Biosearch Nyika

Scientific Exploration

of the
Nyika National Park,

Malawi,
Central Africa

2007

Edited by C. P. & M. J. Overton

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Cover photographs; front by Marianne Overton and back by Hilary Strickland

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FOREWORD

Biosearch Nyika

Major (retired) Ian Gordon MBE

I first met Peter Overton, initiator of the Biosearch expedition programme, in 1972 when he came to the Nyika with the first expedition from Wye College. I was the Park "Ranger" (the manager) at the time, having moved to Chilinda with my wife, Avril, in September 1971 after 25 years in army service. The Wye College expedition was the very first group to do organised research in the area to the north east of Nganda Peak, which at that time was outside the park boundary. The detailed report, which I still keep to hand, was a huge help when a few years later we were instructed by the Malawi government to extend the park boundaries to cover most of the plateau in order to protect the vital water resources. Much basic research in the park was conducted for some years by others until about the mid 1980s when Malawi funding became very difficult for everyone.

Heuglin's Robin *Peter Overton*

The Biosearch Expeditions have been a huge help in providing fundamental expert information over many areas that had never received full investigation. The local people and scouts all have much knowledge in their heads but little is recorded.

For example the local spelling of Chilinda has been superseded widely by the use of the spelling Chelinda and some errors in nomenclature of streams and hills has been perpetuated on maps. Correct spellings were agreed at a meeting in early 1973 of numerous chiefs (Thembas), headmen and local Malawi Congress Party officials, held at Chilinda to meet the Regional Minister when we were discussing arrangements for the future visit by President Banda. He was coming up to inspect the new road built by the British Army off the Nyika plateau in 1972. At this meeting I asked for the correct spelling of Chilinda, as our staff all told me that the use of an 'e' was wrong and the maps had it wrong.

The aerial photographs used to make the maps were excellent, but the map officer had only one day in the Nyika to put names to the features. He took Silas Tambuka, my excellent Head Capital who knew the area intimately, to three viewpoints; Nganda, Chosi Viewpoint and one on the Eastern side. They couldn't see all the points and some names of streams and valleys were muddled on the map, which caused us a good deal of confusion thereafter.

The meanings of the place names are also interesting. All the chiefs agreed that Chilinda means "shelter", like the ones used by children looking after the cattle. Chilinda was a useful overnight stop for people taking honey from the valleys in Zambia to sell at the Lakeshore. In the early days they traded in ivory by the same route. They would leave offerings of beans or fruit to the very revered Kaulime or "spirit" at Kaulime Lake.

The research conducted by Biosearch Expeditions has been particularly valuable since it has included second and third visits to particular parts of the park to enable comparisons to be made. The Department of National Parks and Wildlife (DNPW) has been an important partner in the expeditions by providing scouts to escort and guide and also provide local knowledge, as well as good advice in bush skills; living, moving and observing.

It is clear that there are certain key elements that have made these expeditions both possible and successful. These are: very detailed forward planning, especially for transport throughout to gain access, security and exit over difficult tracks. There is a need for the team to be fit for high altitude hiking and the difficult terrain that can be very demanding at times. The team need to live and work together well, whilst conducting their own research projects effectively. They need to train together in the UK to get to know each other's strengths and weaknesses in advance. The knowledge and experience of the leader from previous expeditions is vital and the choice of area within the National Park to work has to be considered very carefully indeed. It is usually easier to approach the remoter study areas from the top of the plateau but access by vehicle is limited. Recently some broken and burnt bridges have been repaired but movement by foot is best conducted along the watersheds and camps best made in the valleys near water.

There is so much more to be discovered in the remoter parts of the park. I was delighted that the 2004 team found Bleak House, which is not clearly visible from the air and had been effectively 'lost'. Myles Turner had visited and renamed it some forty years ago. There were three Hartebeest in the Domwe area and I wait with interest to see if they are ever rediscovered. The accumulation of information is building up over the years. Twice the expeditions have researched the Juniper Forest area. This, I feel, is the Jewel in the Crown of the Nyika plateau; it is now almost cut off with a severely damaged road in places.

A change I would have liked to have seen is the corridor along the river valley, linking the five mile gap between the Nyika and Vwaza National Parks, which was proposed in 1974. This has been compromised by building development in the intervening years and now seems to be a lost opportunity.

I dearly wish we had been able to visit all the areas Biosearch Expeditions have been to! I did fly over most of the park, old and new; especially when we were showing the area to local officials and politicians before the proposed boundaries were agreed. Myles Turner, who was my boss at the time, did most of the extension work, with his wife Kay and with the help of a team of scouts, labourers and local village headmen – a tremendous task over very rough terrain on the lower slopes of the plateau. They physically marked out the entire boundary over a period of 11 months!

I thank and congratulate the Biosearch teams for the valuable work on the Nyika - and beyond to Vwaza in the future. I am sure they will all look back on this as a very tough experience but will feel it was worthwhile and memorable. I hope it will encourage others to visit the Nyika and Malawi – you are badly needed. I know the attraction of the Nyika since I first flew up to Chilinda with Professor Lemon on 10th June 1969 to do the first aerial game count (on 11th and 12th June 1969) over the Nyika grasslands and briefly at Vwaza. I had the joy of seeing a Leopard in the moonlight, beside the water heater behind the lodge. We were often to see Leopards while we were residents.

