EXPEDITION OVERVIEW

Rohit Sharma

INTRODUCTION

We named our expedition Exercise Gryphon Scout Ebor, in our traditional style. It was an adventurous training expedition carried out by Leeds University Officers' Training Corps (LUOTC), incorporating scientific research in co-operation with Biosearch Nyika. I was keen to organise an expedition following the initial meeting with Peter Overton, of Biosearch Nyika, as it was a tremendous opportunity presented to the Officer Cadets of LUOTC. The expedition involved a three week trek in rugged, remote and mountainous terrain in the northern hills of the Nyika National Park, Malawi. This was followed by a short 'Rest and Recuperation' phase prior to the flight back home. The main aims of the expedition were successfully achieved. The Officer Cadets involved all participated fully and achieved significantly high standards of team spirit, self confidence, survival techniques in remote regions, personal administration, endurance and responsibility. Our scientific objectives were achieved; valuable data regarding the levels of animal activity and poaching within the Nyika National Park was successfully collected.

The advance party consisting of Leslie Mitchell, Richard Jackson and myself, flew out to Lilongwe, arriving on 11th July 1999. As the advance party it was our job to purchase rations and equipment, check that transport and evacuation procedures were in order and to touch base with the British Embassy. The tasks mentioned were completed within 3-4 days, leaving us with some time to enjoy Lilongwe, which was an interesting experience. We liaised with Peter Overton, of Biosearch Nyika, who proved to be most helpful when checking arrangements and obtaining advice about where to go and with whom to speak about our requirements in the country.

We met the main team at the airport on 18th July, and began our long journey up country by bus. Three days were spent travelling up to the Nyika National Park acclimatisation, administration and organisation of basecamp. The spot chosen for basecamp at Nganda was the same as that used by previous expeditions in 1998, 1997 and 1972. The field expedition phase began on 22nd July.

EXPEDITION ORGANISATION AND PERSONNEL

The expedition was initiated and organised in the U.K. by myself in co-operation with Biosearch Nyika. Biosearch Nyika obtained the necessary permissions, provided the logistics and organisation within Malawi, pre-expedition advice and training briefings in basecamp, and edited and published our report. The team was led in the field by Major Leslie Mitchell, with Joint Service Mountain Expedition Leader (JSMEL) qualifications. He was not involved with the planning phase since he came from Northern Ireland and was not a member of LUOTC. Similarly, two other JSMELs joined us; Christine Whiteside, from Northern Ireland and Richard Jackson from Northumbria.

The overall U.K. team was made up of 15 personnel from LUOTC and the three JSMELs, each of whom led a team in the field. There were three scouts, one attached to each field team. Juliana Hughes, Michael Willis and I took responsibility for co-ordinating the scientific work for each team.

Personnel

A Team	B Team	C Team
Richard Jackson	Leslie Mitchell	Christine Whiteside
Rohit Sharma	Juliana Hughes	Michael Willis
Edwin Croxton	Verity Irvine	John Bramall
Dave Longden	Tom Booker	Pete Shuttleworth
Benet Swann	Simon Morford	Stuart Bertram
Richard Carter	James Robb	Dominic Galea
Richard Nyirenda	Manfred Kumwenda	Steve Gondwe

Scientists Ray Murphy and Wilbert Chitikauli accompanied us for the first phase, but needed to work in other areas thereafter.

With the remoteness and harsh terrain that we were often faced with, it is encouraging to know that not a single casualty was encountered. The professionalism and pre-training of the Officer Cadets, and the assistance of the game scouts insured that we were well prepared for any difficulties. Prior to the expedition I ensured that as many people as possible were trained in first aid and had the correct medical supplies and personal equipment with them. We were well equipped with emergency communication means by way of a satellite telephone and the HF radios that came with the scouts. The relevant authorities were informed of our presence.

No significant changes to the initial plan were made with the exception of aborting the second re-supply run at the end of phase two of the expedition. Instead, the re-supply run at the end of the first phase was used to purchase ration and supplies to last until the end of the expedition. We then hired a group of porters from Chelinda Forest Camp to assist us in carrying two weeks of food down in to the Sawi valley in order to give us a more realistic chance of completing as many of the phase three locations as possible. However, several of the grid squares were not surveyed because of the extreme terrain that they contained. This was a in order to ensure the safety of the group and also conforms with the method laid down by Biosearch Nyika.

REST & RECUPERATION PHASE

The R&R phase of the expedition was successful. Three days were spent en route to Lilongwe for the flight home. The first night down from Nyika was at Mphatso Inn in Mzuzu, a low budget Malawian accommodation, short on western standards. However, our second night provided the Officer Cadets with a high standard of accommodation at Chinteche Inn. A little longer on the beach at Chinteche would have been more enjoyable, with the water and beach-based activities that were made available to us, but the group fully enjoyed the well-earned break.

SUMMARY

The expedition as a whole proved to be a valuable experience to everyone involved. From the organisation point of view, much time and effort was required on my part with assistance from John Bramall who made ends meet before deployment to Malawi. A financial statement has been sent separately to the MOD. The group as a whole spent an extremely rewarding time in Malawi as they were placed in a diverse and remote environment. The experience led to a significant improvement in team work, self reliance and personal development for all those involved.

I would like to say a special thanks to the RQMS of Leeds University OTC for arranging all expedition equipment and supplies prior to deployment, John Bramall for his work immediately prior to deployment, Michael Willis for his expedition funding efforts and contribution to this report, and Edwin Croxton, Dave Longden, Richard Carter, James Robb and Dominic Galea for their contributions. Also to Biosearch Nyika for making this type of expedition possible in Malawi.

COMMUNICATIONS REPORT

Edwin Croxton

BACKGROUND

The area we were working in was extremely remote. We were always at least a day's walk away from the nearest communications point for medical facilities and sometimes two days' walk away. Therefore it was clear that communications were not a luxury but a necessity.

The choices

The two options open to us were satellite communications or high frequency (HF) radios. On the 1998 Biosearch expedition, the Southampton University Officers' Training Corps used HF radios but satellite communications had not previously been used in the Park. The HF radios required an intermediary to summon help. With the satellite phone the medical services could be contacted directly, saving time and possible confusion.

The 1998 Biosearch Nyika report on the HF radios stated that they had not been able to contact the nearest settlement at Chlelinda, thus limiting them to communications by foot as far as the basecamp, where there was a vehicle. We had no specific reports about satellite communications regarding Nyika but general reports suggested that they functioned well anywhere in the world.

HF radios were readily available through the army, unlike satellite communications which had to be hired at much greater expense. The clarity of reception between HF and satellite was similar if both were functioning well, however there was much greater possibility of the reception of the HF radio being poor due to the altitude and the mountainous lie of the land. Also long setting up times were needed for the HF radio to achieve good reception. The HF radios are large and heavy and Southampton OTC members reported them to be a burden while trekking (particularly as they were not functioning!). The satellite phone is small and light but possibly more susceptible to damage and water. Due to the essential nature of communications and the 1998 Biosearch Nyika report, the decision was made to use satellite communications.

EVALUATION

The satellite phone was luckily never required for an emergency. However the phone was excellent. It was simple to use and easy to set up quickly, taking only a matter of minutes to get good reception. All members of the group knew how to use it after a short instruction session. The phone was used in the most remote areas of the Park. Excellent reception was obtained although there was a slight time delay between caller and receiver.

The satellite phones ranged in hire price between £300 and £600 for the month. Although being expensive at £3 pounds a minute plus hire fee of £300, it was an excellent use of money, being small, practical and easy to use. It is highly recommended to other expeditions.

EXPEDITION RATIONS

Richard Carter

The table below shows the expedition food rations calculated on 18 days of trekking and 5 days of fresh rations.

