

Chez Nous



Chester Zoo Life is published by the North of England Zoological Society, Upton-by-Chester, Cheshire CH2 1LH Telephone (01244) 380280
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TOURISM MATTERS

CHESTER, along with the other big 'charity zoos', sees itself as existing mainly for conservation, education and science. Nevertheless, it is clearly recognised that paying visitors subsidise all of our charitable activities and that the recreational or 'fun day out' aspect to a zoo visit is very important. The number of tourist attractions in Britain have more than doubled in the last decade. In this increasingly competitive marketplace, Chester Zoo remains the largest single-point, charged-for tourist attraction in the north of England. The Zoo has long been a tourist 'honeypot' and has attracted over 40 million visitors since its foundation and, in recent years, regularly achieves more than 800,000 visitors per year, including the 'under-threes'. Through this remarkable achievement there is, and has been, a correspondingly large impact on the local economy from employment and the purchase of goods and services.

For such compelling economic reasons, tourism in general is now high on the political agenda. In the UK - which stands at number five in the world league - the gross output in 1996 from tourism is valued at a staggering \$US 150 billion, or 10.3% of the total economy, and this supports 1.5 million jobs. These values are set to double within the next 10-15 years! In western Europe, travel and tourism is expected to generate \$US 1,235 billion of gross output, 12% of GDP, and create 3.2 million jobs by the year 2006 (World Travel & Tourism Council figures).

One way in which the Zoo represents its critical interest in tourism is through membership of the regional tourist boards and consortia and through ALVA, the Association of Leading Visitor Attractions. I recently had the benefit of attending an ALVA working luncheon in London. We were there presented with an interesting Government perspective on tourism development by the Rt Hon Virginia Bottomley MP, Minister of State for the

Department of National Heritage, which has the key responsibility for tourism (although some members of ALVA have quietly expressed the view that the Department of Trade & Industry would, in fact, be a more appropriate home!).

In April I attended the Tourism Agenda for Britain conference at the invitation of the Rt Hon Dr Jack Cunningham MP, Shadow Secretary of State for National Heritage (who also attended an ALVA lunch the next day and met with Pat Cade our Public Relations Officer). The Rt Hon Tony Blair MP, Leader of the Labour Party, gave the opening speech, followed by a keynote address from Ken Robinson, Chairman of the Tourism Society, tourism guru and, most significantly for us, assessor for the Report on the Marketing and Presentation of Zoos. Ken led a group discussion on tourism structure; and it was good to see on the panel the familiar friendly face of Chester City Councillor John Price who is also Chair of the Association of District Councils' Tourist Committee.

The closing discussion session, concerning tourism and the environment, was chaired by Professor David Bellamy in his usual robust but good-humoured way. He is still of the view that 'Good zoos are good news' in supporting sustainable development; and that planning and environmental considerations in tourism should not necessarily 'stop things happening'. Instead, they should be the means to 'make things happen better'.

On behalf of the charity zoos, I raised the thorny question of value added tax. The British tourism industry, in general, has to compete with continental European countries who mainly pay far lower rates of VAT - as low as 5.5% in France, for example. In the case of the charity zoos we still pay, under protest, the full 17.5% VAT, yet have to compete with European counterparts who are VAT exempt on gate revenues! These Europeans can, therefore, invest far more surplus funds each year in

educational, animal welfare and conservation projects and in developing their zoos as tourist attractions. If this situation persists, then circulating tourists can expect to see far higher standards of presentation in continental Europe.

To add insult to injury the charity zoos are now being faced in Britain with new private enterprise wildlife attractions heavily subsidised by millions of pounds of public money in European Regional Development Fund Grants, not uniformly available to their charitable competitors. Such enterprises generally do not have the serious conservation/education mission or costly infrastructural responsibilities of the charity zoos. Yet, with inappropriate government backing, private enterprise can be in the position of gaining an overwhelming business advantage.

It is of particular note that, in a recent economic and tourism survey of nine leading European zoos, Chester Zoo was rated 'number one' in terms of financial independence. While Chester receives most of its money from visitors, the other European zoos get, on average, about 16% of their regular income from their national government or local authority. While we can be proud of our independence there is, in an increasingly complex and competitive world, a growing need to gain various forms of external funding support, where available, for the betterment of Chester Zoo.

◆ Front Cover: 'Mia' the baby giraffe born in April, with mother Sumara.

Below: The Director (wearing a tie!) with a group of animal keepers.



MEMBER'S MEETINGS 1996

Saturday 5 October 1996 –
2.30 pm in the Lecture Hall

– Derek Lyon –

'MORE TALES FROM THE ZOO VET'

Derek Lyon is always one of the most popular speakers, with his slides and stories of caring for the zoo's animals

Saturday 9 November 1996 –
2.30 pm in the Lecture Hall

– John Gittins –

'HISTORY OF HILBRE BIRD OBSERVATORY'

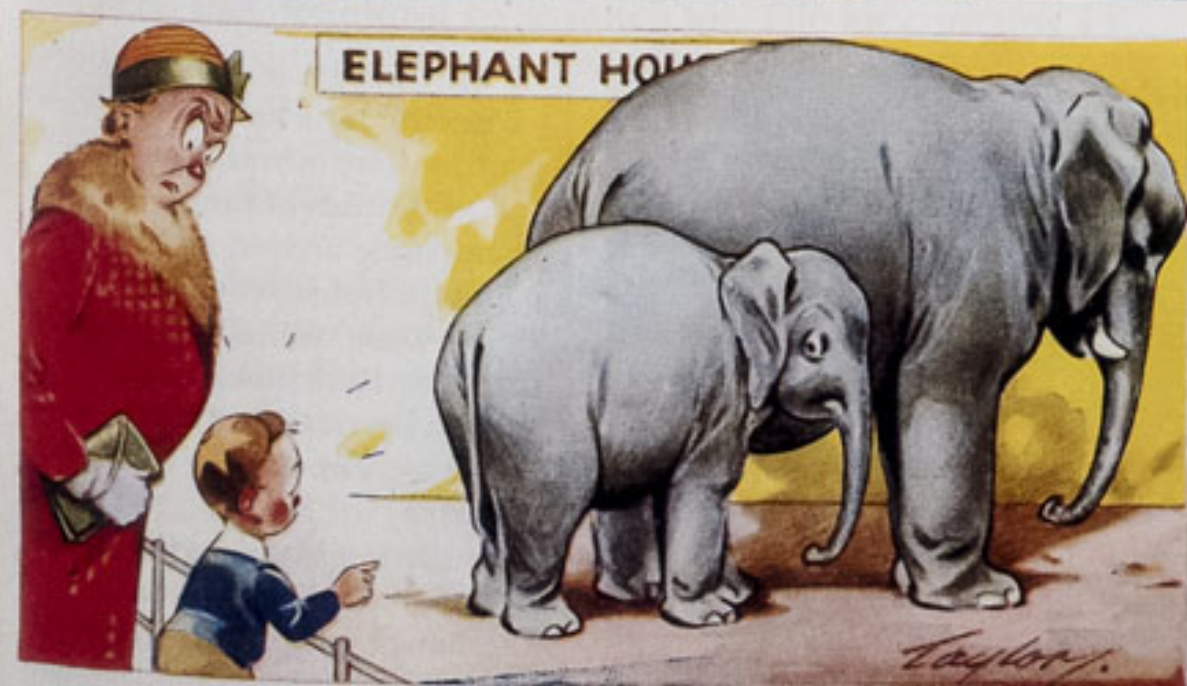
YOUR TICKET TO AFRICA?

