FOREWORD

C. Peter Overton

Biosearch Nyika is a conservation research project involving international teams of enthusiastic professional scientists and amateurs working with the Malawi Department of National Parks and Wildlife, in the wilderness areas of the Nyika National Park in the north of Malawi. With this latest expedition in 2001 we have now completed five in the current phase of exploration. Added to earlier experiences in these remote regions we have now built up substantial experience working in the Park. It is worth restating that the purpose of these expeditions is three pronged. Firstly we are assisting the Department of National Parks and Wildlife by conducting carefully planned scientific surveys in some of the more inaccessible parts of Nyika National Park. Secondly, we aim to give the expeditioners, who largely fund this work, a unique experience of true wilderness. (This experience can be both very physically and psychologically demanding on them). Thirdly we are unashamedly promoting the Nyika as a wonderful example of safe and beautiful wild Africa where people can enjoy the wilderness on foot without damaging the ecosystems at the same time.

In successfully getting this team together we are especially grateful for the financial support offered by the University of Lincoln to help their staff and students become involved. This was a great catalyst for the continuation of the project in 2001. UK team members were also from five further Universities, De Montfort, Edinburgh, Southampton and Imperial College, London. Mike Lainis, our experienced South African leader, had his talents fully tested on this expedition. He led a team of diverse fitness and experience, unlike previous groups which have tended to be more evenly matched and generally more cohesive at an earlier stage. We mince no words in the preparation for the team about the toughness of the expedition. However, it has to be said that when the reality of that northern Nyika escarpment looms into reality the challenge really becomes apparent! The Malawian team members, many of whose names are becoming very familiar in our reports, have said they greatly appreciate our support in the Nyika.

The small group that Mike led into the furtherst quarter in the Sawi and Guwu valleys brought back excellent game and poaching intelligence and did great credit to themselves in showing their perseverence and commitment to the task in hand. Virtually none of the extensive escarpment and hill zone is accessible by vehicle. This in itself makes law enforcement patrolling extemely difficult. It encourages those engaged in illegal activity to set up camps within the Park for the purpose of 'processing' their kills, prior to exiting over the tough terrain. This report includes the poaching intelligence that was obtained and highlights photographically some of the techniques employed with relative impunity in the northern valleys.

The group who worked near Thazima produced some valuable botanical data that has added to our Nyika list, produced the first Baboon study, as well as recording game; and further information on reptiles, which is rather scarce for the Nyika. Having a group at Thazima proved useful in extending the overall expedition experience for some of the team.

This time we were not in a position to include entomological and small mammal surveys. There has been substantial change to nomenclature in the former and we think that it is premature to publish a revised list at this stage. However, we are delighted, yet again, to publish some art produced on the expedition. We shall be encouraging more of this, since art not only more aptly captures the essence of a place but also encourages a greater appreciation of its preciousness in terms of conservation. One of our 1999 expeditioners has recently published a book of work completed in Nyika and Malawi generally during her stay there during and after the September 1999 expedition.

This expedition was able to boast a disciplined approach to hygiene and team welfare which meant that there were yet again few health problems. However, we shall be putting a greater emphasis on pre-expedition hiking as appropriate training in the future. The small personal first-aid kits that each member of the team is advised to bring have usually been more than sufficient for our needs in the bush. However, as always we brought substantial excess medical kit, much of which was fortunately of little relevance to us in the bush but proved very welcome indeed to St John's Hosptital in Mzuzu on the return trip.

The first week of the expedition is always very tough but the rapidity with which people acclimatise to the conditions is remarkable. It is a rule of thumb that attainment in terms of distance travelled and work completed can easily double between week one and two and again between week two and three. For this reason we regard the four week expedition period as a minimum, with the final week usually providing data from Sawi/Guwu valley area. This area is of particular interest and value to the Department of National Parks and Wildlfe because of the very infrequent occasions when scouts penetrate it.

The scouts' patrol reports over the years since Biosearch Nyika started with the expeditions in 1997 show that in a typical year less than half of the area of the Park is covered by patrols at all. Much of the unpatrolled area is inevitably in the northern valleys where we have been concentrating our work. It is hardly surprising that the only parts of Nyika National Park that can be said to have reasonably good law enforcement patrol coverage are the areas in close proximity to the main scout bases at Thazima and Chelinda. Larger numbers of well motivated scouts provided with reliable and closely controlled vehicles, which could at least get them to the perimeter of the more inaccessible areas on a weekly basis, would make a big difference. The psychological difficulty of working in the remote valleys without fall-back vehicles is the same for the scouts as for our teams. It is sometimes very hard to keep your eye on the ball if you have little or no previous experience of working in these conditons. Our teams can be justly proud of their achievements to date.

Whilst we have always placed emphasis on the importance of minimising our impact on the environment we went one stage further this year and appointed an 'eco-warrior' whose main role on the expedition was to oversee the activities of the other team members as far as it was practical with widely spread groups. It is rather depressing to spend several days trekking in a wilderness and happen across a previous camp with not only crushed tins littering the site but possibly wrappers from comfort foods clearly not purchased in the country! The report demonstrates that we achieved a high degree of awareness on this subject. The level of success achieved will be monitored by future expeditions and scout patrols. One of the facts that has struck me over the 30 years that I have known this area is that the recovery of *Brachystegia* woodland and the grassland in particular is remarkably slow when significant damage has occurred, whether it be by settlements or by vehicles. Expeditions on foot pose no significant risk to this environment, nor does the removal of minimal material for organised scientific study have more than temporary consequence to the flora and fauna. In fact quite the contrary. More well disciplined, walking expeditions could add to the protection of some of the fauna and flora by discouraging illegal activity with the increased presence of game scouts. There would also be spin-off economic benefits to the Park and its surrounding population.

To capture the 'personality' of the expedition we have included in substantially unedited form a Captain's Log and a log written by our youngest ever team member who celebrated her eighteenth birthday in Nyika National Park. These show the highs and lows of the overall experience and highlight the difficulties from an organisational view of getting a team together who will almost inevitably be unmatched in experience and have possibly widely differing aspirations. Regardless of these difficulties we press on with encouraging and getting the best out of all those who wish to rise to the challenge of the Nyika, since continuity of this project increases the chance of progressively making a major contribution to the Nyika National Park and its adjacent people.

ACKNOWLEDGEMENTS

Biosearch Nyika would like to extend congratulations to all our partners in this project. Some individual acknowledgements are to be found separately in each section. However, we would like to particularly thank the following for their contributions to this work:

Department of National Parks and Wildlife in Malawi, and the Director L. D. Sefu for continuing permissions to work in Malawi and build up the excellent relationships with Malawian Parks staff that we have achieved over the years, creating added value to the projects.

The staff working in the Nyika National Park and particularly the manager Chisa Manda and Scientific Officer Gibson Mpepho for help with transport and enabling the team to work effectively at two ends of the National Park simultaneously.

Ian Thompson, Regional Parks Director for access to poaching reports to get a better overview of the situation in the Nyika National Park in recent years.

Dr Augustine Chikuni,The Director of the The National Herbarium and Botanic Gardens of Malawi in Zomba, for releasing Hassam Patel to the Expedition, whose continuing contribution to botanical research in Malawi is outstanding.

The Royal Geographical Society for recognition and financial support through the Penruddock-Park Lander Fund.

The British High Commission, Lilongwe for medical support and advice.

The University of Lincoln for agreeing financial support to his members and thus underwriting the formation of a team.

Dr Dorothy Gennard from the Forensic Science Department of the above for encouragement and assistance throughout .

Dr Dick Brummitt of the Kew Herbarium for advice on plant collections and their nomenclature.

Sheffield Hospital (through Helena Skinn, team member) for provision of medical supplies.

David Foot of Nyika Safari Company for advice and logistical support for resupplying the expedition.

Mark Sprong of Land and Lake Safaries for safe and reliable transport.

To all the members of the team who worked hard to raise substantial funding to make this 2001 expedition possible.

Finally, a special thanks to Mike Lainis, whose considerable experience in Africa and good character enabled him to successfully complete a particularly difficult assignment as expedition leader.

EXPEDITION LEADER'S REPORT

Mike Lainis

It was a great privilege to be part of this 2001 expedition to the Northern regions of the Nyika National Park. We went into areas where few white people have been before. While the remoteness of the area proved to be challenging to some team members, I found it to be exciting and stimulating.

Although few animals were seen in the valleys, there was strong evidence of their presence. One sensed that they where studying us, more than we were them. Signs of poaching were very fresh. We came across many traps, shelters and even heard gunshots one day. We did not see anyone but again sensed them close by. Our guides were ready day and night for any eventuality and one felt very safe with them. Well done to all the Scouts as it would not have been at all possible without them. We did not have any serious injuries nor any major illnesses. Personal hygiene was extremely high, a credit to all team members.

We managed to survey in all the designated areas and saw plenty of evidence of animals in most areas. Some plots were difficult to do, as they required determination and commitment even just to get there. Some team members, men and women, did exceptionally well in just putting their heads down and achieving the objectives. I was impressed with their commitment to the project even when a few tears were shed.

Other team members decided to spend some time with the local population and learn more about their cultures. This was a rewarding experience for both parties. Hassam Patel again joined the team to do plant surveys. Although being one of the oldest members, he proved to be the fittest, and helped carry struggling team member's packs. His knowledge of plants and bush craft was amazing.

Team members soon came together. Friendships were quickly formed and hopefully are to last a long time. People were soon helping each other especially when the going got really tough. I was impressed with the team spirit and helpfulness towards the weaker members. As with all expeditions things don't always go smoothly, especially in Africa. Some team members coped well, while others struggled but all in all we came through the difficulties and, on looking back, the hard times were just another part of the whole experience.

Well done to all who took part. Everyone did exceptionally well in achieving the goals we set out. From surveys to taking photographs and mixing with the local population, it was all an amazing experience. Lastly a big thank you to Marianne and Peter Overton for organizing the expedition and for the life-changing time spent being part of the 2001 Biosearch Nyika Expedition. Without them all of this would not be possible.

CAPTAIN'S LOG

Mike Lainis

On the 7 July 2001 I left Gatwick with Peter airport for Lilongwe, Malawi. The flight was full. The air steward, after looking at my passport and mentioning that he had a house in Gordon's Bay, South Africa, asked if I was wearing jeans? I was not. He then said how would I like to be upgraded to business class. What a question! The extra space and service was amazing. Peter also got upgraded. I sat next to a girl who was going off to be a missionary for a couple of months in a remote village in the South of the country. She promised to pray for our safety while in Malawi! When the plane stopped at Entebbe, Uganda for refuelling and to change the crew I was getting some fresh air on the stairs when I noticed there was a lot of action on the tarmac, T.V. cameras etc. The President of Uganda was getting off our plane!

We eventually arrived in Lilongwe on the Saturday morning. The airport bus service had been discontinued, and in true African style the only way to get to the hotel was in a beat-up taxi with a broken windscreen, smooth tyres and the equivalent of £10 for a 20-minute journey. We stayed for the next week at the Imperial hotel. A modest hotel, clean rooms and beds. However there were a few pet rats running around near the bar area. They were not only seen after a few drinks but also been quite sober (me not the rats!). I proceeded over the next week to find all the supplies I needed, with the help of Charcoal the local fruit seller. He was very helpful and led me to all the local markets etc. He would then enlist others to help carry provisions. So I looked like a Victorian Explorer with my porters carrying all my provisions down the road. Soon my name spread far and wide and all the locals knew me.

Peter's mission was to organize permits and customs letters for the specialised equipment the group was bringing. He set up a meeting with Mr Jia Ramos of the Department of Parks and Wildlife to smooth the process of permits. This worked extremely well and we had all the necessary documents the next day.

We ate a few times at the best restaurant in Lilongwe (described in Bradt Guide book) Don Brioni's Bistro. Brian cooked some excellent steaks for us while his glamourous Malawian wife, Hope, served us. We fetched the first expedition member, Bev, from the airport on the Friday, the day before the arrival of the rest of the team.

On the Saturday morning Godfrey Shawa, from Land & Lake Safaries, arrived with the coach to fetch the others from the airport and to start the journey to the Nyika National Park. We were soon on our way to our first night stop at the Kasito lodge at Chikangawa on the Viphya just before Mzuzu. The next day we picked up Hassam Patel (a botanist from the National Herbarium of Malawi*)* and bought the last fresh food supplies. Leaving the last resemblances of civilisation we then drove to Thazima, gate to the Nyika National Park, where we slept the night.

The next day I knew I was in for a rough time when on sighting the first animal, one of the girls screamed "Hey, there's Bambi", referring to a Common Duiker. Eventually we arrived at the base camp, after stopping for chameleons and bush fires amongst other things. The next two days were spent setting up base camp and final briefings. The expedition was to have three phases with two teams of six members each with a Parks scout. Two scouts would always guard the base camp.

Finally at 8 am both teams were on their way down into the Mondwe valley for phase one. It soon became apparent that some members had never hiked or camped before. Some kits were too heavy and some just did not look where they were putting their feet. After Peter left us I was the "supreme commander" of the expedition. I immediately joined the two teams together to give support to the weaker members. After eight and a half hours we reached the first river where we decided to camp .

The next day we proceeded to the designated campsites. I knew I was about to have a mutiny when I told the second team to continue to the next campsite while the first team started to unpack. That night my ears burnt from all the moaning. For the next 3 days we started our work of going to predetermined grid points and to count in a 100m x 100m square animal tracks and dung. We saw loads of tracks but few animals, except for a few buck and snakes, including a Boomslang. Soon it

was time to meet up with the second group for the trek to get back to the base camp. I was told that things did not go well with them. Paul did not find any Baboons, Hassam and Bev did not find any new plants as it was too dry, Sam, Carla, Emma just did not cope with the whole idea of running around in the bush after alex (the appointed leader of that group) counting animal dung.

Half way up to the base camp Emma took a fall, hurting her back and head. Fortunately she was able to continue walking while others carried her kit. If it was serious it would have meant sending the scouts on a 30 km run and 30 km back again, setting up a camp right there, carrying her out to the nearest road, all uphill for 10 km, no path, 20 km rough ride to Chelinda , a two seated plane to Lilongwe and then a another plane to Johannesburg. All in all a massive operation.

Safely back at base camp after rest and fresh food a meeting was called to “asses the situation”. Paul wanted to go see baboons near Thazima Gate, Sam wanted to join him. Hassam and Bev decided also to go to collect plants there. I gave then one scout and told them that they were on their own and if anything happened to them they had to sort themselves out. Nikki, Carla and Emma did not want to even move from the base camp. Nathan (an American Peace Corps worker from Thazima) and Manfred Kumwenda joined us for the second phase for a couple of days.

The second phase was to the plateau, which by the way, is not flat. It had loads of steep hills and very rough terrain. We all camped together but went out in two groups. One day we hiked six hours to a plot only to find it and to decide it was too late to start and if we did not start our return journey to the campsite we would be caught in the dark. Sometime during that day I hurt my knee, damaging a ligament. I continued for the next two weeks with a stick for support.

The plateau was very cold at night with frost in the morning but the days were warm. On our return journey we passed a campsite of Nyika Safaries. Our scout Kingfrey wanted to say hello to his mates but Alex, our scientific officer, wanted to go onto the next plot. Soon both of them were walking off in different directions. I stopped Alex and told him he had just lost the guide and that it was rude in not saying hello to others in such a harsh environment and that they would be the ones that would come to our rescue if we ran into trouble. After a time of reflection Kingfrey returned and we continued our journey back to base camp.

On arrival at base camp Nikki, Carla and Emma had enough of just sitting around and wanted to join the others at Thazima. James, Helena and Lianne also decided they also had had enough. This left Mark, Alex, Penelope, Kingfrey (scout) and myself to complete phase three. Before starting we had two days rest, we climbed the second highest peak in Malawi, Nganda and celebrated Carla's birthday.

Phase three was in a remote valley of the park where few scouts have been - and home to many poachers. To access this valley we followed the same route as on the first phase. We made it to the first campsite in two hours. (Previously eight and a half hours). We found a wonderful campsite next to the Sawi River. We came across fresh poaching huts and spears which we burnt. Two hyaena carcases and loads of tracks. I really enjoyed this time as we were a strong group and well motivated for the difficult task in hand.

On the return journey we somehow went a different route. I was not feeling well due to my knee now giving me much pain, so I left the responsibility of getting us out to them. We were soon on a very defined path. Penelope kept on saying that there should be a river on our left, but then who listens to women when there are four men leading the way. Kingfrey just said, " You want to follow this path? No problem. You lead, I follow." Unfortunately we had climbed the wrong peak! I asked Mark what our height was on the GPS: we were only two hundred feet short of base camp but we then had to go back down to the valley 1500 feet below. It was a beautiful view but also a very depressing view. Eventually we crawled into the base camp just as it was getting too dark to walk and to the news that a leopard had been in base camp the night before.

After resting for the day we packed up base camp and waited for the arrival of Godfrey to fetch us. We dropped off the guides at Chelinda, said hello to an old school friend of mine, Magnus, who I had not seen for 20 years. He was working for Nyika Safaries. Picked up the others and started our R & R period .

On arrival at the Vwaza Marsh Game Reserve some ladies expected lodges, because they were told to give their sleeping mats to the guides. Only a campsite was booked. I soon had a bunch of hysterical females on my hands. Godfrey and I negotiated some beds but they had to pay for them. Soon a crate of Green beers were bought from the locals and tempers subsided. That night some hippos came close. I could hear them eating the grass very close to the tent. The next morning we all went for a walk around the marsh. Came very close to the hippos again. We then dropped off Hassam at Mzuzu and drove down to the Chinteche Inn by the lake.

We arrived just as it was getting dark and to our surprise, the Inn was an excellent hotel with each room having its own shower and toilet and the beds overlooking the beach. Barry and Diedre were our hosts. Ado from a nearby bar and backpackers lodge joined us after dinner. Soon the stories of the Angolan border conflict started flowing as the three of us had spent time there. Barry armoured car division, Ado, intelligence unit, myself engineering support unit. Soon the drinks were flowing nicely and Ado, experienced at running his own bar, came out with the flaming sambuccu, which after warming the drink in a wine glass stuck it to our bottoms. We then had to click our glasses and then down the drink. The next day was spent recovering on the beach. That night we continued our party at Ado's bar. The next day we finally returned to the Imperial Hotel in Lilongwe, did our final shopping, had one last meal at Don Brioni's, a few more Greens (local brew) and on to the plane back to the U.K.

Malawi the warm heart of Africa. The Land of the lake. I feel very privileged to have been to the areas where few people are able to go. I enjoyed the challenge and the remoteness. I certainly enjoyed Malawi and hope to return some day.

Kingfrey Sichinga *(Penelope Whitehorn)*

SUMMARY OF ACTIVITIES

Date	*Event*	*Logistics*	*Comments*
Advance Party			
7 July	Advance party arrives in Lilongwe (Peter and Mike)	Checked into the Imperial Hotel.	Bus service from the Airport no longer operating.
8 July	Relax and planning.	Briefing.	Everything closed on Sundays.
9 July	Check prices and stocks at different stores.	List supplies and prices.	Shortage of certain items, e.g. Jungle oats.
10 July	Start buying equipment for cooking and base camp.	Main supply is the local market.	Would not have been possible without the help of local " Charcoal ".
11 July	Organized and selected main bulk of supplies.	Bought majority of supplies from Metro Cash 'n Carry.	Good selection and plenty stock.
12 July	Visit to British High Commission and Parks.	Discussed evacuation procedures and local emergency organizations with BHC. Organized entry exception for specialised equipment and entry permit to the park.	Best treatment for major accidents is Johannesburg. Best organization to use is MSR in Lilongwe.
13 July	Fetched supplies from metro brought to the hotel for final sorting and packing. Fetched first team member, Bev.	Used help from the Imperial hotel. Ordered fresh rolls and meat.	Must place orders for fresh supplies.
14 July	Loaded Bus. Fetched team from Airport. Sleep over at Kasito Lodge.	Customs needed more time for entry exception.	Godfrey of Land and Lake Safaris was our driver.
15 July	Pick up Hassam Patel. Travel to Thazima gate.	Buy fresh fruit and vegetables.	Last signs of civilisation.
16 July	Travel to Base camp. Pick up scouts.	Route was slow with full load of people &equipment.	Saw massif bush fire.
17 July	Establish base camp and briefings.	Briefings; Welcome, camp craft, EVAC, procedures, and scientific log keeping.	Split group into two teams. Went for welcome wash in river.
Phase One			
18 July	Hike to Mondwe River.	Slow going.	Some team members inexperienced.
19 July	Hike to Camps 1 & 2	Slow going.	Heard gunshots from poachers. Scouts investigated but found nothing.
20 July	Survey commences	Mark's GPS very useful in finding plot positions.	Plenty of elephant tracks (dung & broken branches)
21 July	Survey continues.		Beautiful views. Drinking water disturbed by elephants.
22 July	Survey continues. Move to Mondwe camp.	Hiked as one group.	
23 July	Return to Base camp.	Early start.	Members anxious about hike up escarpment.
24 July	Rest period.	Plan next phase.	Nice to wash properly again.
Phase Two			
25 July	Team A hiked to plateau.	Manfred and Nathan join	Excellent views from

	Team B to Thazima .	group 1.	Nganda.
26 July	Start Survey.	plateau not flat but very hilly.	Tough going.
27 July	Survey continues.	Nathan and Manfred returned to base camp.	Frost on tents in the morning.
28 July	Survey continues.		
29 July	Survey continues. Start return Journey.		Good going. Came across Nyika Safari Company.
30 July	Return to Base Camp.		Rained most of the day.
31 July	Rest at Base Camp.	Plan next phase. Carla's 18th Birthday.	Well-earned break.
Phase Three			
1 August	Team A hike to Sawi River Camp. Team B to Thazima.	Strong evidence of poachers.	Tough going.
2 August	Hike to Sawi River Valley Camp. Start survey.	Team B went on tour of village.	Excellent campsite by the Sawi river for team A.
3 August	Survey continues.	Remote terrain.	
4 August	Survey continues.		Excellent views.
5 August	Team A survey continues. Start return journey.	Team B went on tour of the park.	Team A took wrong path and had to descend down again.
6 August	Team A returned to Base Camp	Rest. Team B was given tour of park offices and armoury of captured guns and traps.	Heard Leopard at night at base camp.
Rest Period			
7 August	Packed up. Fetched team 2. Arrived Vwaza Marsh	Packed up, fetched team B at the gate.	Saw many hippos near tents at night.
8 August	Depart for Mzuzu, drop off Hassam and medical supplies to hospital and then travel to Chinteche Inn.	Early morning walk around marsh. Said goodbye to Hassam. Dropped off tents for forestry department.	The Inn was a pleasant surprise.
9 August	Chinteche Inn.	Lazed around on the beach and visited the village.	Excellent way to finish off.
10 August	Depart for Lilongwe.	Left early to arrive in Lilongwe for last minute shopping.	Last supper at Don Brioni's restaurant.
11 August	Depart Malawi	B.A. Flight to Gatwick airport.	Said our goodbyes before going out to meet family and friends.

Compiled by Mike Lainis and Helena Skinn.

TEAM MEMBERS

UK Field Team

MIKE LAINIS: EXPEDITION LEADER

Mike was born in South Africa and achieved the highest award in scouting, "Chief's Scouts Award". He spent two years on the Angolan/Namibian border, in the engineering support unit of the South African Army during 1980 and 1981. Mike has travelled many self-supported trips by 4x4 into Mozambique, Zimbabwe, Namibia, Botswana, Tanzania and South Africa. A qualified river guide, Mike has led trips down most rivers of South Africa. Mike has travelled to most European countries and is a member of the Royal Geographical Society. Mike is currently working as a site manager with a building firm in London.

JAMES ROBERT ILES: MEDICAL SUPPORT
James graduated from the University of Exeter in 1999 having read Geography. He was involved in running a student expedition group, which included journeys to various locations in Britain and occasional extended trips in mainland Europe. James worked for a chemical company in Exeter for a year after graduating and has had various temporary jobs since. Having come back from Malawi, James is now studying towards a Masters Degree in Integrated Environmental Management at the University of Southampton. On completion in Autumn, 2002, he hopes to find work in environmental consultancy.

LIANNE LEWIS: ENVIRONMENTAL AUDIT
Lianne is 22 years old and graduated in 2000, gaining an honours degree in Animal Behavioural Science at De Montfort University in Lincoln. She is now living back in her home town of Hemel Hempstead in Hertfordshire hoping to pursue a career in the Police Force, eventually specialising in Dog handling.