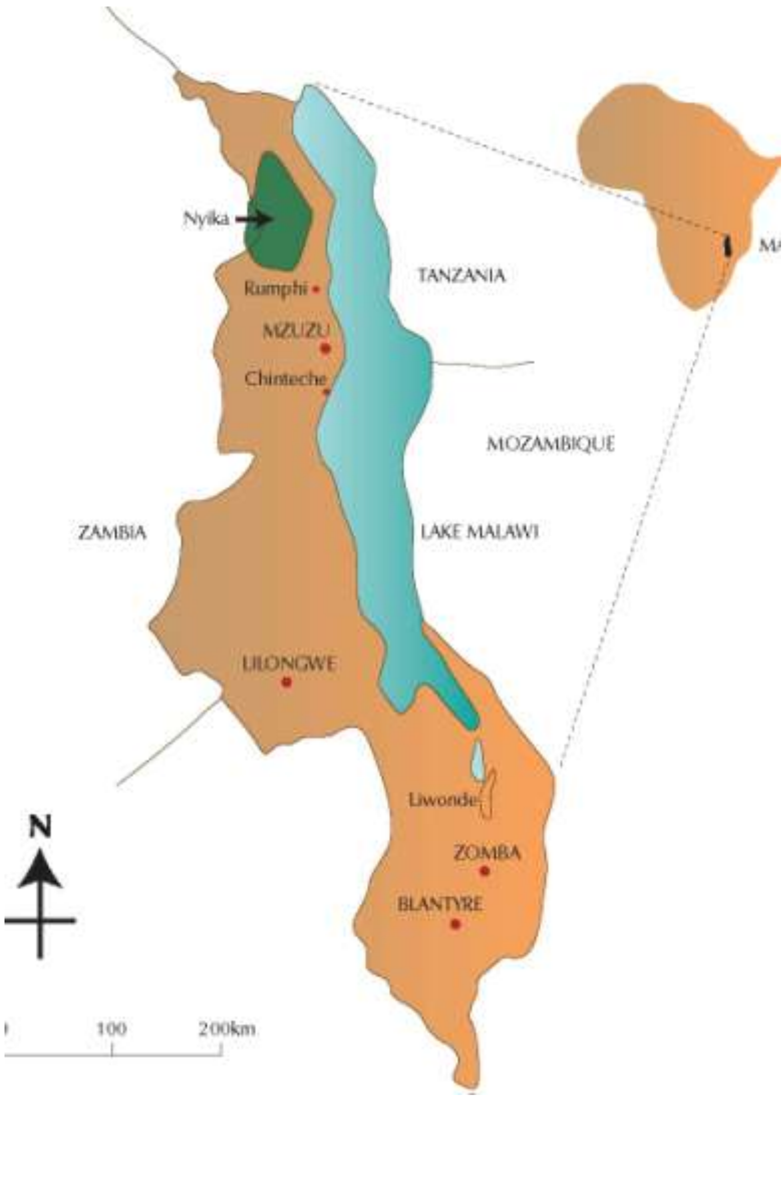
I wish all expedition members, past present and future good researching and a most enjoyable experience. I only wish I could join you!

Ian Gordon at Chilinda with a young male Duiker Jan 1975 *(photo by Eleonor Phillips)*

Ian is currently a consultant to the Nyika-Vwaza (UK) Trust who have been actively raising funds to assist the Department of National Parks and Wildlife in the management of Nyika National Park. Their work includes road upkeep and control of pines, protective burning to secure the remnant forest patches and repair of bridges, to which Ian refers. Contact in the UK on 01752 892632 or www.nyika-vwaza-trust.org