If you have ever watched one of those TV wildlife documentaries on Africa, and thought 'I should love to be there,' then this may be your chance. Ian Ogden, with the support of the Director and the Members' Programme Committee, has offered to organise and lead a safari trip to one of the African countries for any Society members who would be interested.

Ian has been a member of the Society for a number of years, as well as being involved over the last two years with FEDS activities. He has travelled in Africa on a number of occasions in recent years – both in Kenya and South Africa – mainly on holidays which he organised himself, for the purpose of seeing and photographing wildlife. He also has contacts with reputable tour operators in each of these countries and can arrange tailored tours to these and other countries of interest, concentrating on visits to game areas, where High Street tour operators may offer only fixed packages, including obligatory periods at beach resorts or other attractions.

If you would like to know more, please complete the bottom part of the 'Twiga Safaris' flyer enclosed with this magazine and return it to the membership office.

NOW, MOTHER, DON'T TELL ME THE STORK BROUGHT THAT!



This appropriate card was picked up by the Director at a post card fair.

ADOPTER DAYS

The two dates for this year's special days for all our adopters are Sunday 20th October and Saturday 26th October.

Invitations and details will be sent out to adopters with the Autumn magazine in September.

CHESTER ZOO – ONE HUNDRED CLUB –

The monthly winners since the last issue of Zoo Life are:

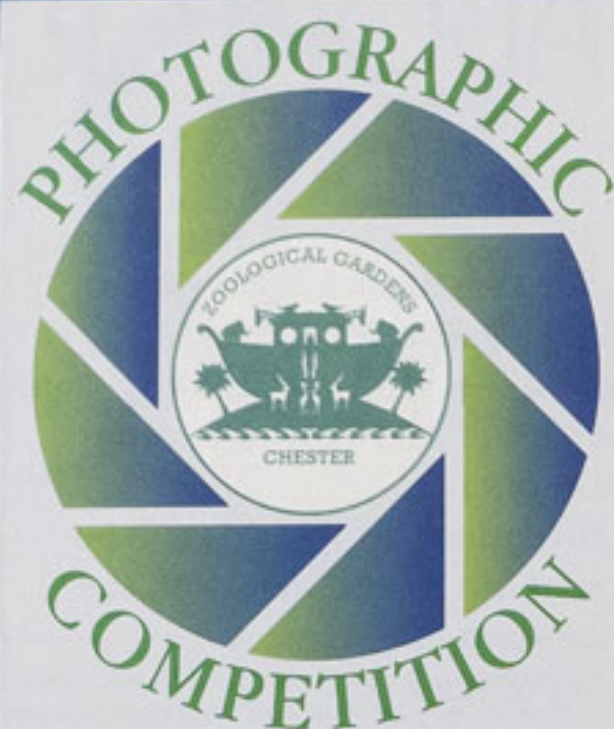
Feb '96:	£100	Mr J. Clegg
	£100	Mrs Diana Cresswell
	£ 50	Mr Gwyn Griffiths
	£ 50	Mrs Gillian Wayne
Mar '96:	£100	Miss K. Nolan
	£ 50	Mr G. Hilton
	£ 50	Mrs S. Jones
	£ 50	Ms C. Reynolds
April '96:	£100	Dr D. Cooke
	£100	Mr T. Williams
	£ 50	Mr R. McNeil
	£ 50	Miss A. Yates

If you would like to join the "100 Club" please contact Alan Sykes at the zoo.

NEW LOGO

You will have noticed a new zoo logo on the cover of this magazine, featuring an ark. The logo made its first appearance on the 1995 annual report, published in April this year, and will be gradually introduced on stationery and other items as they need replacing.

Director Gordon Reid said: "We've used the elephant logo for a number of years, and I felt it was time to have a new one indicating the wonderful biodiversity of the animals and plants in the zoo, highlighting our mission in conservation."



THE entry forms for this year's photographic competition are now available. Once again, Canon have provided the major prizes. For the first prize winners in both print and slide sections, there's Canon's top-of-the-range compact Sureshot Z115, with a range of sophisticated features. The top Junior will win a Canon Sureshot Tele Max camera, with twin focal lengths – a 38 mm wide-angle lens and a

70mm telephoto lens.

Runners-up in the print and slide sections will receive vouchers to spend at any of the branches of Crewe Camera Exchange. Their shops are spread across the North West, and they specialise in new and used photographic equipment, including the latest video cameras.

Other prizes are provided by Bridgemere Garden World (for the best picture of the zoo's gardens); Ness Photo Laboratory; K.J.P. Hargreaves, Liverpool and the Colour Centre, Whitby, South Wirral.

A special prize just for this year is being presented by Council Member Miss Jean Dixon, for the best photograph (slide or print) of Karha the elephant calf.

The subject, as always, is 'My Favourite Chester Zoo Photograph.' All entries must have been taken during 1996, and the competition is open only to amateur photographers. Merit prizes of zoo tickets and Kodak film will be awarded each month. Closing date is 31 October 1996.



MAKE YOUR BID

A striking oil painting (shown below) of two African elephants has been generously donated to the zoo by its artist, Mr B. Higginbotham. He has asked that the painting be auctioned to raise funds for building a new bull elephant facility.

The painting is on display at the zoo, and bids in sealed envelopes may be left at the information desk in the Ark shop, or sent by post to "Painting Auction," Chester Zoo, Cheshire, CH2 1LH. The bids will be opened on Thursday 25th July at the Elephant Experience Evening.

This is a unique opportunity to own an original and beautiful work of art.



CHAMPERS FOR KEEPERS

THE keepers could have been seeing pink elephants on a grey January morning.

Four bottles of pink champagne arrived at the elephant house, courtesy of Henry Kelly of Classic FM Radio. Each day Henry awards the Lauren Perrier champagne to someone 'For adding to the joie de vivre'.

Marketing Manager Chris Vere nominated the staff of the elephant house for their hard work in rearing a baby elephant. It was an irresistible nomination, and the award was made on national radio on 23 January.

THEME EVENINGS IN THE OAKFIELD



Bookings for any of these popular evenings can be made by phoning Jane or Sue on extension 209.

21ST JUNE

Vegetarian Evening and Aquarium Tour.

A guided tour with an aquarist, followed by a vegetarian menu that even the most enthusiastic carnivore will enjoy! **£17.50.**

20TH SEPT

Irish Evening.

If you've ever been across the sea to Ireland – you'll appreciate the appeal of Irish cooking. Enjoy a taste of the Blarney! **£14.95.**

12TH JULY

Zoo Safari and Barbecue.

Cocktails with the staff; meet the animals; a stroll through the zoo; a delicious barbecue on the terrace. **£17.50.**

SOLD OUT

25TH OCT

Medieval Banquet.

Back on the programme for all those regulars who asked why we didn't have one last year. Live music with a Renaissance Quartet. **£17.50.**

2ND AUGUST

Seafood Evening and Garden Tour.

A guided tour through the zoo's award winning gardens followed by a decidedly fishy menu in the restaurant. **£17.50.**

15TH NOV

Portuguese Evening.

It's not only port that comes from Portugal – there is also a cuisine that is exciting and delicious. **£14.95.**

In December, of course, the Christmas menus take over.

Unique PRESENT

TRY stitching a birth sampler featuring Karha, the elephant calf.

Sara Ruks in the Education Division has designed and produced this delightful cross-stitch kit. The kit contains 14 count cream Aida; DMC stranded cotton; needle; chart; full instructions and information about Asiatic elephants.

The Karha birth sampler is available from the 'Things To Do' shop, or the Education Department in the zoo, for £3.99. It's also available by mail order, for an inclusive post and packaging price of £4.50.

Envelopes should be marked: Karha Sampler, Education Division, Chester Zoo, Cheshire CH2 1LH.