NIKKI VOHRA-BEULENS: PHOTOGRAPHER
A graduate and keen professional photographer, Nikki works as a photographic learning advisor with the University of Lincoln, based at the Faculty of Arts and Technology in Hull, where she is also taking her MA in Art Design and Critical Theory. Nikki has previously worked as Picture Editor for a London publishing company and as a cruise ship photographer with the Holland America Line. Previous camping experience was nil, but travel abroad included a photographic tour in her native country of India.

ALEXIS ROBERTSON BRUN: i/c SCIENCE PROJECTS & GROUP LEADER
Alexis is a 21 year-old student of Imperial College, London University, studying Biology. Alexis is also from Norfolk, an old Etonian and a very fit competitive rower. Previous expedition experience included a Biological Management Survey of North Island in the Seychelles, an overland hike in Tasmania and experience working for Wilderness Safaris in Botswana and Namibia.

MARK JOHN GILROY: NAVIGATION & POACHING REPORT
Mark is a third year student at Lincoln University, studying for a BA in Environmental Studies. He had no previous expedition experience, but enjoyed University field trips and hiking. Mark is very fit and used to run competitively for the County. Mark was part of the long-distance team on this expedition.

SAMANTHA ILES: I/C SUPPLIES
Samantha has a first degree in Psychology and is undertaking a further degree in Animal Science at De Montford University. Sam has done a range of jobs, and is currently a Pub Manager. Previous field experience included recreational trips to Derbyshre and North Wales, Duke of Edinburgh Award and the Guides.

BEVERLEY TERESA MASON
Beverley has a BTEC Diploma in Art and design from Hull College and is now a Service Advisor to students using the library, computer and media facilities at University of Lincoln in Hull. Beverley

joined the expedition at the last minute with no previous expedition experience, though she is an experienced skier and qualified advanced diver.

CARLA MAYHEW: I/C EXPEDITION LOG
Carla is the youngest member of the team going on 18, who also took responsibility for keeping the team's diary. Previous experience was limited to family holidays and a field course. Carla is a second year undergraduate studying for a National Diploma in Animal Care at de Montford University in Caythorpe.

EMMA LOUISE POWSEY: MEDICAL SUPPORT
A Forensic science undergraduate at University of Lincoln, Emma has done ten years as a TA soldier and six years as an auxillary nurse, before returning to education.

PAUL G. ROBERTSON: PROJECT ON THE YELLOW BABOONS
Paul has an honours degree in Biology and a post graduate in information technology, which is the basis of his current employment with the University of Lincoln. Paul did an experimental dissertation at BSc level investigating the African Bean Weevil dynamics in grain storage. No previous expedition experience, but plenty of outdoor field experience. Paul initiated, led and successfully completed the project on the feeding ecology of the Yellow Baboon, published in this report.

HELENA MARIA SKINN: ARTWORK
Helena is completing her final year in Animal Science at De Montford University, Caythorpe Campus. Her previous experience as a venture scout included a fifty-mile walk.

PENELOPE RUTH WHITEHORN: SCIENCE AND ART
Penelope is studying zoology at Edinburgh University and completed a three month savannah expedition in Tanzania in 1999, three Duke of Edinburgh Award expeditions and a gap year spent travelling the globe. Very bright and fit, Penelope was one of the four long-distance team members with Kingfrey Sichinga.

LOCATIONS OF TEAM MEMBERS

Phase One		**Phase Two**		**Phase Three**	
Team 1	*Team 2*	*Team 1*	*Team 2*	*Team 1*	*Team 2*
Mike Lainis	Hassam Patel	Mike Lainis	Hassam Patel	Mike Lainis	Hassam Patel
Mark Gilroy	Alexis Brun	Alexis Brun	Samantha Iles	Alexis Brun	Samantha Iles
James Iles	Samantha Iles	James Iles	Paul Robertson	Mark Gilroy	Paul Robertson
Penelope Whitehorn	Paul Robertson	Mark Gilroy	Beverley Mason	Penelope Whitehorn	Beverley Mason
Nikki Vohra-Beulens	Emma Powsey	Lianne Lewis	*Boston Chilongo*	*Kingfrey Sichinga*	Emma Powsey
Lianne Lewis	Beverley Mason	Penelope Whitehorn			James Iles
Helena Skinn	Carla Mayhew	Helena Skinn			Helena Skinn
					Lianne Lewis
					Nikki Vohra-Beulens
Kingfrey Sichinga	*Boston Chilongo*	*Kingfrey Sichinga*	*Base camp*		Carla Mayhew
		Manfred	Emma Powsey		
		Kumwenda	Nikki Vohra-Beulens		*Boston Chilongo*
		Nathan	Carla Mayhew		*Manfred*
					Kumwenda
			Anwin & Heatherwycke		

LOGISTICS

Mike Lainis

EMERGENCY EXIT PROCEDURE UPDATE

During the advance party phase Peter and I went to the British High Commission in Lilongwe. They have a well-stocked and well-prepared medical clinic, which is available to all expatriates. We spoke to the Chief Medical officer on duty that gave us the following information and guidelines.

MSR was the most effective emergency company operating in Malawi. They are able to organize evacuations from remote regions and give advanced medical attention. They would organize all transport to Johannesburg if needed. We faxed them a list of all our team members and their insurance policies, plus our itinerary.

Our evacuation procedure was therefore updated as follows;

1. Send for help to Nyika Safaris at Chelinda.
2. Make contact with MSR. Phone numbers; 794036, or 794967, or 795149, or fax 794009. Arrange transport from the airstrip at Chelinda.
3. If situation required a lesser response the nearest clinic would be Ekwendeni or St Johns at Mzuzu.
4. Contact the British High Commission Clinic on 774151or after hours 771123.
5. AMRAF was also another air support organization operating out of Nairobi.
6. Netcare International in Johannesburg could also be contacted on 101-27-11-301 0101, also there logistics department on 101-27-11-301 0260.

Thankfully we did not have any serious medical emergencies. However in the first instance proper first aid treatment would be the crucial factor. All team members were advised to read the book on expedition medicine (referenced in the medical report), to take a first aid course and for novice campers, to get some experience camping before departure.

COMMENTS CONCERNING FOOD AND EQUIPMENT

All food and equipment was bought in Lilongwe and at the side of the road on route to Nyika. After establishing what was available and what was needed, I commissioned the help of one of the locals, (a chap named Charcoal). He was invaluable in showing where I could obtain various items, speaking the local lingo and in carrying them back to the Imperial Hotel.

I decided to buy all my non-perishable supplies in Lilongwe because of a number of reasons. The selections and price was excellent in the new Metro store. Also there was enough space in the van to transport them.

I came across a team of guys in the market making all sorts of tin goods. I commissioned them to make a tin oven for the bread we baked. This proved to be a big success and was enjoyed by all.

The braai (barbeque) grill proved invaluable, as did the buckets and pots at the base camp. The cooler box also proved invaluable. It was just a polystyrene box not a commercial plastic one. The knives I bought broke within the first couple of days. Better to rely on better quality products from the U.K. The paraffin lamp proved to be more of a problem and not an asset. I over-bought metholated spirits as a lot of cooking was done on the open fire.

With regard to personal equipment the water-free, anti bacterial, liquid soap proved to be a big success. Also I would recommend taking proper walking sticks as the terrain is mostly covered in grass and one cannot see stones and ditches underfoot. There are few paths and surveys are sometimes in very harsh terrain.

Unfortunately we were not able to get radios for emergency procedures. However a satellite phone would be a better option, as the radios tend to be heavy and ineffective in the deep valleys. They would provide a link to park management, which is our primary source of assistance but not directly beyond.

The special requirements for the vegan and wheat allergy persons proved quite challenging. There was one excellent store in the new Old Town Mall in Lilongwe but the prices were high and the selection was minimal. I would suggest for future expeditions if they have special requirements, to purchase them in the U.K.

Fresh meat and eggs were bought before entering the park for the first phase. They were kept by Nyika Safaries at Chelinda. This enabled them to deliver them after the first phase and collect an order for fresh fruit, vegetables, meat and eggs for the end of the second phase. This worked out well.

Everyone had the opportunity to eat well. There was enough variety to keep everyone happy. The Super C sweets were enjoyed by all. Fresh meat and vegetables at base camp proved to be a welcome change but unfortunately those team members who decided to go to the Thazima lost out due to the logistic difficulties of supplying them nearly 100 km away from base camp. Items that ran short were only the Milo and rusks. Items which we had in excess were the tinned sardines, corned beef, peanut butter, mayonnaise and powdered milk. Each team would be different due to ages and preferences. All excess food was given to the scouts and their families at the end of the trip.

Food Stores Inventry

Item	*Quantity*	*Item*	*Quantity*
Porridge Oats	6 pkt.	Fresh Fruit	
Fruity Flakes	24 pkt.	Fresh Vegetables	
Pronutro	6 pkt.	Fresh Milk	4 l
Rusk's	10 pkt.	Meat – Sausage	12 kg
Powder Milk	10 kg	- T- bones	42
Coffee	2 X 750 g	- Steak	42
Tea	11 X 250 g	- Chicken	4 Whole
Milo	6 X 500 g	Eggs	90
Jam	24 X 250 g	Bacon	12 pkt.
Peanut Butter	24 X 250 g	Rolls	50 Rolls
Biscuits	48 pkt.	Bread	12 Loaves
Tin Tuna	55	Margarine	6 tubs
Tin Sardines	70	Fresh Beans	4 pkt.
Tin Corned Beef	50	Bread Flour	7.5 kg
Tin Meat Balls	24	Nsima	5 kg
Tin Fruit	4 X 750 g	Salt	2 kg
Tin Condensed Milk	6 X 310 g	Seasoning	4 bottles
Tin Baked Beans	12	Oil	2 l
Tin Butter Beans	6	Super C Sweets	120 rolls
Tin Tomatoes	6	Mayonnaise	3 X 750 g
Rice	24 kg	Washing-up Liquid	2 l
Pasta	14 kg	Provito Biscuits	20 X 250 g
Popcorn	4 pkt.	Matches	4 boxes of 10
Sugar	22 kg	Dried Fruit	6 pkt.
Msuzi Mix	30 pkt.	Yeast	3 pkt.
Peanuts	10 kg	Lentils	3 pkt.
Raisons	12 pkt.	Tomato Purée	6 Tins
Soup	60 pkt.		
Smash	5 pkt.		

Base Camp Equipment

Pots	2 (5 l & 2 l)	Machete	1
Kettle	1	String	1 Ball
Cooler Box	1	Chopping Board	1
Braai Grid	1	Hessian Bags	10
Tin For Baking	1	Clothes Powder	20 x 25 g
Paraffin lamp	1	Candles	6
Plastic Buckets	4	Wooden Spoons	3
Plastic Bowls	4	Knife	2
Plastic Jug	1	Bread baking tin	1
Hessian	10 m		

Rations
Five days in the field for two team members, that is five breakfasts, six luncheons, six suppers.

Breakfast		*Lunch*		*Supper*	
Sugar	500 grams	Provito	2 Packets	Rice	1 Kg
Milk Powder	500 grams	Sardines	3 Tins	Pasta	500 grams
Fruity Flakes	1 Box	Peanuts	500 grams	Tuna	2 Tins
Jungle Oats	2 cups	Raisons	1 packet	Corned beef	2 Tins
Coffee	As required	Biscuits	2 packets	Meat Balls	1 Tin
Tea	As required	Super C	4 Packets	Soup	2 Packets
Milo	As required	Jam	1 Tin	Msuzi Mix	2 Packets
Rusks	½ Box	Peanut Butter	1 Bottle		

AN EXPEDITION DIARY

Compiled by Carla L. Mayhew

Carla joined the Thazima group after the first week in the Mondwe valley.

THE JOURNEY TO BASE CAMP

13/7/01
The majority of the team arrived at Gatwick airport and proceeded to fly to Lilongwe airport in Malawi.

14/7/01
We arrived at Lilongwe airport at about 1O.15 this morning. Making our way through immigration we met up with Peter, Mike, Bev and Godfrey. After loading up the trailer we began our long journey to the Nyika National Park. At about 12.3O we stopped for lunch and to stretch our legs at the Bua river. Later we broke the journey at Jenda market, where we bought some provisions for the trip. At 5 pm we arrived at the Kasito Lodge in the Viphya Forest Reserve, where we were to spend the night.

15/7/01
We travelled on to Mzuzu today, where we spent some time looking around the market and were able to make some phone calls home. We picked up Hassam Patel, the botanist in Mzuzu. Now we have a complete term. That night we camped just inside Nyika National Park at Thazima gate.

16/7101
We finished the roughest part of our journey by vehicle today. The roads were very tough but we made it. Base camp is all set up and we are ready to go.

PHASE ONE

17/7/01
Our first full day at base camp. We all went down to the waterfall for a wash and freshen up. Some team members washed some clothes. We were split into two teams for the research as follows:
Team 1 : Mike Lainis, Mark Gilroy, Nikki Beulens, James Iles, Penelope Whitehorn, Helena Skinn and Lianne Lewis.
Team 2 :Hassam Patel, Alexis Brun, Emma Powsey, Paul Robertson, Beverley Mason and Carla Mayhew.

18/7/01
Today we walked out from base camp. It was tough and several members of the team found it very difficult. We eventually arrived in the Mondwe and set up the first sub camp.

19/7/01
Both teams set off together to head towards their individual camps in the valley. The walk was disrupted when the scouts, on hearing suspicious noises, headed off alone into the bush to look for poachers. They soon returned. We continued. Late afternoon Team two left Team 1 setting up their camp and trekked onwards to find a camp of their own.

20/7/01
Both teams began the research work this morning. Team two was split into two groups: alex, Emma, Sam and myself worked with Boston Chilongo on the large mammal survey and Hassam, Paul and Bev worked on the botany survey. Team 2 had quite a successful time, finding traces of Common Duiker, Kudu, Grysbok, Bushpig, Bushbuck and Elephants as well as strong evidence of poaching (drying racks and animal skulls).

21/7/01
Second day of research and by all accounts a successful day for both teams. Team two found Roan Antelope tracks in the final quadrat. Boston said that they hadn't been seen in this area of the Park before.

22/7/01
The trek back to base camp began today, again it was very tough but perhaps not quite as tough as it seemed on the way out. Spent the night at our first camp again.

23/7/01
We arrived at base camp late afternoon. As I write, everyone is very tired but very relieved. All the tents are being set up and our evening meal is cooking; vegetable curry and fresh meat, a welcome change from pasta and tinned food.

24/7/01
A lazy day spent doing the essentials; washing clothes and bathing in the stream etc. The team is now divided into three groups. One group will go up onto the high plateau and continue the research quadrats. Another team will return to a camp close to Thazima gate to seek the baboons and do some more botany quadrats and the remainder will stay at base camp.

PHASE TWO

25/7/01
The vehicle has picked up the baboon and botany group and the plateau team are leaving. It will be four days before they return.

26/7/01
The small group left at base camp joined the scouts on their daily patrol and spotted many Reedbuck scattered across the plateau.

27/7/01
Again the small group joined the scouts on their patrol. This time it was to the top of Nganda where they met up with Nathan, who had travelled with the others to the plateau and Manfred, the chief scout.

29/7/01
In the morning the base camp group explored the immediate surrounding area with the scouts and discovered that elephants had passed through the area in the past six months and there were leopards in the vicinity. The plateau team returned today, having finished the quadrats early, looking very tired and glad to be back.

30/7/01
It has been decided that all apart from the strongest team members, (Mike, Mark, alex and Penelope) will be going to Thazima gate on 1/8/01 and that we will be picking up the baboon and botany team along the way.

31/7/01
My Birthday! We had a wonderful day, kicked off by a real breakfast of bacon and eggs, sausages, tomatoes and toast, with Angel delight for lunch and a steak for tea. Everyone was very relaxed and had a most enjoyable day.

PHASE THREE

1/8/01
Mike's team left to go down in the valley again. We watched them leave before packing up and heading up onto the lower plateau to wait for the truck. After a brief stop at Chelinda camp we picked up the baboon and botany group and headed towards Thazima gate, the closest we had been to civilisation for 16 days.

2/8/01
We took a walk into the village and spent some time with the village chief and some school children. The whole experience was a real eye-opener.

3/8/01
We went baboon watching this morning. We waited for ages and were eventually rewarded with a brief glimpse of their behinds as they ran off into the woods! We spent the afternoon at the local school giving a talk on education.

4/8/01
We spent the morning at our camp just washing clothes and relaxing. This afternoon we went to the local choir festival, which was a lot of fun. They had different choirs from all over the place and you could pay money to make some changes to their performance; for example no drums or singing faster.

5/8/01
We went on a mini safari back up onto the plateau. We saw a wide variety of animals including Eland, Bushbuck, Roan Antelope, Klipspringer, Warthogs, Bustards and Jackal. We stopped at Chelinda Lodge on the way home where we had an omelette for lunch and were allowed use of a proper toilet!

6/8/01
We were taken around the scout offices today and shown around the armoury. It was very interesting to see what had been confiscated from the poachers; skulls, spears, guns etc. There was a large crate full of wire snares. Manfred, our guide, told us that the poachers were not only threatening the animals but they were damaging the communities surrounding the park. They stole water pipes to make home-made guns and telephone wires (in the more affluent areas) to make snares.

THE JOURNEY BACK

7/8/01
First stage of our journey home onto Vwase marsh. We spent a pleasant evening on the marsh, played some cricket with a tennis ball and a log. We had a lovely meal and a fair amount of beer. Nikki, Mark, Bev and myself have paid extra to sleep in real beds, two single beds between the four of us should be fun!

8/8/01
We had a great night. The hippos came in really close. Today we wandered round the marsh, where we saw plenty of hippo in the water and on the bank. After breakfast it was on to Chinteche, down by Lake Malawi.

9/8/01
Chinteche is beautiful. When we arrived at the Inn last night we had drinks pressed into our hands the minute we were off the bus. Real beds, real toilets, real showers with hot running water and a beautiful view of the lake from our rooms. Many members of the group are going to watch some tribal dancing while others are just going to relax by the lakeside, its hard to believe that we are only here for one more night.

10/8/01
Final leg of the journey by mini bus, tonight we stay in the Imperial Hotel in Lilongwe, but before then some last minute shopping in the markets and our last meal together before we fly home.

SIGHTINGS IN THE NYIKA NATIONAL PARK

Helena M. Skinn

REPTILES
Five-lined Skink, Chamaeleon, Green Mamba, Grass Snake and Puff Adder.

BIRDS
Common Quail, Red-winged Francolin, White-backed Vulture, Augur Buzzard and Bustards.

MAMMALS
Four-striped Grass Mouse, Yellow Baboons, Side-striped Jackal, Burchell's Zebra, Warthog, Bush pig, Red and Common Duiker, Klipspringer, Grysbok, Roan Antelope, Eland and Reedbuck.

Holes, droppings and prints of another eleven mammals were identified;
Elephant Shrew burrows, Mole or Mole Rat burrows, Civet droppings, Mongoose droppings, Hyaena sounds, prints and droppings, Leopard droppings and prints, Elephant droppings and damage, Aardvark or Ant bear diggings, Buffalo prints, Porcupine quills and droppings, Hare droppings and burrows

Chamaeleon

MEDICAL REPORT

James R. Iles

IMMUNISATIONS

It was the responsibility of each member of the expedition team to seek their own medical advice regarding inoculations and medical precautions before visiting Malawi. This needs to be addressed well in advance (at least 2 months prior to travelling) as some immunisations require a course of injections. These injections can prove expensive so must be considered when budgeting for the expedition.

Current malarial advice was sought by individuals on a personal basis. The majority of the team took the stronger Larium tablets but some opted for Chloroquine based tablets because they are thought to have fewer side-effects. It is important to begin the course of these tablets a week in advance of travelling to check that there will be no nasty side-effects.

The actual risk of malaria appeared very minimal as we encountered no mosquitoes in the high terrain of Nyika. However, mosquitoes were present around the Lake and whilst travelling to Nyika from Lilongwe so anti-malarial drugs were an important precaution.

TRAINING

Every member was advised to have at least a basic first-aid training course, prior to departure. Some training was given on the training weekend. Advice in the RGS book on expedition medicine was discussed and the book recommended. Risk assessments were also discussed and signed.

FIRST AID KITS

Personal First Aid Kits

Every member was advised to bring their own basic medical supplies and these were used most. The Group Medical Kit was intended for emergencies and as a back-up to personal supplies.

Particularly useful items included re-hydration sachets to counter de-hydration which was common after the treks from base-camp, pain-killers like Ibuprofen to alleviate muscle pains, large plasters for blisters and tubigrips for sprained joints. As a team, we were low on supplies of good quality plasters and the tubigrips which we soon learnt were essential items.

Group First Aid Kits

These were not used very much mainly because individuals had brought their own supplies and because there were no emergencies. However, I felt these kits could be improved with more strong, durable plasters, tubigrips and saline bandages for burns.

It was reassuring to have a good supply of hospital equipment at base-camp in case of emergency and considering the lack of supplies in Malawian hospitals. Some people also brought their own personal medical kits which are designed to provide the essentials if you required hospitalisation. The hospital supplies were donated to Mzuzu Hospital on our return to Lilongwe.

CAMP HYGIENE

Maintaining hygiene around base-camp proved quite difficult because of the lack of a near-by, fast-flowing water source. When cooking, whilst we attempted to have a separate bowl for hand-washing and one for dish washing though this was difficult to maintain. Whilst we did have washing up liquid, we would have benefited from having a stronger anti-bacterial detergent, as well as Dettol.

Whilst camping away from base-camp, it was easier to manage hygiene because we were split into smaller groups and because we were near streams providing a plentiful supply of clean and flowing

water. We also tended to cook in pairs or individually whilst away from base camp, rather than as a group, which was better in terms of maintaining hygiene.

Anti-bacterial hand wash (without the need for water) proved to be an essential part of individual's equipment and everyone benefited from having their own supply of this.

The scouts built us a good latrine at base-camp but it was important to keep it covered to prevent flies getting at it and then flying around the camp.

WATER TREATMENT

We all made use of water-purifying methods to clean our drinking water. Some purifying tablets worked quicker than others but different treatments left different tastes in the water so it was down to personal preference about which type worked best.

DIET

The isolation of the expedition meant that supplies of fresh fruit and vegetables was limited and so having a multi-vitamin supplement was beneficial.

ILLNESS

Luckily, we experienced very little illness in the group. We had only a few minor stomach complaints and so obviously managed the conditions pretty well.

TEAM FITNESS

Fitness was a major issue for the expedition. Not every member of the group was fit enough and experienced enough to complete all of the research or cope with the remoteness. It thus became important early on, to adapt the work to suit the group. Because some struggled on the first trip into the lower valley, a few members of the team opted to stay at base-camp rather than trek up on to the plateau and the majority chose to spend the final week amongst the village community at Thazima. The varying levels of fitness amongst us probably caused the greatest problems and sometimes had a negative effect on team morale.

INJURIES

Luckily, we only experienced a few minor injuries. Common problems were bad blisters on feet, mild sprains of ankles or knee problems, and cuts and bruises from falling over.

REFERENCES

Warrell, D. and Anderson, S 1998 Expedition Medicine The Royal Geographical Society with the Institute of British Geographers.

MEDICAL KIT LISTS

Group kit list

Alcohol wipes
Antacid
Antifungal cream - Canesten
Antihistamine
Anti-inflammatory, e.g. Ibuprofen, Traxam, Bruffen
Antiseptic cream
Aspirin - for pain, fever and inflammation (alternatives are Paracetamol and Ibuprofen)
Athletes foot cream
Band aids - assorted sizes

Burn ointment
Candle and Matches
Codeine - mild to moderate pain and cough
Condoms
Co-Proxamol - Pain killers
Cotton open wove bandage - 1, 5, 7.5 cm wide
Crepe bandage - 1, 7.5, 10 cm wide
Decongestant e.g. Actifed, Sudafed
Disposable gloves
Ear drops
Elastoplast
Eye ointment
First aid field dressings
Gauze swabs - sterile and non sterile
Hydrocortisone cream - for itching skin or rashes
Iodine for water sterilisation
Laxative - Senokot
List of contents (waterproofed) - with doses of drugs and side effects
Local anaesthetic - Ligincaine
Local anaesthetic cream
Moleskin/ Second skin
Morphine
Non-adherent dressings
Norfloxacin - for bacterial dysentery
Oral rehydration powders
Paper and pencil
Paracetamol - for pain and fever
Face shield
Safety pins
Samsplint
Scissors
Sporidex, antibiotics for most infections, Augmentin
Sterile fluid - Sterets Unisept
Sterile needles and syringe
Sterile scalpel and razor blade
Sterile suture with needle
Steri-strips and butterfly sutures
Sunscreen
Temporary dental filing
Thermometer
Throat lozenges
Triangular Bandage
Tweezers

Personal First aid Kits

Anthisan
Antiseptic cream
Antiseptic wipes
Aspirin
Assorted dressings
Athletes foot powder
Crepe Bandage
Dressing strip
Ibuprofen
Meloin
Paracetamol
Plasters - assorted sizes
Rehydration powders - dioralyte
Sudocrem
Triangular Bandage
Vaseline
Zinc Oxide tape

ENVIRONMENTAL AUDIT: LEAVING THE ENVIRONMENT AS WE FOUND IT

Lianne S. Lewis

INTRODUCTION

Our presence in a largely remote region could have negative impacts on the environment but it was important to keep these to the bare minimum. To do this every individual of the group had to have their wits about them and be aware of their own impact. It was my job to see that the group as a whole was taking reasonable precautions.

