 2013 Photo Competition - entry closes 30th July.

Here's hoping that Spring has now properly arrived and is moving into a good summer as this June edition of RATEL reaches you.

Stephen P. Woollard,
ABWAK Vice Chair & Editor
RZSS Head of Discovery & Learning

Please send articles for RATEL by email to the editor: editor@abwak.org

The implication of Atoxoplasmosis in the mortality of captive blue-crowned laughingthrushes: tips to reduce its incidence.

Anais Tritto

Study undertaken whilst at University of Plymouth

The blue-crowned laughingthrush *(Dryonastes courtoisi)* is an endemic passerine from South-East China. This active bird is social, often observed in large group and living near the river in the vicinity of human habitation. It is omnivore and becomes highly insectivore during the breeding season[1,2]. In 2011, the last counting said that about 250 birds are present in the Wuyuan region[3]. Because of its small range, the small number of birds and the threats it faces such as trapping for bird trade and destruction of its habitat, the blue-crowned laughingthrush is listed as Critically Endangered by the IUCN.

In captivity, this species is managed via an international studbook (led by Laura Gardner, ZSL) and takes part of an ESB in Europe and an SSP in America. In 2012, there were 166 individuals in 32 institutions. It is worth noting that this number is close to the number of birds present in the wild and can easily demonstrate the great value of the captive population.

The parasite Atoxoplasma and its investigation in the captive population

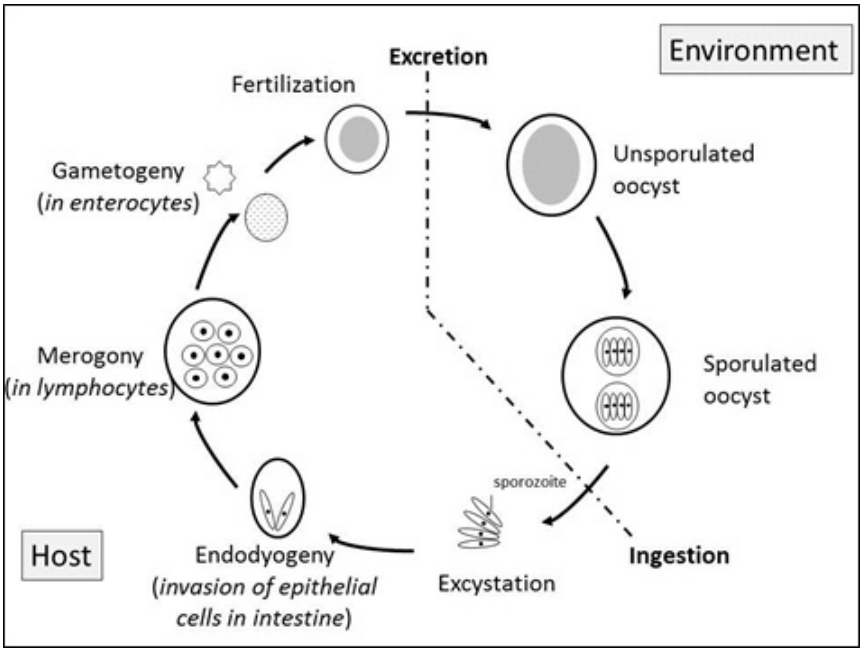
The parasite Atoxoplasma is widely present in passerines in captivity and it has been described before in other species such as Bali Mynahs4 and canaries5. It was also assumed that the parasite is present in the wild in our continent which causes some problems for the control of the disease. The parasite is directly transmitted from one bird to another via the faecal-oral route (picture 1). The parasite reproduces itself in white blood cells and especially in lymphocytes. The sexual reproduction of the parasite in intestine cells leads to gametes and fertilization where a new sporulated oocyst (a zygote) will be released in the environment through the faeces and ingested by another host[6].

A study was performed to understand the implication of Atoxoplasmosis in the mortality of blue-crowned laughingthrushes and its extent in the captive population in Europe and America. To understand the impact of Atoxoplasmosis (clinical signs, predominant age of death…), birds housed at Durrell from 2007 to 2011 were studied via medical and husbandry reports. The current extent of the disease in the whole captive population was investigated via a questionnaire sent to all 32 institutions housing this species.

84% of them answered, which gathers 148 birds, i.e. 89% of the captive population. Among institutions that answered the questionnaire, ten detected Atoxoplasmosis in their collection (2 zoos in USA, 7 zoos in Europe and 1 European private breeder). This result highlights the fact that this disease is present in both continent and transfer between institutions could increase the risk of propagation and transmission.

Clinical signs

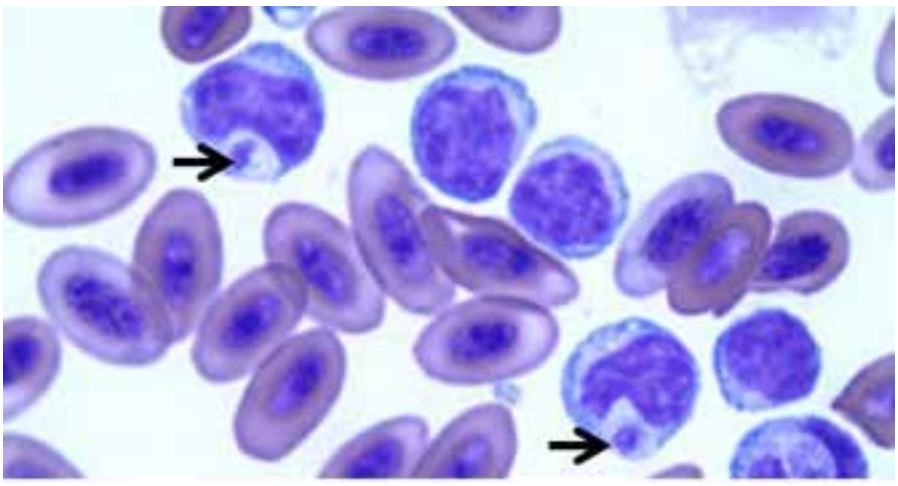
A bird which is infected by Atoxoplasma will have the following clinical signs: respiratory problem (dyspnoea), an enlarged liver (hepatomegaly) and granular surface and inflammation of pectoral muscles (picture 2).



1/ Life cycle of the parasite Atoxoplasma (modified from Gardiner et al. 1988)

2/ Atoxoplasma-infected bird which presents inflammation of pectoral muscles

3/ Parasite (arrow) identified in lymphocytes on a buffy coat smear



Respiratory problems seem to be linked either with the enlarged liver that compresses the lungs or a secondary infection by fungi elements. Deeper medical analyses can be performed to confirm the diagnosis. First, a faecal analysis allows identifying sporulated oocysts. But attention must be paid with this commonly used method of detection because, currently, we cannot differentiate Atoxoplasma oocyst from other Coccidia in the faeces. Further researches are currently performing to analyse the DNA of the parasite responsible for Atoxoplasma and identify it at its sporulated stage. An infection by Atoxoplasma can be confirmed by doing a buffy coat smear where the parasite will be identified in lymphocytes (picture 3). It was noted that, if birds have less than 10% of infected lymphocytes, they will remain asymptomatic and will live as healthy carriers, transmitting the parasite to other birds without being visually and clinically sick. Beyond this limit, they will start to present clinical signs and are more likely to die of Atoxoplasmosis.

Critical period

The study showed that there are critical periods for birds to die of Atoxoplasmosis. First of all, in 2011, Atoxoplasmosis was involved in 18% of the mortality of blue-crowned laughingthrushes and was detected in birds older than 2 months old. Below this age, the causes of death were unknown and are mainly due to the quick autolysis that occurred in chicks which made diagnosis difficult, even sometimes impossible (picture 4). Then, a good majority of birds (46% of studied birds) died of Atoxoplasmosis between 1 year and 2 years old which corresponds to their first breeding season. Moreover, they all developed their clinical signs and died of Atoxoplasmosis from September to November, so after the breeding season. An hypothesis was proposed that they probably faced stressful moments during the breeding season such as their first breeding behaviours or the first interactions with reproductive adults and that these extended stress along the season led to an outbreak of the disease after the breeding season.

4/ Chick with advanced autolysis (on the right). It was found shortly after its death on the nest and the necropsy could not reveal anything.

The period of the year when the birds died of Atoxoplasmosis is consistent to the previous results. Indeed, 90% of birds in the whole population died of Atoxoplasmosis from mid-August to the beginning of December and this pattern is recurrent each year. This can be linked again with the end of the breeding season and the end of a stressful period for some birds (independent of their age) or because of environmental or husbandry changes; these last two points needing to be further investigated. Finally, no death was recorded from March to July, which corresponds to the breeding season and can be linked with prophylactic treatments that are given to the birds at the beginning of the season.

Prophylactic treatments

After studying protocols from numerous zoos in Europe and America, here is the prophylactic treatment protocol that could prevent the apparition of the disease (picture 5). Nevertheless, this protocol is the result of few zoo experiences so its efficiency should be closely monitored.