Item	Quantity
Fresh carrots	2 large plastic bags
Fresh onions	6 large plastic bags
Fresh potatoes	1.5 large sacks
Fresh peas	1 large plastic bag
Fresh cabbage	12 large
Fresh meat - steak	6 kg
Eggs	4 x 30
Bread	5 x breakfast, 5 x lunch
Ham - vacuum sealed packs	2 kg
Fresh fruit - bananas	2 large bunches
Margarine	6 tubs
Salt	500g
Peri Peri seasoning	4 jars
Meat seasoning	6 jars
Vegetable oil	6 l
Tomato sauce	3 large bottles
Tea	600 bags
Coffee	4 large jars
Milk powder	0.5 kg per person
Jam/marmalade	6 jars
Peanut butter	3 jars
Honey	1 jar
Biscuits	1 pkt per person per day
Boiled sweets	1 kg each
Chewing gum	3 large bags
Corn flakes	9 large boxes
Porridge Oats	12 kg
Weetabix	6 x 24
Mixed fruit	5 pkts
Rice	50 kg
Spaghetti/Pasta	12 kg
Corned beef	60 tins
Tinned ham	12 x 1 kg
Luncheon meat	9 tins
Tinned tuna	60 tins
Tinned mackerel	27 tins
Sumu - mixed beans	60 tins
Tinned tomatoes	48 tins
Tomato puree	18 tins
Baked beans	60 tins
Tinned peas	9 tins
Tinned spaghetti	36 tins

These rations formed into some typical meals;

- Breakfast: Cereal / Jungle Oats / Weetabix
- Lunch: Packet of biscuits and boiled sweets
- Dinner: Rice/Pasta, Sumu/baked beans, Tuna/Mackerel/Ham/Corned beef

Compared to our familiar European dried ration packs, the Malawian dried foods seemed limited, so a high proportion of tins was purchased. The weight carried by each person was thus far more than necessary. Although 'comfort foods' were on the equipment list advised by Biosearch Nyika, it is worth emphasising their importance here; a small container of mixed spice/herbs and the odd personal favourite such as marmite does make a difference and we should perhaps have been better equipped with these. Each person had two stripped down issued ration packs for emergency use. The diet was supplemented with vitamin pills.

The fresh rations were used to make stews (and such delights!) when the groups returned to basecamp during the rest and re-supply phase.

EXPEDITION PROGRAM

By Dominic Galea

SUMMARY

The expedition divided naturally into five phases;

Phase	Details	Dates
1	Move out from the UK, via London Gatwick Airport, to the Nyika National Park in Malawi	17 - 20 July
2	Acclimatisation	21 July
3	First data gathering trip. Grid squares 33 to 38	22 - 29 July
	Second data gathering trip. Grid squares 43 to 52	30 July - 2 August
	Reorganisation of groups and ascent of two peaks	3 -6 August
4	R & R phase, including decamping and travel time	7 - 14 August
5	Move back to the UK, via Lilongwe airport.	15 -16 August

EXPEDITION LOG

Date	Location	Altitude (ft)	Dist. covered (km)	Time taken (hrs)	Work
18 July	Chikangawa, Viphya	6 000	-	-	Vehicle Travel
19	Thazima Gate	5 500	-	-	Vehicle Travel
20	Basecamp	7 400	-	-	Setting up basecamp
21	Basecamp	7 500	-	-	Acclimatisation
22	912 572	4 850	14	6.5	Setting up camp
23	912 572	4 850	5-6	6	Data collection
24	912 572	4 850	12-15	8.5	Data collection
25	912 572	4 850	2	2	Data collection
26	909 503	5 850	6	3	Trek
27	Basecamp	7 500	6	4	Trek and rest Lt. Col. Hony (CO) arrived
28	Basecamp	7 500	-	-	Rest day
29	Basecamp	7 500	-	-	Rest day - CO left
30	974 569	4 200	18	8	Trek to basecamp 3
31	974 569	4 200	1	1.5	Data collection
1 August	974 569	4 200	8-10	5	Data collection
2	974 569	4 200	?	?	Data Collection
3	949 628	4 300	8	3	Trek and Start of ascent of Kawozya
4	902 644	7 400	6	5	Ascent of Kawozya
5	974 569	4 200	12.5	6	Trek
6	974 569	4 200	8	5	Poaching data collection
7	909 503	5 850	10	3	Trek
8	968 400	6 750	6.5	2	Trek back to Chelinda via North Rumphi Bridge
9	Chelinda	500	16	5	Vehicle travel
10	Thazima	5 250	-	-	Vehicle travel
11	Vwaza marsh	3 900	-	-	R & R
12	Mzuzu	3 900	-	-	R & R
13	Chinteche	1 540	-	-	R & R Lake Malawi
14	Chinteche	1 540	-	-	R & R Lake Malawi
15	Gatwick	c. 150	-	-	Flight travel to UK

MEDICAL REPORT

Dave Longden

PREPARATION

First-aid was supplied from two sources. The group first aid kit was issued by the military in accordance to adventurous training policy. In addition to this, each member supplied their own personal first-aid kits. (Lists of these kits are at the end of this section.)

A written brief on health issues in Malawi was sent to us by the Joint Intelligence Agency in the U.K.

Efforts were made to have the necessary vaccinations done through the military systems but unfortunately this was not possible. Participants therefore had to arrange their own, mostly with the Leeds Student Medical Practice.

Those given were:

- Polio
- Tetanus
- Typhoid Fever
- Hepatitis A + B
- Diptheria
- Rabies

Rabies was not available free on the NHS, therefore participants again had to finance their own injections at £20 each. Few people will bother with this unless they expect to be handling animals. Three were required to complete the course. For anyone travelling on to Zambia a Yellow Fever certificate is currently needed, though this does not fall into the medically recommended inoculations for Malawi.

Malaria is a significant hazard to health, particularly in lowland areas such as Lake Malawi. To counter this, participants purchased and took anti-malarial treatment, mainly in the form of Mefloquine (Lariam).

The presence or absence of Bilharzia in specified locations on Lake Malawi is a matter for dispute. We were advised that the beach at Chinteche could be expected to be free from the problem but concerned individuals could consult their G.P's on returning home for further advice. Most of the team, in common with previous expedition teams, chose to swim in the Lake. Bilharzia is now treatable by modern drugs.

HEALTH

The health of the expedition members was generally good, although during our work in the field stomach cramps, diarrhoea and possibly food poisoning occurred. It was the responsibility of each individual to take all necessary precautions and to pay attention to their personal standard of health and hygiene. This should not have been a problem, as abundant clean water for washing, bathing and drinking were available from the rivers.

All cuts and bruising were quickly wiped with antiseptic and dressed, in order to prevent infection.

Some members suffered from headaches and dizziness, as a result of the temperature and altitude. Physical fitness was an important factor in combating these complaints. On excursions from field camps and all travelling to and from basecamp, each member was expected to carry enough water to sustain him or her through the entirety of their journey. Through regular intake of water these complaints were generally kept at bay.

Members were exposed to sunburn during the time in the National Park. The time of increased risk was at high altitude or when resting in the valleys during the day. Precaution should be taken to apply high factor sun block and keep covered during the hours of high risk. Hats and sunglasses were taken by all members and proved to be necessary items of kit.

WATER PURIFICATION AND FOOD

Clean water is of paramount importance to any expedition's health in the wilderness. Water in the valleys was of good drinking standard. At no other time during our stay in Malawi was water drunk untreated from natural water courses. Piped water supplies in Lilongwe, Mzuzu and Chinteche, the other points of our stay, are sound but nevertheless all water was treated mainly through carbon drinking water filters. In addition some members carried iodine droplets or sterilising tablets. We also purchased bottled water from the supermarket.

Most food used in the expedition was bought in cans from PTC or Kandodo supermarkets. Efforts were taken to try and keep a balanced diet. It was however, impossible to supply fresh food throughout. To combat this, all members were advised to bring and take vitamin tablets. When we had the chance we purchased potatoes, tomatoes, onions and bananas, all of which are widely available in Rumphi and Mzuzu.

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

SCIENCE REPORT

Michael Willis

TEAMWORK

On arrival at basecamp, we were organised into three groups for field survey work. Strengths and weaknesses of the group were considered when organising teams. One JSMEL was allocated to each team plus one of the game scouts and five expedition members.

METHOD

When we set off from basecamp to start the research and surveying work the teams headed for predetermined, randomly chosen grid squares. Having navigated to the plots, their location was confirmed using GPS. In each grid square five 100m square plots were selected randomly to give a fairly accurate representation of the amount of animal life and activity in the area.

Once the team had reached the corner point of one of the plots someone would pace 50m along the edge of the plot and mark it using a jacket. The team would then form an extended line and pace 100m looking at the ground and recording the results. The scout would help the members of the team identify signs of the animal damage, droppings or tracks. One person in the group would be nominated as the recorder and as the team progressed along calling out the signs he or she would record the data on a pre-printed sheet of paper. Once the group had walked 100m we would all spread out again and walk the other 50m strip of the plot.

At first the plots took a lot of time to do due to inexperience. Some of us found it hard to identify the signs of the animals and required the help of the scouts a lot. This proved to be very time-consuming and meant that each plot could take up to half an hour. After only a couple of days everyone found it much easier and the plots could be done in around fifteen minutes.