We used the booklet produced by Chris Workman, Alison Gimingham and Clive Jermy, called “Environmental responsibility for expeditions, a guide to good practice" to identify areas in which to take particular care and to monitor our effects. These areas were grouped under four headings; Fieldwork, Community, Movement and Camp.

FIELDWORK

Trampling

It is important to try to stick to one path if possible to avoid trampling plants, habitats or disturbing animals en route.

Problems

In the case of our data gathering it was a necessity to carry out a quadrant plot lOOm x lOOm that involved 10 tracks being made through this area. Unfortunately this could not be avoided.

Successes

When travelling between plots the whole group walked in a single file led by a scout. The scouts ensured we took a route that reduced trampling damage e.g. avoiding trampling rare species.

Sampling

Only take samples that are vitally important for example newly discovered species. Do not take more than is really necessary in terms of samples to avoid depleting the environment unnecessarily.

Problems

Occasionally people may have taken flowers to press for their personal use.

Successes

No animal samples needed to be extracted from the park. Unnecessary samples were avoided as Hassam's expertise meant only those samples that were considered to be new species or of particular interest to the herbarium were taken.

COMMUNITY

Photography

It is very unwise to take photographs of anything with any military content, for fear of being arrested. It is also important to seek permission to take a photographs of a personal nature, whether it be of people, animals or houses or indeed of any personal belongings.

Problems

People did sometimes begrudge photographs being taken if they did not receive anything in return. Sometimes, as in any culture, this may be no more than securing an introduction and a polite request.

Successes

One member of the expedition group took a Polaroid camera with them. The local people found this very exciting and most welcomed a picture of themselves. In fact it drew a lot of attention especially from the African children.

Social Contact

Cultural differences must be considered, you are visiting a different country so respect that there will be cultural differences and that you must abide by the rules.

Problems

The language difference was not a problem most of the time but sometimes it caused difficulties. In some cases we were regarded as being rich and were expected to pay more for articles because of this.

Successes

Both us and the Malawians were interested in each other. It was a good learning experience for both parties. We were made to feel welcome and were included in many local events (e.g. football and a church festival). During our stay at Thazima village we were more accepted because we were friends with the scouts, who are well respected. It may have been different if we weren't associated with them. On our departure, many of the expeditioners left camping equipment with the scouts which was much appreciated.

Medical

We were equipped and trained to be as self-sufficient as possible. Our group medical kit included new, sterile, emergency hospital diposable equipment that was donated to Mzuzu Hospital after the expedition. In addition, simple medicines were donated to the nearest clinic at Chelinda.

Problems

Not everybody was self-sufficient in terms of personal medical kits.

Successes

We experienced no serious medical problems.

MOVEMENT

Between the airport and base camp, movement was by good quality, private bus, selectively hired commercially, including driver. Travel at night was avoided. Between Thazima and Chelinda, a four wheel drive park vehicle was used, which was the responsibility of the park manager.

Problems

On one occasion the weather was very wet. The vehicle got stuck and took a lot of attempts to move. In the process an area of ground (off the main track) was dug up and left very overturned. Luckily it was not a large area.

Successes

Quick and effective for long distances. The expedition would not have been possible without the use of a vehicle.

Walking

Although creating less of an impact than use of vehicles, consideration is need. Where paths existed, they were used. Routes were not marked permanently. Temporary marking systems were removed before leaving the area.

Problems

As the area studied was largely unexplored, there were not any proper paths. Game tracks were followed as far as possible. Five people sampling the 10,000 m² plots did result in more trampling than we would have liked. Unfortunately this was unavoidable if we were to retrieve the essentially important data.

Successes

The use of a GPS meant we could avoid the use of route marking. Apart from the sampling plots we made sure that when walking we did so in single file creating only one path.

CAMP

This is one of the most important factors to consider and if not planned appropriately it could possibly result in the most detrimental effects on the environment. Most of this section is up to individual responsibilities but there are also many to consider as a group.

Overall site

Problems

Base camp had to provide for the whole group, including scouts, which amounted to 20 people and 12 tents. Paths were created within base camp, but some trampling was inevitable.

Successes

Our base camp was confined to one area, the same area as used in previous years. Time in base camp was very limited, as the groups were mainly out at one of the six sub-camps. The base camp was well organised to minimise impact on the environment.

Fuel

Problems

Small open fires were often needed for warmth. Dead wood was not plentiful so scouts had to cut some wood for fires. The effect is minimised by our very temporary and somewhat nomadic existence. A small circle of fire damage to the ground could not be avoided, nor smoke pollution. However, this is negligible compared to the regular bushfires.

Successes

All fires were closely controlled. Only one fire would be lit at one time. Cooking was done on stoves powered by methylated spirits, which had minimal, if any, impact on the environment.

Waste

Problems

At base camp waste management was effective but for small groups at the overnight sub camps, the resources and time were not available for the group to be as strict, although attempts were made. Only shallow individual latrines were dug and filled in, for example. Burnt tins had to be brought back to base camp.

Successes

Base camp had very effective waste management. There was a food waste pit, where burnt tins were also put. There was a very deep latrine. Both were well filled in when base camp was left. Plastic and other rubbish was either burnt or stored in personal bags in one area at base camp and removed from the area. Utensils and bodies were washed using bowls, which were emptied into separate soakaway pits away from watercourses to avoid water pollution. Attempts made to keep pot washing bowls and hand washing bowls separate. As there were no upset stomach problems so this must have had an influence.

Other Successes

We camped on most occasions away from trees and a reasonable distance from water sources. We were careful not to disturb wildlife or plants too much. Most of the tents used were not bright and so did not cause a visual impact. We were never very loud so noise pollution was minimal.

IMPROVEMENTS

Attempts were made to keep the impacts to a minimum but problems still arose. Due to the nature of the expedition covering such a large area, it was difficult to stick to the books religiously. Many of the impacts could have been avoided if the expedition was confined to smaller areas but then we would not have achieved as much and helped Nyika as much as a result.

All the environmental guidelines should be discussed prior to the expedition and agreements made so that all expeditioners know where they stand. Books should be read about the topic.

REFERENCES

Jermy, C. & Chapman, R. 1993 Tropical Forest Expeditions Expedition Advisory Centre at the Royal Geographical Centre

Workman, C. Gimingham, A. and Jermy, C. 1995 Environmental Responsibility for Expeditions Young Explorer's Trust, British Ecological Society and the Expeditionary Advisory Centre.

Insert picture of man carving *(Mark Gilroy)*

Burchell's Zebra *Helena Skinn*

PHOTOGRAPHY

Nikki Vohra Beulens

INTRODUCTION

My aim was to create a photographic documentation of the work of a team of students and young professionals who embarked on an expedition to the remote Nyika National Park in northern Malawi. This was to include a set of colour slides for presentation talks, colour prints for the report and some prints for a photographic display of the work of the expedition.

The main aims of the team were

- To enhance the international understanding of the wilderness area of the Nyika National Park.
- To collect concrete scientific data on which to base sustainable management plans for retaining the biodiversity of this region.
- To assist the Parks Department in accessing and effectively policing the remotest areas of the Nyika National Park.
- To conduct surveys into the biodiversity and numbers of plants and animals contained within certain sections of the park.

Our team consisted of students and staff from The University of Lincoln, De Montfort University, Edinburgh University, Southampton University and Imperial College, London University. Each member brought a different skill to the team including forensic science, zoology and information technology.

My personal project as a photographer was to document various aspects of this expedition. Aspects included;

- "The expedition story" that could be presented in a sequence,
- Pictures to capture a flavour of the environment and various habitats, including rainforest patches, dambos, Protea scrub, woodland and grasslands.
- The team members and scouts carrying out activities and their achievements, any amusing incidents, close-ups of faces, local people.
- Any wildlife; plants and animals and the focus of the project work, using close-ups where possible.

The photographer retained copyright but agreed to the use of the photographs for the purposes of the talks, reports, and articles which would be properly acknowledged. In return the photographer agreed to properly acknowledge Biosearch Nyika with any publications or exhibitions.

PHOTOGRAPHIC EQUIPMENT

Nikon FM2 35 mm SLR camera Body
Nikon N90S 35mm SLR Camera
28-80mm Zoom Lens
100-300mm Zoom Lens
24mm Wide Angle Lens
35mm Wide Angle Lens
55mm Macro Lens
Extension Tubes
Tripod
Filters (Polarising, Red, Blue and Yellow)
Olympus C2000Z Digital Camera
Fuji Provia, Fuji Velvia, Fuji Reala, Ilford Delta Black and White Film
For the greater part I used Fuji Provia colour slide film and some black and white film. All the lenses were useful but I could easily have done with just the 28-80mm and 100-300mm lenses.

BOTANY

I. Hassam Patel and Marianne J. Overton

INTRODUCTION

This dry season study includes the Chipome Valley in the north of the Nyika National Park, and two river valleys in the south of the Park, the Lonyina and Chisimuka. As July/August is in the cool, dry season, the hillside vegetation was desiccated and early ephemeral species are not included here. The riverine vegetation remains intact, as well as species that are either later or more perennial.

METHODS

Because the areas covered were so large, with distinctive linear features such as rivers, it was decided to do 2m x 2m quadrats in a representative transect across the river valleys. A total of 74 quadrats were studied in three areas;

- the Chipome Valley area below base camp
- the upper slopes of the Lonyina Valley and
- the river valley near Chisimuka, a village at 6100m altitude.

In the Kasewerera riverine area, a straight forward search was carried out to create a qualitative list of species for the area.

RESULTS

A total of 582 species were identified and listed in table 1. Twenty-seven reference specimens were taken for the National Herbarium of Malawi. Specimens that could not easily be identified in the field were compared against reference specimens before submitting the final list for publication. Six species remain unidentified and are possibly new to science.

The list of new species not previously found in the Park were sent for reference to Dr Dick Brummitt, of the Kew Herbarium. Forty-six were not recorded by any of the previous expeditions. These are listed in family order in Table 2. Only six were found in the previously studied areas of the Chipome Valley. Each is recorded only once, out of 18 quadrats covering 72 m^2, indicating that it is uncommon. There were no new finds in the Lonyina Valley. The majority of the new finds were from the previously unrecorded areas, 26 from the Chisimuka Valley and 26 from the Kasewerera Valley. Searching in the Kasewerera Valley was most successful, collecting 16 new species not recorded from any other area.

Forty one species appeared in 1972 or before, but not in the intervening years until 2001. Most of these reappearances were from the Chisimuka Valley, though a few were from the Chipome.

DISCUSSION

It is remarkable that there have now been eight botanical expeditions to this remote wilderness area, all but one involving the same botanists, Dr Dick Brummitt and Hassam Patel, either in the field or in referencing specimens. These two people have indeed made a tremendous contribution to the sum total of knowledge in the area.

The preliminary checklist of all species identified on all seven previous expeditions between 1958 and 1999 was published in 1999 (Ed. Overton M.J., 2000). This included 1420 species. Seventy-nine new records were added in 1999 and a further forty-six in 2001. The fact that large numbers of new species

are still being identified every year is a tribute to the dedicated fieldwork and the tremendous diversity of the Nyika National Park.

The numbers of species recorded in each valley surveyed were as follows; 106 in the Chipome, 192 in the Lonyina, and 220 from searching in the Kasewerera. These are similar to the counts of the last dry season expedition at around 200, although considerably more quadrats were studied that year. Consistency could imply that the quadrat sampling was adequate to obtain a representative sample. The diversity is great, so that it is difficult to learn more than a few common species through the repetition of doing the quadrats. Each species appears on average, in only 3/18 quadrats.

Significantly more species were found in the Chisimuka area (339), including new records, implying that the area is naturally more diverse. However, more quadrats were studied in this area and the flora may be augmented by human activity, being nearer a road and a village which lies just outside the Park.

A comparison of wet and dry season botanical surveys in the Chipome and Mondwe valleys was done in 1997/8. (Overton, M.J, 1999) 41% of the species found in the wet season of 1997 were not found in the dry season of 1998. However, different new finds brought the total number of species up to nearly half as many again. Only one of our expeditions has been in the wet season. Investigating more remote areas of the Nyika National Park in the warm, wet season is likely to yeild the most new discoveries in future.

ACKNOWLEDGEMENTS

I sincerely thank the organisers, Peter and Marianne Overton, Directors of Biosearch Nyika for the annual invitations. I also thank the Acting General Manager of the National Herbarium of Malawi for allowing me to participate in the field and providing logistical support. Particular thanks are due to the Director and staff members of the Department of Parks and Wildlife for allowing us to work in the Park and for logistical support and security. Beverley Mason, Samantha Iles and Paul Robertson assisted me a lot in supplying field collections and assisting with the quadrat studies and records. Last, but not least, I extend thanks to all the expedition members with whom we worked tirelessly in the field.

REFERENCES

Brummitt, R. K. 1973 Systematic list of Nyika Botanical Collections Wye College 1972 Malawi Project, Final Report.

Chapman, J.D. And White, F. 1970 *The Evergreen Forests of Malawi*. Commonwealth Forestry Institute, University of Oxford.

Dowsett-Lemaire, F. 1985 The forest vegetation of the Nyika plateau (Malawi-Zambia): ecological and phenological studies. *Bulletin du Jardin botanique National de Belgique* **55**: 301-392.

Johnson, S.A. 1993 *A Visitor's Guide to Nyika National Park, Malawi.* Thembasi [Mbabzi] Book Trust, P.O.Box 1438, Blantyre, Malawi

Ludlow, H.R. and Patel, H.I. 1997 [River Catchment Survey] and [Botanical Results] in Overton, M.J. (ed). Malawi 1997. C.P. and M.J. Overton, Hilltop Farm, Welbourn, Lincs

Patel, I. H. and Overton, M.J. 1999 [Botany] in Overton, M.J. and Nagle, C.J.E. (Eds). Biosearch Nyika - Katumbu Challenge 1998. C.P. and M.J. Overton, Hilltop Farm, Welbourn, Lincs

Patel, I.H., Brummitt R.K., M.J. Overton, 2000 [List of identifications of plants collected in the Nyika National Park] in Overton, M.J. (ed) Scientific exploration of the Nyika National Park, Malawi 1999. C.P. and M.J. Overton, Hilltop Farm, Welbourn, Lincs LN5 0QH

Table 1: Species recorded by this expedition in each of four valleys

* Species not recorded on expeditions prior to 2001

58	70	72	97	98	99	01	← Year	Location →	Chipome		Lonyina		Chisimuka		Ave	Ka
							Species	Number of quadrats of 74 total→	18	%	20	%	36	%	%	s
						01*	*Acacia abyssinica*		0	0	0	0	0	0	0	1
				98		01	*Acacia galpinii*		1	6	0	0	0	0	2	0
				98		01	*Acacia macrothyrsa*		1	6	0	0	0	0	2	0
			97			01	*Acalypha chirindica S. Moore*		0	0	0	0	4	11	4	0
			97	98		01	*Acalypha fimbriata Schumach. & Thonn.*		1	6	0	0	0	0	2	0
			97	98	99	01	*Acalypha ornata Hochst. ex A. Rich.*		0	0	1	5	4	11	5	1
			97	98		01	*Acalypha polymorpha*		0	0	0	0	1	3	1	0
				98		01	*Acalypha psilostachya*		0	0	0	0	4	11	4	1
			97	98		01	*Adiantum poiretii*		0	0	0	0	1	3	1	0
		72				01	*Adiantum reniforme*		0	0	0	0	0	0	0	1
			97			01	*Aeollanthus engleri*		0	0	0	0	0	0	0	1
				98		01	*Aeschynomene cristata*		0	0	0	0	1	3	1	0
			97	98	99	01	*Aeschynomene nyassana*		0	0	5	25	3	8	11	0
			97	98	99	01	*Aeschynomene nyikensis Baker*		0	0	1	5	11	31	12	1
			97	98		01	*Agathisanthemum globosum*		0	0	1	5	0	0	2	0
			97			01	*Agelanthus mollerii (Engl.) Polhill & Wiens*		0	0	0	0	1	3	1	1
			97		99	01	*Ageratinastrum goetzeana (O.Hoffm.) Matff.*		0	0	0	0	1	3	1	0
			97	98		01	*Ageratum conyzoides*		0	0	0	0	0	0	0	1
			97			01	*Agrocharis incognita*		0	0	1	5	0	0	2	0
			97			01	*Agrocharis pedunculata*		0	0	1	5	0	0	2	0
						01*	*Albizia antunesiana*		0	0	0	0	1	3	1	1
				98	99	01	*Albizia gummifera*		0	0	0	0	0	0	0	1
				98		01	*Albuca chlorantha*		0	0	0	0	1	3	1	0
			97	98	99	01	*Alepidea gracilis*		0	0	1	5	0	0	2	1
			97	98	99	01	*Alepidea longifolia*		0	0	3	15	1	3	6	0
			97	98		01	*Alepidea propinqua*		0	0	0	0	1	3	1	0
			97	98	99	01	*Allophylus chaunostachys*		0	0	4	20	5	14	11	0
			97			01	*Aloe christianii*		0	0	0	0	0	0	0	1
			97	98	99	01	*Aloe duckeri*		0	0	1	5	0	0	2	0
			97			01	*Aloe nuttii Baker*		0	0	0	0	1	3	1	0
						01*	*Alternanthera sessilis*		0	0	0	0	0	0	0	1
						01*	*Ampelocissus africana*		0	0	0	0	0	0	0	1
						01*	*Ampelocissus sp*		0	0	0	0	1	3	1	0
			97	98		01	*Andropogon amethystinus*		0	0	0	0	1	3	1	0
			97	98		01	*Andropogon schirensis*		0	0	1	5	0	0	2	0
						01*	*Aneilema sp*		0	0	0	0	1	3	1	0
						01	*Anthericum malosanum*		0	0	0	0	1	3	1	0
			97	98	99	01	*Anthospermum herbaceum*		0	0	1	5	5	14	6	1
						01*	*Anthospermum randii*		0	0	0	0	1	3	1	0
					99	01	*Aphloia theiformis (Vahl.)Benn.*		0	0	0	0	2	6	2	0
			97	98		01	*Apium leptophyllum*		0	0	0	0	0	0	0	1
			97	98	99	01	*Apodytes dimidiata E.Mey & Arn.subsp. dimidiata*		0	0	0	0	1	3	1	1
				98		01	*Argyrolobium globosum*		0	0	1	5	0	0	2	0
			97		99	01	*Argyrolobium rupestre*		0	0	0	0	1	3	1	0
					99	01	*Aristida junciformis Trin & Rupr. subsp. serrulata (DC.) Roessler..*		1	6	1	5	1	3	4	0

		98		01	*Aristida recta*	2	11	2	10	0	0	7	0
				01*	*Artabotrys monteiroae*	0	0	0	0	0	0	0	1
	97	98	99	01	*Artemisia afra Jacq.*	0	0	0	0	1	3	1	0
		98		01	*Arthropteris monocarpa*	0	0	0	0	2	6	2	1
		98		01	*Arthropteris pterocaulon*	0	0	0	0	2	6	2	1
	97	98	99	01	*Asparagus africana*	1	6	3	15	3	8	10	0
	97	98	99	01	*Asparagus angolensis*	0	0	0	0	0	0	0	1
	97	98		01	*Asparagus laricinus*	0	0	1	5	0	0	2	0
	97		99	01	*Asparagus virgatus*	0	0	0	0	0	0	0	1
	97	98	99	01	*Aspilia kotschyii*	0	0	5	25	0	0	8	1
	97		99	01	*Aspilia mossambicensis*	0	0	3	15	3	8	8	1
	97	98	99	01	*Aspilia pluriseta*	0	0	2	10	2	6	5	0
		98	99	01	*Asystasia schimperi*	0	0	1	5	0	0	2	1
	97	98	99	01	*Athrixia rosmariniifolia Oliv. & Hiern.*	0	0	1	5	3	8	4	1
58	97	98	99	01	*Athyrium schimperi*	0	0	0	0	2	6	2	0
	97	98		01	*Azanza garckeana*	1	6	0	0	0	0	2	0
		98		01	*Barleria eranthemoides*	2	11	0	0	0	0	4	0
		98		01	*Barleria fulvostellata*	1	6	1	5	0	0	4	0
		98		01	*Barleria lactiflora*	1	6	0	0	0	0	2	0
	97	98		01	*Bauhinia petersiana*	3	17	0	0	0	0	6	0
	97	98	99	01	*Becium grandiflorum*	1	6	1	5	0	0	4	0
		98	99	01	*Becium obovatum*	1	6	0	0	0	0	2	0
			99	01	*Beckeropis uniseta*	0	0	2	10	0	0	3	0
	97	98	99	01	*Bersama abyssinica*	0	0	0	0	2	6	2	0
			99	01	*Bersama zombensis*	0	0	0	0	1	3	1	0
		98		01	*Bidens kilimandscharica*	0	0	0	0	2	6	2	0
		98		01	*Bidens pilosa*	0	0	0	0	0	0	0	1
		98		01	*Bidens steppia*	0	0	0	0	6	17	6	1
				01	*Biophytum nyikense*	2	11	0	0	0	0	4	0
	97	98	99	01	*Blepharis grandis*	2	11	2	10	26	72	31	1
	97			01	*Blumea (Laggera) brevipes*	0	0	1	5	5	14	6	0
	97	98	99	01	*Blumea alata (Laggera crispata)*	0	0	2	10	6	17	9	0
			99	01	*Blumea mollis*	0	0	1	5	3	8	4	0
		98		01	*Boophone disticha*	0	0	0	0	0	0	0	1
				01	*Bothriocline eupatoriodes*	0	0	0	0	1	3	1	0
70	97		99	01	*Bothriocline inyangana N.E.Br.*	0	0	0	0	1	3	1	0
		98		01	*Bothriocline kilimandscharica*	0	0	1	5	0	0	2	0
	97	98		01	*Bothriocline longipes*	0	0	1	5	1	3	3	0
		98		01	*Bothriocline pectinata*	0	0	1	5	0	0	2	0
	97			01	*Bothriocline ripensis*	0	0	1	5	1	3	3	0
		98		01	*Bothriocline tomentosa*	0	0	2	10	2	6	5	0
	97			01	*Bothriocline trifoliata (De Wild. & Muschl.) Wild & G. V. Pope*	0	0	1	5	2	6	4	0
	97	98		01	*Brachystegia allenii Burtt Davy & Hutch.*	3	17	0	0	0	0	6	2
	97	98	99	01	*Brachystegia boehmii*	1	6	1	5	0	0	4	0
	97	98		01	*Brachystegia bussei*	0	0	0	0	0	0	0	2
	97	98	99	01	*Brachystegia longifolia*	0	0	0	0	0	0	0	1
	97	98		01	*Brachystegia manga*	2	11	0	0	0	0	4	0
	97	98	99	01	*Brachystegia spiciformis Benth.*	18	100	5	25	6	17	47	2
	97			01	*Brachystegia taxifolia*	0	0	2	10	0	0	3	0
	97	98	99	01	*Brachystegia utilis*	0	0	3	15	1	3	6	1