NEW SAND LIZARD VIVARIUM

IN recent years many sand lizard colonies have been lost through habitat destruction. English Nature, in partnership with the Countryside Council for Wales, the Herpetological Conservation Trust and the WWF-UK, have initiated The Sand Lizard Project. Chester Zoo was delighted to cooperate in the project, and on 14 May, the new sand lizard vivarium was officially opened by the Lord Mayor of Chester. Dr. Andrew Deadman, General Manager of English Nature; Dr. Chris Tydeman, Head of UK programmes, WWF, and Chris Davis of the Herpetological Conservation Trust were the speakers.

The Herpetological Conservation Trust provided the first sand lizards, and it is hoped that hundreds of babies will be bred in the vivarium for release into suitable and protected sites in Wales and the North West region.

CHANGING COLOURS

The Care and Breeding of Chameleons

THERE are over 80 species belonging to the family Chamaelionidae. True Chameleons range from Africa and Madagascar, to Spain, Palestine, Arabia, India and Sri Lanka. The size of the species is very diverse from the tiny *Brookesia* measuring thirty three millimetres to the Parsons Chameleon *Chamaeleo parsonii parsonii* measuring over 70 centimetres.

Chameleons are synonymous with the ability to change colour and the intensity of this change varies with the species. The colour change is an indication of the mood or health of the animal.

Some species of Chameleons are oviparous (egg laying) and some are viviparous (livebearing). In the past, Chameleons have not done well in captivity, living only for a short time. Today, with an understanding of the species and the correct environment it is possible to keep them a lot longer.

THE MOUNTAIN CHAMELEON (*Chamaeleo montium*)

The Mountain Chameleon is indigenous to the Cameroons and is found at an altitude of 500 to 1,200 metres. The males are approximately 25 cms long and possess two horns, each reaching about 20 mm in length. This species also has a slightly raised flat casque and a sailfin tail. The females are smaller and less colourful. Where the male has horns, the females have conical scales. The main colour of this species is green, but the male develops blue spots around the

head when he is courting the female.

As with most species of Chameleon, they should be housed separately and the male introduced to the female periodically to test whether she is responsive. If not, the female will darken and threaten the male with her mouth open, rocking back and fro. If nothing happens within half an hour, the male is removed. When the female is responsive, she stays in close proximity to him and mating soon takes place and will be repeated several times during the day. At the start of mating the female changes from dark brown to her normal green colour. By day three the female is aggressive again and the male is removed.

This procedure was followed with my pair and after 89 days the female began digging in a tray containing soil and sand. At this stage she was black in appearance. After five hours all eggs had been laid and covered over by the female. She soon left the nest site, after which the eggs were removed for incubation. Each of the 15 eggs measured approximately 1cm and each was placed in dampened vermiculite and then put into an

Senior Keeper Alan Woodward has his own animal collection at home - including a breeding programme for the fascinating chameleon.

Words by Alan Woodward.

Photographs by Jeff Poole.

incubator. Incubation took 86 days for the first egg to hatch, and 13 of the 15 eggs hatched during the following six days.

The young Chameleons measured 5cms from their nose to the end of their tails. They were placed in tanks covered in fine netting for ventilation and kept at 24°C. From day one, they had the characteristics of their parents, changing colour with mood and a threatening response. They also would go around the branches out of view when being observed. Water was sprayed in the tanks daily which contained soluble vitamins. They started feeding after the first day on 'micro crickets' dusted with vitamins and extra calcium.

Twelve of the youngsters survived. The horns started to develop in the males at four weeks.

MAINTENANCE OF ADULTS

Most Chameleons will not take water from a dish, so it is essential that they have access to water throughout the day. This is achieved by spraying the foliage and walls three times a day for them to drink, and to provide essential humidity. Sometimes the animals took water directly from the spray.

Near full spectrum lighting is used with another light to give them more ultra-violet. Spotlights are also used for basking in the morning until the animal has warmed up. For the Mountain Chameleons a temperature of 24°C is required with a temperature drop of approximately 6°C at night. The diet is purely insectivorous being small crickets, house flies and small wax moth larvae. The insects are varied as much as possible and all are dusted with a reptile vitamin supplement.

A soluble vitamin supplement is given as extra once a week. All the chameleon vivariums contain living plants - the main one for the

Male Veiled Chameleon in breeding colours





▲ Veiled Chameleon eggs in incubator container. The 20p piece shows the size of the tiny eggs. Mountain Chameleons is the weeping fig (*Ficus benjamina*).

THE VEILED OR YEMENI CHAMELEON
(*Chamaeleo calyptratus*)

The Veiled Chameleon is found in isolated areas in the Yemen. The growth rate of this species is phenomenal, reaching maturity at six months. The males are unique as they have a high casque on top of their head which can reach up to 5cms. These are one of the most colourful of all the Chameleons, changing from a light green with a pattern, to a banded bright yellow and green. Males can reach 38 cms in length. The females are smaller and do not possess a casque. They are also green and patterned, but change to a dark brown or black colour with yellow markings as a warning.

MAINTENANCE OF ADULTS AND YOUNG

These animals are kept at 28°C with a 6°C drop at night. The lighting and set up is similar to that of the Mountain Chameleons. They are also watered three times a day, but only



▲ Young veiled Chameleon at 2 days

actually drink about twice a week from the spray.

The main diet is large locusts and crickets. This is varied with flies and wax moth larvae all dusted with a vitamin supplement. Plants used in the vivarium for this species are weeping fig and Grape ivy (*Rhoicissus rhomboidea*). The grape ivy is readily consumed on occasions. The male is introduced to the female for mating, and the breeding colours of the male are intensified for courting the female. On introduction the female warns the male by changing colour, but this has no effect on him and he grabs her anyway! As soon as mating commences she goes back to her normal colours.

The female is mated for five or ten minutes several times a day. On the third day she changes back to her warning colours and is aggressive towards the male. He is then removed. For three days after mating the female's water intake increases far more than usual. After 42 days, she lays her eggs in a sand and soil tray.

The eggs measured approx. 19mm long by 13mm wide at first, but they do swell another few millimetres with water intake.

The same procedure as for the mountain chameleons was followed but at a temperature of 27°C. Incubation lasted five and a half months after which the first of 67 eggs started to hatch. The young were put in tanks and the same feeding and watering regime was followed. Altogether 32 of the 67 eggs hatched. The second clutch contained 63 eggs and the latest was 97 eggs which must be a record!

OTHER SPECIES KEPT

Another species of chameleon I am keeping is a pair of captive bred Panther Chameleons *Chamaeleo pardalis*. These animals originate from Madagascar so require a humid environment. At present they are too young to breed, but hopefully will do so in the future.

The captive conditions are the same as for the veiled species, but with a humid atmosphere created by soaking bark chippings at the bottom of the vivarium. Panther Chameleons can grow up to 52 cms long in the case of males and 35cms in the females. The colour phases vary from a blue green and red and green in the males to a brown and red, or brown and green in the females.

For years, the importation of Chameleons has been continuous, due to replacements being sought for animals living only a few months at the most. Hopefully, in the future, now that more Chameleons are being captive bred, there will be less importation of this species from the wild.



▲ Mountain Chameleon baby at 2 days.

▼ Female Veiled Chameleon in warning colours.



KISSING *and* MAKING UP

— keeping the peace on Chimp Island



Julia Casperd has been spending a lot of time studying the chimpanzees – and as her presence became familiar, the observational study became a mutual exercise!