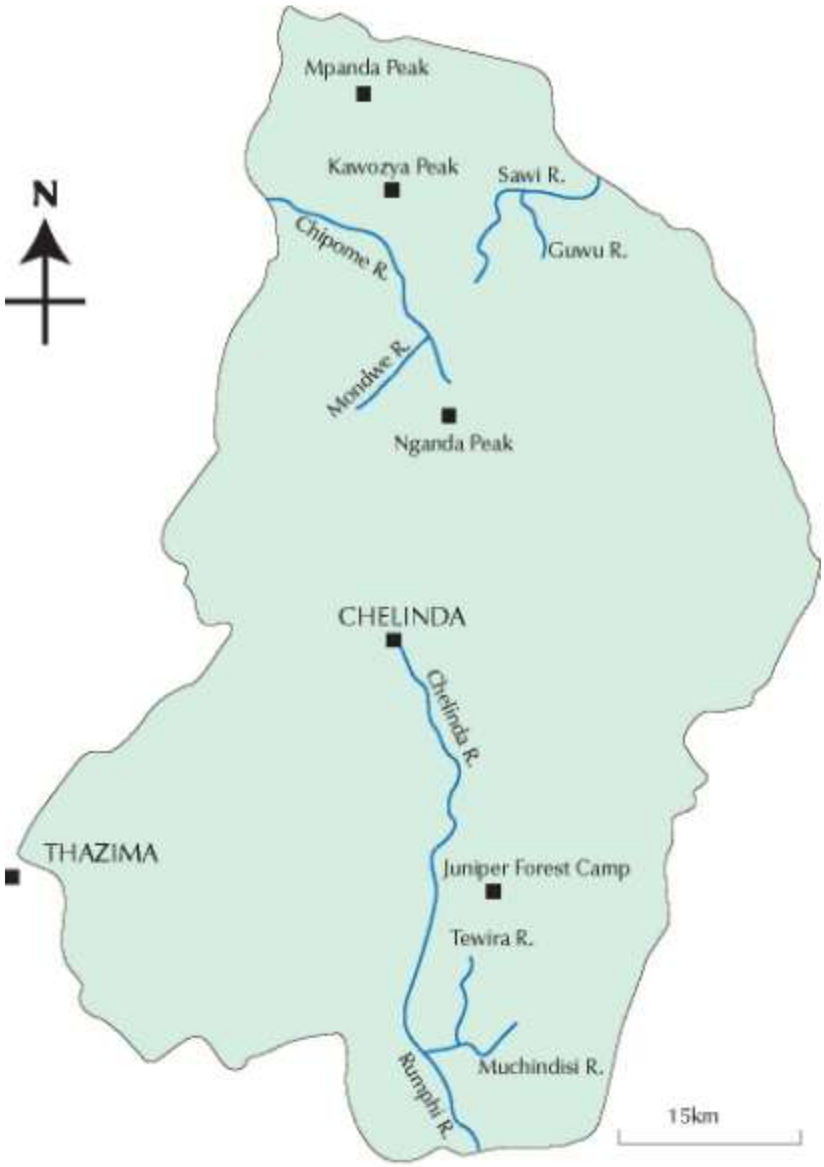
MALAWI

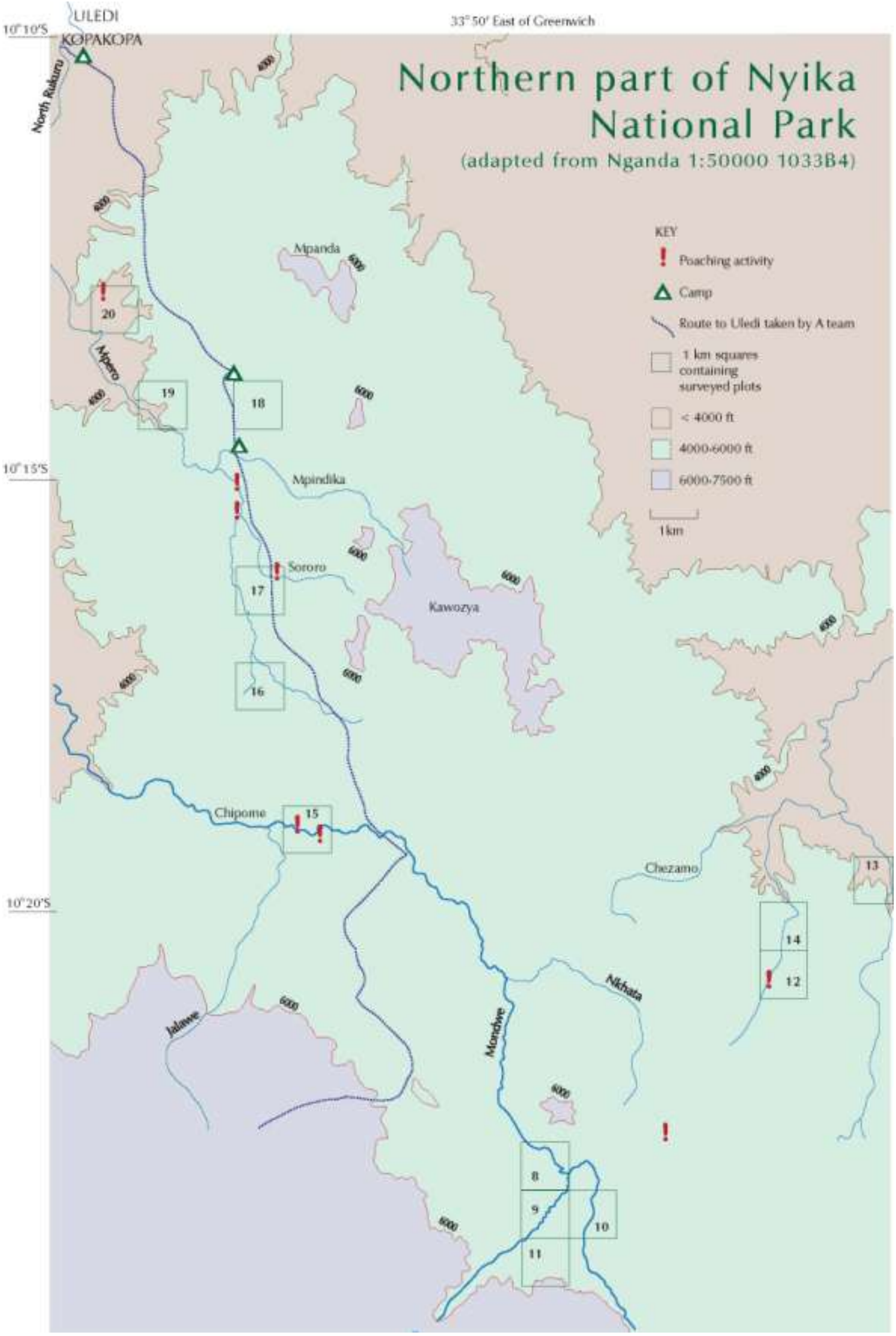
Landlocked Malawi lies at the southern end of the Great Rift Valley and is bounded by Mozambique, Zambia and Tanzania. It lies between 9° and 17° south of the equator. Its climate may be loosely described as sub-tropical but varies considerably, being much influenced by altitude and Lake Malawi, which forms much of the country's eastern border. The dry season is from May to November. Malawi has a rural economy based on subsistence farming and fishing on the lake but also with large tobacco and tea estates. The country is one of the world's poorest and is slightly smaller than England at 45,747 square miles. As more of the population migrates from the countryside, the towns are growing fast. The population, living mainly in the the south of the country, is around 13 million. The varied countryside is characterised by a string of high plateau regions from the north to the south of the country, of which Nyika is one, and isolated rocky intrusions which conspicuously stick out of the flat landscape.



Maps © Hilary Strickland, Biosearch

MAP OF NYIKA NATIONAL PARK




Northern part of Nyika National Park
(adapted from Nganda 1:50000 1033B4)
33° 50' East of Greenwich
10°10'S
10°15'S
10°20'S
ULEDI
KOPAKOPA
North Rukuru
KEY
Poaching activity
Camp
Route to Uledi taken by A team
1 km squares containing surveyed plots
< 4000 ft
4000-6000 ft
6000-7500 ft
1km
Mpanda
Mpero
Mpindika
Sororo
Kawozya
Chipome
Chezamo
Nkhata
Mondwe
Jalawe
4000
6000
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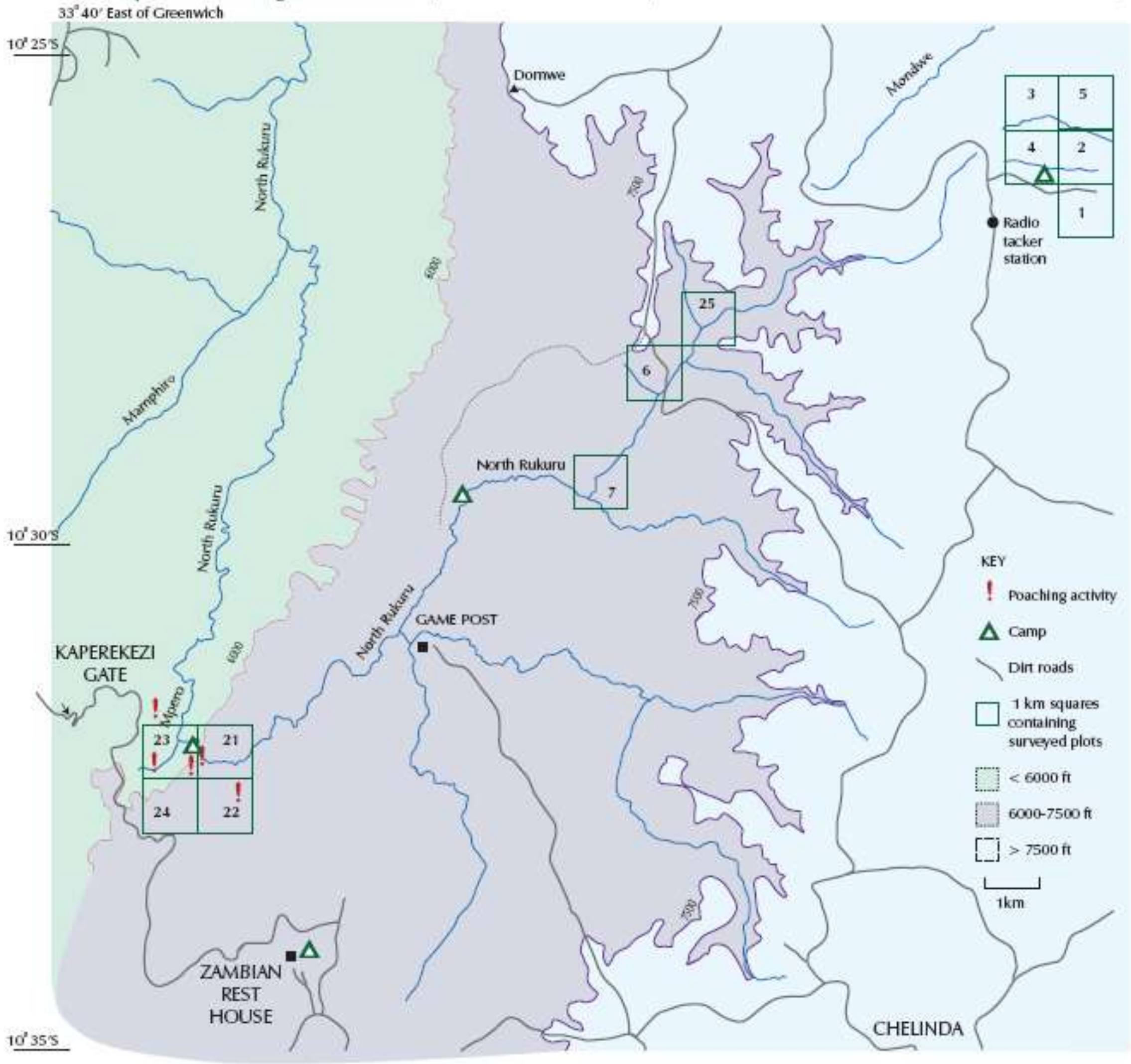
Western part of Nyika National Park