			98		01	*Brachythrix glomerata (Mattf.) C. Jeffrey*	0	0	1	5	2	6	4	0
		97	98		01	*Brachythrix sonchoides Wild & G. V. Pope*	0	0	0	0	2	6	2	0
		97	98		01	*Brachythrix stolzii*	0	0	2	10	1	3	4	0
		97	98	99	01	*Bridelia brideliifolia*	0	0	0	0	1	3	1	0
		97	98		01	*Bridelia carthartica*	1	6	0	0	0	0	2	0
			98		01	*Bridelia micrantha*	1	6	1	5	0	0	4	2
			98		01	*Bridelia mollis*	0	0	0	0	2	6	2	1
		97	98		01	*Buchnera cryptocephala (Baker) Philcox*	1	6	0	0	0	0	2	0
		97	98	99	01	*Buchnera lastii Engl. subsp. lastii*	1	6	0	0	0	0	2	0
		97	98	99	01	*Buchnera nuttii Skan.*	0	0	1	5	1	3	3	0
		97	98		01	*Buddleja dysophylla*	0	0	1	5	3	8	4	0
			98	99	01	*Burkea africana*	0	0	1	5	0	0	2	0
		97	98		01	*Carduus nyassana*	0	0	2	10	5	14	8	0
		97	98	99	01	*Carex brassii*	0	0	0	0	1	3	1	0
		97	98	99	01	*Carex chlorosaccus.*	0	0	0	0	1	3	1	0
		97	98	99	01	*Carex conferta*	0	0	0	0	2	6	2	0
			98		01	*Cassia abbreviata*	1	6	0	0	0	0	2	0
			98		01	*Cassine aethiopica*	0	0	0	0	0	0	0	1
			98	99	01	*Cassytha filiformis*	0	0	1	5	9	25	10	0
					01*	*Catha edulis*	0	0	0	0	7	19	6	1
			98		01	*Catunaregam spinosa*	1	6	1	5	0	0	4	0
		97		99	01	*Centella asiatica*	0	0	0	0	0	0	0	1
		97	98	99	01	*Chamaecrista mimosoides L.*	0	0	0	0	5	14	5	1
		97	98	99	01	*Chironia gratissima*	0	0	0	0	1	3	1	0
	72	97	98		01	*Chironia laxiflora Baker*	0	0	1	5	1	3	3	0
		97	98		01	*Chlorophytum colubrinum*	0	0	0	0	3	8	3	0
		97			01	*Chlorophytum glabriflorum*	0	0	0	0	3	8	3	0
		97	98		01	*Chlorophytum orchidastrum*	1	6	0	0	2	6	4	0
	58	97	98		01	*Chlorophytum stolzii*	0	0	1	5	0	0	2	0
				99	01	*Chrysanthemoides molinifera (L.)Norl. subsp.septentrionalis*	0	0	0	0	3	8	3	0
		97	98	99	01	*Cirsium buchwaldii*	0	0	4	20	5	14	11	0
			98		01	*Cissus integrifolia*	1	6	0	0	0	0	2	0
		97	98		01	*Cissus rubiginosa*	0	0	0	0	1	3	1	1
					01*	*Cissus rupestris*	1	6	0	0	0	0	2	0
		97		99	01	*Clausena anisata (Willd.) Hook.f.ex Benth.*	0	0	0	0	8	22	7	0
		97	98	99	01	*Clematis simensis*	0	0	0	0	5	14	5	0
			98		01	*Clematis uhehensis*	0	0	1	5	2	6	4	0
		97	98	99	01	*Clematis chrysocarpa*	0	0	6	30	9	25	18	0
		97	98	99	01	*Clematis villosa*	0	0	3	15	6	17	4	1
				99	01	*Clerodendrum capitatum*	0	0	0	0	1	3	1	0
			98	99	01	*Clerodendrum kirkii Baker*	1	6	0	0	0	0	2	0
		97	98	99	01	*Clutia abyssinica*	0	0	3	15	6	17	11	0
		97	98	99	01	*Clutia paxii*	0	0	2	10	2	6	5	0
		97	98	99	01	*Clutia whytei Hutch.*	0	0	2	10	3	8	6	0
		97			01	*Coccinia adoensis*	0	0	0	0	1	3	1	0
		97	98		01	*Combretum collinum*	0	0	0	0	0	0	0	1
			98	99	01	*Combretum molle*	2	11	2	10	0	0	7	2
					01*	*Combretum zeyheri*	0	0	0	0	0	0	0	1
		97			01	*Commelina africana*	0	0	1	5	0	0	2	0
		97			01	*Commelina benghalensis*	0	0	0	0	2	6	2	0

		98		01	*Commiphora mozambicensis*	1	6	0	0	0	0	2	0
	97		99	01	*Convoluvulus sagittatus Thunb.var.sagittatus*	0	0	0	0	1	3	1	1
	97			01	*Conyza conyzoides*	0	0	0	0	0	0	0	1
	97			01	*Conyza tigrensis Oliv. & Hiern*	0	0	0	0	0	0	0	1
	97	98	99	01	*Crassula alba*	0	0	0	0	1	3	1	0
			99	01	*Crepis hypochaeridea (DC.) Thell.*	0	0	1	5	1	3	3	1
				01	*Crepis newii*	1	6	0	0	0	0	2	0
				01	*Crocosmia aurea*	0	0	0	0	1	3	1	0
70		98	99	01	*Crotalaria argyroloboides Bak.*	0	0	0	0	2	6	2	0
70	97	98		01	*Crotalaria dedzana Polhill*	0	0	0	0	1	3	1	0
	97	98		1	*Crotalaria goetzei*	0	0	0	0	0	0	0	
				01*	*Crotalaria homblei*	0	0	0	0	0	0	0	
	97	98	99	1	*Crotalaria kipandensis*	1	6	0	0	0	0	2	0
			99	1	*Crotalaria natalitia*	0	0	0	0	2	6	2	
			99	1	*Crotalaria pilosiflora Bak.*	0	0	0	0	3	8	3	0
				1	*Crotalaria recta*	0	0	0	0	2	6	2	0
		98		01	*Croton macrostachys*	0	0	5	25	1	3	9	1
70				01*	*Cryptolepis nigritana*	0	0	0	0	3	8	3	0
		98		01	*Cryptolepis oblongifolia*	1	6	2	10	1	3	6	0
		98	99	01	*Cryptosepalum maraviense*	10	56	1	5	0	0	20	0
		98	99	01	*Cussonia arborea*	0	0	0	0	0	0	0	1
	97			01	*Cussonia spicata*	0	0	1	5	5	14	6	1
				01*	*Cyathodium africanum*	0	0	0	0	1	3	1	0
			99	01	*Cyperus adenophorum*	1	6	0	0	1	3	3	0
			99	01	*Cyperus aethiops Ridley*	0	0	0	0	1	3	1	0
	97	98	99	01	*Cyperus deciduus Boeck.*	0	0	1	5	0	0	2	0
	97	98	99	01	*Cyperus distans*	0	0	0	0	0	0	0	1
	97	98		01	*Cyperus lutens Boeck.*	0	0	0	0	2	6	2	0
				01	*Cyperus margaritaceus*	0	0	0	0	1	3	1	0
	97	98	99	01	*Cyperus niger Ruiz & Pav. subsp. elagantulus*	0	0	0	0	1	3	1	0
	97	98	99	01	*Cyperus pilosus*	1	6	0	0	1	3	3	0
		98		01	*Cyperus rotundus*	0	0	0	0	0	0	0	1
	97	98		01	*Cyphia lasiandra Diels*	0	0	0	0	1	3	1	0
	97			01	*Cyphostemma wittei (Staner) Wild & R. B. Drumm.*	0	0	0	0	1	3	1	1
		98		01	*Dalbergia lactea*	0	0	0	0	0	0	0	1
		98		01	*Dalbergia nitidula*	3	17	1	5	0	0	7	0
	97			01	*Desmodium barbatum Benth.*	2	11	2	10	0	0	7	0
	97			01	*Desmodium gangeticum (L.) DC.*	0	0	0	0	4	11	4	1
				01*	*Desmodium salicifolium*	0	0	0	0	2	6	2	0
	97	98		01	*Dichrostachys cinerea*	1	6	0	0	0	0	2	0
	97	98	99	01	*Dicliptera lingulata*	1	6	1	5	0	0	4	1
	97	98	99	01	*Dicoma amoena*	0	0	1	5	1	3	3	0
		98		01	*Dicoma sessiflora*	1	6	0	0	0	0	2	0
		98	99	01	*Diospyros zombensis*	0	0	0	0	6	17	6	0
		98		01	*Diplorhynchus condylocarpon*	0	0	0	0	0	0	0	1
	97		99	01	*Dissotis melleri*	0	0	0	0	0	0	0	1
	97	98	99	01	*Dissotis princeps*	1	6	0	0	13	36	14	2
	97	98	99	01	*Dodonaea viscosa*	0	0	0	0	2	6	2	0
	97	98	99	01	*Dolichos kalimandscharicus*	0	0	1	5	7	19	8	1
				01	*Dolichos malosanus*	0	0	0	0	0	0	0	1

	97	98	99	01	*Dombeya burgessiae*	0	0	3	15	7	19	11	2
				01*	*Dombeya kirkii*	0	0	0	0	1	3	1	0
	97	98	99	01	*Dombeya rotundifolia*	0	0	3	15	11	31	15	1
				01*	*Dracaena ramosissima*	0	0	0	0	1	3	1	0
				01*	*Dregea sp*	0	0	0	0	1	3	1	0
	97	98	99	01	*Droogmansia pteropus*	4	22	8	40	16	44	36	2
	97	98	99	01	*Dyschoriste albiflora*	0	0	0	0	1	3	1	0
	97	98	99	01	*Dyschoriste fischeri*	0	0	0	0	1	3	1	1
		98		01	*Dyschoriste hildebrandii*	0	0	0	0	1	3	1	0
	97	98		01	*Dyschoriste nyassica Gilli*	0	0	1	5	1	3	3	0
	97	98	99	01	*Dyschoriste verticillaris*	0	0	1	5	9	25	10	1
	97	98	99	01	*Elephantopus scaber*	1	6	2	10	1	3	6	0
		98		01	*Embelia schimperi*	0	0	0	0	0	0	0	2
		98		01	*Eragrostis aspera*	0	0	0	0	1	3	1	0
		98		01	*Eragrostis ciliaris*	0	0	1	5	0	0	2	0
		98		01	*Eragrostis patens*	0	0	1	5	0	0	2	0
		98		01	*Eragrostis tenuifolia*	0	0	1	5	0	0	2	0
	97	98	99	01	*Erica benguelensis*	1	6	1	5	0	0	4	0
	97	98	99	01	*Eriosema buchananii*	0	0	3	15	5	14	10	1
		98		01	*Eriosema caudifolium*	0	0	1	5	1	3	3	0
	97	98	99	01	*Eriosema ellipticum*	0	0	2	10	2	6	5	1
58			99	01	*Eriosema englerianum Harms.*	0	0	1	5	3	8	4	0
	97		99	01	*Eriosema flexuosum*	0	0	0	0	1	3	1	0
		98	99	01	*Eriosema montanum*	0	0	2	10	0	0	3	0
	97	98	99	01	*Eriosema nutans*	0	0	0	0	1	3	1	0
		98		01	*Eriosema polystachyum*	0	0	0	0	2	6	2	0
		98		01	*Eriosema shirense*	0	0	0	0	1	3	1	0
	97	98	99	01	*Eriosema youngii*	0	0	0	0	1	3	1	0
			99	01	*Erlangea abyssinica*	0	0	0	0	1	3	1	0
		98	99	01	*Erythrina abyssinica*	0	0	2	10	1	3	4	2
	97	98	99	01	*Erythrocephalum zambesianum*	1	6	4	20	4	11	12	1
			99	01	*Erythroxylum emarginatum*	0	0	0	0	0	0	0	1
	97	98	99	01	*Euclea schimperi*	1	6	0	0	0	0	2	1
	97	98	99	01	*Eulalia villosa (Thunb.) Nees*	3	17	0	0	0	0	6	0
				01	*Eulophia angolensis*	0	0	0	0	1	3	1	0
				01*	*Eulophia brevisepala*	0	0	0	0	1	3	1	0
		98		01	*Eulophia orthoplectra*	0	0	0	0	0	0	0	1
72				01	*Eulophia paivaeana*	0	0	0	0	0	0	0	1
				01	*Eulophia thomsonii*	0	0	0	0	2	6	2	0
	97	98	99	01	*Euphorbia depauperata*	0	0	0	0	2	6	2	0
	97			01	*Euphorbia schimperiana Scheele var. pubescens (N. E. Br.) S. Carter*	0	0	0	0	1	3	1	0
		98	99	01	*Fadogia andongensis*	1	6	0	0	0	0	2	0
		98		01	*Fadogia stenophylla*	0	0	0	0	0	0	0	1
		98		01	*Fadogiella stigmatoloba*	3	17	4	20	1	3	13	0
		98	99	01	*Faurea saligna*	0	0	0	0	0	0	0	2
	97	98		01	*Faurea speciosa*	0	0	6	30	5	14	15	1
			99	01	*Felicia boehmii O.Hoffm.*	0	0	0	0	2	6	2	0
			99	01	*Festuca abyssinica*	2	11	0	0	0	0	4	0
	97	98	99	01	*Festuca africana (Hack.) Clayton*	0	0	1	5	0	0	2	0
				01*	*Festuca erecta*	1	6	0	0	0	0	2	0

		98	99	01	*Ficus natalensis*	0	0	1	5	0	0	2	0
	72			01	*Ficus sp aff soldanella*	2	11	0	0	0	0	4	0
			99	01	*Ficus stulmanniana*	0	0	1	5	0	0	2	0
		98	99	01	*Ficus sur*	0	0	0	0	1	3	1	1
				01*	*Ficus thonningii*	0	0	0	0	2	6	2	1
		98	99	01	*Flacourtia indica*	0	0	0	0	0	0	0	1
	97	98	99	01	*Flemingia grahamiana*	0	0	8	40	3	8	16	2
		98		01	*Friesodielsia obovata*	0	0	0	0	0	0	0	1
	97	98	99	01	*Galium bussei*	0	0	1	5	7	19	8	0
	97	98	99	01	*Galium scabrellum*	0	0	2	10	8	22	11	0
		98		01	*Geniosporum paludosum*	0	0	2	10	0	0	3	0
	97	98	99	01	*Geniosporum rotundifolium Briq.*	0	0	1	5	1	3	3	1
	97	98		01	*Geniosporum strictum*	0	0	0	0	1	3	1	0
	97	98	99	01	*Geranium arabicum*	0	0	0	0	2	6	2	0
	97	98		01	*Gerbera ambigua*	0	0	2	10	2	6	5	0
	97			01	*Gerbera viridifolia*	0	0	1	5	1	3	3	0
	97	98	99	01	*Gladiolus dallenii Van Geel*	0	0	2	10	2	6	5	0
				01	*Gnaphalium luteoalbum*	0	0	0	0	0	0	0	1
		98		01	*Gnidia glauca (probably not chapmannii)*	0	0	1	5	8	22	9	0
70		98		01	*Grewia truncata*	1	6	0	0	0	0	2	0
	97	98		01	*Guizotia scabra (Vis.) Chiov.*	0	0	1	5	3	8	4	2
	97	98	99	01	*Halleria elliptica*	0	0	0	0	0	0	0	1
			99	01	*Haumaniastrum callianthum (Briq.) Harley*	0	0	1	5	2	6	4	1
	97	98		01	*Haumaniastrum villosum (Benth.) P.A.Duvign. & Planche*	0	0	0	0	8	22	7	0
	97	98		01	*Helichrysum cymosum*	0	0	2	10	4	11	7	0
	97	98		01	*Helichrysum foetidum*	0	0	0	0	1	3	1	0
	97	98		01	*Helichrysum forsskaolii (J. F. Gmel.) Hilliard & B.L. Burtt*	0	0	5	25	6	17	14	0
	97			01	*Helichrysum fruiticosum*	0	0	0	0	1	3	1	0
	97	98	99	01	*Helichrysum kirkii*	4	22	9	45	13	36	34	1
	97	98	99	01	*Helichrysum latifolium*	0	0	0	0	12	33	11	0
	97	98	99	01	*Helichrysum nudifolium*	0	0	0	0	1	3	1	0
	97	98	99	01	*Helichrysum odoratissimum*	0	0	1	5	2	6	4	0
	97	98	99	01	*Helichrysum patulifolium Baker*	1	6	1	5	0	0	4	0
		98		01	*Helichrysum patulum*	0	0	1	5	0	0	2	0
	97	98	99	01	*Helichrysum petersii*	0	0	1	5	0	0	2	0
	97	98	99	01	*Helichrysum plantaginifolium*	0	0	1	5	0	0	2	0
		98		01	*Helichrysum senegalensis*	0	0	1	5	0	0	2	0
	97	98	99	01	*Helichrysum squamosum*	0	0	1	5	0	0	2	0
			99	01	*Helichrysum tillandsiifolium O.Hoffm.*	0	0	0	0	1	3	1	0
	97		99	01	*Helichrysum tithonioides*	0	0	1	5	0	0	2	0
				01*	*Helichrysum trachyphyllum*	0	0	0	0	0	0	0	1
				01	*Helinus mystacinus*	0	0	0	0	2	6	2	0
			99	01	*Herschelianthe baurii (H.Bol.) Rausch..*	0	0	0	0	1	3	1	0
70	97	98	99	01	*Heteromorpha trifoliata*	0	0	0	0	1	3	1	0
				01*	*Heteropyxis dehniae*	0	0	0	0	1	3	1	0
				01*	*Hibiscus cannabinus*	0	0	0	0	2	6	2	1
				01*	*Hibiscus diversifolius*	0	0	0	0	0	0	0	1
	97	98	99	01	*Hibiscus ludwigii Eckl.& Zeyh.*	0	0	1	5	0	0	2	1
				01	*Hibiscus rhodanthus*	0	0	0	0	0	0	0	1
			99	01	*Homalocheilus ramosissimus (Hook.f) J.K.Morton.*	0	0	1	5	2	6	4	0

	97	98	99	01	*Hyparrhenia cymbaria*	2	11	8	40	16	44	32	2
		98		01	*Hyparrhenia dissoluta*	4	22	0	0	0	0	7	0
	97	98	99	01	*Hyparrhenia dregeana (Nees) Stapf..*	2	11	6	30	4	11	17	1
		98		01	*Hyparrhenia filipendula*	8	44	0	0	1	3	16	1
	97	98	99	01	*Hyparrhenia nyassae (Rendle) Stapf.*	6	33	0	0	0	0	11	0
	97		99	01	*Hypericum peplidifolium*	0	0	0	0	0	0	0	1
	97		99	01	*Hypericum quartianum*	0	0	0	0	0	0	0	1
		98		01	*Hypoestes forsskaolii*	4	22	0	0	0	0	7	1
			99	01	*Ilex mitis (L.) Radlk.*	0	0	0	0	0	0	0	1
				01	*Impatiens gomphophylla*	0	0	0	0	3	8	3	0
	97			01	*Imperata cylindrica*	0	0	3	15	6	17	11	2
	97	98		01	*Indigofera fuscosetosa Baker*	0	0	0	0	1	3	1	0
	97			01	*Indigofera goetzei Harms*	0	0	0	0	0	0	0	1
	97	98		01	*Indigofera hedyantha Eckl. & Zeyh.*	0	0	2	10	2	6	5	0
			99	01	*Indigofera hilaris Eckl. & Zeyh.*	0	0	1	5	2	6	4	2
	97	98		01	*Indigofera homblei*	0	0	2	10	10	28	13	2
	97	98	99	01	*Indigofera lyallii*	0	0	0	0	0	0	0	1
	97	98		01	*Indigofera nyikensis*	0	0	1	5	0	0	2	0
		98		01	*Indigofera spicata*	0	0	0	0	0	0	0	1
				01*	*Indigofera subulifera*	0	0	0	0	1	3	1	1
	97	98		01	*Indigofera trachyphylla Oliv.*	0	0	0	0	4	11	4	0
		98		01	*Indigofera volkensis*	1	6	0	0	0	0	2	0
	97	98	99	01	*Inula glomerata*	6	33	18	90	24	67	63	1
		98		01	*Ipomoea eriocarpa*	0	0	0	0	4	11	4	0
58	97	98	99	01	*Ipomoea involucrata Beauv.*	0	0	0	0	5	14	5	0
				01*	*Ipomoea tenuirostris*	0	0	0	0	3	8	3	1
	97			01	*Isachne angolensis*	0	0	1	5	2	6	4	0
	97	98	99	01	*Isoberlinia angolensis (Benth.) Hoyle & Brenan*	0	0	4	20	4	11	10	1
		98	99	01	*Isoberlinia stolzii*	0	0	1	5	0	0	2	1
	97	98	99	01	*Julbernardia paniculata*	1	6	2	10	0	0	5	1
	97	98		01	*Julbernardia globiflora (Benth.) Troupin*	0	0	0	0	0	0	0	1
			99	01	*Justicia striolata Mildbr.*	0	0	2	10	3	8	6	0
			99	01	*Kalanchoe lanceolata Pers.*	0	0	0	0	1	3	1	1
				01*	*Keetia foetida*	0	0	0	0	0	0	0	1
			99	01	*Keetia gueinzii*	0	0	0	0	1	3	1	0
				01*	*Knipfofia thomsonii*	0	0	0	0	0	0	0	1
	97	98		01	*Kniphofia grantii*	0	0	0	0	2	6	2	0
	97	98	99	01	*Kniphofia splendens*	0	0	0	0	11	31	10	0
				01*	*Kohautia coccinea*	1	6	0	0	0	0	2	0
			99	01	*Kotschya aeschynomenoides (Welw.ex Bak.) De Wit & Duvign.*	0	0	0	0	1	3	1	0
	97	98		01	*Kotschya thymodora (Baker f.) Wild subsp. septentrionalis Verdc.*	0	0	0	0	0	0	0	1
	97	98		01	*Kotschya uguenensis (Taub.) F. White*	0	0	0	0	1	3	1	0
	97			01	*Landolphia kirkii*	0	0	0	0	2	6	2	0
				01*	*Landolphia petersiana*	0	0	0	0	0	0	0	1
	97	98	99	01	*Lannea discolor*	3	17	0	0	0	0	6	1
		98	99	01	*Lannea edulis*	0	0	0	0	0	0	0	2
			99	01	*Lecaniodiscus fraxinifolius*	0	0	0	0	1	3	1	0
	97			01	*Lefebvrea grantii*	0	0	0	0	1	3	1	0
	97			01	*Lefebvrea stuhlmannii*	0	0	1	5	1	3	3	0

				99	01	*Lelya prostrata (R.Good) Walt.. Lewis var.prostrata*	3	17	1	5	0	0	7	0
		97	98	99	01	*Leonotis mollisima*	1	6	0	0	1	3	3	0
		99	98	99	01	*Leonotis nepetifolia*	0	0	0	0	1	3	1	0
			98	99	01	*Leonotis pole-evansii Hutch.*	0	0	1	5	0	0	2	0
58				99	01	*Lepidotrichilia volkensii*	0	0	0	0	1	3	1	0
	72				01	*Leucas deflexa*	0	0	0	0	2	6	2	0
				99	01	*Leucas martinicensis*	0	0	1	5	0	0	2	0
			98		01	*Leucas masaiensis*	0	0	0	0	1	3	1	1
		97	98	99	01	*Lippia plicata Baker*	0	0	1	5	0	0	2	0
		97	98	99	01	*Lippia woodii*	0	0	1	5	3	8	4	0
	72				01	*Lobelia giberroa*	0	0	0	0	1	3	1	0
					01	*Lobelia mildbraedii*	0	0	0	0	2	6	2	1
70		97	98		01	*Lobelia ovina*	0	0	0	0	1	3	1	0
70		97	98		01	*Lobelia trullifolia Hemsl.*	0	0	0	0	0	0	0	1
		97	98	99	01	*Lotus discolor*	0	0	0	0	6	17	6	0
	72				01	*Lotus goetzei*	0	0	0	0	2	6	2	1
		97	98		01	*Loudetia simplex (Nees.) C. E. Hubb.*	1	6	0	0	0	0	2	0
					01*	*Macaranga capensis*	0	0	0	0	1	3	1	0
					01*	*Macaranga kilimandscharica*	0	0	0	0	1	3	1	0
		97	98	99	01	*Maesa lanceolata*	2	11	2	10	13	36	19	1
			98		01	*Magnistipula butayei*	0	0	1	5	0	0	2	2
58					01	*Mariscus deciduus*	0	0	0	0	1	3	1	0
			98		01	*Markhamia obtusifolia*	0	0	0	0	2	6	2	0
70		97	98	99	01	*Maytenus heterophylla (Eckl. & Zeyh.) N. Robson*	0	0	2	10	7	19	10	1
		97		99	01	*Maytenus senegalensis (Lam.) Exell.*	1	6	0	0	0	0	2	1
					01*	*Melanthera albinervia*	0	0	0	0	0	0	0	1
			98		01	*Melinis ambigua*	0	0	1	5	1	3	3	0
			98	99	01	*Melinis longifolia*	0	0	0	0	2	6	2	0
			98	99	01	*Melinis longiseta*	0	0	5	25	9	25	17	0
				99	01	*Melinis macrochaeta*	0	0	0	0	1	3	1	1
			98	99	01	*Melinis minutiflora*	0	0	0	0	2	6	2	0
		97	98	99	01	*Melinis repens*	0	0	3	15	5	14	10	0
				99	01	*Mellera submutica C.B.Cl.*	0	0	0	0	3	8	3	1
			98		01	*Microglossa pyrifolia*	0	0	0	0	0	0	0	1
			98		01	*Micromeria purtschelleri*	0	0	0	0	1	3	1	0
				99	01	*Mikania cordata*	0	0	0	0	5	14	5	1
		97			01	*Mollera angolensis (O. Hoffm.) Anderb.*	0	0	1	5	0	0	2	0
70					01	*Momordica friesiorum*	0	0	0	0	2	6	2	0
		97	98		01	*Monotes africana*	4	22	1	5	0	0	9	0
		97			01	*Mucuna coriacea*	0	0	0	0	0	0	0	1
		97		99	01	*Mucuna poggei*	0	0	0	0	3	8	3	0
			98		01	*Mucuna stans*	1	6	0	0	0	0	2	1
		97	98	99	01	*Multidentia crassa (Hiern) Bridson & Verdc.*	1	6	1	5	0	0	4	1
			98	99	01	*Mussaenda arcuata*	0	0	0	0	0	0	0	1
		97	98	99	01	*Myrsine africana L.*	0	0	1	5	0	0	2	1
			98	99	01	*Mystroxylon aethiopicum*	0	0	0	0	0	0	0	1
					01*	*Nelsonia sp*	0	0	0	0	0	0	0	1
		97		99	01	*Nuxia floribunda Benth.*	0	0	0	0	4	11	4	0
			98		01	*Ochna mossambicensis*	1	6	0	0	0	0	2	0
			98		01	*Ochna schweinfurthiana*	0	0	1	5	0	0	2	1