RESULTS

People soon realised that there was a disproportionally high number of Common Duiker markings as daily we recorded scores of droppings and tracks, however we only saw a couple during the entire expedition. A number of us came to the conclusion that there were only a few of them but they had particularly bad digestive problems! Some of the plots were in very difficult terrain and had to be discarded. During the surveys a wide variety of animals, insects and plants were seen.

Signs of the poacher activity were recorded and locations of huts and fires were noted. Some of the valleys showed many signs of poaching activity. This took the form of huts, traps and footprints. All these signs were recorded and locations noted, any traps that were found would be either destroyed or collected and the huts were destroyed. Animals remains were sometimes found. Occasionally they would still be alive which some found a little disturbing. Almost daily each group would have new stories to tell about the days activity and recent encounters with new species such as Green Mambas, "Tarantulas", "Cobras" and a large variety of potentially dangerous insects. At night the groups would merge and discuss the days high and low points and normally the new sightings would be the favourite topic of conversation.

A lot of the group were surprised by the lack of actual sightings and initially it was thought there may be no animals in the Park, except the ever-present Duikers. However it was pointed out that this was due to the heavy poaching in the areas and it reassured us about the worth of the expedition. When the groups progressed to the more remote areas of the Park it was noticed that more wildlife was seen again. This may have been a reflection of less poaching in these areas.

Good sightings were made of antelope, including Eland, Reed Buck, Klipspringer and Duiker. The most impressive of these sightings were made on the peaks of the remote areas were few people venture. But by far the most sightings were of birds, some of which were very impressive indeed. Although no specific bird report has been produced it was good to see good numbers of raptors – eagles, buzzards and hawks, and Eastern Double-Collared Sunbird and Mountain Marsh Widow were spotted by the keener-eyed among us.

Nearly everyday we covered different terrain, so one day the plots could be over very rocky ground where tracks would be few and far between, other days involving grassland would produce huge numbers of reports. The variety of the landscapes kept things interesting and, even where the terrain was similar, new things would still be seen. One of the problems that we encountered was that the maps could be misleading in terms of one's actual experience on the ground. Plots which on the map appeared to be relatively straight forward and flat could turn out to be inaccessible or impossible to accurately survey. This meant that areas and plots had to be improvised depending on the terrain.

CONCLUSION

In summary I would say that the surveying work we did was an interesting and rewarding way of studying the area and an effective way of analysing the impact of poachers on the number of animals. It gave everyone the very privileged opportunity to work with game scouts in a way which the majority of people visiting a National Park would not be able to do. It also let members of the group develop team work skills and get to know each other very well.

POACHING REPORT

James Robb

WEEK 1

Grid Ref.	Item		Action
934526	Poachers Hut	2 recent skins	Destroyed
896586	Hut & drying Rack	5 months old	Destroyed
897589	Burning	2 weeks old	
865595	Branches stripped off bark for rope		
866595	Fishing Basket		Destroyed
871587	Burning	2 weeks	
903582	Camp fire	2 weeks	
869591	Camp fire	3 weeks	
936626	Camp fire		
935601	Camp fire		

Week 2

Grid Ref.	Item		Action
978562	Camp fire and Common Duiker remains	1 month	
940559	Hut	2 months	
974572	Camp fire and Eland remains	2 months	
972589	Camp fire and Bush pig kill	1 month	
971588	Camp fire	1 month	
973588	Foot prints	4 days	
969600	3 snares	1 month	Removed
	Injured Vervet Monkey caught		Destroyed by scout
971591	Honey taken from tree		
964604	Bark stripped away for honey container		
973594	2 snares		Removed
978577	1 snare		Removed
988597	1 snare		
989584	Burning		

Week 3

Grid Reference	Item		Action
998574-991596			
	31 snares following along Guwu river		Removed
997579	Leopard trap baited with baboon carcass		Destroyed
997578	Skinned Leopard carcass		
997585	Camp fire	1 month	
993595	Hut	6 months	
991595	Common Duiker trap		Ropes cut and removed
991595	Dead Baboon in snare		
987598	5 Drying racks and Buffalo remains	Ages differed	Destroyed
987598	Poacher footprint over our tracks	1 day!	
949634	cuttings		
948585	Small hut & 2 fires		Destroyed

SMALL MAMMALS OF THE NYIKA: SURVEY III (1999)

Wilbert N. Chitaukali

INTRODUCTION

In August 1999, a survey of small mammals (with respect to occurrence, distribution, taxonomy, and some aspects of behavioural ecology) was conducted in the remote areas of the Northern extension of Nyika National Park, the Western end of the plateau, and in the Chowo Forest. This work was done as a continuation and extension of similar surveys conducted in the same area in 1997 and 1998. The rationale of the whole project was presented in our earlier reports. At the end of the current field study, 47 rodents, representing six or seven species and eight specimens of fruit bats representing one or two species were collected.

STUDY AREAS

The study was conducted in five remote localities of Chipome, Nganda, Chisanga, Chawezga, and Chowo on the Nyika Plateau. Each of the five localities represented a different vegetation type, though there were some similarities.

Chipome and Chawezga were at almost the same altitude of about 1500 m. The main vegetation communities were montane evergreen forest, montane grassland, *Brachystegia* and dambos (boggy areas cf. Ansell and Dowsett, 1988). Shrubs and grasses were up to 2 m high in some places. Soils were mainly red compact clays, away from streams, to sandy and loose close to streams. Temperatures were relatively high and the areas very dry.

Nganda and the Chowo Forest are at higher altitudes, about 2200 m on the plateau. The plateau is characterised by a series of rolling hills with isolated evergreen forest patches and extensive grasslands. Between the ridges swamps or thickets (Happold & Happold 1989) border shallow valleys. Temperatures were lower and nights felt chilly, and sometimes associated with strong winds.

Chisanga locality is in the transition of the plateau proper and the valleys at the escarpments of the plateau. The altitude is about 1800 m. Remnant evergreen forest patches, with tall grasses and shrubs growing up to 3 m high, mainly covered this area. Also present at this locality were swamps and boggy meadows.

Chipome Valley

In the Chipome Valley (S10°20', E33°50', altitude c.1531 m), temperatures were relatively high and the area was very dry, possibly due to low rainfall in the previous year. At Chipome, three habitats were sampled, two of which were on the south-western side of the river while the third was some 500 m away, on the northern side of the River Chipome.

The first habitat at this locality was on the south-western side of our base camp. The line transect ran perpendicular to the river. This site was very dry, the soils were clayish gravel and very compact. Ground was sparsely covered with grass and *Protea* shrubs. The second habitat at this locality was along the river, on the southern side of our base camp. Traps were set parallel to the river at 1 – 10 m from the riverbank. Most parts were sparsely covered with tall grasses and shrubs up to 2 m in height. Soils were loose and sandy (close to the river) or red clay (away from the river). One end of the transect had a thick ground cover of tall grasses which were almost dry. The third habitat at this locality was on the northern side of the stream. This site had thick ground cover of tall, dry grasses and shrubs up to 2 m in height. Soils at this site were loose and sandy to loamy.

Nganda Slopes

Three habitats were sampled at Nganda (S10.26, E33.51, altitude c.2291 m). The first site was along the stream on the eastern side of our base camp. Short green grasses and shrubs of up to one metre high dominated this site characterised by dark, moist loamy soils. The second habitat sampled was to the south-western direction of the base camp. Sampling was done just at the edge of an evergreen forest patch. Vegetation along the transect was mainly shrubs up to 2 m height and shorter grasses of about 1 m height. The soils were a dry, sandy loam. The third habitat was in the open montane grassland between the first two sites. Short grasses were the dominant vegetation at this site; soils were dark-loamy and dry. During the period of study, day temperatures were very low and nights were cold and windy, with some drizzle.

Chisanga swamps

Chisanga swamps (altitude c.1800 m) are 1-2 km south-east of Chisanga Falls, at the edge of the steep, western escarpment of the plateau. Three habitats were sampled at this locality. The first habitat was grassland surrounded by an evergreen forest. It had a very thick ground cover of grasses and shrubs, 2–3 m in height. The soils were loamy, black and moist. The second transect was set through an evergreen forest patch and an open area of tall grasses and shrubs of up to 3 m high. In the evergreen forest patch the ground was covered by peat and most parts were moist. The open area had compact, dry, loamy soils with thick ground cover. The third site was a water-logged swamp, one part of this site was dominated by bracken, whilst tall, fallen grasses dominated the second part. The third part was along a stream that runs across the swamp, dominated by shrubs and grasses up to 3 m high.