(adapted from Nganda 1033B4, Chelinda 1033D2, Nthalire 1033B3 and Vitinthiza 1033D1)



LEADER REPORT

C Peter Overton, Expedition Leader

TRAINING PROGRAMME

Bringing together a team of 26 people, all of which had different aspirations, and organising them for an expedition for a month is a considerable challenge. However, as with most things in life, the secret is in the preparation. It was not practical to assemble everyone in the UK in advance, since seven of the team members were Malawian. However, we had met three of the Malawian team before and the remainder, being National Parks staff, did not have the same sort of challenges as our UK team members, although learning our way of operating was challenge enough!

The UK team assembled for a training weekend in May. This was a useful opportunity for them to get to know each other better, although most had in fact met in early January at a party organised for this purpose. The weekend was very popular and worked successfully, introducing the team to some of the skills that they were to use in the bush. The training programme is made available to others who are interested, with a view to possibly joining a later team, or indeed have plans to travel in remote areas elsewhere in the world.

We have run training along these lines for some time now and our feedback suggests that people thoroughly enjoy the experience. In 2007 we had the added advantage of climatic conditions to suit. The warm dry conditions that prevailed in April continued until the very hour when the team left camp – at which point the heavens started to open and the summer became a memorable one, for the long run of torrential downpours. Our camps attempt to mimic the real conditions of bush living but the climate, the season and the daylength are likely to remain, for the foreseeable future, outside our control!

ARRIVAL OF THE TEAM

Four members of the team arrived on the day of departure of the expedition from Lilongwe; everyone else arrived between one and three days in advance. Those who arrived early seemed to benefit from the rest after travelling and if time is not of the essence it is recommended that in future all team members arrive before departure day to the north of Malawi.

We yet again faced the problem of delayed baggage from Johannesburg. One item eventually met up with its owner after one week on the expedition but since he had taken the advice to keep his sleeping bag with him in hand luggage, it was not crucial in the event. With a large team, it was possible to find sufficient spare equipment to keep him in camp. One team member, who booked his flight quite late, was able to fly directly into Lilongwe from London on Air Zimbabwe. This clearly avoided risk of lost baggage. Everyone else had at least one change of flight; most came via Nairobi or Johannesburg. The latter is now getting a reputation for mislaying baggage and we may need to make future recommendations to this effect.

FOOD AND TRANSPORT PLANNING

Most of our camp hardware – pots, buckets, utensils etc, - had been either left behind in 2006 or purchased in advance on our behalf and were waiting for our collection near Mzuzu. We are grateful to Ray Murphy for assistance with this. This meant that pre-expedition work in Lilongwe was kept to a minimum, since a food purchase list was prepared from our experience in previous expeditions and we needed to allocate only a single day to its collection; substantially from the supermarket in Lilongwe and subsequently from Mzuzu markets on the journey north. Food was planned for everyone, including scout provisions this year for the first time. They are easy to cater for, since by adding maize flour for nsima and some dried lake fish onto our list we had effectively covered their preferred requirements and for everything else they shared the other expedition rations completely and happily. We needed to attempt to buy all stocks for the 23 days of our journey, which was a substantial amount of food. We again made use of a 26-seater bus to provide sufficient seats for the whole team. Again it proved to be less than ideal for use off the tarred roads and suffered broken leaf springs from use on the rough road conditions on the Nyika plateau. We can now say from our considerable experience that use of a bus for transport on difficult dirt roads should be avoided wherever possible. They are simply not built for the purpose and even with the most careful driving; undue pressure is brought to bear on them, making breakages almost inevitable. In the 2006 report I mentioned how important it is to try and keep baggage off the bus. With a full load it became essential this year. Everyone was advised that any personal items they took with them had to he kept at their feet or on their laps and this had the desired effect of keeping the cabin reasonably clear. Another issue that arose during the expedition was fuel planning. Not for the first time there was difficulty in securing sufficient supplies; the uncertainty turned out to be worse than the reality and we did get by; but there were tricky moments. Chilinda supplies were inadequate and we were faced with the prospect of having insufficient to get back down, despite agreeing supplies in advance. I was able to make a food for fuel arrangement to solve the problem but there were clearly other issues, caused by general uncertainty about the future management of Chilinda. We discovered a limbo situation which I sincerely hope will be fully resolved by 2008. Rumphi had no diesel, so we had to scrounge 20 litres on the roadside from a village near Ekwendeni to be sure of getting back to Mzuzu, where supplies had been intermittent but were available by the time of our arrival. We carried spare fuel from the outset but in the event we needed much more and in future will lay up stocks in our area of operation to insulate ourselves from the vagaries of the deliveries. We commented about how different things are in a third world country and the likely consequences of a similar scenario in Britain. Malawians take things in their stride much better, I feel. Long experience of the situation does help.

Getting provisions to our base camp *Quincy Connelll*

All our baggage and provisions were taken on the back of a four ton flat bed truck, which was ideal for the purpose. It returned to Lilongwe as soon as we had unloaded at our base camp. We had planned to take a trailer on the back of the bus, for our return journey when the truck would not be required. However we had to collect this from Mzuzu later since it was not available at departure from Lilongwe. As things turned out we had the broken spring on the vehicle to repair, which coincided with the trailer collection. We are again grateful to Land and Lake Safaris for acting as our vehicle agents and supporting the transport logistics, which is, of course, a crucial part of the whole expedition.