		98	99	01	*Ochna stolzii*	0	0	0	0	0	0	0	1
			99	01	*Oplismenus burmannii*	0	0	0	0	2	6	2	0
				01	*Oplismenus hirtellus*	0	0	0	0	1	3	1	0
70				01	*Oplismenus undulatifolius*	0	0	0	0	1	3	1	0
58		98	99	01	*Osyris compressa*	0	0	0	0	1	3	1	0
	97	98	99	01	*Ozoroa insignis*	1	6	0	0	0	0	2	0
	97		99	01	*Panicum adenophorum*	0	0	0	0	2	6	2	0
	97			01	*Panicum chionachne*	0	0	0	0	1	3	1	0
	97		99	01	*Panicum claytonii*	0	0	2	10	0	0	3	0
	97		99	01	*Panicum ecklonii*	0	0	1	5	3	8	4	0
	97			01	*Panicum inaequilatum*	0	0	0	0	2	6	2	0
	97			01	*Panicum lukwangulense*	0	0	0	0	1	3	1	0
		98	99	01	*Panicum maximum*	1	6	0	0	0	0	2	0
	97			01	*Panicum pectinellum*	0	0	0	0	2	6	2	0
	97	98	99	01	*Panicum pusillum*	0	0	0	0	1	3	1	0
	97	98	99	01	*Panicum trichocladum*	0	0	1	5	8	22	9	0
		98	99	01	*Parinari curatellifolia*	0	0	4	20	3	8	9	1
			99	01	*Parinari excelsa*	0	0	0	0	2	6	2	1
		98		01	*Pavetta schumanniana*	0	0	0	0	0	0	0	1
	97		99	01	*Pavonia urens Cav.*	0	0	1	5	2	6	4	1
		98	99	01	*Peddiea fischeri*	0	0	0	0	1	3	1	0
		98	99	01	*Pennisetum purpureum*	0	0	1	5	0	0	2	2
				01*	*Pennisetum unisetum*	0	0	0	0	0	0	0	1
	97	98		01	*Pentas schimperiana (A.Rich.) Vatke*	0	0	0	0	0	0	0	1
72				01	*Peperomia retusa*	0	0	0	0	1	3	1	0
			99	01	*Peperonia tetraphylla (G.Forst.) Hook & Arn.*	0	0	0	0	1	3	1	0
	97	98		01	*Pericopsis angolensis*	0	0	0	0	0	0	0	2
	97			01	*Pericopsis bussei*	0	0	0	0	0	0	0	2
	97			01	*Periploca linearifolia Quart.- Dill. & A. Rich.*	0	0	0	0	1	3	1	0
	97			01	*Peucedanum nyassicum*	0	0	1	5	0	0	2	0
58		98	99	01	*Phaulopsis imbricata (Forssk.) Sweet subsp. imbricata*	0	0	0	0	1	3	1	0
			99	01	*Phaulopsis sangana S.Moore*	0	0	0	0	1	3	1	0
			99	01	*Phoenix reclinata*	0	0	0	0	0	0	0	1
	97	98	99	01	*Phragmites mauritianus*	2	11	0	0	0	0	4	2
	97	98		01	*Phystotrichia heracleoides*	0	0	0	0	3	8	3	0
		98		01	*Piliostigma thonningii*	1	6	0	0	0	0	2	1
	97	98		01	*Pimpinella buchananii*	0	0	0	0	4	11	4	0
	97	98		01	*Pimpinella caffra (Eckl. & Zeyh.) Dietr .subsp.conopodioides C. C.Towns.*	0	0	0	0	2	6	2	0
	97	98		01	*Pimpinella chrysocarpa*	0	0	0	0	2	6	2	0
	97	98	99	01	*Pimpinella engleriana*	0	0	0	0	1	3	1	0
	97	98		01	*Pimpinella huillensis*	0	0	0	0	1	3	1	0
	97	98		01	*Pimpinella stadensis (Eckl. & Zeyh.) D.Dietr*	0	0	1	5	2	6	4	1
		98	99	01	*Pittosporum viridiflorus*	0	0	0	0	2	6	2	2
58	97	98	99	01	*Plectranthus daviesii (E.A.Bruce) Mathew..*	0	0	0	0	2	6	2	0
	97	98		01	*Plectranthus laxiflorus Benth. variant*	0	0	0	0	1	3	1	0
		98		01	*Pogonarthria squarrosa*	1	6	0	0	0	0	2	0
	97	98	99	01	*Polygala stenopetala Klotzsch*	0	0	0	0	1	3	1	0
	97		99	01	*Polygala virgata*	0	0	0	0	2	6	2	0
				01*	*Polygonum salicifolium*	0	0	0	0	0	0	0	1
58	97	98	99	01	*Protea angolensis*	0	0	5	25	7	19	15	2

	97	98	99	01	*Protea heckmanniana Engl. subsp. heckmanniana*	0	0	0	0	0	0	0	1
			99	01	*Protea madiensis*	0	0	0	0	0	0	0	1
		98	99	01	*Protea petiolaris*	0	0	0	0	4	11	4	1
72				01	*Protea rupestris*	0	0	0	0	0	0	0	1
	97	98	99	01	*Protea welwitschii Engl.*	0	0	3	15	1	3	6	1
		98		01	*Pseudarthria hookeri*	0	0	0	0	1	3	1	0
	97	98		01	*Pseudolachnostylis maprouneifolia*	3	17	0	0	0	0	6	1
	97	98		01	*Psorospermum febrifugum*	2	11	2	10	0	0	7	1
	97	98		01	*Psychotria eminiana (Kuntze) Petit var. stolzii (K. Krause) Petit*	1	6	0	0	0	0	2	0
	97	98	99	01	*Psychotria mahonii C. H. Wright*	0	0	0	0	4	11	4	0
72				01	*Psychotria megistosticta*	0	0	0	0	1	3	1	0
		98	99	01	*Psychotria montanum*	0	0	0	0	3	8	3	0
	97	98	99	01	*Pteridium aquilinum*	0	0	5	25	23	64	30	1
	97	98	99	01	*Pteris cretica L.*	0	0	0	0	1	3	1	0
			99	01	*Pycnostachys schweinfurthii*	0	0	0	0	0	0	0	1
				01*	*Pycnostachys stuhlmannii*	0	0	0	0	0	0	0	1
72				01	*Pycreus aethiops*	0	0	0	0	1	3	1	0
	97		99	01	*Rapanea melanophloeos*	0	0	0	0	1	3	1	0
		98		01	*Raphia farinifera*	0	0	0	0	0	0	0	1
		98	99	01	*Rhoicissus revoilii*	0	0	0	0	2	6	2	1
	97	98	99	01	*Rhoicissus tridentata*	0	0	3	15	8	22	12	0
	97	98	99	01	*Rhus longipes*	0	0	4	20	16	44	21	1
		98	99	01	*Rhus natalensis*	0	0	0	0	1	3	1	1
				01*	*Rhynchosia hirta*	0	0	0	0	5	14	5	0
	97	98		01	*Rhynchosia minima*	2	11	0	0	0	0	4	0
		98		01	*Rhynchosia nyassica*	0	0	0	0	2	6	2	0
		98		01	*Rhynchosia sublobata*	1	6	0	0	0	0	2	0
	97	98	99	01	*Rubia cordifolia L. subsp. conotricha (Grand.) Verdc.*	0	0	0	0	10	28	9	0
	97	98	99	01	*Rubus iringanus Gust.*	0	0	1	5	3	8	4	0
	97		99	01	*Rubus rigidus*	0	0	0	0	1	3	1	0
	97	98	99	01	*Rumex abyssinica*	0	0	1	5	0	0	2	0
				01*	*Rutidia orientalis*	0	0	0	0	1	3	1	1
	97	98	99	01	*Rytignia monantha (K. Schum.) Robyns*	0	0	0	0	0	0	0	1
		98	99	01	*Salix subserrata*	0	0	0	0	0	0	0	1
				01*	*Sapium ellipticum*	0	0	0	0	0	0	0	1
72				01	*Satureja punctata*	0	0	0	0	1	3	1	0
		98	99	01	*Scabiosa austro-africana*	0	0	2	10	0	0	3	0
		98	99	01	*Schefflera abyssinia*	0	0	1	5	1	3	3	0
	97	98		01	*Schistostephium artemesiifolium Baker*	8	44	1	5	3	8	19	0
70				01	*Scirpus fluitans*	0	0	0	0	2	6	2	0
	97	98		01	*Scleria delicatura*	0	0	0	0	1	3	1	0
	97			01	*Scleria dregeana*	0	0	0	0	2	6	2	0
	97			01	*Scleria erythrorrhiza*	0	0	0	0	1	3	1	0
	97			01	*Scleria poaeoides*	0	0	0	0	0	0	0	1
	97	98		01	*Sebaea longicaulis*	0	0	0	0	2	6	2	0
			99	01	*Selago thomsonii Rolfe var.whyteana (Rolfe) Brenan..*	0	0	0	0	1	3	1	0
	97	98		01	*Selago thyrsoidea*	1	6	0	0	0	0	2	0
	97	98		01	*Senecio diphyllus*	0	0	1	5	1	3	3	0
	97			01	*Senecio hochstetteri*	0	0	0	0	1	3	1	1
	97		99	01	*Senecio hockii*	0	0	0	0	1	3	1	0

	97	98	99	01	*Senecio proprior S. Moore*	0	0	1	5	0	0	2	0
		98		01	*Senecio roseiflorus*	0	0	0	0	1	3	1	0
	97	98	99	01	*Senecio syringifolius O.Hoffm.*	0	0	0	0	1	3	1	0
				01	*Senecio variabilis*	0	0	0	0	0	0	0	1
	97	98		01	*Senecio wollastonii*	0	0	0	0	0	0	0	2
		98	99	01	*Senna singueana*	2	11	0	0	0	0	4	1
72				01	*Sesbania sesban*	0	0	0	0	1	3	1	0
	97		99	01	*Setaria grandis Stapf..*	0	0	0	0	0	0	0	1
	97	98		01	*Setaria sphacelata (Schumach.) Moss*	0	0	0	0	0	0	0	1
	97			01	*Silene burchellii*	0	0	0	0	1	3	1	0
		98	99	01	*Smilax kraussiana*	1	6	0	0	12	33	13	2
72				01	*Solenostemon shirensis*	0	0	0	0	5	14	5	2
			99	01	*Sonchus eminii*	0	0	1	5	0	0	2	0
				01	*Sonchus ledermanii*	0	0	0	0	1	3	1	1
	97	98		01	*Sonchus luxuriana*	0	0	1	5	0	0	2	0
	97	98	99	01	*Spermacoce dibrachiata*	0	0	0	0	0	0	0	1
				01*	*Spermacoce huillensis*	1	6	0	0	0	0	2	0
	97	98		01	*Spermacoce senensis*	0	0	0	0	1	3	1	0
	97			01	*Spermacoce sphaerostigma*	0	0	1	5	0	0	2	0
		98		01	*Sphenostylis stenocarpa*	0	0	1	5	0	0	2	0
			99	01	*Spilanthes mauritiana (Rich. ex Pers.) DC.*	0	0	0	0	0	0	0	2
		98	99	01	*Steganotaenia araliacea*	0	0	0	0	0	0	0	1
70				01	*Stellaria sennii*	0	0	0	0	1	3	1	0
	97		99	01	*Stephania abyssinica*	0	0	0	0	4	11	4	0
				01*	*Stipa keniensis*	1	6	0	0	0	0	2	0
		98		01	*Strombosia scheffleri*	0	0	0	0	0	0	0	1
		98	99	01	*Strychnos cocculoides*	0	0	0	0	0	0	0	1
		98		01	*Strychnos spinosa*	1	6	0	0	0	0	2	1
	97	98		01	*Swertia curtiodes*	0	0	0	0	1	3	1	0
	97	98	99	01	*Swertia welwitschii Engl.*	0	0	0	0	4	11	4	0
	97	98	99	01	*Syzygium cordatum*	2	11	1	5	9	25	14	1
		98	99	01	*Syzygium guineense*	0	0	1	5	5	14	6	1
		98		01	*Syzygium owariense*	0	0	1	5	0	0	2	1
				01*	*Targionia hypophylla*	0	0	0	0	1	3	1	0
	97		99	01	*Tecoma capensis*	0	0	0	0	6	17	6	0
	97	98	99	01	*Temnocalyx obovatus*	4	22	0	0	0	0	7	0
		98		01	*Tephrosia holstii*	1	6	0	0	0	0	2	0
	97	98	99	01	*Tephrosia interrupta Hochst. & Steud. ex Engl .subsp. elongatiflora J.B.Gillett*	0	0	0	0	20	56	19	2
	97	98		01	*Tephrosia nykensis*	0	0	2	10	0	0	3	0
				01*	*Tephrosia sp.*	0	0	0	0	0	0	0	1
		98		01	*Tephrosia villosa*	3	17	0	0	1	3	6	0
	97	98		01	*Terminalia stenostachya Engl. & Diels*	0	0	0	0	0	0	0	1
		98	99	01	*Tetradenia riparia (Hochst.) N.E.Br.*	0	0	0	0	0	0	0	2
	97	98	99	01	*Thelypteris confluens*	0	0	0	0	1	3	1	0
	97			01	*Thelypteris pulchra*	0	0	0	0	2	6	2	0
	97	98	99	01	*Themeda triandra*	10	56	10	50	10	28	44	1
			99	01	*Thesium cymosum A.W.Hill*	0	0	1	5	0	0	2	0
	97	98	99	01	*Thesium fastigiatum*	0	0	2	10	0	0	3	0
		98		01	*Thilachium africanum*	1	6	0	0	0	0	2	0
	97	98	99	01	*Thunbergia alata Sims*	0	0	2	10	12	33	14	1

		97			01	*Thunbergia kirkiana*	0	0	0	0	2	6	2	0
			98	99	01	*Thunbergia lancifolia T.Anders.*	0	0	0	0	1	3	1	0
					01*	*Toddalia asiatica*	0	0	0	0	1	3	1	0
			98	99	01	*Tricalysia nyassae*	0	0	0	0	0	0	0	1
		97		99	01	*Trichodesma physaloides*	0	0	1	5	0	0	2	0
		97	98	99	01	*Triumfetta annua*	0	0	0	0	0	0	0	1
		97	98	99	01	*Triumfetta rhomboidea*	0	0	0	0	0	0	0	1
			98	99	01	*Uapaca kirkiana*	2	11	0	0	0	0	4	2
70					01	*Uapaca robynsii*	0	0	0	0	1	3	1	0
					01*	*Urena lobata*	0	0	0	0	0	0	0	1
			98	99	01	*Vangueria infausta*	0	0	1	5	0	0	2	1
			98	99	01	*Vernonia adoensis*	0	0	0	0	2	6	2	0
		97	98	99	01	*Vernonia alticola G.Pope*	0	0	1	5	0	0	2	0
		97	98		01	*Vernonia bracteosa*	0	0	1	5	0	0	2	0
		97	98	99	01	*Vernonia calyculata S.Moore*	0	0	0	0	1	3	1	0
		97	98	99	01	*Vernonia cinerea*	0	0	3	15	4	11	9	0
58		97	98	99	01	*Vernonia erinacea*	0	0	0	0	1	3	1	0
		97	98	99	01	*Vernonia gerberiformis Oliv. & Hiern*	0	0	1	5	1	3	3	1
			98		01	*Vernonia glabra*	0	0	0	0	1	3	1	0
			98		01	*Vernonia holstii*	0	0	1	5	0	0	2	0
					01*	*Vernonia javanica*	1	6	0	0	0	0	2	0
		97	98		01	*Vernonia karaguensis Oliv. & Hiern*	1	6	2	10	3	8	8	0
		97			01	*Vernonia kawoziensis (?)*	0	0	0	0	1	3	1	0
		97	98	99	01	*Vernonia praemorsa*	0	0	0	0	1	3	1	0
		97	98		01	*Vernonia ringoetii*	0	0	1	5	0	0	2	0
70	72				01	*Vernonia syringifolia*	0	0	0	0	1	3	1	0
		97	98	99	01	*Vicoa auriculata*	1	6	1	5	1	3	4	0
				99	01	*Vigna axillaris*	0	0	0	0	2	6	2	1
		97	98		01	*Vigna fischeri*	0	0	0	0	3	8	3	0
58			98		01	*Vigna gazensis*	0	0	0	0	6	17	6	1
			98	99	01	*Vincentella passargei*	0	0	0	0	0	0	0	1
		97	98		01	*Vitex doniana*	0	0	0	0	0	0	0	1
	72				01	*Wahlenbergia virgata*	0	0	0	0	0	0	0	1
		97	98	99	01	*Ximenia caffra*	1	6	1	5	0	0	4	1
		97	98	99	01	*Zonotriche inamoena*	3	17	3	15	0	0	11	0
					01*	*Zornia glochidiata*	0	0	0	0	1	3	1	0
						Number of species in each location	106		192		339		481	2

*New record for the Nyika National Park

Table 2: New species found in 2001, not recorded by the previous seven expeditions.

Cyathodium africanum	Liverwort
Targionia hypophylla	Liverwort
Artabotrys monteiroae	Annonaceae
Landolphia petersiana	Apocynaceae
Cryptolepis nigritana	Asclepiadaceae
Dregea sp	Asdepiadaceae
Knipfofia thomsonii	Asphodelaceae
Catha edulis	Celastraceae
Combretum zeyheri	Combretaceae
Aneilema sp	Commelinaceae
Helichrysum trachyphyllum	Compositae
Melanthera albinervia	Compositae
Vernonia javanica	Compositae
Ipomoea tenuirostris	Convolvulaceae
Dracaena ramosissima	Dracaenaceae
Sapium elipticum	Euphorbiaceae
Macaranga kilimandscharica	Euphorbiaceae
Macaranga capensis	Euphorbiaceae
Pennisetum unisetum	Gramineae
Stipa keniensis	Gramineae
Festuca erecta	Gramineae
Pycnostachys stuhlmannii	Labiatae
Albizia antunesiana	Leguminosae-Mimosoideae
Acacia abyssinica	Leguminosae-Mimosoideae
Indigofera subulifera	Leguminosea-Papilionoideae
Crotalaria homblei	Leguminosea-Papilionoideae
Zornia sp	Leguminosea-Papilionoideae
Zornia glochidiata	Leguminosea-Papilionoideae
Rhynchosia hirta	Leguminosea-Papilionoideae
Desmodium salicifolium	Leguminosea-Papilionoideae
Hibiscus cannabinus	Malvaceae
Urena lobata	Malvaceae
Hibiscus diversifolius	Malvaceae
Ficus thonningii	Moraceae
Heteropyxis dehniae	Myrtaceae
Eulophia angolensis	Orchidaceae
Polygonum salicifolium	Polygonaceae
Keetia foetida	Rubiaceae
Rutidia orientalis	Rubiaceae
Spermacoce huillensis	Rubiaceae
Kohautia coccinea	Rubiaceae
Anthospermum randii	Rubiaceae
Toddalia asiatica	Rutaceae
Dombeya kirkii	Sterculiaceae
Ampelocissus africana	Vitaceae
Cissus rupestris	Vitaceae

Table 3: Species most common overall
(appearing in more than 12% of quadrats)

Inula glomerata
Brachystegia spiciformis Benth.
Themeda triandra
Droogmansia pteropus
Helichrysum kirkii
Hyparrhenia cymbaria
Blepharis grandis
Pteridium aquilinum
Rhus longipes
Cryptosepalum maraviense
Schistostephium artemesiifolium Baker
Maesa lanceolata
Tephrosia interrupta Hochst. & Steud. ex Engl .subsp. elongatiflora J.B.Gillett
Clematis chrysocarpa
Hyparrhenia dregeana (Nees) Stapf..
Melinis longiseta
Flemingia grahamiana
Hyparrhenia filipendula
Dombeya rotundifolia
Protea angolensis
Faurea speciosa
Thunbergia alata Sims
Dissotis princeps
Helichrysum forsskaolii (J. F. Gmel.) Hilliard & B.L. Burtt
Syzygium cordatum
Fadogiella stigmatoloba
Smilax kraussiana
Indigofera homblei

Table 4: Species most common in Chisimuka
(appearing in more than 10% of quadrats)

Blepharis grandis
Inula glomerata
Pteridium aquilinum
Tephrosia interrupta Hochst. & Steud. ex Engl. subsp. elongatiflora J.B.Gillet
Droogmansia pteropus
Hyparrhenia cymbaria
Rhus longipes
Helichrysum kirkii
Maesa lanceolata
Dissotis princeps
Thunbergia alata Sims
Smilax kraussiana
Helichrysum latifolium
Dombeya rotundifolia
Aeschynomene nyikensis Baker
Kniphofia splendens

Table 5: Species most common in the Chipome Valley
(appearing in more than 15% quadrats.)

Brachystegia spiciformis Benth.
Themeda triandra
Cryptosepalum maraviense
Schistostephium artemesiifolium Baker
Hyparrhenia filipendula
Inula glomerata
Hyparrhenia nyassae (Rendle) Stapf..
Droogmansia pteropus
Helichrysum kirkii
Monotes africana
Hyparrhenia dissoluta
Hypoestes forsskaoli
Temnocalyx obovatus
Fadogiella stigmatoloba
Tephrosia villosa
Zonotriche inamoena
Dalbergia nitidula
Lelya prostrata (R.Good) Walt. Lewis var.prostrata
Bauhinia petersiana
Brachystegia allenii Burtt Davy and Hutch.
Eulalia villosa (Thunb.) Nees
Lannea discolor
Pseudolachnostylis maprouneifolia

Table 6: Most common species in the Lonyina Valley (appearing inmore than 15% of quadrats)

Inula glomerata
Themeda triandra
Helichrysum kirkii
Droogmansia pteropus
Hyparrhenia cymbaria
Flemingia grahamiana
Hyparrhenia dregeana (Nees) Stapf..
Clematis chrysocarpa
Faurea speciosa
Brachystegia spiciformis Benth.
Pteridium aquilinum
Melinis longiseta
Protea angolensis
Helichrysum forsskaolii (J. F. Gmel.) Hilliard & B.L. Burtt
Aeschynomene nyassana
Croton macrostachys
Aspilia kotschyii
Fadogiella stigmatoloba
Erythrocephalum zambesianum
Rhus longipes
Allophylus chaunostachys
Cirsium buchwaldii
Isoberlinia angolensis (Benth.) Hoyle & Brenan
Parinari curatellifolia

FIGURES 1: YELLOW BABOON *PAPIO CYNOCEPHALUS*

FEEDING ECOLOGY OF THE YELLOW BABOON, *PAPIO CYNOCEPHALUS*

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INTRODUCTION

The Yellow Baboon, *Papio cynocephalus*, (figure 1) is a ground foraging cercopithecine primate which is distributed across the Eastern regions of Africa from the Amboseli National Park in Kenya down to the Zambezi River in Mozambique. *P. cynocephalus* can be found throughout Malawi, and in the Nyika National Park it is typically found in *Brachystegia* woodland (figure 1) and patches of evergreen forest, habitats characteristic of the areas of the park lower than 1800m in altitude.