▲ Nicky (left) tries to prevent Cleo and Gloria from attacking Wilson (foreground, right)

IN the beginning I was just another visitor. Just another target for Boris' magnificent displays which challenge the construction of bullet proof glass and leave the public quaking in their boots! But within days of my arrival Boris began to realise that I was no ordinary visitor. Indeed, despite my persistent daily presence and my obvious intense interest in the group, not only was I paying him very little attention, I was, in fact – shock, horror(!) ignoring him altogether. 'Have I lost my magnetic personality, my alpha male charm?' I imagined him asking himself as I endeavoured to remain an impartial observer as he perched on the edge of the moat staring at me, quizzically blowing kisses, or poking his tongue out to one side.

What was I doing anyway, patrolling round his territory's perimeter? I did not seem to want to pinch his food, or steal his mates and I did not challenge him, or cross the territory boundary. I even seemed friendly with his bosses-in-chief (the director, curators, chimp keepers *et al.*) In fact, what I was doing was collecting data for my Ph.D.. But, in truth, I was also becoming totally absorbed in the days-in-the-lives of Chester Zoo's 'cheeky-panzees' (as I overheard one little girl call them) and thoroughly enjoying it too!

LIFE AS A CHIMP

I think all of us have, at some time or other, heard the piercing screams that herald the beginning of yet another bust-up between the chimpanzees. But what is all the excitement about? Why do they fight – and how on earth do our ape cousins (we share 98.4% of the same genetic material) manage to live together reasonably peacefully when they have such apparently ferocious fights? The answers to these questions were the reason for my prolonged presence on the outskirts of the chimp community's home range.

In their natural habitat, the forests of Africa, chimpanzees live in social groups similar to the one here on Chimp Island. Membership within a group is vital to individual wild chimpanzees' survival since it affords them greater protection against predators such as leopards, than if they were on their own. It also allows them to compete with individuals in other groups more successfully for both food and mates.

IT'S GOOD TO TALK!

Every social group in the animal kingdom is held together by social bonds.

These social bonds which exist between individual group members hold the group together. This social 'togetherness' is essential to ensure the group functions efficiently as a whole. Therefore, each chimpanzee within the group must demonstrate commitment to kin and friends to maintain membership in the group. They do this by pursuing 'tit for tat' type co-operative strategies. In addition, they communicate their willingness to reciprocate apparently altruistic acts through their rich repertoire of vocalisations and gestures, and by means of social grooming – their version of gossiping with, or about the Jones'!

A chimpanzee in the wild who refused to keep its side of the bargain in a co-operative relationship could, at worst, be alienated from the social group, and forced to try and survive alone.

BEATING THE SYSTEM

This notwithstanding, one cannot escape the fact that all animals are, in evolutionary terms, selfish and will only do something if it is going to benefit them. Primates are no exception and are past masters at

using their relatively large brains to try and beat the system. However, cheating is not tolerated within the group, so an individual's ability to deceive others is fairly crucial. Meg and Alice were the least skilful of cheats during my time at Chester. They were frequently caught out which, on occasion, resulted in full blown tantrums! Dylan on the other hand, at the beginning of last year thought he had his machiavellian 'sneaky copulations' with Florin down to a fine art. Unfortunately for Dylan, Boris and the rest of the males were in fact, fully aware of this, but tolerated his adolescent ardour. So when emotions between the males hit a high in the summer of 1995 due to the semi-synchronous cycling of six of the prime, adult females, the males became frustrated with Dylan's pubescent cheek. They quickly deflated his sexual confidence by dealing him a few short, swift thumps. Well, can you blame them? He was getting to the stage where he would think nothing of physically trying to prevent Boris from exercising his mating rights!

PURE THUGGERY

So what causes these conflicts on Chimp Island? Are they the result of pure thuggery in which the dominant animals beat the living daylights out of the subordinates? Not at all. As Frans de Waal discovered in the Arnhem chimpanzee colony in the 1980's, chimpanzee society is very



▲ Boris, the dominant male.



▲ Dylan and Florin in flagrante delicto!

political. Chimps are egalitarian in nature and breaches of this right to equality are punished. A number of low ranking chimpanzees are quite capable of ganging up and outwitting more dominant animals if they feel that he or she is in the wrong.

The desire to acquire social status by males within chimp communities in the wild is a frequent source of fights. This is because high ranks in the social hierarchy confer greater mating rights and access to more food. Such contests also occurred regularly at Chester mainly as a result of Friday's determined campaign to climb the social ladder by winning Boris' support and playing Nicky and Wilson off against each other. Often fights would snowball. Retaliatory attacks and the redirection of victim's frustration on to defenceless subordinates were rife. Conflicts that arose out of sexual jealousy; competition for favoured positions in the group, play and grooming opportunities and punishment attacks were also common. In short, chimpanzees' grievances are very similar to those of humans and if they feel sufficiently strongly about it some form of fight will ensue.

**"MAKE FRIENDS, MAKE FRIENDS,
NEVER NEVER BREAK FRIENDS"**

Inevitably, fights damage the cooperative relationship that exists between opponents. Thus, even at Chester where the chimps enjoy the luxury of five star 'free-ranging'

accommodation (the best in the UK), the art of rapid and successful reconciliation is a social skill that every group-living, captive chimp must master at an early age if they are to live happily. In contrast, their wild counterparts – especially the females who tend to have a less cohesive existence anyway – have the option to flee from the battle scene, let the dust settle and return once their opponent has had time to cool down.

Nevertheless, even in the wild some form of peace-making process is essential, especially in the event of serious fights, to restore friendly relations between the two opponents before they can continue to cooperate, or are accepted peacefully back into the social milieu of the group. More often than not, the aggressor and victim make friends themselves by kissing, offering their hand in friendship, hugging each other, or perhaps entering into a little friendly negotiation/grooming about the problem. On occasion, following a big fight in which the whole group may become involved, other members must mediate in this sensitive conciliatory process to bring the various parties together. Ultimately, peace reigns – that is, until the next disagreement!

IN THE END...

... for the majority of the group, I remained a visitor. A steadfast, yet unobtrusive, observer of their daily trials and tribulations. For two I was a secret ally. They trusted me with their fear. They sought my reassurance when their social position was threatened and touched by their naked emotion I committed myself to this non-participatory role by reaching out across the 'territory boundary' to gesture my understanding to my nearest non-human primate relative.



▲ Best of friends: Sarah and Wanda play with Kate.

Bath-time Fun for **KARHA!**

with student
Catherine McLaughlin

Photographs courtesy of Viewfinder Pictures, Chester



PARROT TALK

STAFF at the zoo may have noticed that for nearly the whole of March this year I was not in the zoo, except briefly first thing in the mornings. I know that many of them wondered what I was up to and some of them will have presumed I was on holiday! In this short article I would like to explain what I was doing – and why.

The four main roles of a modern zoo are; Conservation, Education, Recreation and Research.

Conservation is high on the agenda at Chester Zoo: we are an important part of many high profile conservation breeding programmes, holding 124 species which the IUCN considers to be under some degree of threat. Of these, 92 have successfully bred here. Education too has a high profile, with a large and innovative Education department. The importance of recreation is obvious. Attracting people to the zoo and giving them a good day out pays for everything else that we do. However, perhaps the importance of research is less clear.

For zoos to achieve academic and scientific credibility they must actively encourage quality research projects both for visiting students and from their own staff. Zoos are, and have always been, a huge potential source of scientific knowledge. Chester Zoo's reputation as a serious scientific institution is growing rapidly, with a number of academic staff producing papers for prominent scientific journals and the encouragement of its staff to continue their academic careers at all levels. Chester Zoo also has an excellent policy for encouraging project students to

*Avicultural Deputy
Mark Pilgrim
writes about his
research project on
the Lilacine Amazon
parrot*

▼ Lilacine Amazon Parrot, the subject of Mark's research.



utilise the collection. More than 75 students from local universities and colleges took advantage of this in 1995.