TRAVEL TO THAZIMA

We had our usual overnight stop at Kasito Lodge near Chikangawa on the Viphya plateau. It was a beautiful night and warmer than any I can recall in recent years. Yet again the lodge was double booked but we all made do with what accommodation was available. We had already advised the team that some of us would be camping, since there are not sufficient beds for a group of 19 anyway. The warden was immensely helpful, as always, and it seems a shame that he has to rely on inadequate communication from the Forestry Department in Mzuzu to plan his accommodation. The place has an air of colonial neglect about it but our teams seem to find this an interesting part of the journey; it has atmosphere at least. We ate well, we slept well and we got away by 7.15 to complete the big shop in Mzuzu. The truck went ahead to collect the pre-arranged hardware and met up with the bus again in Rumphi. We had set up camp down on the river at Thazima in good time and the previous training of the team was now starting to show clearly. For such a large team we were already working well together better than would be expected and this set the tone for the whole expedition. It was indeed impressive to see good order where some of the team had not even put up a tent a few weeks earlier.

SETTING UP BASE CAMP

Our base was in place for 17 nights: Tuesday 31 July to Thursday 16 August

Map reference 791377 Altitude 6,500'

There were no delays in leaving Thazima the next morning, since it seemed that the three staff we wished to speak to were away. We were on the road by 8 a.m. Since we had to decamp and reload the truck for the final leg of its journey to base camp this was very good work by the team. By now we had assembled our support staff; Stephen, from the Millennium Seed Bank in Mulanje, had joined us at Thazima. Alfeyo had joined us earlier in Mzuzu and Faston in Rumphi. Lewis, Richard and Daniel joined us on the Nyika. Our original plan had been to spend a night at Chilinda and then head out the next day to set up a base. This is never ideal since it makes the journey time longer and it can be frustrating when the team are keen to get settled in the bush. A chance meeting with Robyn Foot and the inclement weather conditions made me rethink this plan. The Old Horse Camp on the western side of the plateau, which she suggested, was more accessible than the North Rumphi Bridge and, as it turned out, would give us a much better climate to start the expedition. The very cold season was to make the eastern side of the plateau less than ideal for our work. The following week one of our teams was to experience this first hand while others went down hill into the northern valleys. So our base camp turned out to be a three tiered settlement. Burning of the grass, close to the river persuaded most to pitch their tents at either the upper level, near the

established toilet, or at the middle level, nearer the camp fire. The fire was on the adjacent stream, between that and the main river was a flat area which was used by some of the team as a camp site. Although at first the site seemed less than ideal, it was in reality a good camp, certainly better than our 2006 camp at Zungwara, which was ant infested. The team soon got used to working between the three levels and the North Rukuru River there has sufficient flow to be excellent for washing and close to the main camp for drawing water. We soon had set up a food bazaar by stripping down an old toilet construction, which had already been partly destroyed by poachers or others seeking firewood. The poles and planks were ideal for our purpose. We used no nails; just sisal string which had been brought for the purpose. The skills of the scouts, given the simple design based on the previous few years experience, meant that it was only a couple of hours before most of our food was off the ground. We had not intended that this should be a long-term camp but it was in place for the next 17 days and proved a useful depot for our supplies when most of the team was away in one of several satellite camps. It is time consuming to move a base, when most people prefer to travel very light and much of the equipment and supplies are not required for the forays, thus a good base camp is paramount even if it is little occupied, as was the case in 2007.

ACCLIMATISATION

The first five days of the expedition were spent working out from our base, with one overnight stay near the North Rukuru Bridge. This acclimatisation process and testing of methods and procedures has proved valuable. We collected data and covered some plateau plots but with less walking required between plots, it gave everyone the chance to get used to the new environment and decide how they were going to handle the more difficult expedition treks later on. James Herbert's magnificent but rather cumbersome pole inclinometre lasted a few days before being discarded, as a burden too far. Ration planning leaves room for error when the store is only a short distance away; later in the trip it became more crucial. Sharing of tents starts to become more attractive when the reality of the termite-ridden landscape becomes more apparent. For some, the experience of being up at dawn was apparently new and for one or two team members I am not sure whether they actually did experience it at all! However, the team did respond well to encouragement and the good example being set by most. As requested at the training weekend, 'a calm momentum' was soon established. The rest day of Sunday 5th August, when preparations were made for the following week's long trek, saw an early team walk over to the western escarpment and get magnificent early morning views across the Nthalire plain, albeit with a very strong wind blowing. This initial period also enabled the establishment of the other projects, including a realistic attempt at bird surveys, which require an early morning slot which does not fit in well with the departure time of the groups doing day treks. Our two Malawian collectors wasted no time in getting to work on the entomology and plants of the area.

TREK TO THE SAWI

The 'A' Team, as they liked to be known, were selected to travel the furthest of the three groups, into which we split for the first major foray. This team was led by Adam Rollitt, with Adam Lee, Michael, Andrew, Amanda and Fred making up the group, with Richard Nyirenda in charge of navigation and security .The trip to the Sawi Valley camp, from the drop off point at the old transmitter station on the plateau, is about eight hours, if the team is reasonably fit. It helps to have done it before, but if it is split over two days it is not particularly difficult. The hardest part is inevitably the final climb out from the Mondwe River and back up the steep escarpment. All of the A team managed this without assistance but felt they had done a hard walk by the time they reached the top, with Fred Glyn and Michael Overton making a fast ascent and getting to the bus first for a well-earned lunch. Some record of their experience in the Sawi is given by an edited version of Adam Rollitt's diary:

Set off for the first of the major forays, bags laden with tins of meatballs, beans and fruit, none more so than poor Fred's!

After enthusing about the, apparently quite close, calls of hyaenas last night, we set off in the golden morning light, spirits high….