First of all, a good survival rate was observed when birds receive regular treatment with Toltrazuril (Baycox®) during their first year of life: 4 days after hatching given in the mouth (2-day treatment, 5-day off, 2-day treatment, namely 2/5/2), at 2 ½ months old and 3 ½ months old given in the mouth (2/5/2) and at 5 ½ months old given in the drinking water (2/5/2). Another treatment is given before each breeding season to prevent the adults to develop clinical signs during breeding and another one at the end of the breeding season, for example in mid-August, because of the critical period which follows (see previously).

Finally, one institution provides vitamin B spread on food when chicks hatch and presents a low mortality rate. It was assumed that the parasite can interfere with the absorption of nutriments so a supply in vitamins during rearing could help the chick to reinforce its strength[5].

5/ Prophylactic treatment given to a 9-day old chick

Factors that may influence the outbreak of the disease

The outbreak of the disease is multi-factorial and can be linked with either husbandry or environment. The design of the aviary plays a role and a significant higher mortality rate due to Atoxoplasma in mixed-species aviaries was noted. It means that interspecific contamination may occur and the access of the feeder by several different species could increase the risk of contamination as long as the load of parasite. Concerning bird handling, even if it can be a stressful moment for birds, it does not affect Atoxoplasmosis mortality.

Birds can thus be handled with little concern to give them, for example, the previous regular treatment. Nevertheless, attention must be paid when birds are hand-raised and released back in the aviary with the adults. Indeed, chicks are raised in a controlled environment with a high hygiene level and they are most of the time isolated from other birds. When they are released, they can become more susceptible to the parasite because of their late exposure and the lack of natural immunity. This problem was observed in only one institution but it is important to know that it may occur and implement a new treatment protocol if this problem becomes recurrent. Finally, even if it was not clearly demonstrated, genetics could play a role as chicks of some pairs always died of Atoxoplasmosis while others survived well with infected parents. In a general way, it has been observed that some individuals constantly provide positive results for parasite infection in spite of appropriate treatment while other remain negative in absence of treatment, which can highlight the influence of genetics.

Conclusions

The study of captive blue-crowned laughingthrushes in Europe and America showed that, to decrease the outbreak of the disease and consequently, death because of Atoxoplasmosis, attention must be paid on particular bird stages of life, particular husbandry aspects and more consistent prophylactic treatment must be implemented to prevent the transmission of the parasite even if a complete eradication is unlikely. Behavioural study could be pooled to focus on factors that increase stress and lead consequently to an outbreak of the disease such as intraspecific and interspecific aggressions.

Atoxoplasmosis is implicated in the mortality of Blue-crowned laughingthrushes in captivity even if it has not been completely proved for chicks before fledging. The parasite is widely spread in the population but suitable screenings and identification of the subspecies of Atoxoplasma responsible for the disease could help to better understand the impact of Atoxoplasmosis in this bird species.

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The Effects of Ultraviolet (UV) Light Exposure on the Physiology And Behaviour of Captive Corn Snakes *(Elaphe guttata)*

Jordan Bradwell & Jessica Hackett
Reaseheath College

Abstract

In the field of research based on the needs of UV light exposure, there are minimal studies carried out on the effect of UV lighting on the physiological growth in captive corn snakes *(Elaphe guttata).* In this experiment a group of captive E. guttata (N=6) were split into two test groups. One group exposed to UV lighting (N=3) and the control group (N=3) denied access to UV. Over the course of seven weeks each subject was measured taking data on weight (g), length (cm), the position of the subject within the vivarium and any behavioural changes. The results show no significant effect upon the physiological growth of the animals; however the behavioural differences between the groups were significant. This difference shows that the addition of UV lighting could have an impact upon the captive welfare of the species.

Introduction

Although it is believed that many species of reptile do rely of the exposure of UVB for the synthesis of vitamin D3 in their skin (Baines, 2005). The utilisation of UVB is most commonly recorded in diurnal species of lizard (Ferguson et al, 2010), and research has found that captive lizards such as the green Iguana *(Iguana iguana)* when unable to access UVB lighting can develop issues such as metabolic bone disorder (Adkins et al, 2003; Marsden 1999).

The little research that has been undertaken has proven that the use of UVB in captive snakes could be beneficial, proving that it aids hormone production in the corn snake (Acierno et al, 2008). Further research has supported that wild snakes such as the western ribbon snake *(Thamnophis proximus)*, the yellow-bellied water snake *(Nerodia erythrogaster)* and the Texas rat snake *(Elaphae obsoleta)*, all voluntarily bask in the sun to aid thermoregulation and exposure to UVB lighting from the sun (Ferguson, 2010). Although there is conclusive evidence to support the needs of lizards in concern with UVB exposure, the gap in data supporting the need of snakes is large when concerning the physiology and behavioural effects of UVB exposure.

The following research undertaken was devised on the thesis that the E. guttata, being most common snake pet species (Bernstein, N.D). The possible benefits of exposure to UVB lighting could improve the captive population welfare. The research looks at six subjects, three of which being the test group were provided with UVB lighting at an output of 10, and the other three being the control group were denied access to UVB lighting. The hypotheses derived are as follows.

Hypotheses

Hypothesis 1- Weight (g)

H0- There is no significant difference in weight growth rate between the control group and the test group.
H1- There is a significant difference in weight growth rate between the control group and the test group

Hypothesis 2- Length (cm)

H0- There is no significant difference in length growth rate between the control group and the test group.
H1- There is a significant difference in length growth rate between the control group and the test group.

Hypothesis 3- Behaviour

H0- There is no difference or change of behaviour in the experimental group compared to the control group.
H1- There is a significant difference or change of behaviour in the experimental group compared to the control group.

Methodology

Six unsexed subjects of the ages 2 years old were used in the experiment, three of which being the test group were kept under a 30w, 90cm 'reptiglo exoterra desert terrarium lamp' with an output of 10.00 UVB, and provided with 'Vet ark Nutribowl supplements' to their diets, the other three subjects were denied any access to UVB lighting and given no extra dietary supplements. All subjects were housed in a 12" x 12" x 12" exoterra vivarium and temperature was controlled by the room in which they were kept at around 25o and 28o.

Once a week for 7 weeks measurements were carried out, weighing (g) and measuring (cm) the snakes, as well as noting the position of the snakes before they were handled. Additional notes were taken on the behaviour and activity levels of each particular snake separately at the time of handling. The subjects were removed from the vivarium using a small snake hook, and physically restrained and laid out on a work surface, this technique of handling was used to prevent injury to both handler and subject and reduce stress as much as possible (Mitchell, 2004). A piece of string was placed along the subjects body and measured once the most accurate length was judged, the snakes were then placed in a tub which was placed on a set of digital scales (the weight of the tub was accounted for before placing the snake inside), the snakes were handling quickly and efficiently to reduce stress as much as possible (Animal welfare act 2006). The handling of the snakes and all notes and data recorded were carried out between the times of 12pm and 2.00pm every week.

Results

Overall 82 quantitative data sample points in weight (g), length (cm) and UV output where applicable were collected over the course of the seven week research period. These were separated into three different measurements according to each separate vivarium. The data collected were split into two tables according to experimental group (Table 1) and the control group (table 2).

Measurements of experimental group table

Date	Weight viv1	Length viv1	UV reading Viv1	Weight viv2	Length Viv2	UV reading viv2	Weight viv3	Length viv3	UV reading Viv3
30/01/2013	74g	69cm	10	71g	72cm	10	91g	74cm	10
06/02/2013	70g	69cm	10	68g	74cm	10	90g	74cm	10
13/02/2013	71g	70cm	10	74g	74cm	10	92g	74cm	10
20/02/2013	Half term no measurements taken								
27/02/2013	75g	72cm	10	72g	74cm	10	87g	74cm	10
06/03/2013	75g	72cm	10	74g	74cm	10	90g	75cm	10
13/03/2013	76g	75cm	10	74g	75cm	10	92g	76cm	10
20/03/2013	75g	76cm	10	79g	75cm	10	93g	76cm	10

Table 1. The quantitative measurements of the experimental group.

Measurements of control group table

Date	Weight viv 4	Length viv 4	Weight viv 5	Length viv5	Weight viv6	Length viv6
30/01/2013	72g	71cm	-	-	84g	72cm
06/02/2013	68g	71cm	74g	68cm	83g	75cm
13/02/2013	68g	73cm	74g	70cm	79g	75cm
20/02/2013	Half Term no measurements taken					
27/02/2013	69g	73cm	73g	73cm	80g	78cm
06/03/2013	71g	73cm	74g	73cm	81g	78cm
13/03/2013	72g	73cm	74g	73cm	80g	78cm
20/03/2013	72g	73cm	73g	73cm	83g	78cm

Table 2. The quantitative measurements of the control group.

Position of snake in vivarium at time before measurements taken experimental group

Date	Viv 1	Viv 2	Viv3
30/01/2013 12.00	Under Paper	Under paper	Under paper
06/02/2013 12.00	under paper	under paper	under paper
13/02/2013 14:00	Under paper	Under paper	In hide
27/02/2013 13.30	Under paper	Under paper	Under paper
06/03/2013 13.00	Under Paper	In Hide	Under Paper
13/03/2013 13.00	Under Paper	In Hide	Under Paper
20/03/2013 14.00	Hide	Hide	Under Paper

The qualitative data collected throughout the research period noted the positions of the individual snakes in the vivarium before any handling or measurements were taken. These notes were put into tables and split into two tables according to the experimental group (table 3) and the control group (table 4).