P. cynocephalus is a large monkey, especially in the case of the adult males, which can weigh up to 30kg. Adult females are generally only half the weight of the adult males. It is a very social animal, frequently to be found living in groups of 40 or more individuals. Baboons are omnivorous, but generally rely on plant material for nutrition, for which they spend most of the daylight hours foraging. They forage as a social group or 'troop', often travelling several kilometres in a single day. The troop spends the night up in trees, frequently demonstrating a preference for particular favoured 'sleeping trees', to which they will return night after night.

Group foraging activity is typified by steady group progression through a suitable habitat, with individuals occasionally pausing when an appropriate food plant is encountered. Feeding behaviour depends upon the source of nutrition. For example, an individual can dig up a plant with edible roots by scratching at the soil with its hands, or can climb a tree to remove edible fruits. Baboons have been shown to utilise a wide range of food plants, and the species of plant used to provide nutrition can vary according to seasonal changes exhibited by those plant species. Altmann & Altmann (1970) describe pronounced and sudden changes in the diet of *P. cynocephalus* troops in Amboseli, Kenya, according to the season of tree fruits and flowers. The baboon diet typically consists of the roots and tubers of grasses and herbs, and the fruits and even flowers of trees, depending upon which of these are available throughout the seasonal and phenological cycles of the plants in their habitat.

Observers have suggested a negative correlation between the nutritional productivity of a habitat with the mean daily distance covered by a troop while foraging, and the daily mean amount of time spent foraging. Rowell (1964, 1966) describes baboon activity in relatively productive riparian forest habitats in Uganda, in which the baboons frequently do not even need to leave their sleeping trees to find food: The mean distance and duration of 'day journey' foraging for these animals is much less than that described by Kummer (1968), who studied the behaviour of baboons in arid regions near the Sahara desert. Such plasticity of baboon feeding behaviour in response to variations in habitat productivity, in association with great dietary versatility, would be typically indicative of the considerable adaptivity of *P. cynocephalus.* This adaptivity has enabled the species to attain an extensive distribution across a wide range of African habitats, to become the most prevalent species of primate on the continent except for man.

The baboons of the Nyika National Park have not before been formally studied. A comprehensive understanding of the feeding ecology of this important species would necessarily demand an extensive and prolonged study. The short study presented in this report can however, introduce some basis for further research by presenting preliminary findings and providing a discussion of the practical issues associated with studying the species in the Nyika National Park.

This study aims to meet the following objectives:

- To carry out surveys across a range of habitats in order to examine the resources exploited by the baboons in the Nyika region.
- To explore the relationship between the behavioural ecology of the baboons in Nyika and the resources and habitats that the baboons utilise.
- To identify relevant areas in which there is a potential for further research.
- To address the potential development of field techniques applicable to further study of the ecology of *P. cynocephalus* in the habitats utilised by the species in Nyika.

METHODS

Two areas of known baboon activity were selected and a camp was established in each. The first camp was at map reference UTM 36L 0570370, 8812440, near the site previously occupied by the old Southern park boundary gate. The second camp was at map reference UTM 36L 0565550, 8802920, near Thazima, the site of the current Southern park boundary gate.

Eight transects, each 2km long, were carried out during the dry season in July and August. The starting point of each transect was chosen at random from an area within 2 hours walk of camp, to allow sufficient time for the transect to be completed in daylight. The direction of each transect was selected using a 1:50000 map of the area. The direction was chosen in order to cover a range of habitats and to ensure that the transect could be completed in the time available.

Each transect was followed on foot, using a Garmin 'GPS 12' twelve channel GPS receiver to maintain a straight line. The straight line was maintained regardless of the terrain and the habitats encountered. The transect was examined in detail at a slow walking pace, and each transect in general involved between 7 to 9 hours data gathering, depending on the nature of the terrain. Careful attention was paid to all evidence of animal activity, and for each piece of evidence discovered, an assessment was made based as follows;

Was the evidence a consequence of baboon activity? If so, then the following information was recorded:

Location and habitat

the *UTM position* of the evidence given by the GPS receiver; the *FOM* margin of error for the position given by the GPS; the *altitude* of the evidence given by the GPS receiver; and also the *habitat* in which the evidence was discovered. The habitat was defined as one of the following five categories:

- Evergreen forest,
- Deciduous woodland,
- Scrub,
- Grassland,
- 'Dambo' wetland/riparian vegetation.

Whenever possible, the habitat was also defined in terms of an indicator species, the plant species most prevalent at each particular location.

Feeding activity

Did the evidence demonstrate *feeding* activity by baboons? For each piece of evidence of baboon feeding activity, all of the following observations were recorded where possible:

- the *method* used to harvest the food, for example, digging with hands;
- the *species* of plant harvested;
- an estimate of the *age* of the evidence, that is, the time elapsed since the harvesting had taken place; and finally
- an estimate of the *intensity* of the harvesting, incorporating both an estimate of the *number* of individuals involved, and the allocation of an index from 1- 5 indicating the *abundance* of different pieces of evidence for each particular site - an index of 1 for a single piece of evidence, and an index of 5 for a site with evidence of feeding activity by a large proportion of the troop.

Droppings

Were there any baboon *droppings* evident? For each baboon dropping discovered, all of the following observations were recorded where possible:

- an estimate of the *age* of the dropping, that is, the time elapsed since the dropping had been deposited; the *number* of individual droppings; and finally
- an estimate of the *abundance* of droppings at each particular location - an index of 1 for a single dropping, and an index of 5 for a site with evidence of droppings by a many individuals within the troop.

Movement

Did the evidence demonstrate directional *movement* by baboons, in the form of trails on the ground? For each piece of evidence of movement activity, all of the following observations were recorded where possible:

- the estimated *direction* of the trail as a compass bearing, for both the direction the trail came from and the direction the trail was heading;
- an estimate of the *age* of the trail, that is, the time elapsed since the trail had been made;
- an estimate of the *intensity* of the trail, incorporating both an estimate of the *number* of individuals involved, and the allocation of an index from 1-5 indicating the *abundance* of different pieces of evidence each particular site - an index of 1 for a single trail for a single individual, and an index of 5 for a trail made by a large troop.

RESULTS

The results were analysed using SPSS statistical analysis software version 10.0.5 (SPSS Inc, 1999) and Microsoft Excel 2000 software (Microsoft Corporation, 1985-99). Data records were created for each piece of evidence recorded.

Activity

113 pieces of evidence were recorded over eight transects.

- 60.2% was related to evidence of feeding activity,
- 32.7% was evidence of movement, related to the recording of trails.
- 7.1% was related to the recording of droppings.

Habitat

The vast majority (95.5%) of the evidence was recorded in deciduous woodland, dominated by *Brachystegia sp* (figure 1). 2.7% of the evidence was recorded in evergreen forest - no single indicator species can be isolated for this type of habitat. 1.8% of the evidence was recorded in grassland, dominated by either *Themeda triandra* or *Hyparrhenia sp.* No evidence was found in dambo/riparian vegetation, dominated by sedges such as *Imperata cylindrica*, or in scrub, dominated by *Protea angolensis* and *Uapaca sp*. Evidence is harder to detect in habitats with more extensive undergrowth,

such as dambo vegetation or grassland, but this was partly overcome by being very thorough in each search, covering each 2km transect in 7-9 hours.

The absence of baboon activity evidence from *Protea angolensis* scrub (figure 2) was particularly notable, as this habitat is often adjacent to *Brachystegia sp* woodland, overlapping at just over 6,500' altitude. Sampling of the plant species in both habitats demonstrated many species in common. For example, both *Uapaca sp* (figure 3) and *Protea angolensis* were frequently found in *Brachystegia sp* woodland, though in smaller number and size than when *Brachystegia sp* was absent. Species lists for the two habitats are compared in table 1.

Statistical comparison of flora in the two habitats was carried out using a 'CYs Similarity Index', which uses formulae derived by Yong *et al* (1997), as shown in appendix 1. The CYs index ranges from 0 for totally dissimilar communities to 1 for identical communities. The CYs index has been designed to minimise bias generated by variations in species abundance and sampling error, and shown to be more responsive to differences in communities than existing indices such as Morisita's index of similarity and Horn's index of similarity. The index takes into account both the number of species present in the samples and also the relative abundance of each species.

Comparison of the *Brachystegia* woodland and *Protea* scrub gave an index of 0.29. This indicates a considerable difference between the communities, despite the presence of many shared species. This difference can, at least in part, be attributed to the differences in the relative abundance of the shared species. The difference in plant communities is likely to explain why no evidence of plant resource exploitation by baboons could be found in areas of *Protea angolensis* scrub.

The mean altitude of the samples in the *Brachystegia sp* woodland was 1618.5 m, and the mean altitude of the samples in *Protea angolensis* scrub was 1650.7 m. The difference in altitude may possibly also be a contributory factor to differences in feeding activity evidence.

Figure 2: *Protea angolensis* scrub

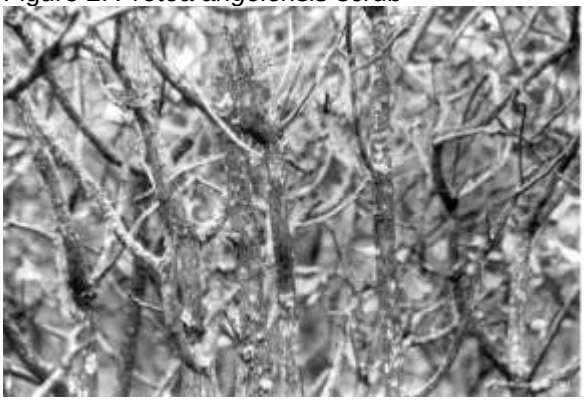


Figure 3: *Uapaca kirkiana* seedling

Table 1: Plant species found in samples from deciduous woodland habitat and scrub habitat

Species sampled in woodland habitat only	Species sampled in both habitats	Species sampled in scrub habitat only
Acalypha ornata	*Acalypha villicaulis*	*Brachystegia boehmia*
Aspilia mossambicensis	*Aristida recta*	*Cyperus* sp
Biophytum nyikensis	*Brachystegia longifolia*	*Eriosema montanum*
Brachystegia bussei	*Brachystegia spiciformis*	*Fadogia andongensis*
Brachystegia utilis	*Cyperus nduru*	*Fadogia odorata*
Clematopsis chrysocarpa	*Eriosema labrum*	*Fadogia triphylla*
Desmodium barbatum	*Faurea spiciosa*	*Gerbera ambigua*
Dicoma sessiflora	*Haumaniastrum callianthum*	*Gerbera viridifolia*
Euphorbia sp	*Helichrysum kirkii*	*Indigofera emarginella*
Galium scabrellum	*Hyparrhenia dregeana*	*Indigofera nyikensis*
	Protea angolensis	*Kyllinga alba*
Helichrysum squamosum		
Strychnos innocua	*Psorospermum febrifugum*	*Melinis repens*
Tephrosia mundulea	*Schistostephium artemesiifolium*	*Microchloa kunthii*
Thesium triphylla	*Spermacoce dibrachiata*	*Panicum ecklonii*
Vavetta schumanniana	*Themida triandra*	*Parinari curatellifolia*
Vernonia sp	*Thunbergia lancifolia*	*Parvetta schumanniana*
	Uapaca kirkiana	*Pimpilla whitii*
		Vernonia petersii

Calculating the CYs Similarity Measure After Yong *et al* (1997)

$$CYs = 1 - \left(\frac{observed \;\; CYd}{maximum \;\; CYd} \right)$$ where:

$$observed \;\; CYd = \sum \left(\frac{X_{ij} + X_{kj} \log_{10} \left(\frac{X_{ij} + X_{kj}}{2} \right) - X_{ij} \log_{10} X_{kj} - X_{kj} \log_{10} X_{ij}}{X_{ij} + X_{kj}} \right)$$

where: X_{ij} = number of individuals of species *j* in sample *i*, X_{kj} = number of individuals of species *j* in sample *k*

and: $maximum \;\; CYd = D_1 + D_2 + D_3$

where:

$$D_1 = \sum_{j=1}^{b} \left(\frac{X_{ij} + 0.1 \log_{10} \left(\frac{X_{ij} + 0.1}{2} \right) - X_{ij} \log_{10} 0.1 - 0.1 \log_{10} X_{ij}}{X_{ij} + 0.1} \right) \quad D_2 = \sum_{j=1}^{c} \left(\frac{X_{kj} + 0.1 \log_{10} \left(\frac{X_{kj} + 0.1}{2} \right) - X_{kj} \log_{10} 0.1 - 0.1 \log_{10} X_{kj}}{X_{kj} + 0.1} \right)$$

$$D_3 = \frac{a}{2} \left(\frac{D_i + 1 \log_{10} \left(\frac{D_i + 1}{2} \right) - \log_{10} D_i}{D_i + 1} \right) + \frac{a}{2} \left(\frac{D_k + 1 \log_{10} \left(\frac{D_k + 1}{2} \right) - \log_{10} D_k}{D_k + 1} \right)$$

where: *a* = the number of species present in both samples *b* = the number of species present in sample *i* only
c = the number of species present in sample *k* only

and

$$D_i = \frac{\sum X_{ij} - a/2}{a/2} \qquad D_k = \frac{\sum X_{kj} - a/2}{a/2}$$

Table2: Relative proportion of plant species identified in evidence of feeding

Species	Frequency	Percent
Acalypha sp	1	1.5
Aloe nuttii	1	1.5
Anthericum malosanum	2	2.9
Brachystegia allenii	1	1.5
Brachystegia longifolia	1	1.5
Chlorophytum stolzii	1	1.5
Clematopsis uhehensis	1	1.5
Desmodium repandum	11	16.2
Dicoma sessiflora	1	1.5
Dolichos sp	8	11.8
including *Dolichos kilimandscharicus*	7	
Droogmansia pteropus	3	4.4
Eriosema sp	2	2.9
including *Eriosema ellipticum*	1	
Erythrocephalum zambesianum	1	1.5
Fadiogiella stigmatoloba	2	2.9
Gardenia subacaulis	1	1.5
Heteromorpha arborescens	1	1.5
Indigofera homblei	1	1.5
Lapeirousia erythrantha	1	1.5
Parinari sp	2	2.9
including *Parinari excelsa*	1	
Rhus longipes	1	1.5
Rhynchosia insignis	1	1.5
Senecio roseiflorus	1	1.5
Syzygium owariensis	1	1.5
Thunbergia kirkiana	1	1.5
unknown species	21	30.5
Total	68	100.0

Table 3 — Relative proportion of plant part feeding frequencies in identified plants

Plant part	*Frequency*	*Percent*
Roots and rhizomes	34	72.3
Eating roots or rhizomes of identified shrub	29	
Sapling roots	2	
sucking roots moisture	1	
Tubers and bulbs	8	17.0
Tubers	7	
small bulbs	1	
Fruits	5	10.5
Flowers	1	0.5
Gelatinous sap (from stalks)	1	0.5
Total	47	100.0

Feeding Activity

In total, 27 different species of plant were identified as having been eaten by baboons (see table 2). These plants constituted the 76% of the feeding evidence which provided specimens of plants that could be identified. The remaining 24% of sites yielded either no evidence of the plant species utilised by the baboons, or plant remains which could not be identified. There were 21 plant specimens that could not be identified. Of the plant species which could be identified, the three species most frequently eaten by the baboons were all leguminous herbs. Of the evidence collected, feeding evidence was as follows;

- 16.2% Roots of *Desmodium repandum.*
- 11.8% Large tubers of *Dolichos* sp, 87.5% of which were the tubers of *Dolichos kilimandscharicus.*
- 4.4% Roots and flowers of *Droogmansia pteropus.*

Of all the other species, few specimens were identified of each species during the study. Notable examples of these plants include the following:

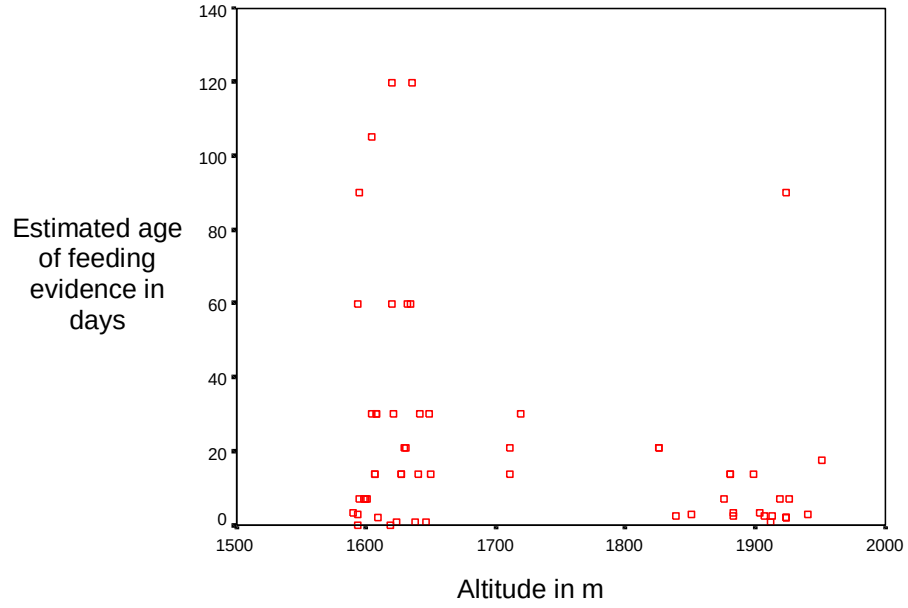
- Evidence showing that a baboon had been sucking the gelatinous sap from the succulent stalks of *Aloe nuttii.*
- Evidence showing that baboons had been climbing *Parinari excelsa* and *Brachystegia allenii* trees to pick the fruits of these trees.
- Evidence showing that baboons had been eating the roots of tree saplings of *Syzygium owariensis* and *Brachystegia longifolia.*

As shown in table 3, 72.3% of the feeding evidence indicated that the baboons had been feeding on roots or rhizomes, usually those of herbs. 17.0% of the feeding evidence showed that the baboons had been feeding on underground storage organs such as tubers and bulbs. Only 11.5% of the feeding evidence involved food sources that were not underground, including fruits, flowers and stalks. This is reflected by the evidence of feeding techniques, in which 92.6% of the feeding evidence involved digging actions by the feeding animal. Evidence of digging may be easier to detect than evidence of other feeding techniques, such as fruit picking. Also evidence indicating the use of certain plant species may be easier to locate than for other species; plants with larger underground tubers may require more digging activity by the baboons, leaving evidence which is subsequently more noticeable to the human observer.

Altitude

There was a significant negative correlation between the mean age of the feeding evidence and the altitude at which evidence was found ($r = -0.28$, $df = 58$, $p<0.05$), as shown in figure 4.

Figure 4: Relationship between age of feeding evidence and altitude.



Recent evidence of less than 40 days old was found in *Brachystega sp* woodland at all the altitudes sampled. However, there was little or no older feeding evidence at higher altitudes, over and including 1650m. Evidence over 40 days old is that associated with the late wet season in Nyika, a season of heavy rains usually lasting from January to March. Evidence of movement and droppings did not show the same bias, which could imply that although baboons still travel over terrain at the higher altitudes during the late wet season, they prefer to feed at lower altitudes.

Although older evidence is more likely to be obscured by subsequent animal activity in the same space, this would have happened equally in both locations, since recent activity was widespread.

DISCUSSION

Some potential sources of bias have been mentioned and more extensive analysis would be useful. More analysis of the total sampling duration for each habitat would also be necessary, in order to determine the extent of any bias resulting from discrepancies between the total amount of sampling time spent in each habitat.

Accepting the limitations, it can be concluded that the baboons in the study area spend the majority of their feeding time during the dry season digging for the edible roots and tubers of herbs growing in *Brachystegia* sp woodland. The huge tubers of *Dolichos kilimandscharicus* were one of the most favoured food sources of the baboons, along with the edible roots of the herb *Desmodium repandum.* Digging activity tends to be limited to the *Brachystegia* woodland, and appears to be largely absent even from habitats which seem relatively similar, such as *Protea angolensis* scrub habitat found in close association with *Brachystegia* sp woodland. Larger trees, although present in this type of scrub, are much less common than in the *Brachystegia* woodland. This factor alone may contribute to the relative absence of feeding activity. The baboons may prefer spending time in areas with larger trees, as a consequence of the protection provided by those trees, used to escape from and look for threats at ground level. However, the difference between the plant communities indicated by the CYs index of 0.29 could also contribute to the difference in the abundance of evidence. A greater abundance of suitable food plants in *Brachystegia* woodland during the dry season could favour feeding activity in that habitat, in comparison with *Protea angolensis* scrub, if we can assume that the difference in plant communities between the two habitats incorporates a difference in the relative abundance of food plants. This assumption would need to be examined by more comprehensive plant community sampling in the two habitats.

The altitude of habitats needs to be considered in relation to the preferences exhibited by the baboons. The distribution of habitats in the study area is frequently heterogeneous, with pronounced clines over short distances between neighbouring plant communities. This "patchwork" of habitats is likely to be a function of altitude variability in the study area. The terrain is composed of many small rivers running through valleys, each separated by a series of hills. The resulting changes in altitude are frequently associated with corresponding changes in the composition of plant communities. The tops of the highest hills are often dominated by *Protea angolensis* scrubland, a habitat replaced at slightly lower altitudes by *Brachystegia* woodland. These habitats are often found in heterogeneous association, with small areas of one habitat juxtaposed by areas of other habitat. Factors governing habitat distribution include the spatial distribution of nutrients and human activity in the form of burning and timber harvesting, which encourages grasland. Evergreen forest and dambo vegetation line the rivers and streams. In considering the changes in plant community with altitude, it is likely that the activity of baboons at particular altitudes is influenced mostly by the species found at those altitudes, rather than any other characteristic of a particular altitude. A comprehensive assessment of the feeding ecology of *P. cynocephalus* in Nyika requires both spatial and temporal distribution of food plants to be considered in some detail, as these factors are fundamental influences governing feeding behaviour.

In addition to the species identified as food plants from the transects, further *ad hoc* sampling, beyond the formal scope of the transects, yielded more information concerning the species of herb utilised by baboons. There was evidence indicating that the roots of many, perhaps all, species of the genus *Eriosema* were eaten and also the shallow roots of the herbs *Sphenostylis marginata* and *S. stenocarpa*. The exploitation of these species illustrates another trend of consequence to the analysis of baboon diet: Baboons never dig deep for edible roots, seeming to prefer digging for the roots of

herb species with relatively shallow roots. This is possibly a consequence of adaptive pressures to optimise net calorific gain by minimizing the necessary energy expended in order to obtain nutrition. It could also be hypothesised that similar selection pressures would select for a preference towards plants with the greatest nutritional value. This would appear to be supported by our evidence, in which there was a prevalence of species in the Leguminosae-Papilionoideae family. Nitrogen-fixing roots are a characteristic of this family. A study of fhe nutritional and calorific value of the roots and tubers of the legumes *Dolichos kilimandscharicus*, and *Desmodium repandum*, in comparison with other less frequently utilised species, would be of interest. Are the baboons choosing these legumes as the most efficient source of nutrition, or are their choices limited more by the availability of each particular species? Alternatively, could feeding decisions be influenced to a greater extent by more subjective factors, for example, are the baboons showing a preference for plant species which have the most agreeable taste?

The evidence from the study also suggests a temporal variation in the plant species most favoured as sources of food, in that feeding activity in *Brachystegia* woodland appears to be less common during the rainy season than it is during the dry season. This trend could be a consequence of changes in food availability in particular habitats, or of tendencies to spend more time in different habitats for other reasons. For example, the advent of the rainy season may influence the capacity of the baboon troop to spend time at higher altitudes, or make travelling longer distances less viable. However, changes in the location and extent of troop day journey have frequently been associated with variations in food abundance (Altmann & Altmann, 1970; Hall, 1962; Rowell, 1964, 1966; Kummer, 1968). What temporal variation in food abundance could be evident in Nyika that could influence feeding behaviour in the baboon population of the area? *Ad hoc* sampling throughout the study, along with various anecdotal accounts, can provide some insight into the feeding preferences during the wet season in comparison with the evidence of dry season activity gathered during this study. During the dry season, edible fruits are less prevalent than would be expected at other times of the year. This may indicate that it is necessary for the baboons to travel further during the dry season in search of suitable food resources. This could be hypothesised to be the reason why baboons are more likely to participate in feeding activity at higher altitudes during the dry season.