It is 3 am. I am aroused by nicking and nipping and pricking about my wrists. After scrambling for the headtorch, it is revealed that my Thermarest sleeping mat is literally crawling with 'red' ants. Further inspection reveals several holes in the groundsheet, through which the marauding army have managed to chew and throng (the stories were true!). The next hour or so is spent squashing them, one by one, to screams and laughter from Fred, who, amazingly, remains virtually unswarmed and ungorged upon; so he leaves me to get on with it…

After our gruelling and plot-heavy day, our ambition (or lack of foresight) meant we had quite a distance to walk from our last plot back to base camp. As we wearily descended a steep gully in the stuffy, still, dusk air, a gunshot penetrated the daydream, and ripped through the valley. It took me a few moments to make the connection: gunshot, in the Nyika means that something is amiss. We all lay low and giddy, while Richard scoured the trees and sniffed the air, and fired a couple of rusty rounds in response. As Alfeyo, back at camp, failed to respond to Richard’s subsequent whistle, he crouched down to our level and whispered, “it is poachers”. Tension all round. We slowly and measuredly trod a different route back to camp, our breaths baited and hearts racing as darkness fell. I fancied poacher-shaped shadows lurking a few metres away amidst the tress and long grass, and a dead Alfeyo at basecamp.

Upon suddenly reaching our familiar little gully, expertly picked out by Richard, we paused on the other side… the camp fire playing silently through the trees...

Turns out that the shot was from Alfeyo, who was concerned about our whereabouts!

A quick note on the atmosphere…it all seems very still; hardly any birds except for the honeyguide and the odd swoop of a bird of prey; the bark and boom of baboons; the gurgle of a stream; our tramping through the crispy golden grass; and an alert animal posied on the hill opposite. It is winter here; the same winter, quiet and dormant, that you get back home, just with a warm African twist, in anticipation of the rains to come and quench the baked, orange earth.

There was lots of commotion in the morning. Marianne appears while we eat our porridge, rather upset about the loss of Kit’s glasses and probably also about the marsh mallow raid conducted by our team on the others the night before.. After a couple of hours or so arguing and sweeping the impossibly long grass we set off, partly reunited with B team on the last slog up the hill to the awaiting bus but without Kit's glasses. As most of the team takes a rest on the ridge running up to the plateau, talk turns to ‘vanilla smoothies’ and other scrumptious things from that place in Nottingham where they make milkshakes out of chocolate bars and cookies and 'half baked' Ben and Jerry's. We get by with Aussie's (Andrew’s) delicious organic raisins, and then later with a feast of tuna, peanut butter and cheese with Provita and a dessert of rusks.

THE MONDWE CAMP

We watched the two teams meander their way down into Mondwe Valley for five nights, both returning on Saturday 11th August, with some tired people! Marianne’s team included Chris, Vikki, Hils, Laura, James Herbert, Steven and Sidney. Scouts Lewis and Daniel supported them on this foray.

Marianne Overton writes:

The first day of plot survey was in a square some 2 km away. We were tempted by that extra plot even though it was getting past time, so we had a worrying half hour when we had difficulty finding home as it was further than it had seemed on the outward journey! James got stuck into the practical necessities of lighting a fire and collecting water, some of us got the food going and the tired team were soon revived, resolving not to be so ambitious in future!

We moved camp further up the valley to a superb, flat, grassy, floodplain on the Mondwe River. Lewis marked the way for the others, should they arrive unexpectedly. We could now be seen clearly from the ridge. We found elephant trails with fresh droppings and a lovely grove of ancient, stunted *Brachystegia taxifolia*, high up on a koppie. On one plot were many huge caterpillars of Saturnid moths going into pupation, having stripped the neighbouring *Brachystegia spiciformis* tree. The evening was brightened with pineapple in orange sauce and custard.

At the top of a hill we found poacher burning. Around a huge fig tree right on the very summit we came across the sad remains of a village. Circles of dirt that represented what was once a fine hut, with associated abandoned clay pots. At this site was also a fresh poacher shelter, having been used as an overnight stop.

Everyone got safely across the river; that is everyone except the long-legged Steven, who slipped right in. He ran back to camp and returned to join the group just five minutes later. This must be a record for our expeditions!

WINTER NEAR NGANDA

5nights: Monday 6 August to Friday 10 August

Map reference 916482 Altitude 7750'

Those of us, who formed the 'C' team, were destined to spend an exceptionally cold week at our camp between the old tracker station and Nganda peak. We found a reasonably sheltered spot, some 100 m away from an evergreen forest patch but a difficult walk of 200 m through a wet bog to a small water course. We experienced cold nights; the lowest temperature recorded was 2 degrees Celsius with a white frost in the morning. The daytime temperatures were kept down by, at times, persistent low cloud. Maximum was just 12 degrees on the first three days, with a stiff breeze at times making it feel colder. On 7th August, a day when one of our team spent the day in his tent, one of at least four who seemed to go down with a flu-type virus early in the expedition, I wrote in my diary "hands too cold to write!" We had to return early to camp on one afternoon as the cloud started to descend onto us and we feared being fogged out completely. Towards the end of the week the weather improved a little but most of the team were wearing as many clothes as they could muster in bed; certainly woolly hats and socks proved their worth. This 'slow' team did exceptionally well, with meticulous recording of what we were able to find and achieving our target of 20 plots during the week, albeit covering a deliberately reduced area of 16 km^2. The week was undoubtedly brightened by our discovery of a Marsh Owl nest with two young on the ground. They were receiving rather too much attention from some Ravens and we hope our presence did not attract this attention. However, we noticed from afar the next day that the Ravens were still harassing the owls and were being seen off. We also found that Reed Buck was evident in good numbers and there were sufficient tracks and signs to keep us interested. This proved to be a very optimistic period on the plateau, when we looked successfully for signs of reduced poaching and increased game numbers. We found little or no poaching evidence in this area. At 2 a.m. on 10th August we were all awakened by a human voice plaintively calling in the distance "hello". This caused great consternation, since at that hour it could only mean that one of our teams, having broken the rule of not travelling by night, was in serious trouble. Hearts pounded, heads popped out of tents, torches shone, shouts rang out through the night and echoed round the valley, breaking the normal plateau silence. When it transpired that it was only our own group member who had taken a wrong turning for her comfort break and got lost, the relief (no pun intended) was immense. Poor Kath will never live that one down and her plaintive "Hello" became her catchword for ever more.