Table 3. The Qualitative data collected for the experimental group.

Table 4. The Qualitative results collected for the control group.

Position of snake in vivarium at time before measurements taken, control group			
Date	Viv4	Viv5	Viv6
30/01/2013 12.00	Under paper	-	Outside
06/02/2013 12.00	In hide	In hide	under paper
13/02/2013 14:00	outside	Under paper	In hide
27/02/2013 13.30	Hide	Outside	hide
06/03/2013 13.00	Outside	Hide	Outside
13/03/2013 13.00	Under Paper	Under Paper	In Hide
20/03/2013 14.00	Under Paper	Hide	Hide

Table 5. Descriptive statistics devised from the raw data, the range, mean, and Std. Deviation for the experimental group (under UV), and the control group.

	N	Minimum	Maximum	Mean	Std. Deviation
Weight/g UV	21	68.00	93.00	79.1905	8.71561
Length/cm UV	21	69.00	76.00	73.5238	2.11232
Weight/g	20	68.00	84.00	75.2500	5.10804
Length/cm	20	68.00	78.00	73.5500	2.76205
Valid N (listwise)	20				

Descriptive statistics were devised by analysing the raw data using S.P.S.S. version 19, these statistics shows the range, mean and Std. deviation of the data seen in Table 5.

Kolmogorov–Smirnov tests were performed on each data set to test for normal distribution. The hypothesis used for each data set when testing for normal distribution is stated below;

H0- The data will have no significant difference from normal distribution

H1- The data will have a significant difference from the normal distribution

The results for the K-S test for data concerning weight (g), ($P<0.05$= sig. 0.112) of subjects under UV and weight (g), ($P<0.05$= sig. 0.175) and length (cm), ($P<0.05$= sig. 0.089) of subjects not under UV show that the data does not follow normal distribution, therefore the H0 should be rejected and the H1 accepted. For the length (cm), ($P>0.05$= sig. 0.042) data of subjects under UV the H1 should be rejected and the H0 is accepted as the data does follow normal distribution.

Due to the results of the K-S test showing predominantly non-parametric data, a non-parametric test was chosen. The Mann-Whitney U test is used when analysing two unpaired sets of measurements from different groups, to see whether there is a significant difference between medians (Ennos, 2007).

Using this test we analysed each set of data in order to answer the hypothesis.

Hypothesis 1- Weight (g)

H0- There is no significant difference in weight growth rate between the control group and the test group.
H1- There is a significant difference in weight growth rate between the control group and the test group

The test shows no significant difference ($p< 0.05$= sig. 0.156) in the weight growth between the experimental and control group. This result means that H0 is accepted and H1 is rejected.

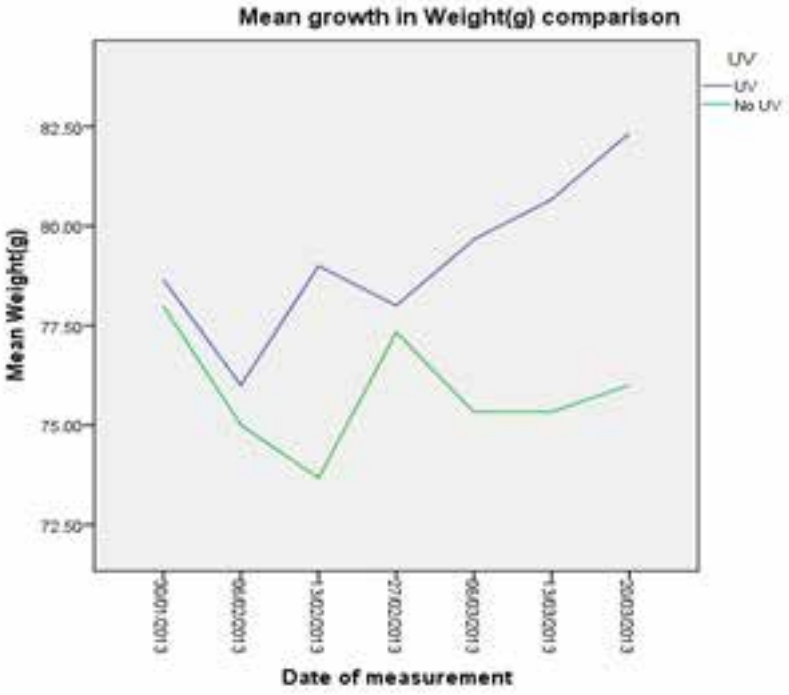

Figure 1 shows the difference in average growth in weight (g) between the two test groups. Blue line indicates average growth in weight (g) of experimental group. Green line indicates average growth in weight (g) of control group. No significant difference was seen.

Hypothesis 2- Length (cm)

H0- There is no significant difference in length growth rate between the control group and the test group.
H1- There is a significant difference in length growth rate between the control group and the test group.

The test shows no significant difference in results (p< 0.05= sig. 0.476) in the length measurements taken from both control and experimental group (see appendix 7), this means that H0 is accepted and H1 is rejected.

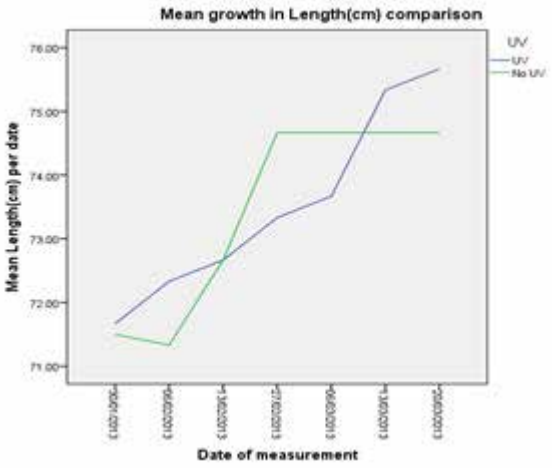

Figure 2. Shows difference in average length (cm) between both control and experimental groups, blue line indicated average length of experimental group. Green ling indicates average growth in length of control group. No significant difference in growth was seen.

Hypothesis 3- Behaviour

H0- There is no difference or change of behaviour in the experimental group compared to the control group.
H1- There is a significant difference or change of behaviour in the experimental group compared to the control group.

As data for hypothesis 3 is qualitative no inferential statistical analysis could be carried out. However visual representation of data was completed to show the preference of each individual subject in concerns with positioning in the vivarium (see figure 3.) Figure 3 clearly outlines an increasing preference in position from the experimental group to hide away in the vivarium when compared to the control group.

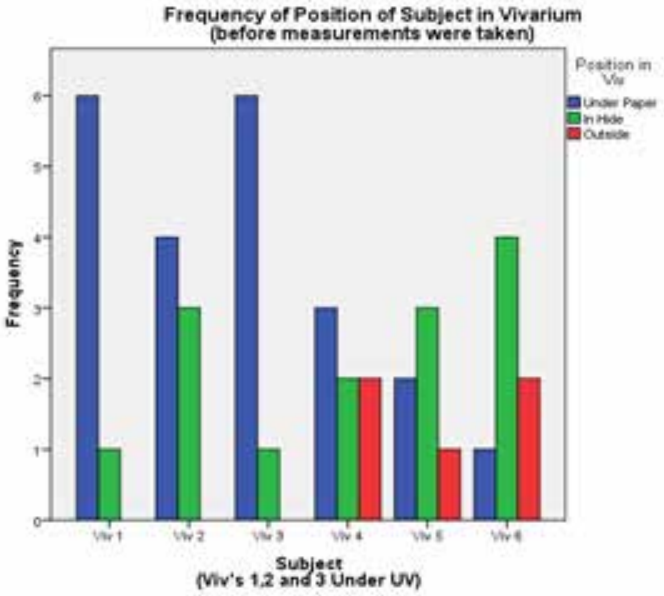

Figure 3. the frequency of position each subject was found in the vivarium before measurements were taken. Experimental group choosing only to be under the paper and in hide indicated by blue bar (under paper) and green bar (in hide), whereas control group choosing to be outside indicated by red line.

On the basis of the further additional notes taken, a heightened state of aggressiveness and alertness could be seen in the experimental group. As well as the data seen in figure 3, it can be inferred that H0 can be rejected and H1 accepted, meaning the UV exposure did have a significant effect upon behaviour of the subjects.

Discussion

The research undertaken was to further limited current research for noticeable physiological growth differences and behavioural changes between two test groups of snake (Acierno et al, 2008, Ferguson et al, 2010, Adkins et al, 2003) in concerns with the addition of UV lighting to the experimental group. The results show an indication of behavioural changes in the experimental group (see figure 3). The data also supports that the experimental group has heightened aggressiveness and vigilance behaviours, this data concludes that the hypothesis 3 H1 is accepted meaning more naturalistic behaviours were seen in subjects exposed to UV lighting. Due to the lack of time available for this kind of research to be undertaken no significant difference in growth in weight (g) or length (cm) was seen concluding that both hypothesis 1 and 2, H0 were accepted (Bellamy and Stephen, 2007). As other research in this field carried out at Chester Zoo and ZSL, was carried out over a two year period (Bellamy and Stephen, 2007). However to improve the reliability of the results, more accurate equipment could have been used to measure the subjects.