Chawezga

The fourth study area was at Chawezga (altitude c.1500 m), in the valley at the base of the north-western escarpment. The study locality was about 10 km north of Kaperekezi gate, along the Mamphiro River which forms boundary of the Park in this region. Line transect was set in the flooding area on the banks of the meandering river. This area is mainly covered by *Brachystegia* woodland. The soils are mainly loose and sandy close to the river to compact red clays (away to the woodland). Mistnets were set at our campsite at Chawezga in the *Brachystegia* woodland.

Chowo Forest

The last locality sampled was at Chowo Forest. This forest is one of the remnant evergreen forest patches on the plateau and is just on the Zambian side of the border with Malawi. Sampling was done on the Malawi side. Line transect was set at about 20 m from the main Nthalire-Kaperekezi Road that passes through the Park. Vegetation was mainly of shrubs and grasses up to 1 m high. Soils were mainly grey, sandy-loam. Temperatures were relatively low during day and chilly at night.

METHODS

Traps were set, where possible at suitable habitats. Only live-traps were used; medium and small-sized Sherman traps, Longworth, and medium cage BTS traps. Traps were set in line transects at about 5 m apart, and sometimes in clusters of two to four traps. The clusters could be up to 10 m apart. Peanut butter mixed with ground roasted maize, smeared on cardboard was used as bait. Where possible, baiting, re-baiting and checking of traps was done twice daily; in the morning and late in the afternoon. Bat mistnets were put up very late in the afternoon, inspected during the night and closed early in the morning.

Animals were sacrificed using diethyl-ether. For each specimen collected, standard mammalogical measurements (head and body length, tail length, hindfoot length, ear length, and forearm length for bats), sex and reproductive condition (where possible) were recorded. Abdominal cavities were opened and specimens preserved in 70% alcohol as voucher specimens for further determination and laboratory study.

RESULTS AND DISCUSSION

In the 11 days/nights, 24 to 34 traps were laid per day/night which makes altogether 261 trap-day/nights being realized. Forty-seven rodents were collected (see Table 1). The trap success per night (mean 18.0%) ranged between 0% at Chipome to 27.1% at Nganda. Additionally, eight specimens of bats were mistnetted.

Table 1: Species distribution and contributions per locality

Locality	**Altitude (m)**	**Genus**	**Number of Species**	**Number of Specimens**	**Sex**		**Species contribution (%)**
					M	**F**	
Nganda	2,255	*Rhabdomys*	1	5	1	4	38.5
		Mus	1	4	1	3	30.8
		Lophuromys	1	4	3	1	30.8
Total			3	13	5	8	100
Chisanga	1,800	*Mus*	1	13	8	5	81.2
		Mastomys	1	1	0	1	6.3
		Lophuromys	1	1	0	1	6.3
		Rhabdomys	1	1	0	1	6.3
Total			4	16	8	7	100
Chipome	1,531	*Acomys*	1	5	3	2	41.7
		Aethomys	1	3	2	1	25.0
		Mastomys/Praomys	1-2	3	2	1	25.0
		Mus	1	1	1	0	8.3
Total			4-5	12	8	4	100
Chawezga	1,500	*Aethomys*	1	3	3	0	75.0
		Mus	1	1	0	1	25.0
		Epomophorus	1-2	8	2	6	
Total			3-4	12	5	7	100
Chowo		*Mus*	1	3	1	1	75.0
		Lophuromys	1	1			25.0
Total			2	4	1	1	100

At the end of the expedition period a total of five localities were visited in which nine sites representing different habitats were sampled. A total of six different genera representing six or seven rodent species and one or two species of bats were collected.

At Nganda, three species (*Rhabdomys*, *Lophuromys*, *Mus*) were collected (Table 1). These species were fairly equally represented in the sample, indicating that they are abundant in this area and/or easily trappable. Hanney (1962, 1964) considered *Rhabdomys* a common species in the Nyika and at Zomba, especially in stream valleys, but not in forests and rocky areas. *Lophuromys* was the most common species he trapped on the plateau, particularly in sheltered areas, regenerating woodland, bracken, cultivation, bog and at woodland edges. Ansell & Dowsett (1988), described the three species, *Lophuromys, Rhabdomys*, and *Mus* as having almost the same habitat preference for grasslands and bracken, with *Lophuromys* and *Mus* associated with forests and *Mus* and *Rhabdomys* favouring damp places.

During the current survey, the three species were collected in slightly different habitats: *Lophuromys* mainly inhabited the damp, well-covered places, close to the stream (site 1) while *Mus* occupied areas with high dense grass coverage, at the edge of evergreen forest patches, and *Rhabdomys* dominated in the open grassland areas. This observation also supports the hypothesis of competitive exclusion of the smaller *Mus* by the larger *Rhabdomys* as suggested by Happold and Happold (1989).

At Chisanga, the dominant small mammal was the mouse (genus *Mus*), which may be, according to the conventional classification, designated as *Mus triton* (see our 1997 report). This species was mainly captured in the boggy meadows and bracken surrounded by patches of evergreen forests. The presence of *Lophuromys* and *Rhabdomys* at this locality was also of significance as it shows that these species have a wider presence on the plateau. Because of the limited study at this locality it is not easy to predict how many of these species are represented at this locality.

The results also show that the *Mus* were captured in all the localities sampled and across the altitude range. This is also consistent with the findings of Ansell and Dowsett (1988) and de Graaf (1981), who described *Rhabdomys* and *Mus* as forms with wider habitat tolerance.

Table 2: Rodent distribution and species contributions in Nyika (altitudes 1500-2255 m). Summary of results of the current study.

Genus	Number of species	Number of specimens	Sex		Species contribution (%)
			M	F	
Mus	1	22	11	10	46.7
Aethomys	1	6	4	2	12.8
Lophuromys	1	5	3	2	10.6
Rhabdomys	1	5	1	4	10.6
Acomys	1	5	3	2	10.6
Mastomys/Praomys	1-2	4	2	2	8.5
Total	**6-7**	**47**	**24**	**22**	**100**

The results above show that *Mus* contributed significantly to the number of specimens collected. This could be due to its wider habitat tolerance and abundance, as this species was captured in almost all the habitats that were sampled, and in some cases outnumbering the other species. Another reason could be that they are not trap sensitive. Apart from the *Mus*, the other species were collected in either higher altitudes (1800 m), such as *Lophuromys*, *Rhabdomys*, or in the lower altitudes e.g. *Acomys*, *Aethomys*, and hence not well represented in the overall results.

Results from Nganda, (Table 3), could partly be comparable in the three years of study.

Table 3: Comparison of results of rodent trapping at Nganda 1997, 1998, 1999

	Species	1997 (rainy season)			1998 (dry season			1999 (dry season)			Sum
		M	F	%	M	F	%	M	F	%	%
1	*Rhabdomys*	8	8	25.8	8	0	24.2	1	4	38.5	26.9
2	*Grammomys*	7	7	22.6	4	3	21.2	0	0	0	19.4
3	*Lophuromys*	9	6	24.2	9	1	30.3	3	1	30.8	26.9
4	*Mus*	4	7	17.7	3	0	9.1	1	3	30.8	16.7
5	*Zelotomys*	2	0	3.2	2	0	6.1	0	0	0	3.7
6	*Dendromus*	0	0	0	1	1	6.1	0	0	0	1.9
7	*Praomys*	1	0	1.6	0	0	0	0	0	0	0.9
8	*Graphiurus*	1	0	1.6	0	0	0	0	0	0	0.9
9	*Aethomys*	1	10	1.6	0	0	0	0	0	0	0.9
10	*Mylomys*	0	1	1.6	0	0	0	0	0	0	0.9
11	*Otomys*	0	0	0	1	0	3.0	0	0	0	0.9
Total		**32**	**30**	**100**	**28**	**5**	**100**	**5**	**8**	**100**	**100**

The results show that out of the 11 species collected from this locality in the three years of study, *Rhabdomys* and *Lophuromys* were prominent throughout. In all the years the two species contributed over 50% of the total catch. *Mus* was also recorded in all the three years of study, though in lower numbers. *Graphiurus, Aethomys*, and *Mylomys* were collected only in the 1997 rainy season, *Dendromus* and *Otomys* collected only in the 1998 dry season. The results show that most of the rodent species are habitat specialists and therefore could only be trapped in particular habitats. There are some variables that need to be considered. It is possible that certain species are trap sensitive. Also the studies were conducted in the different seasons, in different habitats, and the total trap nights in each of the years the study was conducted varied. In 1997 there was a wider habitat coverage, more trap nights and it was towards the end of the rainy season, while as the 1998 and 1999 field work was conducted in cool, dry season and fewer habitats were sampled. Observations also showed that in 1999 it was drier than in 1998, due to lower rainfall. All these factors could greatly affect the species representation on our results.