BACK TO BASE

3 Nights Saturday 12th, Sunday 13th and Monday 14th August

Map reference 791377 Altitude 6,500ft

After 26 people had physically lifted the bus out of a gulley and got it turned round to head back to base it became apparent that we had problems with the rear suspension. This was to necessitate a trip down to Mzuzu to get it fixed, since the planned trip to Uledi the following week could not go ahead without both the bus being repaired and sufficient certain supply of fuel to complete the programme. Some of the team were exhausted at this stage and there was special concern over the health of one or two of them. The extra night at base was thus probably fortuitous. Sunday was a scheduled rest day and it gave us a chance to recover. Monday involved a trip by the leader and two team members to Chilinda, where we were able to make arrangements for the repair of the bus in Mzuzu and establish sufficient fuel to be sure of being able to collect the A team at the end of the week. We returned to base camp just before dark. This was a difficult evening since the best interests of the expedition did not coincide with everyone's ambitions. We needed to split the team appropriately for one group to travel to Uledi, as we had originally planned. We could not allow any real, or perceived 'weak links' in the team since they were going to be out of touch for virtually the whole week and we needed to make sure they worked together very well, physically and emotionally. It took the usual 'sleeping on things' before decisions were taken and the split of the groups was finalised. There are occasions when a committee cannot make a decision and this was one of those occasions! Therefore the leader went it alone. The result was that a slightly altered 'A' team, led by Richard Nyirenda, who was joined by Lewis Mtumbuka, Adam Rollitt, Adam Lee and Amanda, Michael, Vikki, Fred and Andy did the long trek to Uledi. Most of the 'B' team, led by Marianne and including Daniel, Sydney, Stephen, James Herbert, James Hebron, Hils and Helen walked the three hours to Chisanga Falls, where they spent a very productive five days. Quincy and Laura took the bus out to drop off the 'A' team at Jalawi to start their week. They then drove to Mzuzu for repairs, to collect a trailer and to collect a few more items of provisions – principally tea which had disappeared at an early stage and caused some consternation in a few quarters. The leader remained at base camp with Chris, Bill and Kath, Alfeyo and Faston. We did further useful transect surveys and had the place cleared by the time the bus returned. We decided to leave the 'bazaar' in situ for any possible future use but otherwise the site was left as pristine as when we arrived. Our base now had to migrate to the Zambian Rest house.

THE TREK FROM JALAWI TO ULEDI

Richard and Lewis led the, by now, very fit A team, now joined by Vikki, on the physically demanding trip into the Chipome Valley and eventually up to the scout base at Uledi, covering the north western part of the park. This transect was known to be much frequented by illegal intrusion and we hoped to pick up plenty of intelligence, since it had been four years since any of our Biosearch teams had been along the Chipome for any distance. The route was more or less direct, with a handful of plots being surveyed within reasonable distance of the trail.

Adam Rollit writes:

After a long descent through the *Brachystegia* woodland, we arrive at the camp for the night, beside a comparatively wide river. After soothing dips and rests, we tuck into our spicy beans and rice as the night sets in. We exchange some stories with the scouts, with nsima and green vegetables, around the flickering campfire, with a background filled with the muffled trumpeting of elephants a mile or so away, and silence.

Skirting the North Rukuru River, flashes of faces and laughter along the opposite banks become more and more frequent...the civilization of the small settlement of Uledi! Another mile or so and we reach the much-talked-about bridge, constructed by students from Imperial College, London. After helping Aussie collect some more river results, I joined Chris to explore the village. The school consisted of a couple of simple buildings, one for the younger, and one for the older children. They were learning about Aids and simple maths; chalked on the board; how fast was the truck going if it travelled 25 miles for half an hour? Chris etched a few more words onto the blackboard. Flushed with sentiment, Chris recounts his experiences of the last time he came here in 2004, as we perch on the homemade pews in the tiny church. It doesn't seem to matter that the soft walls have mostly crumbled away.

We joined everyone around the fire for songs and sips of their millet beer - thick, bitty and tangy; it had mixed reviews from us. Then it was the 'way choo chooey, zion a way choo chooey zion' song. 'Everbody, come and see!', it was loosely translated, and sang in celebration...of life really! The village girls did it first, little balls of rhythmic energy dancing the familiar dance in the centre of our little huddle, and singing the familiar words in beautiful synchrony. But there were additions and peculiarities that Richard didn't teach us about around the camp fire last night, so those were mumbled and the known words grasped as they came round the next time. We took turns to dance in the middle; Andie and Fred, Adam, me, and even Quincy and Lewis. This was followed by brilliant bouts of 'howkie kowkie' and 'heads shoulders knees and toes'. Ours and their lives converging seamslessly…

Morning arrived. Breakfast consisted of sautéed cassava, tomatoes, onions and boiled egg. Very nice! Then one or two or three of those gorgeous short, fat bananas and a spoonful of fresh yoghurt made from animals a few fields away.

Football match (This is a replay following the match four years before – the inevitable result was similar – it would have been bad manners to rob the host team of their only international match of the season! The draw seemed a happy compromise)

This time we played on a full-sized pitch, with a proper ball (not a bundle of rubber bands), against bigger, but less nippy boys. Explosive and agile, and well adapted to their bobbly terrain - they played the full match with no shoes on! Our delicate feet needed stout walking boots (except for Aussi Andrew), which made running laboured and the more intricate aspects of ball control more difficult. We took the lead, only for them to cancel it out a while later. Then they scored a highly tenuous second, which almost certainly went around the back of the goal (shot from the side, no net). Herbie equalised with a tap-in after good work from Richard down the right. Finished 2-2, robbed! - but what a wonderful experience!

THE TEAM AT CHISANGA FALLS

The teams had now settled down to work well together. Getting everyone acclimatised and fit is the biggest challenge and cannot be done quickly, so the final week is of great importance in trying to make some good progress in discovery and recording.

With the A team heading north for the long trek and the older team members focusing on transects and bird surveys at the base camp, Marianne's team headed for the sheltered but steep surrounds of Chisanga. This seemed to be a productive week and they settled well for the few days available to them, gathering much useful data.

Marianne Overton writes;

Elephants and Chisanga Falls

It took five hours to walk from base camp to Chisanga, with a stop for lunch on the way. Pete and Bill did the first part with us, enjoying the impressive views from the highest rocky points, looking down into the Rift Valley to our destination. It was truly impressive. Later, I suddenly recognised a point we had surveyed a few years before;
"Ah! There was the skin of a Berg Adder by that rock and over there were – elephants!!" And four walked into view, their trunks up sniffing our scent on the air as they went. We could easily have missed them and it was only because I stopped to look round, at the very spot where they appeared in a break in the bush. We waited and watched but they kept out of sight after that.

I was pleased that I managed to find the exact camp spot that I had picked out three years before - quite perfect. Tents were set on a grassy bank in a bend of the river, with a beautiful fast- flowing pool, ideal for a swim after a hard days trek. We climbed down an animal path to paddle in the pool below the lower most impressive part of the falls, then climbed a rocky koppie to watch the sun set over camp. That evening, we enjoyed dancing and singing round a big fire, laughing 'til our sides nearly split at the creative dances developed, especially by James Hebron with his wonderfully expressive face. Then as the embers quietened so did our mood and we were utterly engrossed by the accounts our scouts gave of their lives and events in Africa.