The study yielded evidence to suggest that baboons spend their nights sleeping in areas of evergreen forest. These forest areas are situated near rivers and streams where there is sufficient water availability to support the growth of such thick vegetation.

This study did find evidence that baboons also feed on the fruits of trees in evergreen forest. These food resources could often be found in close proximity to trees used for sleeping. The fruits of the trees *Parinari excelsa* and *P. curatellifolia* are available in riverine evergreen forest areas. Also *Diospyros zombensis*, a large species of tree which can reach up to 40m in height has edible fruits. Baboons were observed sleeping in a 25m tall *D. zombensis* tree located at UTM 36L 0571000, 8812530. The tree had a strong residual attraction for a troop of around 40 to 50 baboons, who used it for sleeping over several continuous nights. For an extensive discussion of residual attraction for specific trees, see Altmann & Altmann (1970), in their discussion of the yellow baboons of Amboseli in Kenya. Various factors can be suggested concerning the specific reasons for strong residual attraction in such large trees: bigger trees may provide better protection from predators, more opportunities for social interaction, more feeding opportunities, or any combination of these and other factors.

In addition to ingesting the fruits of evergreen trees of the genus *Parinari,* as shown by this study, baboons are also reported to eat the fruits of the trees *Diospyros kirkii*, *Ximenia caffra*, *Vanqueria infausta* and *Vitex doniana,* when these fruits are available, as well as the long seed pods of *Cassia abbreviata*, and the vine fruits of *Landolphia parvifolia* and *L. kirkii.* The evergreen forest can by expected to provide a much greater extent of nutrition during the rainy season when fruits and flowers are more abundant, than during the dry season. For example, baboons are reported to eat orchids of the following genera: *Cynorkis*, *Disa*, *Disperis*, *Eulophia*, *Habenaria* and *Satyrium*. Orchids are most commonly found in evergreen forest areas, during the rainy season. An increased availability of these and other food sources may diminish the need for the baboons to search for food further from their sleeping trees. However, during the dry season baboons need to spend more time feeding in the deciduous *Brachystegia* woodland, in order to dig for the edible roots of the herbs that grow in this habitat. It can therefore be suggested that digging for roots becomes a much more important food source for the baboons during the dry season than in the wet season, when fruits and other sources

of food are more readily available. Similar seasonal variation in feeding preferences have been discussed by observers previously, for example Altmann and Altmann (1970) and Kummer (1968).

Abundance of food might ultimately prove to be the most influential factor in defining the behavioural feeding strategies of the baboon, regardless of the other advantages and disadvantages of a particular habitat. A preference for deciduous woodland and evergreen forests as the favoured feeding habitats of the Nyika baboons can be contrasted with the findings of Altmann & Altmann (1980) in their discussion of the yellow baboons of Amboseli in Kenya. The Amboseli baboons demonstrated a preference for feeding in open grassland areas, which could indicate that baboons are more influenced by food abundance in a habitat than the composition of the plant community or the potential danger presented by a habitat. It can be difficult to draw decisive conclusions about the most influential factors involved in shaping behaviour. Altmann & Altmann (1980) speculated that a preference for open grassland could be a consequence of the greater ease with which predators can be spotted in this type of environment. In contrast, the grasslands associated with the woodlands of our study were frequently of heights of up to 1.5–2m, high enough to provide cover for predators, an aspect recognised by Altmann & Altmann (1980) in their discussion of the different types of grassland in Amboseli. This could imply that avoidance of predators is the most decisive factor to influence baboon behaviour in Nyika. The leopard *Panthera pardus* is the principle predator of baboons, and the Nyika area has probably the highest density of leopards in Central Africa. The relative absence of tall trees in habitats such as grassland and *Protea angolensis* scrubland could preclude opportunities for baboons to spot predators at a distance. With their good vision, this is the principle method used by baboons to avoid danger. This factor may also be of consequence in explaining a lack of baboon evidence within tracts of *Protea angolensis.* The habitat often features large groves and thickets within which it is difficult to see very far. The abundance of plants can be very visually disruptive (see figure 2). This is also true of the dense vegetation found in grasslands. It is possible to propose that in addition to temporal fluctuations in food abundance within habitats, the feeding ecology of the baboons in Nyika is also influenced by the differing levels of protection afforded by those different habitats.

A much longer term study would be necessary for a more detailed investigation of this behavioural model in the Nyika region. Observations of baboon activity and feeding evidence data would need to be collected across a more extensive sampling area, and for an extended duration, ideally incorporating seasonal changes. Faecal analysis to determine the species of plant ingested would provide important data that could consolidate the results of transect sampling. However in this study, droppings were encountered only at relatively infrequent intervals, in comparison with other forms of evidence. A more ambitious and comprehensive approach to investigating the model could involve monitoring group movement on a daily basis for a suitably extended duration of time. During our study, attempts were made at tracking the day journeys of particular troops. The methodological difficulties that were encountered during these attempts can be considered in relation to the potential for developing a successful implementation of this approach. Implementation of such a study would require all of the following criteria to be addressed:

The observer would need to be confident that the baboons were exhibiting *natural behaviour* patterns. The baboons in Nyika usually behaved very cautiously in the presence of humans, and until a troop could be habituated to human observers, it would be difficult to draw meaningful conclusions from any behavioural sampling that could take place. The animals invariably responded with alarm behaviour at the sight of human strangers attempting to track their progress. Another problem relating to this aspect is exemplified by behaviour demonstrated by the baboon troops observed near the village of Thazima, at UTM 36L 0564600, 8801700. The baboons had become accustomed to stealing food from the villagers, to the extent that the animals could be expected to engage in this activity on a regular basis. The observer would need to rationalise to what degree such behaviour could be categorized as natural behaviour. Anecdotal accounts suggest that this behaviour could be a response to a deficiency of food elsewhere in the area, as it appears that the behaviour is most common during the dry season. Alternatively the behaviour could be considered simply as exploitation of a relatively easy food source. Therefore an argument can be made in favour of including such troops, perhaps in association with studies of troops that do not exhibit the behaviour, either because the animals encounter more resistance to such activity, or because the opportunities to participate in the behaviour are not available.

The observer would need to *record the position* of the troop at regular intervals. One way of addressing this criteria would be to take GPS readings for the location corresponding to the estimated centre of troop activity. The location can be recorded at 30 minute intervals throughout the hours of daylight, and charted on maps of the study area, reproduced at a suitably detailed scale, for example, 1:12500. A hand-held rangefinder would also prove useful to aid data recording of this nature, allowing the user to estimate distances during calculation processes when necessary. However, the use of such equipment is perhaps more suited to open habitats such as grasslands, in which single isolated trees can be more accurately targeted during distance estimations.

The estimated length of the total day journey could be calculated by summing all the distances recorded on the chart each day. The day journey could often be expected to start and end at the same sleeping tree. The *mean length of day journey* can then be calculated for specific periods of time, perhaps on a weekly basis, and these means used to investigate any trends in the mean length of day journey in relation to temporal changes in food abundance.

The observer would need sufficient equipment and logistical support in order to enable *continuous monitoring* throughout all the daylight hours for the necessary study periods. Ideally, camp sites near to the favoured sleeping trees of the study troops would be deployed. This could facilitate ease of access to the study troop, and limit the distance that the observer needed to travel each day to the distance covered by the baboons.

The distances covered by the baboon troop may ultimately prove impractical for continuous observation, due to the difficult nature of the terrain at Nyika. Ideally, focal animal sampling of individual behaviour and scan sampling of troop behaviour (Altmann, 1974) would be used to establish behavioural time budgets, but these techniques proved to be extremely difficult in the thickly forested areas that the baboons frequent in this area of Nyika. For primates, focal animal sampling should consist of continuous sampling periods ideally from 15 to 30 minutes in duration, using a comprehensive ethogram such as that presented by Coelho & Bramblett (1990). However, the nature of the terrain in Nyika usually made it very difficult to maintain the necessary continuity. Moreover, the terrain was often too difficult to move through at a sufficient speed to maintain continuous contact with a baboon troop, even to just monitor the position of the troop. With the necessary animal handling skill and resources, *radio telemetry* would ultimately seem to be the most practical way to address this fundamental issue. Lehner (1996) provides an overview of issues relating to the use of radio telemetry. Tagging one or two typical individuals in each study group with radio transmitters could be the only realistic way of monitoring troop location with the sufficient continuity demanded if this type of study is to yield meaningful results.

REFERENCES

Altmann, J. (1974). Observational study of behaviour: sampling methods. *Behaviour* 49: 227–267.
Altmann, J., Altmann, S.A., Hausfater, G. & McCuskey, S. (1977). Life histories of yellow baboons. *Primates* 18: 315–30.
Altmann, J. (1980). *Baboon mothers and infants*. Chicago: University of Chicago Press.
Altmann, S.A. (1979). Baboon progressions: order or chaos? A study of one-dimensional group geometry. *Anim. Behav.* 27: 46–80.
Altmann, S.A. & Altmann, J. (1970). *Baboon ecology*. Chicago: University of Chicago Press.
Altmann, S.A. & Altmann, J. (1979). Demographic constraints on behaviour and social organisation. In *Primate ecology and human origins*, eds I.S. Bernstein & E.O. Smith. New York: Garland Press.
Barnett, A. (1995). *Expedition field techniques: primates.* London: Expedition Advisory Centre, RGS.
Coelho, A.M. & Bramblett, C.A. (1990). Behaviour of the genus Papio: ethogram, taxonomy, methods and comparative measures. In *Perspectives in primate biology, 3: 117–140,* eds P.K. Seth & S. Seth. New Delhi: Today and Tomorrow's Printers and Publishers.
DeVore, I. & Hall, K.R.L. (1965). Baboon ecology. In *Primate behaviour: Field studies of monkeys and apes*, ed I. DeVore. New York: Holt, Rinehart and Winston.
Hall, K.R.L. (1965). Variations in the ecology of the chacma baboon. *Symp. Zool. Soc. Lond.* 10:1–28.
Kummer, H. (1968). *Social organisation of hamadryas baboons.* Chicago:University of Chicago Press.
Kummer, H. & Kurt, F. (1963). Social units of a free-living population of hamadryas baboons. *Folia Primatol.* 1: 4–19.
Lehner, P.N. (1996). *Handbook of ethological methods.* Cambridge: Cambridge University Press.

Rowell, T.E. (1964). The habit of baboons in Uganda. *Proc. E. Afr. Acad.* 2: 121–127.
Rowell, T.E. (1966). Forest living baboons in Uganda. *J. Zool.* 149: 344–364.
Rowell, T.E. (1969). Long-term changes in a population of Ugandan baboons. *Folia Primatol.* 11:241–54.
Saayman, G.S. (1971). Behaviour of the adult males in a troop of free-ranging chacma baboons. *Folia Primatol.* 15: 36–57.
Sharman, M. & Dunbar, R.I.M. (1982). Observer bias in selection of study group in baboon field studies. *Primates.* 23(4): 567–573.
Stammbach, E. (1987). Desert, forest and montane baboons: multilevel societies. In *Primate societies*, eds B. Smuts et al. Chicago: University of Chicago Press.
Stoltz, L.P. & Saayman, G.S. (1970). Ecology and behaviour of baboons in the northern Transvaal. In *Ann. Transvaal Mus.* 26: 99–143.
Yong, C., Williams, P. & Bark, A.W. (1997). Similarity measure bias in river benthic Aufwuchs community analysis. *Water Environment Research.* 69: 95–106.

LARGE MAMMALS

Alexis R. Brun and Penelope R. Whitehorn

ABSTRACT

A 2-level cluster sampling method is used to assess the relative abundance scores (RAS) of each of 27 large mammal species, based on tracks, signs and droppings. 800 000 m² were surveyed, within 16km² representative of the three main areas of the northern part of the park. These are the high plateau grassland at Nganda, miombo woodland in the Chipome and Mondwe Valleys and the lowland Sawi/Guwu Valley. Kilometer square plots surveyed were the same as those studied by *Biosearch* in previous years. The activity of each large mammal species is compared over five years 1997-2001.

INTRODUCTION

The significance of Nyika National Park is demonstrated through the large diversity of mammal species present; there are over 95 species of mammal, including 33 of the "large" mammal species (Johnson 1993). The area supports large populations of Eland, *Taurotragus oryx*, Roan Antelope *Hippotragus equinus*, Reedbuck *Redunca arundinum*, Leopard *Panthera pardus* and Common Duiker *Sylvicapra grimmia*. The Elephant *Loxodonta africana* is also present in the lower level woodlands, along with Buffalo *Syncerus caffer*, probably the most endangered large mammal in the Nyika National Park) Kudu *Tragelaphus strepsiceros* and Hippopotamus, *Hippopotamus amphibious* (with surprising evidence well away from the North Rukuru river in 1999).

However, continued poaching and burning within the park is endangering the survival of some of these species. Therefore up to date information regarding the diversity and distribution of mammal populations is essential for the implementation of adequate management strategies. It also allows anti-poaching patrols to be better briefed and directed. This information, and whether the populations are being adversely affected by poaching, can also be used to make claims for resources to protect Nyika.

In Malawi 1997 (edit. Marianne Overton) S. Husson et al. wrote;
"There have been surveys of large mammals in the northern hills in the past, notably that of the Wye College Expedition (Overton and Nursaw 1972). Other attempts at statistical analysis, particularly from elephant dung counts, have included the northern hills (Critchlow 1995a, 1995b, Chirwa 1996; the Annual Reports of the Nyika Wildlife Research Unit). Large mammals for the Park as a whole have also been frequently recorded (for example, McClounie in 1903 and, more recently, Ansell and Dowsett 1988; Munthali and Banda, 1992).

A comprehensive survey of the large mammal population of the northern hills zone, in particular, does not appear to have taken place in the past. The 1972 Wye College Expedition Report was largely anecdotal, as is the information that has been collated from scout patrol reports. Records are naturally biased towards more accessible areas, and often rely on sightings to gather information. Difficult terrain with no roads, poor visibility in the woodlands, and a clumped distribution of animals make assessment difficult. Animal mortality surveys and roadside counts provide information, but may not be comprehensive enough to be statistically valid. An aerial survey was attempted, but was unsuccessful, because of fog and the difficult terrain (Chirwa, 1996).

A further aerial survey was carried out in 1997 by the Nyika-Vwase Conservation Project. It confirmed the presence of a small herd of elephant in the north of the Park. However, accurate counts may not be possible using the aerial survey methods in more enclosed woodland habitats, although they are relatively simple to conduct and avoid the considerable logistical difficulties and time cost of ground-based surveys. This method is at least a way of establishing presence or absence and minimum populations of a large mammal species."

The first Biosearch Nyika expedition in 1997 established a baseline and a system of monitoring, which is easily reproduced. Following expeditions in 1998, 1999 and now 2001 have repeated the same methods of surveying large mammals in the same areas.

AIMS AND METHODS

The aim of this survey was to establish the current distribution and population status of large mammals in the northern extension of Nyika National Park. This information is used in conjunction from data collected from previous expeditions to assess how the populations have changed over time.

To estimate animal densities, in terms of relative abundance scores, the 2-level cluster sampling method was used. In 1997, when this methodology was established, the study area in the park was divided into 5 regions. Within these regions one-kilometre squares were selected randomly, as far as was logistically possible. It is these squares that have been surveyed over the years to gain comparative data. Thus each kilometer square studied by this expedition was also studied in previous years.

Each kilometre square was divided into 100m x 100m plots. Five of these plots were then selected randomly for the detailed surveys, so that 50,000m² or 5% was surveyed in each km². The random co-ordinates were selected by two people; one counting numbers in their head, the other stopping them at different intervals. This would give a representative sample of the mammals present in that kilometre square.

Within each plot 5 team members walked parallel along the midline of each 10m interval, looking at the 5m either side of their path. The team members noted all signs, droppings and prints and called these out to the recorder. Using this method, two sweeps were required to cover the entire plot. The scouts trained the teams in the identification of tracks and droppings. In addition, the proportion of bare ground, rock, grass, shrub, canopy cover and marsh in the plot was recorded.

Some areas were inaccessible. If a randomly selected plot was seen to cover impassable terrain, the only realistic option was to discard it and select another. This does mean that a few habitat areas are not accounted for, for example the dense, impenetrable forest patches on the plateau. The terrain also meant that some plots were 200m by 50m, which saved traversing ravines and unnecessary river crossings - although these were sometimes attempted! Also, when the number of team members had reduced, the five remaining field workers covered the plots in one sweep looking at the 10m either of their path. This was seen to be sufficient, once skills had been acquired and allowed more plots to be covered.

In this 2001 expedition a total of 16 kilometer squares were surveyed; 6 in the Chipome - Mondwe valley, 5 up on the plateau and another 5 in the Sawi - Guwu valley. These 3 areas form natural habitat zones within the study area. The habitat in the Chipome and Sawi valleys is almost entirely deciduous *Brachystegia* ('miombo') woodland. Under the canopy there is a fairly continuous understorey of grasses. In the areas previously cultivated by man, tall, single-species grassland is found. Riparine vegetation tends to be thick. Montane grassland predominates up on the plateau and is interspersed with evergreen forest patches, and dambos, which are marshy areas found in the hollows.

Maps illustrating location of the kilometer squares and detailed habitat descriptions were published previously. (Overton, M.J. (Ed) *Malawi 1997)*

RESULTS

A list of all species recorded by the expedition in the Nyika National Park in given in Table 1 below. These are from sightings (in bold) or other signs.

The systematic order followed here is according to Ansell and Dowsett (1988) after Meester et al. (1986). Some species were only recorded outside the plots. The notation in brackets is used in the results charts below.

Table 1: Mammals identified during the expedition.

Yellow Baboon*	(Ba)	*Papio cynocephalus*
Side-striped Jackal	(J)	*Canis adustus*
Cape Clawless Otter	(Ot)	*Aonyx capensis*
African Striped Weasel		*Poecilogale albinucha*
Civet	(Ci)	*Civettictis civetta*
Rusty-spotted Genet	(G)	*Genetta rubiginosa*
Slender Mongoose	(Mg)	*Galerella sanguniea*
Banded Mongoose	(Mg)	*Mungos mungo*
Spotted Hyaena	(Hy)	*Crocuta crocuta*
Leopard*	(Le)	*Panthera pardus*
Caracal	(Ca)	*Felis caracal*
Serval	(Se)	*Felis seval*
African Elephant	(Ele)	*Loxodonta africanus*
Burchell's Zebra	(Z)	*Equus burchelli*
Aardvark	(Aa)	*Osycteropus afer*
Warthog	(W)	*Phacochoerus aethiopicus*
Bushpig*	(Bp)	*Potamochoerus porcus*
Red Duiker*	(RD)	*Cephalophus natalensis*
Common Duiker*	(CD)	*Sylvicapra grimmia*
Klipspringer	(K)	*Oreotragus Oreotragus*
Grysbok	(Gb)	*Raphicerus sharpei*
Roan	(Ro)	*Hippotragus equinus*
Buffalo	(Bf)	*Syncerus caffer*
Kudu	(Ku)	*Tragelaphus strepsiceros*
Bushbuck	(Bb)	*Tragelaphus scnptus*
Eland	(Ela)	*Taurotragus oryx*
Reedbuck	(Re)	*Redunca arundinum*
Porcupine	(P)	*Hystrix africaeaustralis*
Scrub Hare*	(Ha)	*Lepus saxatilis*

* Indicates seen during valley surveys. Other sightings included those on the plateau, contributed by Helena Skinn.

The surveys were carried out mid-morning to early afternoon, due to the safety concern of navigating in the bush and thus the need to ensure that everyone was in camp by dark. The timing of the surveys may explain why only six species were actually sighted during the surveys. It is likely that most of the mammals were crepuscular or nocturnal, more active in the hours close to or during darkness.

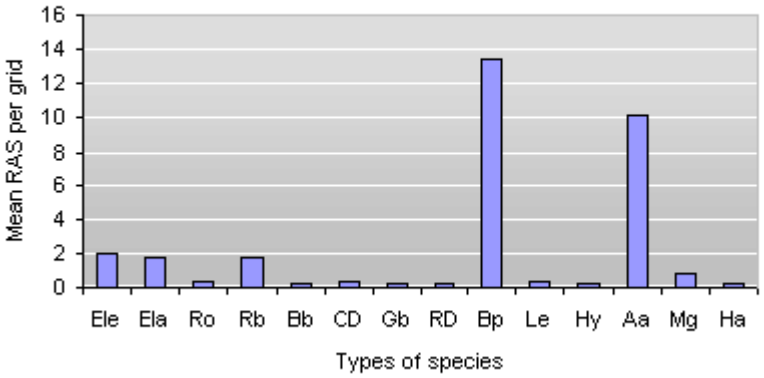
This list of 29 species is the same as found in previous years by *Biosearch*. However, Ansell's Mammals of Malawi (1988) have been complimented by further records. Ansell comments that the Aardvark is found around the Nyika plateau below 1800m, though a sighting had been accepted in 1968 on the plateau itself. The next definite record is a sighting from David H Foot in 2001. The presence at Nyika of the Rusty-spotted Genet was considered unlikely by Ansell, but has now been confirmed by David Critchlow in a report in press for "Nyala" 22.

Hippopotamus, *Hippopotamus amphibius* and Lion *Pathera leo* were listed as recorded in the Park by Johnson in 1990 but there had been no signs for many years until 2000 and 2001, respectively. Hippopotami were known to inhabit the North Rukuru River, but their prints were photographed by our previous expedition. Lion had not been seen since the mid 1960's, but was recorded by David Foot in 2001.

Plateau East of Nganda

Twenty-five plots in five kilometer squares or "grids" were surveyed at the edge of the plateau, east of the Nganda peak. The frequency of large mammal signs is calculated for each species in each kilometer square as the Relative Abundance Scores (RAS).

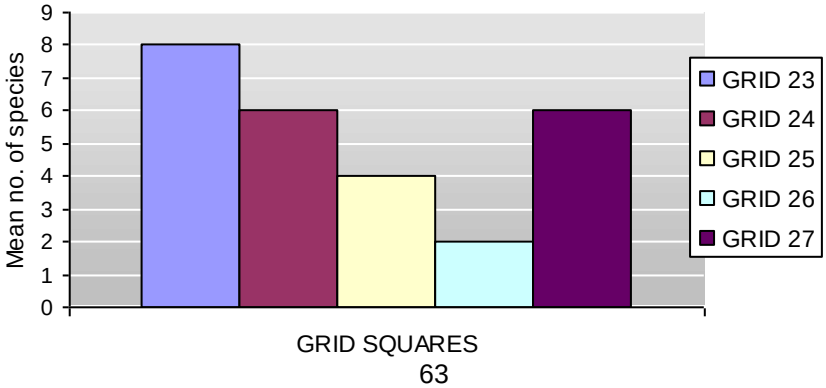
Figure 1: Frequency of records for all species found East of Nganda



The Relative Abundance Scores (RAS) per km^2 or "grid" for each of the species that were recorded is shown in figure 1. The predominant species for which there was most evidence was Bushpig and Aardvark, which had scores of 13 and 10 respectively. These scores were significantly higher than for any of the other species. The next most common signs were of Elephant, Eland, and Reedbuck with scores of 2, 1.8, and 1.8 respectively. All the other species recorded had Relative Abundance Scores of less then 1. The predominant evidence of Bushpig was the characteristic diggings and scratching in the ground, a signal of their behaviour in searching for roots and other food sources under the soil. These were easily identified and a maximum RAS (3) was given in almost every plot. In this part of the plateau the most noticeable evidence of mammal activity was the large number of Aardvark holes dug into the side of sloping grassland. The majority of evidence of Antelope species was based on droppings. Due to the very dry soil conditions on the top of the plateau there was very little evidence of fresh tracks.

The mean number of species found in each kilometre square grid in the East of Nganda region is shown in figure 2. There is some variation between each square, even though they were all in the same area of the National Park. For example, Kilometer square grid 26 only had a mean of 2 species per plot where as grid 23 had a mean of 8 species per plot.) This variation is indicative of the variation in habitat and vegetation within each plot in this area of the park. The terrain on the plateau was very undulating, with some areas of flat land and some areas of steep slopes. Interspaced between the gullies, and close to the tributaries, were very dense patches of vegetation. The 100 m x 100 m plots were chosen randomly and the vegetation and gradient could be very different in some plots.