At Chipome a total of seven species have been collected in the two expeditions (Table 4). Two species, *Acomys* and *Aethomys* contributed over 60% of the total catch in each of the years, while as *Praomys* and *Mus* were collected in both years, though not well represented. *Saccostomus, Steatomys* and *Graphiurus* were collected only in the 1998 dry season.

Table 4: Comparison of results of rodent trapping at Chipome 1998, 1999

	Species	**1998 (dry season**			**1999 (dry season)**			**Sum**
		M	**F**	**%**	**M**	**F**	**%**	**%**
1	*Acomys*	2	3	33.3	3	2	41.7	37.0
2	*Aethomys*	2	3	33.3	2	1	25.0	29.6
3	*Praomys*	0	1	6.7	2	1	25.0	14.8
4	*Mus*	1	0	6.7	1	0	8.3	7.4
5	*Saccostomus*	1	0	6.7	0	0	0	3.7
6	*Steatomys*	1	0	6.7	0	0	0	3.7
7	*Graphiurus*	1	0	6.7	0	0	0	3.7
Total		**8**	**7**	**100**	**8**	**4**	**100**	**100**

CONCLUSIONS

It can be concluded that *Mus* is one of the most widely distributed and common species of rodents on the plateau. It has a wide range of habitat tolerance. *Rhabdomys* and *Lophuromys* are common species in the montane grassland habitats on the plateau, 1800 m and above. *Acomys* and *Aethomys* are also very common in the lower altitudes (1500 m) of the plateau. The three species, *Mus, Rhabdomys* and *Lophuromys* were captured throughout the study period; in the 1997 wet season, 1998 and 1999 dry seasons.

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LARGE MAMMALS 1997-1999

Marianne Overton

This report is based on fieldwork done by Biosearch alone and in partnership with the Scientific Exploration Society and the Officers' Training Corps of Leeds and Southampton Universities.

ABSTRACT

The 2-level cluster sampling method is used to assess the relative abundance scores (RAS) for each large mammal species, based on tracks, signs and droppings as well as the occasional sighting. This assessment has been repeated in up to three regions of the northern hills of the Nyika National Park, in three consecutive years, 1997-1999. Comparisons for each species are made to illustrate distribution in the northern area and changes between the years. The effects of burning and poaching is discussed and recommendations are made for future monitoring.

INTRODUCTION

Mammal species of regional and National significance are resident in the remote northern hills of the Nyika National Park. However, serious poaching and burning leads us to a concern for the survival of some species. Decisions need to be made about how best to manage the area and basic information on animal populations and poaching activity is needed, so that anti-poaching patrols can be better briefed and directed in the future. If claims are to be made for more resources to protect or even to utilise the area, then evidence is needed of the game populations and whether they are affected by poaching or not. There has been a lack of basic information regarding the diversity and distribution of the mammal populations, which we have begun to address.

In Malawi 1997 (edit. Marianne Overton) S. Husson et al. wrote;
"Nyika National Park is home to over 95 species of mammal, including 33 “large” mammal species (Johnson, 1990). It supports large populations of Eland (*Taurotragus oryx*), Roan Antelope (*Hippotragus equinus*), Reedbuck (*Redunca arundinum*) and Leopard (*Panthera pardus*). We recognised three distinct habitat types: the high plateau grassland; remnant patches of evergreen forest and lower-level deciduous woodland. The latter falls largely within the northern and southern extensions to the Park. Both the latter two habitats contain species that rarely venture on to the plateau. These include the Elephant (*Loxodonta africana*), which is rare and endangered in Malawi; Buffalo (*Syncerus caffer*), Kudu (*Tragelaphus strepsiceros*) and Hippopotamus (*Hippopotamus amphibious*). Found in the evergreen forest patches are the Blue Duiker (*Cephalophus monticola*) and the Red Duiker (*Cephalophus natalensis*), both of which are found in moist forest, including montane, in northern Malawi (Ansell and Dowsett 1988).

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.

There has been particular interest in the status of the remnant population of elephant, one of the most endangered animals found in the northern extension. This majestic animal is the ultimate trophy for tourists and poachers alike; consequently it has been the subject of a separate survey. Permanent plots have been set up for a dung survey, using a method described by Jachman and Bell (1984). The most recent density estimate was made in 1992 (Chirwa,1992), obtaining a figure of 172±5 individuals. This figure was much higher than previous estimates, which ranged from 50-100; it seems that the author may not have allowed for the baseline dropping density, i.e. the droppings present before the survey was started. Dropping counts have been made regularly since 1992, although not all plots have been surveyed each year. There has been a dramatic decrease in droppings recorded during this period, with the 1994 count one-twelfth of that of 1992. Elephants are believed to have moved from the survey area - centred on the Chipome-Mondwe-Guwu Valleys - to the east of the Park (Critchlow, 1995a), where the most recent sightings have been made. The DNPW Feasibility Study (1995) estimated populations of elephants and other large mammals. Estimates range widely, reflecting the difficulty of obtaining accurate information. For example, Buffalo were estimated at between three and 50 individuals. Many studies have been planned but have been logistically very difficult to achieve. "

The 1997 project established a baseline and a system of monitoring, which is easily reproduced by an expedition with logistical back-up. The same method of large mammal survey was repeated in 1998 and 1999 in the same area.

AIMS AND METHODS

The survey aims to;
1. assess the current distribution and relative abundance of large mammals in the northern extension of Nyika National Park.
2. assess the magnitude and severity of poaching in the different sectors of the area.

Method Options

2-level cluster-sampling method

In order to estimate animal densities of a very large survey area with no roads, a 2-level cluster-sampling method was chosen, based on that described by Sutherland (1996). To ensure coverage of as much of the area as possible, the study area was divided into zones, each visited once during the survey. Each zone was divided into one kilometre squares, or 'clusters' as on the O/S maps. Kilometre squares for survey were then randomly selected. (Grid references were written on paper, put into a hat and selected out in turn.) Within each kilometer square, five plots of 100mx100m were chosen at random and surveyed. One or two plots were entirely inaccessible and had to be discarded.

We found it is not possible to get sufficient sightings to make valid estimates of population numbers. This is because of the difficulty of moving through the terrain and seeing through woodland. However, an indication of relative abundance based on the level of activity can be achieved by recording the frequency of animal signs encountered in each plot. Thus the frequency of sightings, droppings, tracks and other signs were recorded for each mammal species in each plot. By using this simple method, not only the distribution of each species but an indication of the relative abundance can be estimated, to enable comparison between years. The method does rely on getting sufficient data to overcome two main sources of error; localised variations in the ground holding the tracks and clumping of populations. Any possible bias is noted in the field and considered when analysing the results. Each plot takes a team of five people between 15 and 45 minutes, speeding up with practice, as fewer calls are needed on the scout to check identifications.

Line transect methods

Survey by noting sightings per unit time spent trekking was discounted for two reasons;

i) It soon became evident that is not possible to get sufficient sightings to make valid estimates of population numbers. This is because of the difficulty of moving through the terrain and seeing through woodland.
ii) The variability of observation between various expedition teams is likely to be larger than when set on a short specific survey task in a limited area.

Poaching reports

Poaching reports were made in the standard National Park format, recording all incidences and signs of poaching activity.

PROCEDURE

To ensure coverage of as much of the area as possible, the study area was divided into zones, each studied for one field session, lasting about five-days. Within the zones, kilometer squares, then 100m x 100m plots are selected at random, as described above. Each plot was pinpointed using a combination of DOS maps (1971) and a Magellan 4000 Global Positioning System.

To survey each plot, observers walked parallel to each other at 10m intervals, surveying 5m on each side. Park scouts trained the teams in the identification of tracks and droppings.

The following information was collected in each plot:
- Habitat description
- Percentage cover of trees; shrub; grass/herbs; bracken; marsh/reeds; bare ground; rock; open water
- Aspect & angle of incline
- Weather conditions
- Number of sightings for each species
- Number of droppings for each species (where one dropping is considered to be an individual pile of faeces)
- Number of other signs (for example, tracks, damage to trees/plants, diggings/ scratchings/holes, animal remains) up to a maximum of three for each species.

In addition, a photograph of each sub-plot was taken from the southwest corner looking towards the northeast corner, where possible.

The data collected can then be analysed in three different ways;

1. *From actual counts of live animals.* Using a 2-level cluster sampling method (Sutherland 1996), animal density may be estimated. This may be appropriate on the plateau, but the combination of animal fear and poor visibility in woodland, clumped distribution and difficult terrain cause inevitable under-estimation in much of the northern hills zone.