Having read for my first degree at a very anti-zoo university, I am now attending a very pro-zoo one. I see great differences not only in the way that zoos and captive breeding are presented by the lecturers but also in the attitudes of the students. This is incredibly important, as it is these university students who will often be among the conservation policy makers of the future.

The subject of my research is the Lilacine Amazon parrot. We have two pairs here at Chester, one pair in the Oakfield aviaries opposite the otters, the other pair in the aviaries opposite *Europe on the Edge*. The Lilacine is classified as endangered using the criteria produced by Georgina Mace and her co-authors, which are currently used to assess which animals are threatened and to what degree. The category 'endangered' means that there is a greater than 50% chance that the Lilacine will be extinct in five generations or twenty years. Although under current taxonomy, the Lilacine is classified as a subspecies, it has been suggested by a number of authors that it should be treated as a full species. As a subspecies it has a lower priority for protection than if it were considered a 'good' species. Indeed, currently the Lilacine receives little or no protection in its native Ecuador. The subspecies or species question then has great implications for its future survival.

Historically, all taxonomy was based on morphological and anatomical differences between animals. Later, other methods were used, including behaviour,

vocalisations, ecology and biochemistry. The most recent technological advance, which has allowed a great leap forward in taxonomy, is the development of a technique for taking a minute amount of DNA and producing millions of exact copies from it. The technique is called the polymerase chain reaction (PCR).

Following a lengthy and complicated procedure using a small machine costing more than a house in Chester, the base pairs on the DNA fragments can be read. These base pairs are the genetic code, the blueprint for all life. Comparing the differences in these base pair sequences, in a similar way to comparisons of morphological data, produces a massive amount of information which can be used to study species, subspecies, races or individuals. It would be impractical to attempt to sequence an animal's entire DNA, 'Jurassic Park' style, as this would mean sequencing something like 100,000 genes. This would amount to 3 billion base pairs for each individual and my research involves 60 individuals!! As it is likely to take four years for me to sequence 3 genes of about 1000 base pairs each, you can see the problem. The solution is to choose the sections of DNA which are likely to give the most useful information.

The source of DNA for this study are the moulted primary, secondary and tail feathers shed from aviary birds. DNA from feathers from museum specimens may also be sequenced at a later stage. This approach was chosen as many of the birds involved are part of captive breeding programmes. Using moulted feathers picked up from the aviary floor, avoids placing any stress on the birds.

The following is a brief summary of how we get the genetic code or base pair sequence of our parrot from a feather. Once the feather has been collected its shaft is cleaned using ethanol. The end of the shaft is then chopped up into small pieces. The minute amount of DNA contained in the feather is extracted using a protein digesting enzyme.

"There is a greater than 50% chance that the Lilacine will be extinct in five generations"

The key to this technique is to produce millions of exact copies of specific sections (genes) of the DNA strand. We do this using the PCR with specific primers which amplify only that section of DNA in which we are interested. The PCR is so efficient at amplifying these specific regions of DNA that, potentially, contaminant DNA could also be amplified. For this reason great care is taken to reduce the possibilities of contamination. A gel electrophoresis is used to see how successful the PCR has been, as even when we have millions of copies of the DNA it is far too small to see. If the PCR is successful the DNA is purified and then undergoes an asymmetric amplification using unequal amounts of primers, to produce single stranded DNA.

The final stage is the sequencing of the nucleotide base pairs on these DNA strands. Liverpool John Moores University is very fortunate to have an automatic fluorescent dye sequencer. With some clever computer software this machine reads the base pairs directly

from the amplified DNA strand. Comparisons of these sequences for a number of individuals of the same species and a number of related species, produces a lot of useful information about the evolutionary relationships within the group. From these data and those produced from more traditional taxonomic methods, including measurements of live birds and skins and comparisons of behaviour and ecology, the status of the Lilacine Amazon should become clearer. The research may also show some of the interesting evolutionary history within the Amazon parrot group and give some indications of the time scales involved.

There are approximately 150 Lilacine Amazons held by European Zoos and private breeders. The vast majority of these were brought illegally into Britain and Germany thirteen years ago and were confiscated by customs officials in these two countries. For the past three years I have been co-ordinating the European Endangered species programme (EEP) for this population. If managed properly, the Lilacine Amazons' future in captivity should be safe. It is my hope that this joint project between Chester Zoo and Liverpool John Moores University will facilitate a conservation strategy that will also help to safeguard this delightful parrot in the wild.

Finally I would like to thank everyone involved in allowing me the opportunity to do this research and the bird staff for covering for me while I was away.

▼ Mark prepares the samples for polymerase chain reaction in the ultra sterile cabinet. The PCR machine is to the left of the cabinet.



By
**Professor George
 Hughes, who
 recently gave a
 fascinating
 presentation
 on this living
 fossil fish at a
 Members' Meeting.**

**WHAT HAVE LAXATIVES
 AND COELACANTHS HAVE
 IN COMMON?**

THE answer is *Ruvettus praetiosus* – or the Caster-Oil fish! This is the fish that the Comorean fishermen are trying to catch on their longlines (about 200 metres) when by chance they hook a Coelacanth – which happens about four times a year. They have probably been doing it for centuries, but it was only in 1938 that this fish became known to scientists. That first specimen was captured off the South African coast and astounded the world when it was recognised as belonging to a group of fishes thought to be extinct more than 60 million years ago.

The Coelacanth, *Latimeria chalumnae*

Coelacanth – 20 years on



This specimen from the 1972 expedition shows the colour and pattern of white specks. Photo courtesy the Royal Society.

has continued to be of great interest and many groups of scientists have travelled to the Comoro Islands, where all except the first and a very recent specimen have been captured. In 1972, I was fortunate to participate in a British\French\American expedition during which two fish were caught by local fishermen from dugout canoes. The body cavity of the first specimen contained 19 large eggs each about the size of an orange. Since then *Latimeria* has been shown to be live bearing as a result of studies on two later specimens. One of these was dissected at the American Museum of Natural History in

1975 and contained five embryos each with a well-developed yolk sac. Even more significantly, a recent specimen captured off the Mozambique coast at the end of 1991 contained 26 embryos. A second fish, captured in 1972 was observed by two members of the expedition who then completed a previously agreed protocol of tissue preparation. Tissues were sent to scientists all over the world. This illustrates an aspect of conservation that should be encouraged in relation to rare species – i.e. to ensure that when individual specimens die, that the greatest amount of scientific knowledge

▼ A 'dugout' canoe or pirogue, used by fishermen at Grande Comore.



is acquired.

Twenty years later, it was a great pleasure to return to the Comoro Islands, especially as only six hours before my arrival a specimen was captured and I was able to obtain gill tissue from this animal. My renewed interest in *Latimeria* came at a very fortunate time as I have been able to collaborate with Professor Hans Fricke and his team from Seewiesen, Germany. Their 1987 film of a living fish showed that its inactive life style was similar to that which I had predicted on the basis of the original gill structure studies, which enabled me to estimate a very low oxygen consumption. We also studied the effect of temperature on the oxygen-combining properties of blood from the 1972 fish, and this helped Fricke in his search for the living *Latimeria*. In fact, the gills of *Latimeria* have a smaller surface area than nearly all modern fishes that have been studied and this has been confirmed over a size range of 400g - 80kg. Inability to obtain sufficient oxygen is probably the main reason they die when brought to the surface.

By good fortune, I had planned to visit the JLB Smith Institute of Ichthyology at Grahamstown in January 1992. It was very exciting to be there when Professor Mike Bruton returned from Maputo with ten of the 26 juveniles found in the 98 kg fish trawled off the Mozambique coast. These small animals showed all the external features of adult coelacanths, although there were no signs of the 'white scale flecks' at this stage. The gills were in reasonable condition and I was the first person to study tissues from these invaluable specimens. They had no external yolk sac but a mid-ventral scar showed where it had passed through the body wall.