Figure 2: Mean number of species per kilometer square or "grid".

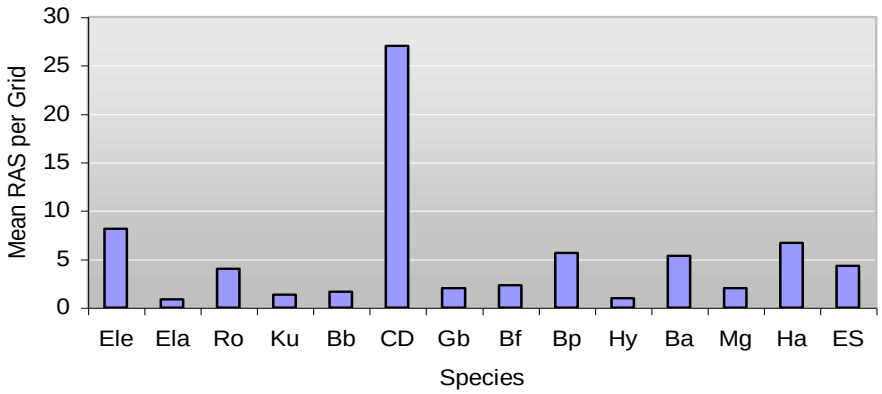


Chipome-Mondwe Valley

Figure 3 below shows that the species most in evidence in the Chipome Valley was Common Duiker, (RAS=25). There were also quite high scores for Elephant, Roan Antelope, Bushpig, Baboon, Scrub Hares and Elephant Shrew.

The Common Duiker produces exceptionally high RAS scores due to its behavioural habit of producing large quantities of widespread droppings. Therefore this is perhaps not a true reflection of

Fig 3: Main species recorded in Chipome Valley

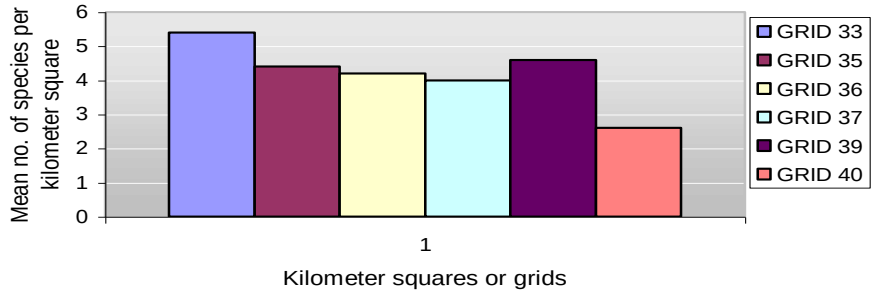


the numbers of actual animals in the area. However, as indicated in Table 1, the Common Duiker was one of only six species actually sighted during the surveys.

There was much evidence of elephants in this area of the Nyika National Park, and although none were seen, there was widespread evidence of droppings and vegetation damage due to elephant activity. The evidence of Bushpigs and Baboons was mainly from scratchings in the soil.

The mean number of species in each kilometer square grid in the Chipome Valley is compared in figure 4. The terrain in the Chipome Valley was more consistent, with almost continuous cover of *Brachystegia* and *Uapaca* woodland. This meant that each 100 m x 100 m plot was covering a similar habitat and thus gave more consistent results.

Fig 4: Mean number of species per kilometer square in the Chipome valley



Sawi-Guwu Valley

Figure 5: Main species recorded in the Sawi/Guwu Valley

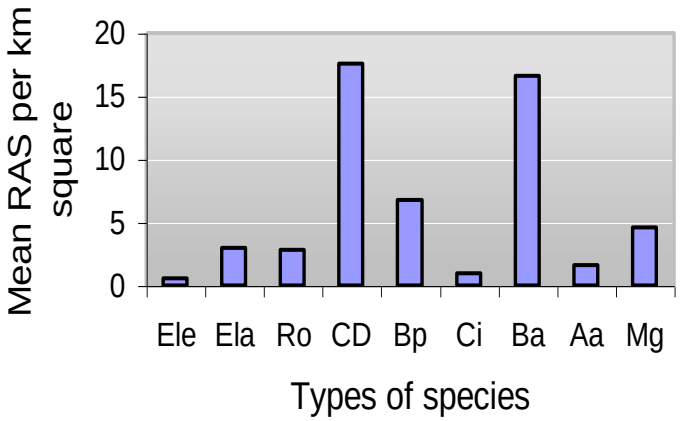
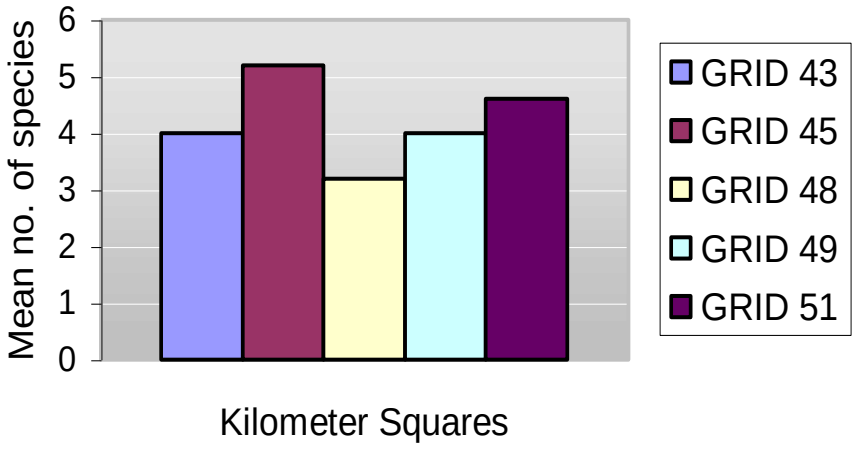


Fig 5 shows that Baboons and Common Duiker were the most predominant species recorded in the Sawi valley. Common Duiker were again determined by droppings and Baboons by scratchings in the soil. There was less evidence of Bushpigs than in the other areas of the park, and there was virtually no evidence of elephants. There was, however, a much higher RAS for Mongoose (5 per plot). The evidence for this was from the characteristic holes and droppings.

The vegetation in the Sawi valley was almost continuous cover of dense Brachystegia woodland, which meant that all the plots covered a similar habitat and thus the mean number of species per 100m x 100 m plot was again more similar for each plot.

Figure 6: Mean number of species found in each plot in the Sawi-Guwu Valley



Comparison between areas

There is a difference in altitude between each area, Nganda is the highest up to 1900m (6200ft) above sea level, Sawi Valley is the lowest at 1108m (3600ft). The survey was carried out during the cold, dry season and one might have expected an increase in diversity and abundance with

decreased altitude as animals migrate to the warmer, more favourable climate in the lower valleys. Figure 7 below illustrates the differences in mean number of species per plot in each area.

The plateau East of Nganda did indeed have the lowest species diversity, but there was very little difference in diversity between the upper Chipome and Sawi valleys. In fact, the lower Sawi valley had marginally less species recorded in each plot.

However, as can be seen from the previous charts for each area there was a difference in the types of predominant species in each area. Figure 8 illustrates more clearly the difference in RAS for some of the species in the different areas. It is clear from this graph that there was little obvious correlation with altitude for most of the species. In fact, Baboon and Mongoose are the only two mammals to show a definite increase with decreasing altitude. In the case of the baboons this is probably because they rely heavily on the fruits of trees as a food source and therefore are forced to move to lower altitudes as the resources are depleted.

Fig 7: Mean number of species recorded per km square in each area

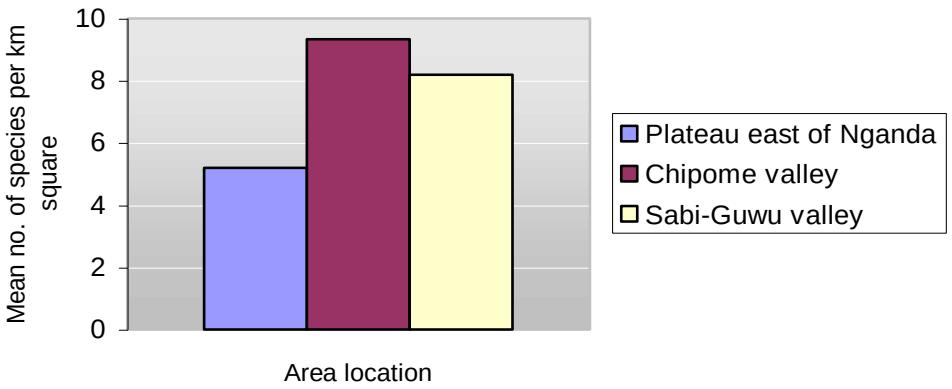
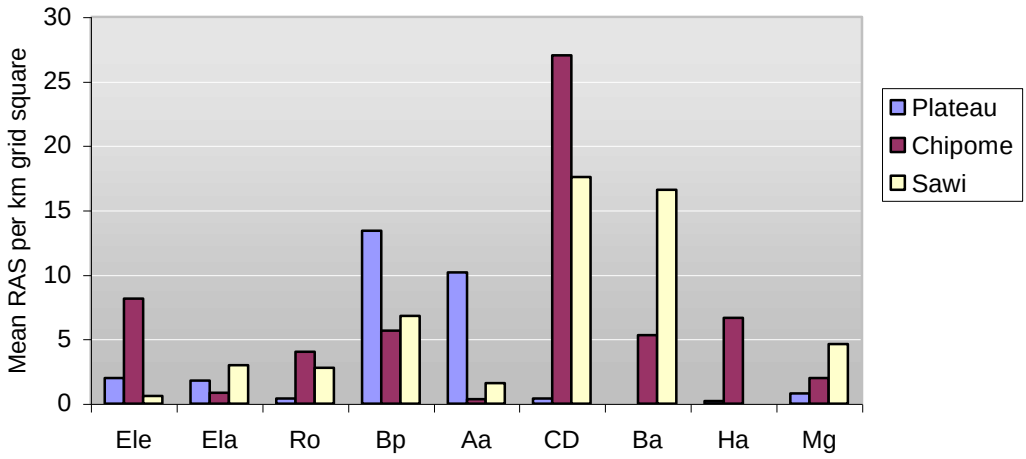


Fig 8: Comparison of Relative abundance scores of mammals with decreasing altitude



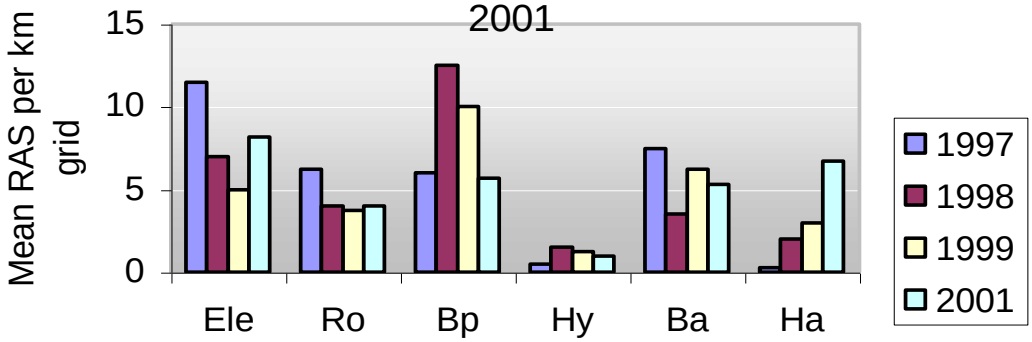
Changes in Mammal activity 1997-2001

The area to the east of Nganda was not surveyed in 1997 or 1998. Therefore it is only possible to compare the result for the areas in the valleys. The same kilometre square plots were surveyed each time. The 1998 and 1999 surveys were done in the cooler dry season of July and August, whilst the

1997 survey was done in April, at the end of the wet season. Therefore the 1998 and 1999 surveys are more directly comparable with this survey in 2001.

Figure 9 shows the mammals that showed a stable or slight increase in Relative abundance score from 1997 to 2001.

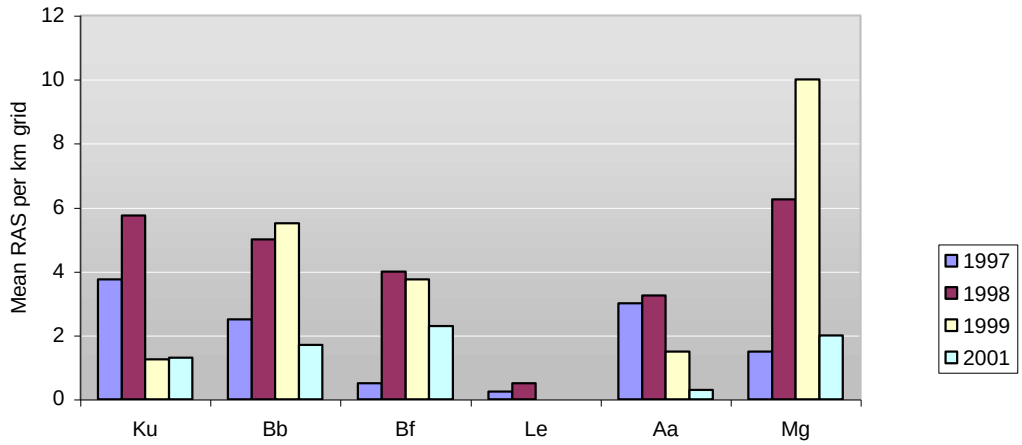
Fig 9: Relative abundance of successful large mammals in the Chipome valley from 1997-2001



Scrub Hares are the only species to show a steady increase in relative abundance each year. Elephants and Roan antelope were decreasing steadily each year until 1999, but the 2001 results show slight increases in both species. Hyaenas and Baboons appear to maintain a stable relative abundance.

Figure 10 show those mammal species that show a noticeable decrease in relative abundance over the years. The decline of Kudu, Bushbuck and Buffalo are particularly notable, as this may be indicative of the level of poaching in this area. During the surveys signs of poaching activity, e.g. bones, skulls, drying racks etc, were commonplace.

Fig 10: Relative abundance of less successful mammals in Chipome Valley 1997-2001



The apparent decline and complete absence of Leopard evidence is not necessarily an accurate reflection of the relative abundance. They are soft-footed species and are therefore less likely to be recorded by this surveying method. Also, although there was no evidence actually recorded in the plot squares surveyed, Leopard droppings were noticed several times while on route to the plot squares. Therefore the low relative abundance score for this species should not necessarily indicate a population concern.

CONCLUSIONS

The results have shown that there is a significant difference in species type and abundance between the three areas of the National park that were surveyed. The plateau area east of Nganda appeared to be mainly dominated by Aardvark and Bushpig evidence. It should also be noted that there was excessive evidence of mouse activity (mouse holes!) and, although these were recorded, they have not been included in the results, as they do not class as large mammals.

The predominant evidence of species in the Chipome valley appeared to be from Common Duiker and Elephant, although there was evidence of other species and this valley appeared to have the greatest biodiversity of the three areas surveyed.

The Sawi-Guwu Valley evidenced a high level of activity of Baboons and Common Duikers but there was a noticeable lack of evidence of Elephants. This area had the most amount of evidence of poaching activity and this therefore may explain the apparent absence of elephants and other large antelopes such as, Kudu, Reedbuck and Bushbuck.

There was evidence of changes in relative abundance for some species over the last four years. The most notable changes were the apparent recent resurgence in abundance of Elephants and Roan Antelope in the Chipome valley. This may suggest the anti-poaching patrols are enabling the safe return of these mammals to this area of the National Park. However, there were also a noticeable decrease in the evidence of Kudu and Bushbuck. Taking account of all the evidence found, it is likely that the level of poaching activity is having some effects on the populations of these mammals.

The result of this survey would not seem to bode well for the populations of cat species (e.g. Leopard, Servil, Genet). However, as they are the top predators one would expect them to be in low numbers compared to the other species, and, in fact, an appreciable amount of evidence of large cat droppings was evident on the animal tracks used in our hiking.

The survey therefore showed some interesting patterns in the distribution of large mammals in the Nyika National park and from the evidence recorded there is obviously a large amount of mammal activity. However, there is also a very high level of poaching activity and it is likely that this is affecting the populations of some species. It is not possible from this survey to give an accurate estimate of population numbers for each species but it does give a good representation of relative abundance. During this dry, cold period of July/August, animals are believed to migrate to the warmer climates in the lower valleys. It is recommended that the survey be carried out in the warmer, wet season in future, in order for more overall view of the relative abundance.

REFERENCES

Ansell, W.F.H. and Dowsett, R.J., (1988) *Mammals of Malawi: An Annotated Checklist and Atlas.* Trendine Press, Zennor, Cornwall. Also Addenda and Corrigenda of 1988. *Nyala* 15(1):43-46.

Chirwa, A.M. (1992) *The Status of Elephants in Nyika National Park, Malawi.*

Chirwa, A.M. (1996) *Nyika Wildlife Research Unit 1995-1996. Annual Report.*

Chirwa, A.M. and Mkanda, F.X. (1996) *Mortality of Common Ungulates in Nyika National Park, Malawi.* Ref.No. WRV/2/51/2/13/28.

Critchlow, D.P. (1995a) *Elephant dung count ulendos and other 1994 elephant information in Nyika National Park, Malawi*. Ref. No. WRU/2/51/2/11/77

Critchlow, D.P. (1995b) *Nyika Wildlife Research Unit 1994-1995. Annual Report.* Ref. No. WRU/2/6/2/23

Critchlow, D.P. (1995c*) An Assessment of the Judiciary Process as it Applies to Poaching Offences in Nyika National Park.* Ref. No. WRU/2/51/4/2/ vol. II/12.

Department of National Parks and Wildlife (DNPW), (1995) *Feasibility Study on the Sustainable Management of Nyika National Park and Vwaza Marsh Game Reserve.* Volume IIA, Annexes 1-6.

Jachman, H. (1996) *Counting Elephants on the Ground: Dropping Counts and Line Transect Methodology. A Field Manual,* pp 14-17.

Jachman, H. & Bell, R.H.V. (1984) The use of elephant droppings in assessing numbers, occupancy and age structure: a refinement of the method. *African Journal of Ecology*, 22:127-141.

Johnson, S.A. (1993*) A Visitor's Guide to Nyika National Park, Malawi,* p45-84. Mbabzi Book Trust, Blantyre

McClounie, J. (1903) A Journey across the Nyika plateau. *Geogr. J.* 22(4):423-437.

Mkanda, F.X. (1991) Possible solutions for the encouragement of positive public attitudes towards National Park's and game reserves in Malawi. *Nyala* 15(1):25-37.

Munthali, S.M. and Banda, H.M. (1992) Distribution and abundance of the common ungulates of the Nyika National Park, Malawi. *Afr.J.Ecol.* 30:203-212.

Mwalukomo, A.C.W. (1983*) Patrolling Nyika National Park, 1982: Draft.* Department of

National Parks and Wildlife, unpublished. Ref No. NY1/WRU/1/28/18.

Overton, C.P. and Nursaw, J. (1972) *Wye College Expedition Report.* Wye College, London. Internal Publication.

Overton, M.J. (Ed) *Malawi 1997 A biodiversity expedition in the northern hills of the Nyika National Park.* C.P. and M.J. Overton, Hilltop Farm, Welbourn, Lincs

Overton, M.J. and Nagle, C.J.E. (eds). *Nyika - Katumbu Challenge 1998*. C.P. and M.J. Overton, Hilltop Farm, Welbourn, Lincs

Overton, M.J. (Ed) *Scientific exploration of the Nyika National Park, Malawi 1999*

Sutherland, W.J. (1996*) Ecological Census Techniques: A Handbook.* Cambs. Univ. Press.

Tattersall, F (1995) Ivory spree: Brand new democracy, same old attitudes. *BBC Wildlife* 13(2):60.

Insert pictures of poachers' hut and snares

POACHING REPORT

Mark J. Gilroy

917545*	19/07/01	Poacher Camp - Destroyed
918525	19/07/01	Heard poacher gun shots - Scouts investigated, no sightings.
919548	20/07/01	Poacher drying rack - Destroyed
917545	20/07/01	Poacher viewing point
926568	21/07/01	Poacher Camp, 2 drying racks - Destroyed
907573	22/07/01	Poacher Fire - Scattered
950435	25/07/01	Poacher Camp, Fire and Sitting Logs - Destroyed
023414	27/07/01	Poacher Snares - removed
030408	27/07/01	Poacher Tracks - no action taken
958531	01/08/01	Poacher Camp - destroyed
976590	03/08/01	Poacher hut, spear, snares, and animal remains - hut destroyed, snares & spear removed

*Poaching GPS Refs (UTM):

On each of the three separate weekly excursions from the base camp a range of poaching evidence was uncovered. The poaching evidence that was found varied in age. Some of the camps were only a couple of days old with fresh food remains (maize) still in situ. Other poachers' camps were well established and regularly used. These camps were well constructed with grass roofed huts and well used cooking areas. They were normally found in well wooded, hilly areas with good grass cover and situated within a reasonable range of a fresh water source.

The poachers that enter Nyika National Park originate from with Malawi and its boardering countries such as Zambia. From the evidence uncovered the poaching groups ranged in size. The smallest groups consisted of 2 poachers with the larger groups containing up to 4 - 5 members each with specific skills:

Tracking
Shooting
Skinning & drying
Trap setting

It was indicated to us via the guides that a lot of the poachers are ex-military men with illegal fire arms and good survival/hunting skills. There was a large amount of burning within the study areas that had been initiated by the poachers to drive out there target prey. On one occasion we found the remains of a young female elephant that had been killed the previous year according to the guide (Kingfrey). (Sorry. I did not get a GPS fix for this particular find).

Insert of baby elephant

A MEDLEY OF PERSONAL COMMENTS

The UK Team

These comments are extracted from the confidential evaluation forms, something from each form. They are included here to give a flavour of how the expedition felt for the participants.

"I was a novice at camping prior to Nyika but now I feel I could camp anywhere in the world. I enjoyed the challenge of the expedition, I have made a new set of friends, seen some amazing scenery and become a stronger person. It was well worth it."

"The scouts were brilliant and made the expedition for most of us. Very helpful, informative and great fun. No problems…It was a valuable experience to see the importance of trying to maintain good morale. The rough terrain and lack of paths meant it was the toughest hiking I've ever had to do, and navigation was quite difficult as well…
…Overall, it was a tough expedition and to give everyone credit, we did achieve most of what we set out to do. Most importantly, all got back safe in one piece."

"It was a great opportunity to see a developing nation and hopefully leave a valuable contribution to the Nyka National Park. The scouts were extremely helpful and courteous. The cultural exchange with them was one of the most memorable aspects of the trip for me. I particularly enjoyed this and the time spent in Thazima… I did find things challenging, as I had expected, especially coping with the remoteness. I certainly gained from the experience, especially making the best out of some difficult circumstances."

" Being able to learn from the scouts was most valuable for me. Also gaining experience of navigation (map reading and GPS), leadership (making decisions, although probably not always the right ones!), general campcraft, bush living and more knowledge of the flora and fauna of that part of Africa."

"The expedition was character-building, challenging physically and emotionally. The large mammal project was interesting, though I would rather not hike quite so far."

"Remote! Challenging! Interesting! Frightening! The best thing was not being able to hear a car (or an aeroplane.) I have gained a lot of respect for what I have taken for granted. I liked the wilderness."

"I enjoyed the challenge and the remoteness… The projects were interesting. The poaching evidence was exciting to see and one felt a sense of accomplishment being able to have a direct effect in combatting it…I personally feel privileged to go to this area where few people are able to go. "

"The team worked well together as best it could in the situation. Different levels of experience wasn't really the issue - certain members had no interest in the science work, hated camping and didn't want to be physically challenged! Other "inexperienced" members coped very well and gained a lot because they were enthusiastic and positive."

"No refrigerator, not enough fresh fruit and vegetables, knives that fell out of their handles, no large container for boiling water, insects ate through the ground sheet, no helicopter…Chinteche Inn was fabulous. Should have been longer."

"The expedition certainly challenged me physically but the sense of achievement each day made this a very positive thing. I now know that I can cope a lot better than I previously thought and I know that I love a challenge! "

"Personally I have gained a temendous amount from the experience. I have made some very good lasting friends. I have learned a lot about myself and my limits and I have gained more self confidence. And I realise how lucky I am to have spent time in a place as unknown and as beautiful as Nyika."

Insert Picture: Malawi 2001 The End