2. *From dung counts.* A method exists to estimate elephant density from dung counts, and has been put into practice in the northern extension by Park scouts, as discussed in the Introduction. Defaecation rates and decay rates, which are seasonally variable, must be known in order to translate dung densities into animal densities (Jachman 1996). However, population density may be very low, so that dung counts are too few to make useful analysis.

3. *Relative abundance of populations from counts of signs.* This method makes use of the tracks, signs, droppings and sightings for each species to give an indication of abundance. A Relative Abundance Score (RAS) is calculated for each species, in each 1km^2 cluster. Each RAS is formed from the combined total of sightings, droppings and other signs in each cluster. Table 1 shows an example of how an RAS is calculated. These scores for each species can then be compared with subsequent studies, or between areas. Where areas are of similar habitat and substrate, scores could be used to assess the impact of poaching, or other factors.

Thus only the third method seemed to be appropriate in this study.

Table 1: Example of how a relative abundance score (RAS) is calculated

Five 100mx100m plots are surveyed in each cluster (1km square). All evidence of tracks, droppings, damage or sightings were recorded. Each plot is then assigned a score for each species, as shown below. The plot scores in each cluster are then totalled for each species. These scores are mapped to indicate relative distribution. To prevent undue bias, Tracks + Damage have a maximum of three, whilst Sightings/Droppings have no maximum.

Sub-plot number	Tracks and signs sighted	Number of times sighted	Relative Abundance Scores allocated
Sub-plot 1:	Eland Tracks	1	
	Eland Droppings	2	Eland: 3 (2+ 1)
	Roan Droppings	1	Roan: 1
	Bushpig Tracks	6	Bushpig: 3
	Leopard Droppings	1	Leopard: 1
Sub-Plot 2:	Bushpig Diggings	6	
	Bushpig Tracks	2	Bushpig: 3 (max. of 3)
	Eland Tracks	3	Eland: 3
	Roan Tracks	4	Roan: 3 (max. of 3)
	Reedbuck Droppings	4	Reedbuck: 4 (no max.)
Sub-Plot 3:	Eland Droppings	1	
	Eland Tracks	5	Eland: 5 (3+1)
	Roan Droppings	2	Roan: 2
	Kudu Sighting	2	Kudu: 2
	Leopard Droppings	4	Leopard: 4
Sub-Plot 4:	Bushpig Diggings	5	
	Bushpig Droppings	2	
	Bushpig Tracks	2	Bushpig: 5 (3+2)
	Eland Tracks	12	Eland: 3
	Roan Tracks	4	Roan: 3
Sub-Plot 5:	Reedbuck Droppings	1	Reedbuck: 1
	Roan Tracks	2	Roan: 2
	Bushpig Diggings	3	Bushpig: 3

Relative Abundance Scores (RAS) for the cluster are the sum of the scores in each sub-plot.
Thus the overall RAS scores for this km sq. cluster are:-
Eland: 14, Roan: 11, Bushpig: 14, Reedbuck: 5, Leopard: 5, Kudu: 2

SURVEY LOCATIONS

It would be desirable to survey plots selected from the whole of the northern extension, some 600km^2. However, study of maps, discussion with the Park scouts and reconnaissance forays into the survey area, illustrate the arduous nature of the terrain. The study was therefore contained within the area between the Nyika Plateau to the south, the Guwu River to the northeast and the Kawozya-Mpanda ridge to the northwest. This is centred on the Mondwe, leading into the Chipome Valleys and the area around the Sawi/Guwu confluence. (See map fig. 1). This amounted to an area of 121 square kilometres.

There are three natural zones in the study area;

i) *Sawi* The most remote from the Nyika plateau is the area around the confluence of the Sawi and Guwu rivers, separated off by a ridge to the west. The zone contains mainly lower plots, including the lowest of all at 3750 ft, but some on the edge of the ridge rising to 6000 ft. Vegetation is largely *Bracystegia* woodland,

ii) *Chipome* To the west and separated from this area by a ridge is the Chipome River area, where the Mondwe and Nkharta join the Chipome.

iii) Nganda *On the slopes down from the plateau below the Nganda peak, upriver from the Chipome area, closest to the road access.*

Additional plots were done only once, on the plateau and in the area between the other zones in 1997 and the results are reported in *Malawi 1997*.

The habitat in the Chipome and Sawi Valleys consists almost entirely of deciduous miombo or *Brachystegia* woodland, dominated by species of *Brachystegia, Julbernardia* and *Isoberlina* (Family Leguminosae-Caesalpinoideae). *Acacia* and *Uapaca* species are common in some plots. Under a full canopy, the lower and ground storeys are generally not well-developed with a fairly continuous understorey of grasses. Occasional patches of tall, single-species grassland occur, marking areas previously occupied by villages and gardens. Riparine vegetation tends to be thick. The Nganda hills were is covered with montane grassland, interspersed with evergreen forest patches in the hollows and occasional boggy areas, known as dambos. The habitats were fully described in a previous report (H. Ludlow, 1997).

The highest point in the northern extension is Nganda at 8552 ft above sea-level. Plots however, ranged from 6200 ft in the *Nganda* zone to (3600 ft) 1108 m in the *Sawi* zone. Most plots fell within the 300 m altitude range (4700 ft to 5700 ft) above sea-level.

The substrate in the survey area is mainly loose and sandy, containing many pebbles and stones, interspersed with exposed boulders and subject to erosion. Thick leaf litter was encountered in a few plots with high evergreen forests or marshy dambos. The angle of incline varied from 0 to 60 degrees within the plots, although was seen to be considerably steeper in some areas outside the plots.

Quantity of data collected

Over three years 1997-1999, 344 plots have been surveyed. Plots in two areas, namely the plateau and the area between the *Chipome* and *Nganda* areas, were only studied once, in 1997, so these are excluded from the comparison of data.

Table 2:Number of plots surveyed

Year	No. of plots	Natural Zone	No. of plots
1997	110	Nganda	57
1998	137	Chipome	147
1999	97	Sawi	105
		Area between Chipome and Nganda	25
		Plateau	10
Total	344	Total	344

Comparison of data

In the case of each species, the relative abundance scores (RAS) for each plot have been added to a total for each zone. The aim was to do 50 plots in each zone. Where this has not quite been achieved, the total score has been weighted to an RAS score per 50 plots, thus enabling direct comparison of total scores for each species.

It is important to remember that this method gives useful comparitive data through repeated sampling using the same method. It does not give a population number. The comparison is in the scores for that species between years or in different areas.

Some soft-footed species normally score lowly since they leave relatively few signs, whilst others such as the Common Duiker habitually leave many representations of their presence. The relative abundance score is thus not very useful in comparing species populations within one year or within one area, but does give an indication of activity between areas, or over time.

RESULTS

Species List

A list of all species recorded by the expeditions in the Nyika National Park in given below. These are as a result of 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 tables results tables below.

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

1. Species not recorded in *A Visitors Guide to Nyika National Park, Malawi* (Johnson c.1990), but listed in *Mammals of Malawi* (Ansell and Dowsett, 1988) and signs positively identified by Park scouts. We have probably collected evidence of several mongoose species.
2. Species not positively identified as being present in Nyika National Park. Large holes in termite mounds indicate their presence, however, and they are locally believed to exist here.
3. Tracks originally identified as Steinbok *(Rhaphicerus campestris)*. These species have been confused in the past; however, there are no official records of Steinbok in Malawi (Ansell and Dowsett, 1988).
4. The Genet and Caracal was only recorded in the south-eastern part of the Park and has not been confirmed.

Changes in mammal activity 1997-9

The Chipome and Sawi valleys were studied on three consecutive years. The 1999 survey repeated almost all the same kilometer square plots done in 1998. The 1997 squares used in this comparison were in the immediate viscinity. 1999 and 1998 studies were at the same time of year, the cooler dry season of July and August, whilst the 1997 study was done in April, at the end of the rainy season. 1999 is directly comparable with 1998, whils 1997 data was collected at the end of the wet season.

Some species show a clear decline in activity, notably the Elephant and Kudu (see Fig. 1) which show steady declines in every year.

Roan antelope seemed to have dropped dramatically in 1999 from 1998. The Roan is believed to be migratory moving into the warmer valleys from the Plateau during the cooler season (Johnson c.1990). This would account for an increase in 1998 over 1997. The drop in 1999 is therefore of concern.

The Aardvark also dropped in 1999, but studies in further years may be needed to see a definite trend.