Further work by Fricke showed that *Latimeria* congregated in caves and groups of up to 14 have been observed. Recognition of individual fish is possible because of different patterns of white flecks on the steely-blue body surface. Individual fish move between neighbouring caves and have a relatively small range. They leave the caves at night and drift downwards along the lava flows which form the sides of this volcanic island. They do not use their fins as supporting structures and the nickname 'old four legs' is therefore inappropriate. They return to the caves in the early hours of the morning. These movements have been followed by means of ultrasonic tags which also indicate that they may descend even below 800m. There is some suggestion it is at these depths that reproduction and birth occurs.



▲ Holding one of the 26 'pups' from the Maputo specimen.

Data on numbers in the caves indicate population size. Early estimates suggested that there were about 400 individual fish off Grande Comore (the largest of these islands). Unfortunately the more recent counts of numbers in the same caves suggest a marked reduction and the most recent estimates are closer to 200. It is probable that this reduction is related to a recent interruption of the traditional fishing methods as a result of attempts by outside agencies to improve the economy of these islands. Efforts are being made to establish suitable nature reserves and to provide alternative fishing possibilities in order to reduce

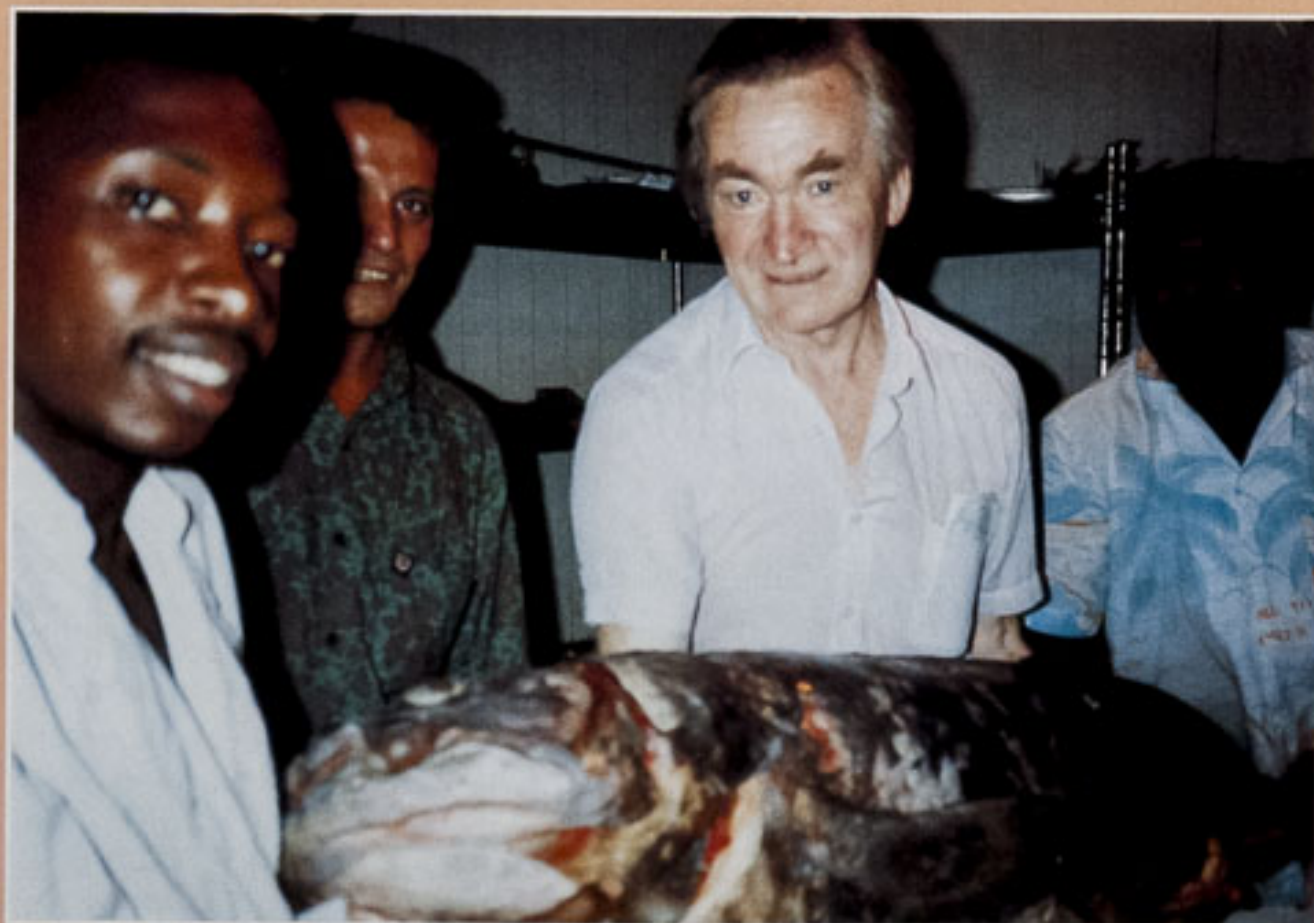
the long-lining which by chance leads to the capture of coelacanths.

Many questions remain to be answered regarding the living coelacanth, especially its mode of reproduction, navigation and social behaviour. Only two specimens are known to have contained embryos and the one trawled off the Mozambique coast has answered some of the problems relating to the mode of nutrition of the developing young. For example, the suggestion that some of the developing embryos feed on other eggs in the same mother has been disproved. The fact that, like the 1938 specimen, this fish was captured off the coast of the American mainland, has naturally raised the possibility of populations of *Latimeria* existing outside the Comoro Islands.

However, study of the DNA obtained from the pups has shown similarities to those of fish captured in the Comoros. Hence it seems likely that they have drifted from the Comoro Islands in the well-known Mozambique current. Nevertheless, the question as to what would have happened had the 26 pups been born and whether they would have survived off the African coast, remains an intriguing and unanswered possibility.

Just as I enjoyed my return to Comoros, so it was a great pleasure to talk to Chester Zoo members 20 years later, and to be able to report on some of the remarkable discoveries that have been made in that time.

▼ George Hughes with the fish captured just six hours before his arrival in November 91.



IN Western society, vultures get a pretty bad press. Perhaps it is a case of one too many television programmes showing vultures squabbling over the gory remains of another wildebeest. However, vultures are not just the grim reaper in disguise, but wonderfully skilful, energy efficient aviators adapted to fill the niche of top scavenger. Whether on African savannahs or in South American rain forests, vultures locate and consume more carrion than all other scavenging animals put together.