The suspected reasoning as to why the addition of UV lighting has an effect on the brain and behaviour has been studied, and the apparent reasoning is suppressed melatonin levels, causing increased alertness (Rautkylä, Puolakka, Halonen, 2011). This was also supported through personal communication with F. Baines (2013), Author of UV Guide UK. Agonistic behaviours have also been reported in Igaunid and Agamid species when exposed to UV lighting (Moehn, 1974, Sievert, Hutchison, 1991, 1988).

The Effect of UV on the brain has been noted in many species including human, also indicating an obvious effect on melatonin regulation in the brain (Brainard, et al, 2001; Chellappa, et al 2011; West, et al 2011; Vandewalle, Schmidt, Albouy, Sterpenich, Darsaud, 2007). These finding could support further research in the field of Colubridae and Serpentes. Other research into UV lighting and the effect on the brain has been carried out on *Boa constrictor imperator* (Sillman, Johnson, Loew 2001), and the Garter snake *(Thamnophis sirtalis)*, which states sensitivity to UV lighting is important when concerning pheromone trails (Sillman, Govardovskii, Röhlich, Southard, Loew, 1997).

To further the research in the future specific aspects of the UV lighting such as UVA and UVB could be tested to examine which part of the lighting has an obvious effect on behaviour (Personal communication, Baines, 2013).

Conclusion

Overall the results show that the addition of UV lighting exposure on the subjects had no significant effect on the physiological growth between the control group and experimental group. However with a larger time period to carry out the research a difference may have been seen. This means hypothesis 1 and 2 H0 were accepted and H1 were rejected. However significant differences in behavioural observations were seen between the two test groups, meaning that hypothesis 3 H1 was accepted and H0 rejected. Further research to expand on these findings could be carried out to help improve welfare of captive snakes and help aid more naturalistic behaviours.

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Breeding Success With Narrow-Striped Mongoose *(Mungotictis decemlineata)* in a Mixed Exhibit with Crowned Lemurs *(Eulemur coronatus)* at Newquay Zoo.

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Introduction

The narrow-striped mongoose *(Mungotictis decemlineata)* or 'boky-boky' (pronounced 'booky-booky') as it is locally known, is a small member of the Eupleridae family like all Madagascan carnivores, but was formerly classified within the Herpestidae family with the rest of the mongoose species. This small carnivore has sandy yellow-beige underparts and legs and a light brown-grey grizzled pelage on its dorsal side, with eight to twelve narrow brown longitudinal stripes running from just behind the shoulders down to the base of the tail. The tail is a similar colour to the upper body but more flecked and quite large and bushy. They have a pointed head with small but prominent ears as well as partially webbed feet with long claws for digging. Their wild weights range between 400g to 550g however in captivity they average at 700g. The total body length from tip of nose to tip of tail is approximately 450mm to 560mm. The longevity of this species is thought to be approximately 12 years.

Two subspecies have been proposed, *M.d.decemlineata* and *M.d.lineata*, on the basis of colour differences however this needs further investigation. (Garbutt,2007) *M.decemlineata*'s known distribution is restricted to the dry deciduous forested range between the Tsiribihina River to the north and the Mangoky River to the south while *M.d.lineata* occurs south of the mangoky river to the banks of the Fiherenana river. They are rarer at the southern extremes of their distribution and extremely rare in the spiny forests south of the mangoky river. *M.d.decemlineata* is however readily seen and fairly common in the kirindy reserve North-East of the sea side town of Morondava

It is a diurnal terrestrial species which lives in family groups of six to eight who keep in contact using a number of calls. One particular bubbling call is very distinctive when they are alert and excited. The animals are thought to cooperatively rear their young within these groups. In the wild, they are mainly insectivorous but have been known to eat other items such as eggs, vertebrates such as lizards and even small lemur species (Cheirogaleidae). They forage readily in bushes and have been found to share trees with lemurs of the Lepilemuridae family with little or no interaction. The species is classed as Vulnerable by the IUCN due to slash and burn agriculture which is fragmenting the deciduous forest it lives in, the building of access roads for logging, human disturbance and predation by domestic dogs. Currently there are only 16 individuals held in captivity worldwide and only 10 in the UK.

History of the species in captivity

The first narrow-striped mongoose brought into a European zoo was in 1997 when Berlin Zoo received a pair. They were brought about by Berlin's partnership with Tsimbazaza Zoo in Antananarivo, Madagascar. A few years later, Durrell Wildlife Conservation Trust in Jersey received a small number of individuals. Since then, Chester Zoo have received a pair (a handreared female from Durrell Wildlife Park and a male from the recently closed private collection called Endangered Madagascar in Bath, UK. Amersfoort Zoo in the Netherlands have received further animals born in Berlin. The animals have bred reasonably well at Berlin Zoo for a number of years. Durrell has produced quite a few offspring and although rearing rates have been sporadic they now have two females with 7 month old babies and have just received a young male also 7 months of age born and bred at Newquay Zoo in 2012 to join their breeding program.

Breeding Success with both species

The pair of crowned lemurs who came to Newquay Zoo as a non-breeding pair from France have successfully produced two very healthy female offspring the first in May 2011 and the second in May 2012, whilst being housed in the mixed exhibit with the narrow striped mongoose at Newquay Zoo. After the first baby lemur was born keepers were concerned as to the risk of any injuries by the mongoose but the two species interacted very well together and there was no cause for concern. In fact the female mongoose gave birth to a healthy male offspring just a month before the 2nd baby lemur was born.

Unfortunately due to previous losses of narrowstripe infants due to infanticide by the female mongoose it was unamiously decided to handrear the baby due to the importance of the birth for this species.

The baby was taken for handrearing at two weeks of age and subsequently did very well. At first he was fed on a goat milk formula every two hours as well as through the night but slowly become less reliant on the constant feeds and had a last feed at 12pm until the next feed at 7am in the morning. He was weighed daily to track his growth and grew steadily over the days and months until he was strong enough to be housed back in the enclosure adjacent to the parents to be socialised with them through fine mesh.

During the day he was housed in a warm enclosure with hay for bedding and a surrogate mongoose soft toy for company with a fine mesh divider between him and his parents to enable him to vocalise and interact with them. He weaned at 3 months although he started to sample solid foods such as wax moth larvae rich in fat from approximately two months old. At 7 months old, Kirindy as he was aptly named after the forest in Madagascar they are indigenous to, was transferred to Durrell Wildlife Conservation Trust and has since successfully mixed with another male mongoose with a view to hopefully be paired with one of their young females in the future and become part of this important breeding program.

Kirindy at Durrell, age 7 months

The BBC filmed Kirindy's transfer to Durrell for their Children's 'Deadly Madagascar' Series to highlight the plight of Madagascan species and their conservation.

After Kirindy was removed for handrearing the male and female mongoose were put back together. (Guidelines from Berlin Zoo recommend separating the male and female pre and post parturition as their presence seems to stress the females). The female gave birth to a second baby just 4.5 months after kirindy's birth and this time keepers gave her the opportunity to rear the baby without intervention and gave her full access to both the indoor and outdoor enclosures with nultiple nestboxes both in and out. Inintially she did very well, she was very attentive towards the baby grooming and feeding it and protecting it.

The lemurs showed interest in the new baby but posed no threat. She was observed for the first time in the outdoor enclosure sunbathing with the infant and carrying it into the nestboxes and also placing it next to her while she foraged. She seemed very calm and relaxed with the baby and the young infant was observed trying to climb a log at just a week old. However after two weeks she started spending more time in the indoor enclosure and although disturbance was kept to an absolute minimum when keepers entered the enclosure to carry out normal daily activities such as feeding and cleaning she would hastily pick the baby up and run into the nest box with it. However as soon as she was left alone she would bring the baby out and place it next to her or under a log or foliage while she foraged.

Sadly at 4 weeks of age keepers found the young infant partially eaten. It is not known whether the infant died of natural causes or it was infanticide but due to the history of infanticide in this species in captivity it was assumed she had killed it for reasons unbeknown to us at this stage however we are looking into breeding strategies of this species in the wild and breeding success and loss patterns at both Berlin and Jersey to try and ascertain the best possible husbandry guidelines for breeding and keeping this unique and beautiful carnivore.

Keepers at Newquay Zoo are however delighted that Kirindy survived and will hopefully go on to breed in the future and contribute to this species longegevity both in the wild and captivity. The adult pair of mongoose have been observed mating in the last few weeks so keepers are preparing for the arrival of yet another important birth from this species and hoping for a successful rearing and another rare baby to add to the very small captive population.

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Kirindy at Newquay Zoo age 2 weeks.

Breeding the Red Crested Turaco *(Tauraco erythrolophus)* at The Living Rainforest

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The Living Rainforest

The Site

The Living Rainforest is an educational charity which allows public to explore a tropical rainforest housed within two greenhouses situated in the village of Hampstead Norreys, near Newbury, Berkshire. The main aim of The Living Rainforest is to deliver high quality education about how plants, animals, ecosystems, human needs, economies and cultures are all related. This is done by allowing the individual to explore the rainforest in an immersive environment whilst learning ways in which they can assist in sustaining it.