Some species are clearly in fairly low numbers, such as the Reedbuck, which is more common on the Plateau. Soft-footed species such as the Leopard are likely to be less recorded by this method and a low RAS may not be an indication of low populations. One would expect predator populations to be low relative to their prey species. However, it is seems surprising that no leoplards at all were recorded in the squares in 1999, compared to four and six in previous years and is of some concern.

Some populations do seem to be in very low numbers and not well recorded. Certainly the numbers would be too low to detect changes. A few Zebra prints were seen in the area in 1997, but not recorded in the squares. (Similarly in the lower valleys in the south-east of the Park, September 1999.)

Fig 1: Activity of some large mammals in the Chipome and Sawi Valleys

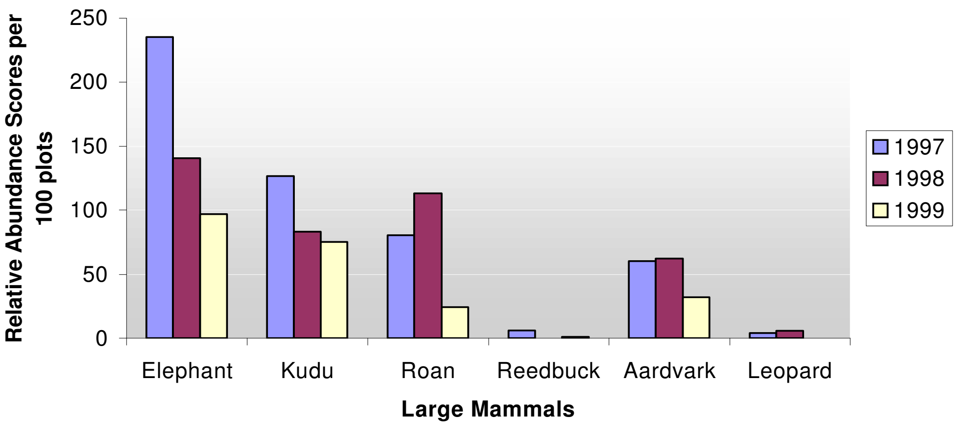
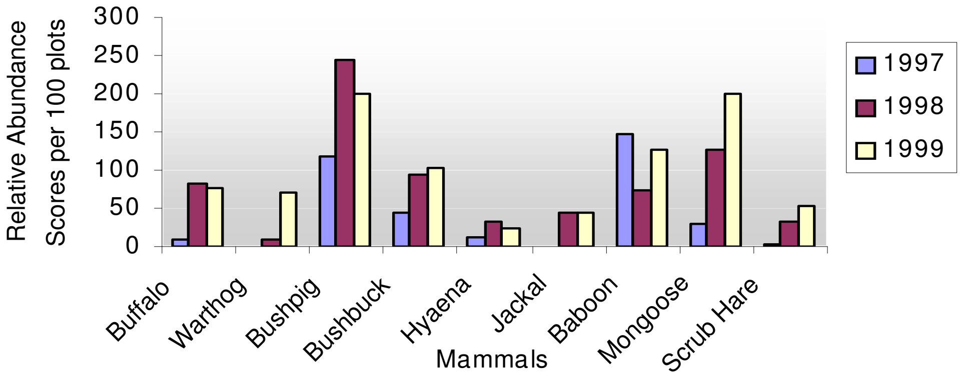


Fig 2 shows the relative abundance scores for some mammals which do not show declines in their signs of activities over the three years, notably Buffalo and Bushbuck. Bushbuck is a resident woodland species, which Husson suggested could become a substitute prey species for poachers when other game is up on the Plateau (Husson 1998). Perhaps poachers are less active at that time. It seems that Bushbuck is not undergoing any greater poaching pressure than other antelope species.

Fig 2: Activity of some successful larger mammals in the Chipome and Sawi Valleys 1997-9



A further species, the Common Duiker has produced exceptionally high RAS scores in all three years, largely due to its habit of producing considerable quantities of widespread droppings.

Other little recorded species showed a large increase in the dry season of 1998, over the previous wet season, but this was not continued into the dry season 1999 in almost identical plots. It is possible that the signs were less permanent in the rainy season and thus under-recorded in the wet season of 1997. However, the two studies of 1998 and 1999 are directly comparable. The drop in numbers is thus of concern, especially when the pattern appears to be reflected across a number of species.

Table 3: Mammal species declining in 1999 from 1998.

	Roan Antelope	Grysbok	Serval	Civet	Porcupine	Otter	Genet	Leopard
1997	128	0	0	5	0	0	0	4
1998	164	26	30	31	12	11	7	6
1999	30	0	1	5	1	4	1	0

The overall number of species actually recorded in the squares varied little in the three consecutive years, that is, 19, 22 and 22 respectively. This is not significant.

Differences in large mammal populations between areas

In both 1997 and 1998 data was collected from the same three areas in the northern hills. These areas are described above. Data has been summed and calculated to enable comparison of the relative abundance scores per 100 plots.

A number of species were more common at the lower altitudes with its warmer, miombo (*Brachystegia*) woodland. Species which showed clear trends of increasing activity with lower altitude were Kudu, Common Duiker, Grysbok, Buffalo, Bushpig, Servil and Baboon. (Fig. 3)
Species more common in the upper areas were Eland, Reedbuck, Red Forest Duiker, Warthog, Zebra, Leopard, Porcupine, Otter, Scub Hare and Genet. (Fig. 4)

Species without a clear trend with altitude were Roan Antelope, Bushbuck, Hyaena, Jackal, Civet, Aardvark and Mongoose, although Roan Antelope did avoid the lowest altitude. (Fig. 5)

The number of species appearing in the plots at each site was similar; 19 in the Sawi Valley, 23 in the Chipome Valley and 22 at Nganda.

Fig 3: Relative abundance scores of mammals whose activity decreased with altitude
(RAS Scores are per hundred plots in 1997/8)

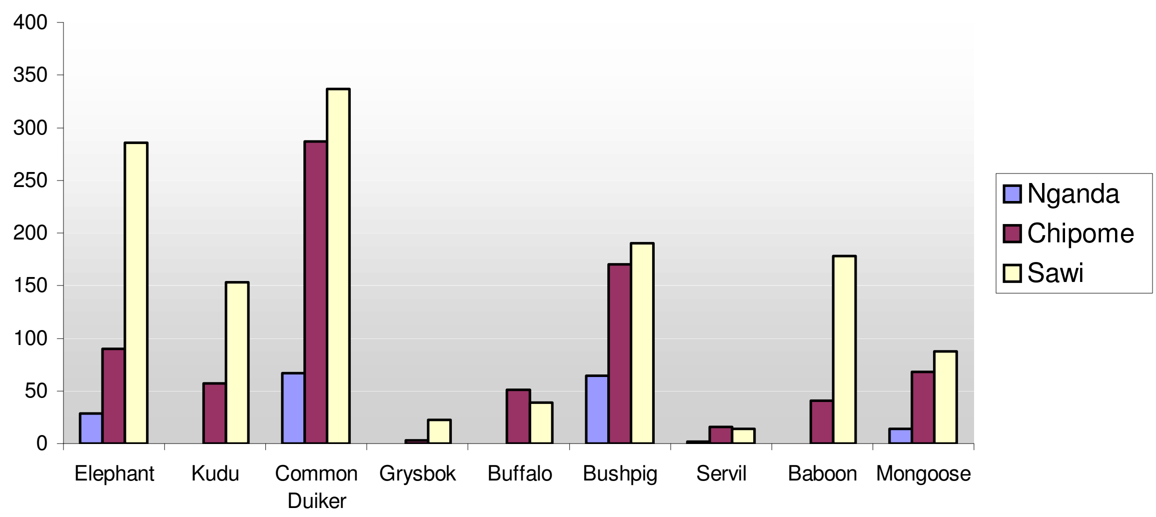


Fig 4: Relative abundance scores of mammals that increased with altitude
(RAS Scores are per hundred plots in 1997/8)