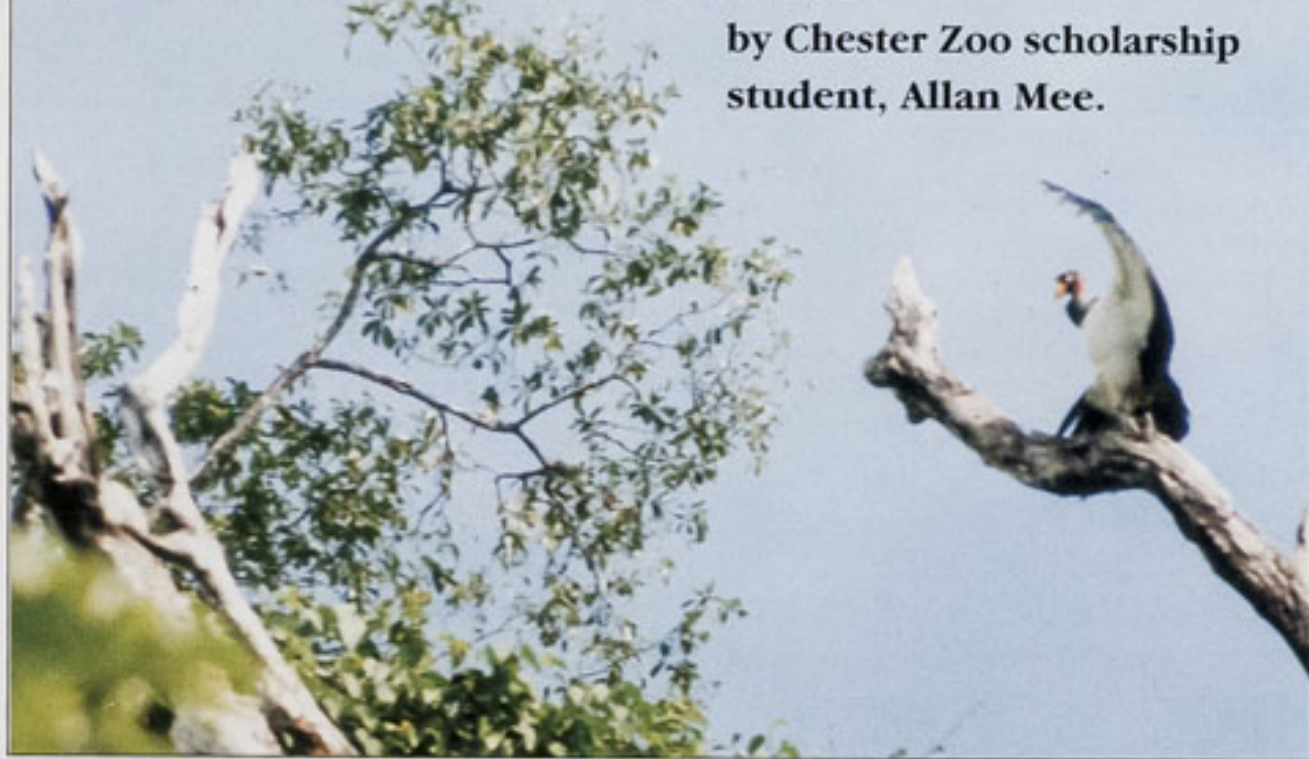
Although New World vultures look very similar to Old World vultures, it is now known that the similarities are a remarkable example of convergent evolution. Both groups are derived from a totally different ancestry. In fact, New World vultures share a common ancestry with storks, some of which also occasionally feed by scavenging. In specialising on carrion, New World vultures probably evolved similar adaptations and behaviour to Old World vultures. However some of the New World birds have a well developed sense of smell and this has allowed the group to exploit a resource unavailable to Old World vultures – that of the animal populations in dense forest. Most of the New World species have a wide distribution and are found in a variety of habitats from open grassland savannah to dense forest. However, one species, the Greater Yellow-headed vulture, is entirely restricted to lowland rainforest with a centre of distribution in northern Amazonia.

Thanks to Chester Zoo, I was lucky enough to get the opportunity to spend two months during 1995 at Iwokrama Forest Reserve, Guyana (formerly British Guiana) studying vultures. The reserve covers an area of about 400,000 hectares of pristine lowland rainforest, situated some 150 miles inland on the west side of Guyana's largest river, the Essequibo. As such, the reserve is one of the largest undisturbed tracts of forest outside Amazonia and made a wonderful base for large-scale field research. The main aims of my study were to estimate the density of vulture populations as well as identify the habitat and foreign preferences of different species.

All vulture species forage above the forest canopy making study of population size or behaviour from the forest floor impossible. The Essequibo river, however, provided a natural

SEEING THE VULTURES FOR THE TREES

by Chester Zoo scholarship student, Allan Mee.



transect route through the forest by which I could count any birds soaring above the canopy, up to about 2 kilometres distant. A small boat with an outboard motor allowed me to cover a route of 40 kilometres long on each transect. In addition, vantage points along a road through the reserve covered most major habitat types within the forest.

Greater Yellow-headed vultures occurred at high densities (91% of all vultures) within forest where it was the most common raptor species encountered. This species was most active in the late morning when it foraged a few metres above the forest canopy.

Both King and Black vultures were much rarer and this is perhaps not so surprising given that neither has a sense of smell and are largely dependant on the Greater Yellow-headed vulture to locate carrion beneath the canopy. King vulture is a territorial species and is never seen in large aggregations at carcasses. It was largely active later in the morning than the Greater Yellow-headed vulture and generally soared at great heights (up to 50 metres) above the canopy.

The Greater Yellow-headed vulture was entirely restricted to forest, though it was common over edge habitats, such as riverine forest and forest tracks. King vulture was most common over primary forest, while Black vultures were only encountered with any regularity near the small areas of disturbed forest around Amerindian settlements. King vulture spent more

time soaring (92%) than any other species; wild Black vultures were most likely to indulge in flapping flight. Greater Yellow-headed vultures alternate between soaring and gliding while flying just above the canopy, exploiting the weak thermals around emergent trees. Its relatively larger wing and tail area give it a manoeuvrability which other vulture species lack. Black vultures were most likely to associate with other vultures and to form large foraging groups.

The density of Greater Yellow-headed vultures at Iwokrama was more than twice that in a comparable study (Nouragues, French Guiana). This may reflect the relatively undisturbed nature of the habitat and high mammalian biomass (the main source of food for vultures.) Six species of primate; jaguar; Brazilian tapir and peccary were recorded, while Red Brocket deer, agouti and paca were common.

The impact of indigenous Amerindians on animal populations appeared to be low and sustainable. However, the immigration of Brazilian miners with firearms may pose a serious threat both to the reserve's biodiversity and its Amerindian population in the future. Most recently, the fate of the whole reserve and its largely Amerindian field-staff has been thrown into doubt, with the withdrawal of overseas funding (*New Scientist*, 6 March, 1996.) If the affluent west is serious about biodiversity, then surely it should support such an innovative and important project.

JUNIOR MEMBERS' PROGRAMME OF EVENTS

PLEASE NOTE

Most Junior Members' events are arranged for eight year olds or older, but occasionally we have to target events at just over tens or over twelves. Bookings must be made for all events. Please ring Penny at the Zoo on 01244 380280, Extension 215, not more than two weeks before the event you would like to attend. Places are allocated on a first-come, first-served basis, and may be limited. For those trips which involve either a bus trip or the provision of food or materials, a charge will be made to cover costs – but we keep this as low as possible. This list is provisional and in exceptional circumstances we may have to alter the dates and times of some of the trips. You will not be informed of such changes individually – so please read the Junior pages in the magazine each quarter to keep up-to-date with Junior News.

ANGLESEY – SOUTH STACK AND PUFFIN ISLAND

Saturday 22nd June 1996

This should be a bird watching delight as we discover the view from the tower at the RSPB's Reserve at South Stack on Anglesey, before an afternoon boat trip around Puffin Island.

Juniors of ten years old and over are invited to join us. You will need a picnic and good shoes. The boat could be chilly, so bring something warm to wear. We will leave the staff car park at 10.00 am, returning at 5.00 pm.

A 'DAY WITH A KEEPER'

Wednesday 24th July 1996

We have to limit this most popular event to Juniors who are a minimum of twelve years old as it can be very hard work.

Juniors will spend a day working alongside a Keeper learning about their job and some of the animals they look after.

Meet outside the Oakfield at 10.30 am. The day will finish at 4.00 pm at the Oakfield for collection. Bring along a picnic and wellies.

SUMMER BARBECUE

Friday 16th August 1996

The summer barbecue holds lots of surprises for those who have not seen the Zoo at dusk. The essence of the evening is to have fun and enjoy the flavour and aroma of cooking over the coals.