Fig 1. Entrance to The Living Rainforest site. Fig 2. Main pond in Amazonica glasshouse Fig 3. Aquarium in Amazonica glasshouse

The two tropical houses, named Amazonica and Lowland, hold approximately 60 animal species across all taxa both free ranging and in enclosures. Off show, there are further invertebrate, amphibian and reptile species. The Rainforest's education work is aimed at both formal and informal audiences. 80,000 members of the general public and 20,000 school children cross The Living Rainforest doorway every year (Information correct as of Nov 2012).

Bird Species at The Living Rainforest

In 2006 the first Turaco species were added to the existing bird collection, which comprised of 10 different species from the Orders Galliformes, Columbiformes, Anseriformes, Cuculiformes, Passeriformes (all of these were free range in Amazonica House) and additionally Piciformes in a separate enclosure. Initially 1.1 white cheeked turacos *(Tauraco leucotis)* were brought in as a model species, followed several months later by a related pair of red crested turacos *(Tauraco erythrolophus)*.

Red Crested Turaco history

Our original pair of *T. erythrolophus* (local ID B1037 / B1038) were donated as immature birds in November 2006 from Paradise Park Wildlife Sanctuary in Hayle. Two years later, the male (B1038) was exchanged with an unrelated male from Birdworld, Farnham to form a viable breeding pair at The Living Rainforest.

The pair failed to bond initially and after four months the male disappeared without a trace. We then began consulting with the studbook to arrange the acquisition of a new male and reconsider how we might create a successful breeding situation. In the interim period, whilst no male *T.erythrolophus* was on site, our female bonded with a male *T.leucotis* and we felt this posed hybridisation risks if the pairs were maintained together. It was also noted that breeding success in other collections was higher in single species aviaries and therefore we initiated a plan to create a separate breeding aviary within our glasshouses.

Following the creation of this aviary a mature male *T. erythrolophus* would be loaned from Durrell Wildlife Conservation, Jersey in May 2010 (local ID B1102).

Aviary

Location and Construction

There were several consideration factors for the location of the breeding aviary; the area had to be quiet and secluded, away from other species of turaco, good ventilation was necessary, a natural environment allowing for suitable nest site and the aviary needed to be at least 2-3 metres high to allow for a generous flight path. Suitable areas at The Living Rainforest were discussed with studbook holder Louise Peat and the design of the aviary was completed by Curator, Lisa Clifforde.

It was decided to locate the aviary at the back of the smaller Lowland Glasshouse away from free range birds. This corner of the greenhouse was very quiet, had automated screen shading over the roof glass, plus automated heating and ventilation. Seasonal misting systems are also set up in both greenhouses to ensure humidity is kept constant. There was the presence of a large mature Swiss cheese plant *(Monsterra deliciosa)*, which would provide a perfect secluded nest site for the birds.

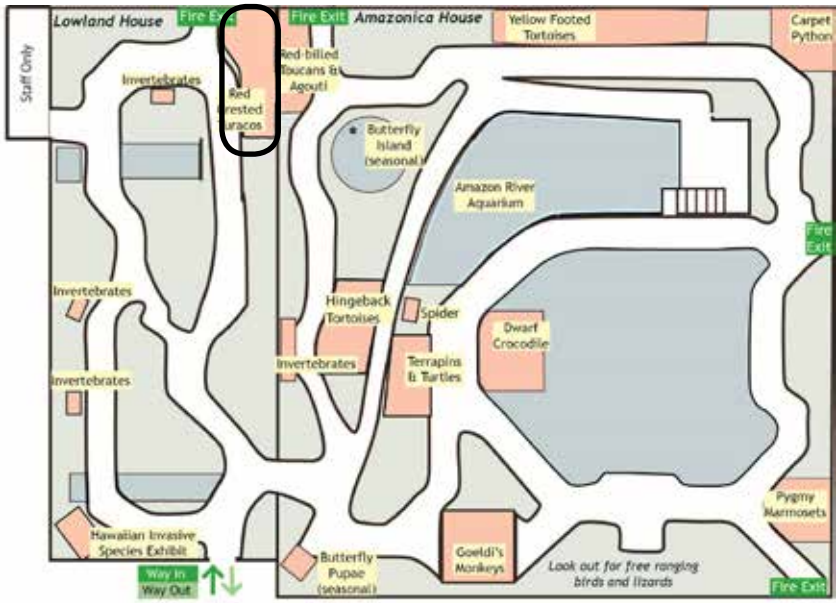


Fig 4. Map showing aerial view of Lowland House (Left) and Amazonica House (Right). The Aviary is circled, top left.

Size requirements

Recommendations for aviary size for a breeding pair range from between 2.2 metres x 5metres and with a height of around 3m (Houston zoo - Turaco Tag Husbandry Guidelines) to a minimum of 2metres squared (EAZA Red crested Turaco Husbandry Guidelines). The dimensions used for the aviary at The Living Rainforest were 6 metres x 2.0-2.5 metres with a height of 3.5 metres .

Benefactor support

All materials for the aviary were funded by the corporate benefactor Vodafone, based in Newbury Berkshire. The Living Rainforest has a mutually beneficial arrangement whereby small scale projects are undertaken by Vodafone employees on company team building days. The Living Rainforest staff nominate and manage the projects and supervise the Vodafone volunteers, but the cost of all materials is covered by Vodafone. The total cost of materials for the breeding aviary was under £1000.

Materials

The aviary consists of a nylon mesh and angle iron framework; chosen because it would withstand the high humidity within the glasshouses better than traditional wooden framework. The mesh gauge was 2.5cm x 2.5 cm as recommended by EAZA Red-Crested Turaco Husbandry Guidelines. Nylon mesh was used instead of metal in because it is lightweight, flexible, less visible and reduces the chance of injury if a bird should collide with it. Fortunately, the Living Rainforest is situated entirely indoors and therefore we do not have to worry about vandalism or other security issues associated with nylon mesh. Soil was used as base substrate so the enclosure would appear natural and blend in with the surrounding area. The enclosure was very heavily planted, with the addition of *Calathea sp*, never-never plant *(Ctenanthe oppenheimiana)*, two northern large leaved dragon trees *(Draecena steudnerca)*, Kentia palm *(Howea forsteriana)*, *Philodendron sp* and *Bromeliad sp*. To the existing mature *Monsterra deliciosa*. Fixed and flexible branches were added as perching at different heights throughout the exhibit. A small water pool for bathing and drinking was constructed at ground level in small clearing in the foliage.

Fig 5 (left). Aviary near end of construction, showing how it blends in with the rest of the glasshouse.

Fig 6 (top). Visitor view of completed aviary (August 2010). Branches and logs attached at front of aviary prevent visitors from falling onto netting.

Husbandry and Breeding

Introduction

The male (B1102) and female (B1037) were introduced and housed together in an isolated off show enclosure for a period of three days in order for keepers to monitor bonding. This proved to be very positive and courtship signs were shown such as food passing, sharing same perch space and beak locking. Both birds were moved into the aviary for the first time in September 2010. Despite the time of year and short duration of the pairing, an abandoned egg was found in the heart of the Swiss cheese plant at the beginning of October. Mating signs, such as chasing and food sharing continued throughout the winter months.

Diet

Food is given three times per day, consisting of a variety of fruits, vegetables and Nutribird T16 pellets. This is presented in hollowed out coconut shells suspended near perches in the aviary. Each week, three different fruit/veg mixes are rotated to ensure maximum variety. Each mix is designed based upon palatability, cost and iron content.

	Mix one	**Mix two**	**Mix three**
Bulk (60%)	apple, pear, melon, nectarine / peach, plum	apple, pear, melon, nectarine / peach, plum	apple, pear, melon, nectarine / peach, plum
30%	banana, blueberry, papaya	green grape, pomegranate, mango, orange	cucumber, tomato, courgette, carrot, sweet potato
10%	kiwi, apricot, pineapple, red grape	fig, berries, physalis	parsnip, sweetcorn, greens, peas

Fig 7. Daily diet preparation list for all fruit feeding birds

Each individual turaco is given 100g fruit mix and 10g T16 per day. Additional supplements are given daily of IZVG Carnivore calcium (2:1) and IZVG Zooderm (a product to maintain healthy feather and fur), sprinkled on food. Green Tea is added daily on alternate months to aid in reducing iron storage.

Fig 8. Food mix prepared in hollowed out coconut ready to suspend from branches.

First breeding season

In April 2011, a hanging basket lined with coco fibre was added to the heart of the Swiss cheese plant to encourage nesting behaviour. A crate of leaf litter, hay and small twigs were also added to the base of the enclosure to encourage self-nest building. Two eggs were laid in the nest basket in May 2011, and incubation began with both parents alternating every two hours. No additional nesting material had been used to line or build up the nest. Ten days into incubation the female was observed off the nest and showing signs of lethargy and ill health. After consulting with the vet it was decided to pull the bird off show for antibiotic treatment. During this period the male attempted incubation for a further two days but then abandoned the nest.