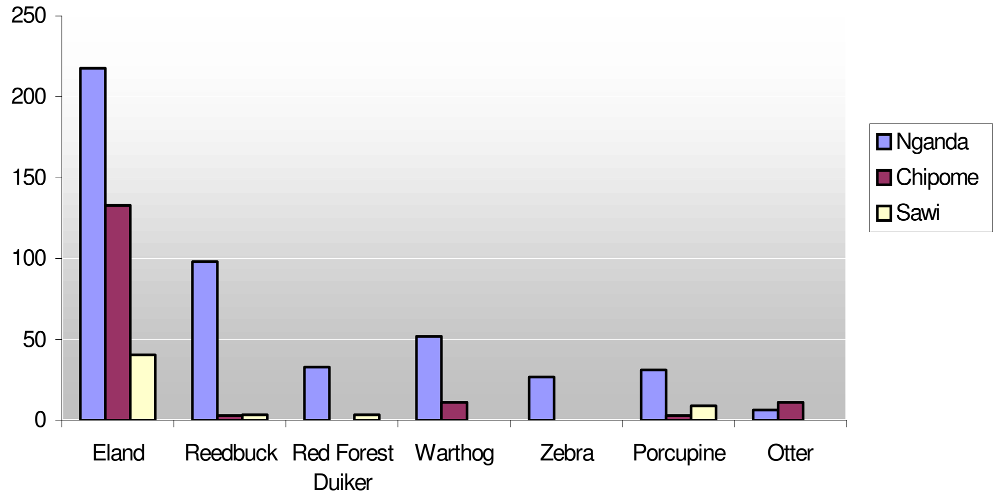
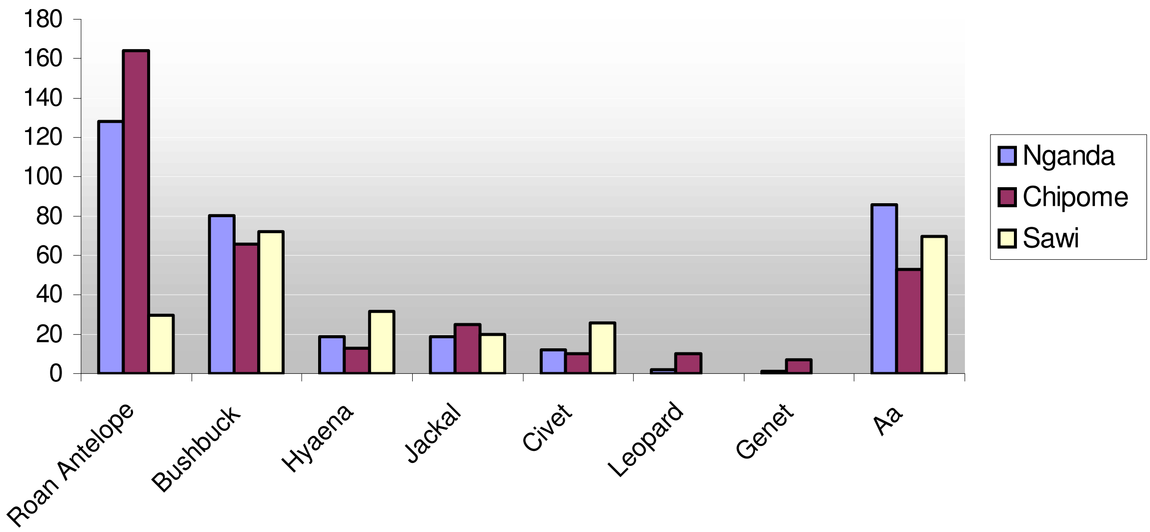


Fig 5: Relative abundance scores of mammals species that appear to have little correllation with altitude. (RAS Scores are per hundred plots in 1997/8)



POST SCRIPT

Data from the south-eastern part of the Park, from the Juniper Forest and to the south and east has recently been contributed by a team in a partnership with Biosearch Nyika and the Scientific Exploration Society from studies completed in September 1999. Sixteen of the 45 plots had been burned either wholly or in part (one plot). A comparison of burned and unburned areas showed that burning does affect the scores. Thus only the 29 unburned plots have been used for comparison with unburned areas in the northern hills. The altitudinal range covered by these south-eastern plots is 6000ft to 7700ft whilst the 1999 expedition in the northern hills was lower, and ranged from 4000ft to 6000ft. The 1997/8 Nganda data is from plots up to 7500ft is at a similar altitude to the area of study in south-eastern hills, both being montane grassland with evergreen forest patches and some wetland areas.

Table 4 :Comparison of large mammal activity recorded in three areas.
(RAS scores per 100 plots)

	Ele	Ela	Ro	Ku	Rb	Bb	CD	Gb	RD	Bf	W	Bp	Z	Le	Se	Hy	J	Ci	Ba	P	Ot	Aa	Mg	Ha	G	Ca
SE Park 99	0	24	20	0	6	32	806	0	0	0	44	176	0	4	0	6	6	6	90	38	0	0	118	0	20	0
Nganda 97/98	29	218	128	0	98	80	67	0	33	0	52	64	27	2	2	19	19	12	0	31	6	86	14	15	1	1
Chipome 97/98	90	133	164	57	3	66	287	3	0	51	11	170	0	10	16	13	25	10	41	3	11	53	68	35	7	0

The activity scores for almost all animals are much less in the south-eastern part of the Park. Exceptions are the Common Duiker, Bushpig, Baboon, Porcupine and Mongoose. Particularly noticeable is the lack of Elephant, Kudu, Buffalo and Aardvark, and the limited numbers of Roan Antelope, Reedbuck, Bushbuck, Hyaena, Jackal, Civet, Otter and Hare. This is covered more fully earlier in this volume.

CONCLUSIONS

Certain large mammals showed a decrease in the recorded relative abundance scores (RAS) in successive years 1997,1998 and 1999. Most notable of these are the Elephant and Kudu. Concerns are also raised by the scores for cats (Leopard, Servil, Genet and Caracal) and for the Roan Antelope, as scores for all of these dropped substantially 1999 from 1998.

Some species were found to be more active in the lower altitudes where the most poaching activity was witnessed. Species which prefer wooded areas may therefore be more at risk. Of the antelope, only the Bushbuck and Common Duiker appear little changed in the three years, and the Common Duiker may even have increased somewhat.

The severe reductions in some game populations is likely to be due to poaching activity and further work is strongly recommended. Many suggestions have been made earlier in this report and in previous reports. There is much still to be done.

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Appendix A: Comparison of collated Relative Abundance Scores

Appendix A: Comparison of Relative Abundance Scores per 50 plots

	Ele	Ela	Ro	Ku	Rb	Bb	CD	Gb	RD	Bf	W	Bp	Z	Le	Se	Hy	J	Ci	Ba	P	Ot	Aa	Mg	
1997 Chipome	12	82	77	40	3	30	179			8	1	91		4		5	1	2	39			37	30	3
1998 Chipome	78	51	87	17		36	108	3		43	10	79		6	16	8	24	8	2	3	11	16	38	32
1999 Chipome	83	144	24	70	1	84	430		2	72	59	115			1	20	32	3	39	1	4	19	95	49
1997 Sawi	223	37	3	87	3	13	127		3			27				7		3	107			23		
1998 Sawi	63	4	26	66		59	210	23		39		164			14	25	20	23	71	9		46	88	
1999 Sawi	14	14		5		18	204			3	12	84				2	12	2	88			13	105	4
1997 Total	250	259	170	127	71	103	361	0	33	8	6	143	25	4	0	17	11	15	146	15	0	100	30	3
1998 Total	154	132	152	83	33	115	330	26	3	82	57	282	2	8	32	47	53	33	73	28	17	108	139	47

Fig. 2: Comparison of large mammal activity in the Chipome and Sawi Valleys 1997-1999 per 100 plots

1997 Chipome & Sawi	235	119	80	127	6	43	306	0	3	8	1	118	0	4	0	12	1	5	146	0	0	60	30	3
1998 Chipome& Sawi	141	55	113	83	0	95	318	26	0	82	10	243	0	6	30	33	44	31	73	12	11	62	126	32
1999 Chipome & Sawi	97	158	24	75	1	102	634	0	2	75	71	199	0	0	1	22	44	5	127	1	4	32	200	53

Fig. 3 Comparison of large mammal activity in three areas in 1997 and 1998

	Ele	Ela	Ro	Ku	Rb	Bb	CD	Gb	RD	Bf	W	Bp	Z	Le	Se	Hy	J	Ci	Ba	P	Ot	Aa	Mg	Ha
Nganda 97/98	29	218	128	0	98	80	67	0	33	0	52	64	27	2	2	19	19	12	0	31	6	86	14	15
Chipome 97/98	90	133	164	57	3	66	287	3	0	51	11	170	0	10	16	13	25	10	41	3	11	53	68	35
Sawi 97/98	286	40	30	153	3	72	337	23	3	39	0	190	0	0	14	32	20	26	178	9	0	70	88	0
SE Park 99	0	24	20	0	6	32	806	0	0	0	44	176	0	4	0	6	6	6	90	38	0	0	118	0