Provisional timings are to come through the Staff Entrance at 7.00 pm and walk to the Jubilee café, and be collected from the Jubilee at 9.45 pm. Over eights.

MACHYNLLETH

Saturday 21st September 1996

This will be the Junior Club's first visit to Machynlleth which is a centre for alternative power and conservation. We will travel to Powys in mid Wales to find out about water power, wind power and how to conserve power.

The coach will leave the staff car park at 9.30 am, returning at around 4.30 pm. Over eights are welcome to come along and learn more about the environment. Warm clothes and a picnic will be needed.

EXCELLENT NEWS!

I am delighted to say that owing to the great amount of interest from Junior Members, we have already reached our initial target of raising £300 for the children of the Mali Hai Wildlife Club at Endarofta School in Tanzania. Soon after the launch of the appeal, pocket money started flooding in and bit by bit added up to a superb £315.64.

Huge thanks to all those who contributed, with special thanks to Junior Member Emma Pennington who raised a brilliant £26.64 from her friends at school.

What is more, as I write, Senior Members Brian and Elizabeth Livingstone are in Africa and will be visiting the children at Endarofta School to hand over the money on behalf of the Junior Members. They will be taking lots of photos while they are at the school and will also be making the arrangements for the children to visit the

Serengeti this year. On Elizabeth and Brian's return, we will arrange for those of you who have already expressed an interest in becoming 'pen pals' to make contact with your new friends. Keep an eye on the next 'Chester Zoo Life' magazine for the Livingstone's report on their visit.

A BIG 'thank you' to everyone who has helped to make some fellow animal enthusiasts very happy!

*Penny Rudd
Junior Club Leader*

THE MALI HAI WILDLIFE CLUB APPEAL





Picture Gallery

The Tracks and Signs day in March was very well attended – and the touch session is always popular.



Arrivals ○ Births ● and 🌐 Hatchings 🐣 🐣

FEBRUARY, MARCH AND APRIL 1996



▲ Bactrian Camel.



▲ Bongo calf.

MAMMALS

Red-necked Wallaby	<i>Macropus rufogriseus</i>	0.0.2	Born
Rodrigue's Fruit Bat	<i>Pteropus rodricensis</i>	0.0.5	Born
Ring-tailed Lemur	<i>Lemur catta</i>	0.0.6	Born
Cotton Top Tamarin	<i>Saguinus oedipus</i>	0.0.1	Born
Chimpanzee	<i>Pan troglodytes</i>	0.0.2	Born
Orang Utan (Bornean form)	<i>Pongo pygmaeus pygmaeus</i>	0.1.0	Born
Bactrian Camel	<i>Camelus bactrianus</i>	1.0.0	Born
Axis Deer	<i>Cervus axis</i>	0.1.0	Born
Nilgai	<i>Boselaphus tragocamelus</i>	0.1.0	Born
Giraffe	<i>Giraffa camelopardalis</i>	0.1.0	Born
Bongo	<i>Tragelaphus eurycerus</i>	0.0.1	Born
Sitatunga	<i>Tragelaphus spekei</i>	0.1.1	Born
Kafue Flats Red Lechwe	<i>Kobus lechwe Kafuensis</i>	0.1.0	Born
Scimitar horned Oryx	<i>Oryx dammah</i>	1.1.0	Born
Blackbuck	<i>Antelope cervicapra</i>	0.0.5	Born
Arabian Gazelle	<i>Gazella gazella arabica</i>	1.0.0	Arrival

BIRDS

Ostrich	<i>Struthio camelus</i>	1.1.0	Received
Humboldt's Penguin	<i>Spheniscus humboldti</i>	0.0.11	Hatched
White Pelican	<i>Pelecanus onocrotalus</i>	0.2.0	Received
Black-necked Swan	<i>Cygnus melanocoryphus</i>	0.3.0	Hatched
Hawaiian Goose	<i>Branta sandvicensis</i>	1.4.0	Hatched
Meller's Duck	<i>Anas melleri</i>	2.2.0	Received
Chinese Painted Quail	<i>Excalfactoria chinensis</i>	1.0.0	Received
Palawan Peacock	<i>Polyplectron emphanum</i>	1.1.0	Received
Roulroul Partridge	<i>Rollulus rouloul</i>	1.0.0	Received
Satyr Tragopan	<i>Tragopan satyra</i>	1.0.0	Received
Congo Peafowl	<i>Afropavo congensis</i>	0.0.1	Hatched
Red-crowned Crane	<i>Grus japonensis</i>	0.0.2	Hatched
Ocellated Turkey	<i>Agriocharis ocellata</i>	1.0.0	Received
White-naped Crane	<i>Grus vipio</i>	1.1.0	Received
Crowned Plover	<i>Vanellus coronatus</i>	0.0.3	Hatched
Speckled Pigeon	<i>Columba guinea</i>	0.0.2	Hatched
Rock Dove	<i>Columba livia</i>	0.0.2	Hatched
Diamond Dove	<i>Geopelia cuneata</i>	0.0.3	Hatched
Superb Fruit Dove	<i>Ptilinopus superbus</i>	0.0.1	Hatched
Plumbeous Redstart	<i>Rhyacornis fuliginosus</i>	0.0.6	Hatched

BIRDS continued

Yellow-backed Chattering Lory	<i>Lorius garrulus flavopalliatu</i>	0.1.3	Received
Derbyan Parakeet	<i>Psittacula derbiana</i>	0.0.3	Hatched
Thick-billed Parrot	<i>Rhynchopsitta pachyrhyncha</i>	1.0.0	Received
Red-masked Conure	<i>Aratinga erythrogenys</i>	0.0.1	Received
Spectacled Owl	<i>Pulsatrix perspicillata</i>	0.0.2	Hatched
Fairy Bluebird	<i>Irena puella</i>	1.0.0	Received
Bali Starling	<i>Leucopsar rothschildi</i>	0.0.4	Hatched

REPTILES

Tokay Gecko	<i>Gecko gecko</i>	0.0.2	Hatched
Leopard Gecko	<i>Eublepharis macularius</i>	0.0.6	Hatched
Madagascar Giant Day Gecko	<i>Phelsuma madagascariensis grandis</i>	0.0.2	Hatched
Thailand Water Dragon	<i>Physignathus cocincinus</i>	0.0.10	Hatched
Philippine Sail Fin Lizard	<i>Hydrosaurus pustulatus</i>	0.0.4	Hatched
Honduran Milk Snake	<i>Lampropeltis triangulum hondurensis</i>	0.2.0	Received
Pacific Boa	<i>Candoia carinata</i>	1.1.0	Received

AMPHIBIA

Mexican Giant Tree Frog	<i>Pachymedusa dacnicolor</i>	0.0.8	Received
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INVERTEBRATES

Tadpole Shrimp	<i>Triops cancriformis</i>	0.0.20	Hatched
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AQUARIUM

Lake Victoria Cichlid	<i>Astatoreochromis alluaudi</i>	0.0.219	Bred
Lake Victoria Cichlid	<i>Haplochromis 'argens'</i>	0.0.32	Bred
Lake Victoria Cichlid	<i>Haplochromis nyereri</i>	3.1.0	Received
Panda Catfish	<i>Corydoras panda</i>	0.0.57	Bred
Peppered Catfish	<i>Corydoras paleatus</i>	0.0.60	Bred
Seahorse	<i>Hippocampus sp.</i>	0.0.111	Bred
Banded Pipe Fish	<i>Dorybampbus dactylophorus</i>	0.0.4	Received
Nautilus	<i>Nautilus pompilius</i>	0.0.1	Received