Fig 9. Hanging basket lined with coco fibre for use as a nest site.

In June 2011, one further egg was laid in the nest however neither bird attempted to incubate; this was thought to be due a population of Pharaoh ants taking over the nest site. The hanging basket was re-secured in place using long wire to suspend the nest to help to prevent the ants reaching the nest self-contained poison packets were hung on the outer side of the basket. No further attempts were made at egg laying in 2011.

Second breeding season – first clutch of eggs

In early spring 2012, pair bonding behaviour increased and by May 2012 two eggs were found in the nest. A couple of days after laying, the female began to show signs of lethargy and being unwell as previously seen in 2011. However, this time it was decided to keep the female on show and attempt treatment through targeted feeding, allowing her to continue to incubate as she had not come off of the nest yet. This approach worked and resulted in two chicks hatching and the female returning to normal health.

Fig 10. May 2012- Two chicks in the coco fibre lined nest.

Following the birds hatching, the diet was altered to that of ESB guidelines, with the daily addition of cheese, greens, carrot and egg food on a ground tray, in addition to normal feed continuing to be presented arboreally.

On day 16 after hatching the first chick (B1132) fledged the nest and was given a thorough health check, all appeared well and lower branches were added to provide a pathway to higher branches. The remaining chick (B1131) was observed taking food from parents and clambering around in the nest and fledged four days later. Following fledging a health check was undertaken and it was discovered there were skeletal problems and the chick was unable to walk without falling. The legs appeared to be permanently crossed over which hindered locomotion.

The chick was taken to the local veterinary practice for x-ray, to determine if there were broken bones or skeletal deformities. The result of the x-ray would determine whether an attempt could be made at cradling the chick to allow the legs to realign. The local veterinary practice x-rayed without anaesthetising the chick and therefore the x-rays lacked perfect clarity but revealed symmetrical angular deformity or bending of the tibias from an unknown cause. After consulting with the studbook and vet it was decided that any treatment attempt had a high chance of failure and could result in pain for the chick as time passed. Therefore, on welfare grounds the decision was made with to euthanize the chick and a post mortem was carried out.

Fig 11. X-ray of chick B1131.

The post mortem confirmed limb deformity with chronic folding metaphyseal fractures of the tibia, scoliosis of the thoracic vertebra and suspected metabolic bone disease. Possible causes of deformities were suggested including rapid growth due to nutrition (e.g. overfeeding), nutritional imbalances or deficiencies such as excess protein or lack of calcium, lack of UV, accidental injury amplified into deformity by fast growth rate, or a possible genetic defect. To eliminate variables where possible, the diet was altered to include daily Vitamin D3 and increased calcium applied directly to food. Cheese was removed from the diet to reduce protein intake.

Chick (B1132) remained active, bright and continued to be fed by both parents throughout fledge weeks 1-4.

Fig 12. B1132 at 7 weeks of age

Second breeding season – second clutch of eggs

In August 2012 two more eggs were discovered in the nest and incubation began again. Both parents showed sign of aggression towards the juvenile (B1132) and began chasing it away from food and perches. Following hatching of the second clutch, parental aggression levels increased towards the juvenile and it was necessary to remove B1132 for its own safety and to ensure the new chicks were raised without disruption. At this time, the juvenile was considered too vulnerable to be free ranged with the rest of our collection, and no suitable aviaries were available, so it was moved into an off show enclosure with a female Crested wood partridge *(Rollulus rouloul)* and chick for company.

Less than 48 hours after hatching, one chick (B1137) was found dead on the floor of the enclosure. It was suspected that the bird was knocked out of the nest overnight. Post mortem examination revealed no signs of skeletal deformities. The remaining chick (B1136) developed normally and was raised on the amended diet with added D3 and calcium and reduced protein.

Fig 13. B1136 at around 12 weeks of age

Second breeding season – third clutch of eggs

In mid September 2012 two further eggs were discovered in the nest and incubation began by both parents and also the juvenile (B1136). The fully fledged juvenile was repeatedly observed in the nest alongside a parent, possibly for warmth and security. Additionally the adult male was observed continuing to feed and guard the juvenile while the female incubated the eggs, in contrast to the aggression shown to B1132 previously. Two days after the clutch hatched juvenile B1136 was moved out of the aviary.

During the period of incubation, the enclosure was discovered to have been damaged by rodents and in several places the mesh had been chewed through. Ground trays feed dishes removed and food was only presented in suspended arboreal bowls. All damaged areas of the enclosure were repaired and reinforced with metal mesh at the base of the enclosure.

In mid October 2012, the first chick (B1141) fledged the nest and it was evident that it had skeletal problems. The chicks' toes were permanently closed and it was unable to walk. Attempting the use of a solid ball placed under the foot to stretch open the toes was considered, but rapid degeneration of its condition meant that there was no progression and chick (B1141) was euthanized.

The remaining chick from this clutch developed normally but disappeared from the enclosure at four weeks of age. A small hole in the aviary mesh was discovered at ground level and therefore rodent ingress and predation may have been factors in its disappearance.

Juvenile B1132 and B1136 introduction

Introduction of the two juveniles B1132 and B1136 was done in an off-show aviary for a period of several weeks before initiating a soft release into the free ranging environment with the rest of our bird collection. A period of adjusted was deemed necessary on advice from the studbook. The immaturity of the birds would likely cause them to attract aggression from other species, but they would also have to adjust to higher visitor numbers, a new environment and different feeding routine. A temporary aviary was constructed in Amazonica to allow the birds to become habituated to the surroundings, visitors and other birds.

Fig 14. B1136 at 5 months of age.

During this soft release period, it was noted that the male T. leucotis was consistently perching on top of the aviary above the younger unsexed juvenile (B1136) and was mirroring every move the juvenile made from branch to branch. The male *T. leucotis* ignored the presence of the confirmed female B1132 and therefore this inter-species behaviour gave an indication that B1136 could possibly be a male due to the apparent territorial aggression being displayed by *T leucotis*. Following DNA results, this proved to be the case.

The release of the both *T. erythrolophus* from the aviary was carried out in early December 2012 and monitored closely by keepers and volunteers. Initially, the birds took cover in the greenhouse and for a couple of days it was very difficult to find both of the birds. After a few days had passed, both birds then started to understand the feeding routine and began to follow keepers around for morning and afternoon feeds. Minor aggression is sometimes observed from the male *T. leucotis*, however the male *T. erythrolophus* (B1136) has been observed chasing other individuals occasionally as well. A month further down the line, both juvenile *T. erythrolophus* are well established in the Amazonica greenhouse.

Future plans

In the Spring/Summer of 2013, both red crested juveniles will be surplussed to other collections in line with ESB reccomendations. Following the breeding success of the *Tauraco erythrolophus* throughout Europe in 2012, and the successful establishment of a breeding pair within our collection, our birds will be moved out of the breeding aviary and free ranged with the rest of our collection. It remains to be seen if they will then go on to breed in this different set up with the additional competition and distractions, but the move will allow them to have a rest if they need it and also to enjoy free flight for another year.

Instead in 2013, we intend to move a recently acquired pair of Fischer's turacos *(Tauraco fischeri)* into the breeding aviary. This species is of Near Threatened IUCN conservation status and is also a nominated ESB species, however population management is inactive and birds are rare in zoological collections. The building of the aviary has provided a permanent breeding facility for interchangeable Turaco species that can be determined by the needs of Zoo captive stock requirements. Breeding behaviour, diet and development of any chicks will continue to be monitored and fed back to the *T. erythrolophus* studbook in the hope that we will continue to gain insight into best practice breeding of this fascinating family of birds.

Zoo Enclosure Design Project for Humboldt Penguin

Nikki Fountain, Derby College

London Zoo's penguin enclosure, closed 8 years ago, because it was deemed no longer suitable as housing for the penguins and also for health and safety reasons (see picture 1). Built in 1934 and designed by architect Berthold Lubetkin, this was during the "era of zoos as art rather than considering the animal's needs or environment". (Daily Mail, 2012)

(Nature.com, 2012)

(flickr 2012)

After its closure the penguins were moved to a smaller but more natural environment until recently when the zoo unveiled its 13,000 sq ft Penguin Beach, which is the largest penguin pool in England holding 100,000 gallons of water. It is home to 66 penguins and is a more natural environment with room for natural behaviour and providing enrichment to the animals. (Daily Mail, 2012)

Dimensions and Description of My Enclosure Design

My design aims to house a colony of 60 penguins, it includes; shoreline rocky areas, nesting burrows, a large main pool with waves, a smaller top pool for feeding and play and a beach to re-create the Humboldt Penguins Peruvian desert coastal habitat.

I have also considered both the public needs (ease of viewing, safety, cater for all visitors, aesthetics, reflect natural habitat of the animal and education) and the staff/ zoo needs (contact, health check area, safety, cleaning and suitable off limits areas) within my design.

The penguin enclosure is 17,000sq ft (1,579.3sq m) with a 13,000 sq ft pool (top and main pool combined) which holds over 200,000 gallons of water. The top pool is 14 ft deep as it is higher than the main pool which is 12ft deep and as stated previously will house approx 60 penguins.

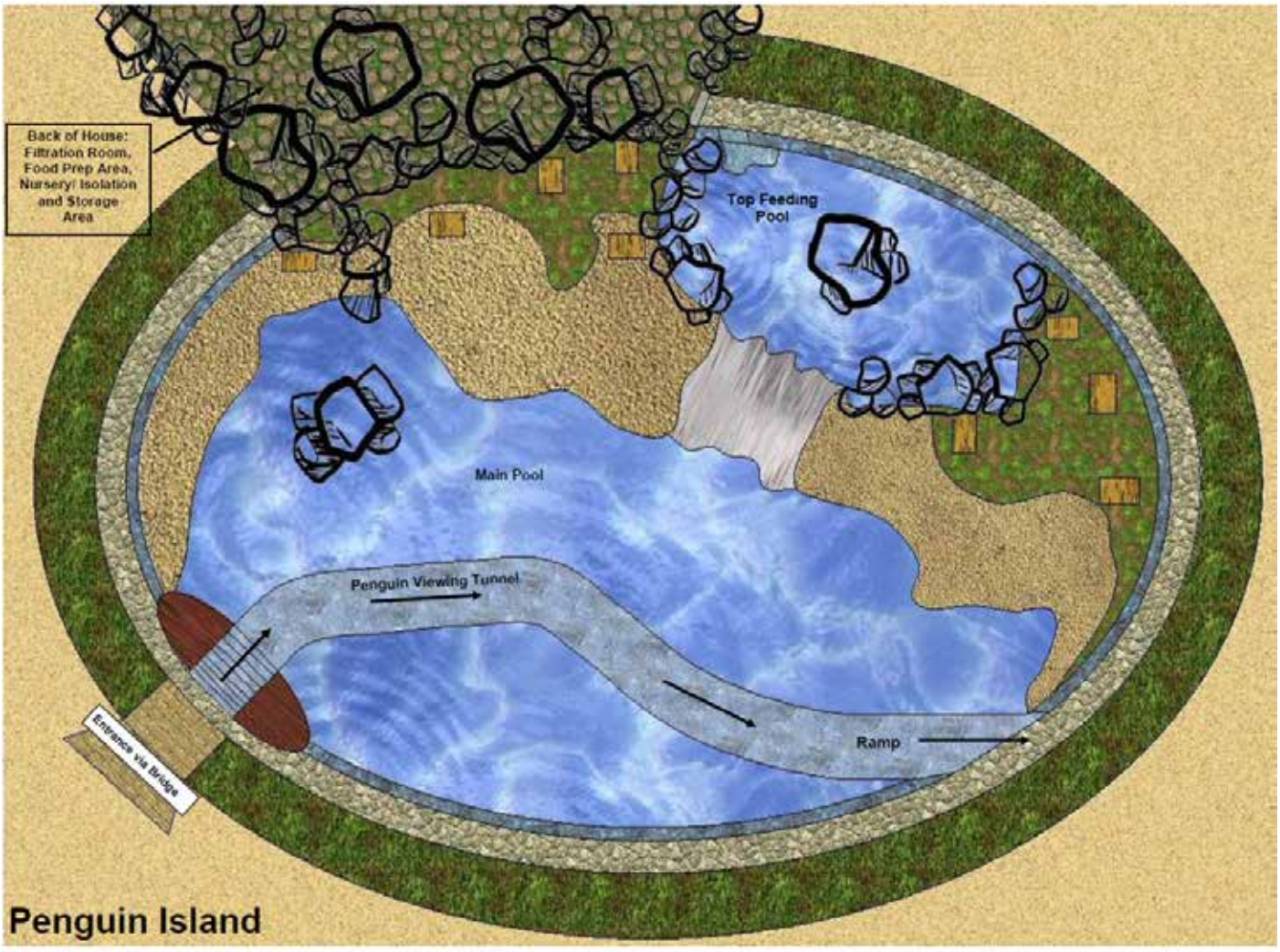
You access “Penguin Island” via a bridge across the bio filtration reed bed, which runs around the perimeter of the island. The enclosure incorporates a top pool for feeding and enrichment, a main pool for play and swimming. The main pool has an underground tunnel running through it, which you enter through a ship wreck and then head down under the pool via some steps which has disabled access via a ramp at the exit. There is also a path which runs around the perimeter of the enclosure and the public are separated from the penguins by a clear acrylic barrier. (Photo below: Zoo Wuppertal, 2008)

Within the main enclosure the penguins have realistic beach areas; the main pool has waves to replicate a more natural environment. Also included are nesting boxes and rocks to enable resting/ basking areas. Visitors will experience getting close to the birds as they explore the waves, currents and porpoise over rocks and dive for fish, in the top pool there is a feeling area for the keepers to hand feed and throw fish to the penguins and a rocky area for them to dive from.

The enclosure is designed with nature in mind, instead of using traditional fill and dump methods the penguin pool will only be filled once. The earth’s natural systems will be used to maintain pristine water quality and a natural environment for the penguins.

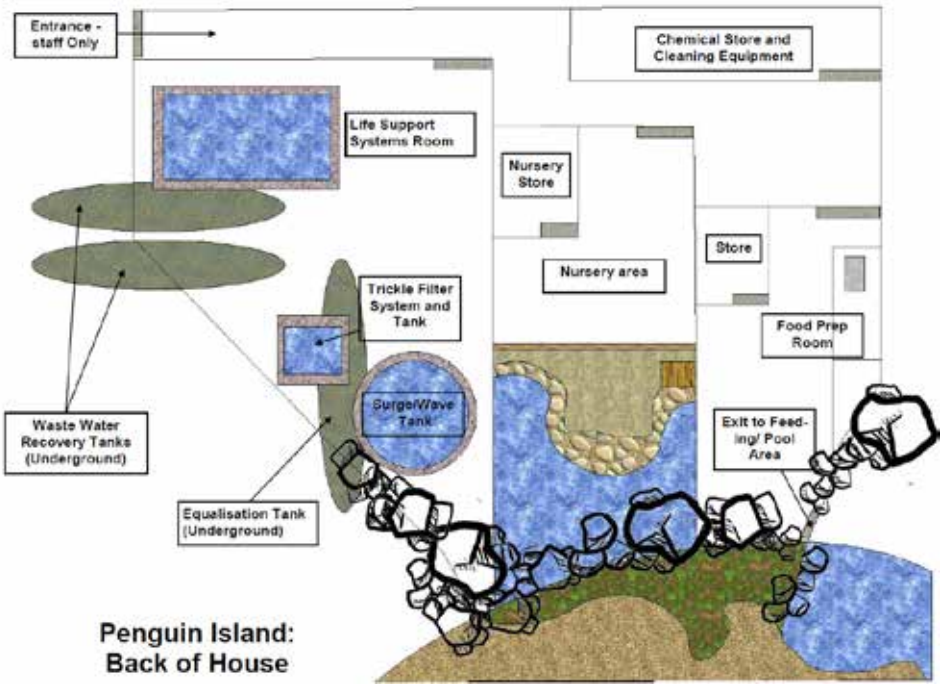
The enclosures systems will filter rain/storm water using 2 methods; firstly rainwater will be collected and used to replace naturally lost pool water through evaporation. Secondly “dirty” but nutrient rich water from the penguin pool will trickle through the constructed wetland (bio filtration reed bed) modelled on a natural filtration ecosystem. Plant roots and microbes will naturally cleanse the water and the purified water will then be returned to the penguin pool, no water from the penguin enclosure will enter the sewer system. (Woodland Park Zoo, 2012)

Enclosure Design - Penguin island



The earth geothermal capacity will heat and cool the penguin pool water. The water temperature will be kept at approx. 50 – 60 degrees F, deep tubes will use the earths thermal reserves to temper the pool appropriately; cool it in summer and heat it in winter. (Woodland Park Zoo, 2012)

The main enclosure suggestion is shown above (previous page). The back of house areas are shown below and these include the food prep area, chemical/cleaning equipment area, the life support systems, trickle filter, surge/wave tank and nursery area.



Humboldt's are used to varying temperatures and do not need indoor enclosures, nesting boxes are sufficient. They also do not need any specialist lighting or heating requirements again due to their natural environment

The Enrichment

Enrichment for penguins does not require elaborate or costly apparatus. Examples of enrichments which will be introduced are colourful rubber balls, sprinklers and children's blocks. The deeper top feeding pool will enable the penguins to dive for fish which is extremely good enrichment and also the penguins enjoy varying water currents, which the wave pool (main pool) offers.

Other enrichment involves varying feeding strategies, extended feedings and scatter feedings as outlined above and these are the most a penguin needs.

The Substrate in the penguin enclosure is mainly sand and sandy loam with some mud and grass areas. The design tries to replicate the natural substrate very closely also taking into account the need for natural filtration to the reed bed. Rocky cliffs (these will be fake rock to save on costs) and rocks for basking and resting on will also emulate their natural rocky, cliff side beach habitat.

Feeding and Water Provision Feeding will be incorporated into the enrichment program, with the feeding being 2 or 3 times a day it is a major part of both the enrichment and a normal feeding regime. Water provision is catered for within the pools as they are fresh water however fresh untreated water will be provided for the penguins should they require it.

Safety Features For the safety of both the staff and the penguins the enclosure is surrounded by a 4ft acrylic barrier. With penguins there is not the risk that there is with tigers attacking the keepers or the public however there is still a risk of injury to all parties and so health and safety legislation has to be part of any design.

Within the back of house area a full first aid kit with eyebaths will be provided, along with COSHH (control of substances hazardous to health) information and appropriate PPE for handling the chemicals and all equipment needed for cleaning and safety; including penguin restraint equipment.

There will be signage and notices warning the public about the dangers of deep water, the animals and any other safety notices needed. There will also be a health and safety notice at the zoo main entrance and at other points within the zoo to warn of the dangers within a zoo and the zoo rules.

Staff will be fully trained and have risk assessments for each animal and their enclosures; there will be first aid facilities close at hand for any emergencies.

A Keepers Perspective

I have tried to keep the design from a keeper's perspective including an easy to clean pool and enclosure. I have looked at the keeper' needs and zoo needs such as contact with the animals giving the staff the ability to clean and interact with the penguins easily. The enclosure is very secure with the complete acrylic barrier keeping the penguins in and public out, this barrier is also easy to clean. The bio-filtration system also means the water remains cleaner and there is little need for pool cleaning and no need for water changing.

Any chemicals used and cleaning equipment will be easily available in the back of house area and a food prep area within the building will mean that everything is on hand for the staff.

Other staff safety features include first aid facilities, restraint equipment should it be needed and all staff will be fully trained in first aid, fire safety, COSHH and RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations).

I have also looked at ease of access for maintenance, cleaning, feeding (kitchen and special feeding area provided), and an area for health checks within the back of house. I have provided suitable staff only areas with a nursery/ isolation area and an appropriate area for breeding to take place within the nursery facility.

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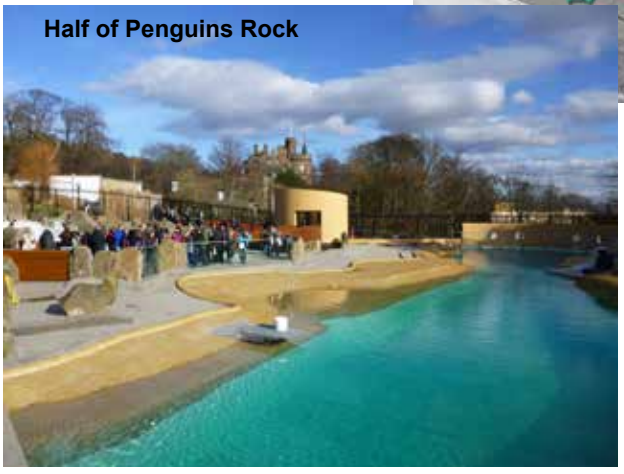
Edinburgh Zoo's "Penguins Rock" plan (2012-13)

Enclosure for gentoo, king and rockhopper penguins.



Half of Penguins Rock

Edinburgh Zoo's "Penguins Rock" opened March 2013 (reworking the 1991/2 penguin enclousre)

In my opinion....

Simon McGlary, RZSS Edinburgh Zoo Volunteer

First of all allow me to introduce myself. My name is Simon McGlary and I am a volunteer at Edinburgh Zoo. As part of the Discovery and Learning section our role is to engage the public in the work the Royal Zoological Society of Scotland (RZSS) does at the zoo, in the UK and around the world. I became a member at Edinburgh Zoo before I became a volunteer and all that came about following getting my first pet at the age of 43, a hamster, as a way of helping with depression. Being the type of person I am I wanted to learn as much as I could about hamsters and then other animals as well!

That urge to keep learning was only fuelled and fed at the zoo, and more so through volunteering. I have developed a passionate interest in biodiversity and value of ecoservices. Recently I have also read Ken Thompson's book "Do We Need Pandas? The uncomfortable truth about biodiversity". It's only driven my passion for conservation and the survival of species even further. It has also boosted my passion for talking to people when they visit Edinburgh Zoo about biodiversity and the importance of not only protecting the animals but also their wild places. This is particularly easy with agouti's and a Brazil nut that I carry with me everywhere at the zoo.

During animal handling sessions, which is handling of Madagascan hissing cockroaches and giant spiny stick insects, I am often called to refer to my favourite statistic from Ken Thompson's book which refers to the American dung beetle. The work of this one insect has an impact further up the animal chain that if it didn't do what it done the environmental loss of everything else that relies on that one species is estimated to cost the USA some $600 billion to put right, each year!

Another financial linked quote really shows how the conservation work done in and funded by good zoos all over the world is why I am convinced that the impact that zoos can have on changing peoples understanding of the environment is massively underestimated by politicians. Apparently Birdlife International reckons that £19million over the next 5 years targeted in the right places could save all of the worlds 189 critically endangered birds. That's less than the cost of a premiership footballer!

Reading Bill Oddie's column in a recent BBC Wildlife magazine I read that although palm oil plantations can support 12 different bird species, the primary rainforest that was lost as a result would probably have supported at least 220. In percentage terms I calculated that as a 95% drop in species, if you could go the other way it's a ridiculous increase!

When you start giving figures like that, zoo visitors really seem to take notice of conservation issues. I will often explain to people that it isn't a case of can we afford to do this conservation work, it's really a case that we cannot afford not to!

Where does this leave the work done in and by good modern zoos? Vital! It strikes me that many good conservation programmes also involve giving local people in the conservation hot spots a regular income and a living wage. Don't we all want a living wage? They also end up with education programmes and health care, thus helping encourage a better understanding of the world around them along with a greater passion to save their wild places. In many of the documentaries I've seen people in these places would rather find a way of protecting their livestock rather than kill an offending predator, whereas in the Westernised world the opposite would be true!

But wait, doesn't that mean that good conservation saves wild places, wild animals and provides economic stability to otherwise less fortunate people? Therefore, it strikes me that good conservation helps save the worlds wild places, wild animals and finds a way of dealing with poverty at the same time!

Either I am understanding this all wrong and getting the wrong end of the stick but doesn't this mean that any organisation like zoos, that are major conservation organisations through education, captive breeding programs and work out there in the wild, including valuable research, are actually doing more to help poverty and the general health and well being than any political based organisation? If that is indeed the case, then everyone that works or volunteers in zoos for the animals or to make the visitors experience more memorable so that they will return is doing more for the planet than any so called world leader. Many of them do it, not for the money that's for certain; there really isn't that much money available working with animals or in conservation. They do it for the passion. When you look at the money that those in really powerful places earn, it's huge compared to those in the nature and conservation sector.

In my personal view, the people who do any job, primarily for the money, are going to make a complete mess of this world. Those who do things because they have a passion will make a difference. To all who work, professionally or voluntarily, in and for good zoos around the world, well done, you are among the key players who can and will make the biggest difference to the world!

We need the natural world; we need the wild places far more than we are aware of. We cannot afford to lose it, and that includes financially! Global financial crisis is small change compared to environmental disaster. It's smaller change to save it though! Keep up the good work conservation and zoo people! We are the ones who can really save the world!

ABWAK Photography Competition 2013

Association of British and Irish Wild Animal Keepers

Categories:

1. Life as a Wild Animal Keeper

Images should show a keeper at work and may illustrate any aspect of the working day.

2. Enrichment or Training

Images should illustrate the use and effectiveness of enrichment or training. (The enrichment or training method must be clearly identified and described).

3. Animal Portrait

An individual animal or group of animals photograph. The photographs entered in this category may be taken in captivity or the wild – and must be accompanied by a note on species, and where it was taken.

4. Animal in its enclosure

Images should illustrate an animal or animals in their enclosure. (The image must be accompanied by a note on where it was taken and upon enclosure features that can be seen).

A short written description is required with each entry, identifying species, location and any relevant information.

To Enter:

Send your photos to editor@abwak.org

Please include the category you have entered, your name and email address along with a description of the photograph.

Or you can upload photos onto ABWAK facebook page, clearly label uploaded photograph ABWAK COMPETITION along with a description of the photograph and the category you have entered. (Photos will be removed and stored off facebook until winning announcements are made, and we may request you to send a high resolution copy)

Please view the Terms and Conditions (see website www.abwak.org)for more information

Results

The results will be announced in the December issue of RATEL, www.abwak.org, ABWAK Facebook and ABWAK Twitter. Please note that only successful entrants will be contacted individually and no correspondence will be entered into regarding the entries or results.

There will be one winner and 2 runners up in each category.

Prizes

The 4 winners will win: 1 year membership to ABWAK (either as a renewal or as a new member) and copy of the December RATEL in which winners photographs are published.

Runners up will receive: copy of the December RATEL in which their photo is published.

Full acknowledgement will be given to the winning contestants.

CLOSING DATE: 30th JULY 2013

(entries received after this date will not be judged)

2012 Competition Winners: Shane Heron, V Allison-Hughes, Andrew Wootton and Yianna Cooling

Vision:

“To achieve and advance the highest standards of excellence in wild animal care”

Mission:

“ABWAK is a membership organisation for those interested & involved in the keeping & conservation of wild animals, which seeks to achieve the highest standards of excellence in animal care through communication, cooperation, training and development”

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red crested turaco

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