New species and Ghosts

We left camp in good time having finished our first plot by 9am. The four plots of the day covered a lovely range of habitats. We started with long grass, well over our heads on a steep slope – terrifying for Helen, who was kindly rescued by hero, James Hebron. Next was a lovely wet rainforest, partly flooded, with signs of hippo, elephant, monkey - and a georgeous golden-eyed frog! Birds of many kinds were busy on the newly flowering Sysigium in the canopy above our heads. The leaf-carpeted ground was plaited with streams which flooded at the forest edge where the flowering borders blossomed in rich sunshine. Two Brachystegia woodland patches revealed much bushpig activity and beehives. Two francolin and a flighty nightjar flew up from under our feet. We spotted, photographed and recorded a new species for the Park, the candelabra cactus, *Euphobia trigona*.

Back at camp we swam in the North Rukuru above the falls and James leapt from the overhanging trunk, draped with orchids – after I had checked it for submerged objects! That night the cooling embers inspired weird stories of the other world!

Joka! Snake!

Since we were out of Nsima, Daniel ate his first porridge breakfast, slowly and reluctantly, until at last we said he could have rice next time! We set off up escarpment and did five plots, in steep *Brachystegia* woodland, Rainforest edge, *Protea* grassland and a lovely rocky ridge with great views. On the last lowland plot, Daniel disturbed a large snake about a metre long, which shot over towards Steven. Horrified, he leapt out the way and fell over. The confused snake then turned and came straight for him again, so Steven leapt up into a tree, shouting Joka! And earning much humour all round! Leaping up the nearest tree, shouting "Joka!" soon became a standing joke causing much hilarity. Next time, we hope to remember to just stand still!

Returning to camp at 3.30pm, we enjoyed a delicious swim in the cool, clean flowing river. We sat on the rocks above the roaring falls, amid orange Aloe and brilliant purple aromatic flowers (*Dissotis princeps*) to watch the sunset and then chatted round the fire until 8pm, well after dark!

Exploring Day and Bats – visitors missed!

We set off downhill and walked 2km to meet the white dirt road, winding down the escarpment towards Kaperekezi Gate, crossing two lovely streams. We recorded tracks and signs along the transect and did two plots in *Brachystegia* woodland. We recorded signs of poachers, attacking the natural beehives in hollow tree trunks, leaving tell-tale remains of fire at the trunks of the trees. We followed the falls part way down for another plot and watched with incredulity as long tailed melodius birds alternated between enjoying the afternoon sun on the treetops and dipping in and out of the waterfall itself. Their roost is behind the heavy flowing waterfall, inaccessible to predators. We decided they must be the remarkable Slender-billed or Chestnut-winged Starlings, endemic to a few afro-montane areas from Ethiopia to Malawi.

Sydney went to see if the Acrididae butterflies, for which he was particularly searching, were also out enjoying the evening sun and met Peter's team just returning after a long day visit to see us.

About 8pm, we watched bats quartering up and down the river, feeding on insects and some others passing through at a great rate, evidently in a hurry to get to their feeding grounds!

Half day rest and riverine forest plot

The call of nsima was too much. Daniel and a small team was sent off to meet the bus on the track and returned later that day, happily replete with enough flour to make huge feasts of nsima! A "rest morning" was well spent in art and photography; Hils photographed Sydney's insect collection for later artwork, I made a necklace out of seeds, porcupine quills and dried hare dung. Helen wrote her 800 words for the Lord Mayor of London. The others returned in good time for an afternoon of

wonderful, dense riverine forest plots, where tracks of cat and antelope were clear in the sand.

Goodbye to the valleys
Up and off at first light, leaving the camp as delightful as we found it, though the bees were already busy collecting salts from the small, well-hidden loo pit! With full pack and two stops en route, I was proud it only took us 50 minutes to get to the top. We did two plots, one on the rocky ridge which was wonderful with extensive views and inhabited by Klipspringer and nightjars. The next was a real feat, in long, unburnt grass on a steep slope with watercourses in ravines that are invisible until you've fallen into them. I genuinely found it very funny as the terrain seemed to play with me, making me tumble about, sometimes rising up in walls in front or rugby-tackling my boots. Out of our group, I always chose the most adventurous line in our transects, but this time I was glad I wasn't alone and James was also brave enough to tackle the dense growth in search of tracks and signs. Signs are much less evident in this dense grassland habitat, but bushpig and bushbuck really make a habit of it!

Last out, I puffed up the hill to the track to find and warmly greet a scout from previous expeditions, Solister Munthali, complete with a truck, and leading a huge crowd of Wildlife Club members from the villages on a Sunday outing to learn about the Park.

Feeling well satisfied with ourselves, we settled happily for lunch with a fantastic view until our expedition bus could be seen creeping up the steep slope, laden with happy expeditioners from Uledi. Last night on the Nyika was camping next to the eerily deserted "Zambian Resthouse", once a colonial outpost. That afternoon we distributed all our remaining gifts and enjoyed a great party with Kath's brilliant rendition of our expedition and dancing the "choo choo!"

RELOCATION AND RESCUE Peter Overton continued.
With one team headed for Uledi and another at Chisanga, we needed to move our transport to a more strategic point in the park. We had also received an SOS concerning shortage of food at Chisanga. This was a communication breakdown regarding length of stay. We decided that we would benefit in future from bush ration checklists for these forays, where the basics at least, should be double checked. The rations are clearly more condensed and precise than for a stay at a fixed base camp. We therefore took a party consisting of Faston, Peter, Kath, Bill and Chris and Laura down to The Falls, left a few extra provisions with a note, enjoyed the wonderful midday cool of the fast flowing water and returned to our new base at the Zambian Rest House by late afternoon. We are very grateful to John; one of the resident scouts there, for assisting us on our arrival, but did not take up his offer of sleeping on the floor of the decaying old building! Our modern, insect-proof tents seemed a better idea at the time. This abandoned building will surely one day regain its former glory and be a great asset to visitors to the park. Its location could not be better. Anyone taking it over will need reassurance about the continued maintenance of the park road and a long-enough lease for repayment of the funding required bringing it up to modern standards. For those of us who enjoyed three nights there we found it an interesting sheltered location with, at last, some reasonable variety of bird species following quite a barren time on the more exposed parts of the plateau.

COLLECTION FROM ULEDI – VIEWING THE BRIDGE
Quincy, Chris and Laura, all of whom had been on the 2004 Biosearch Expedition to the far north of the Nyika National Park, set off on Saturday 18th August for Uledi. Alfayo accompanied them; it was his first visit to this far flung outpost for scouts. It was during this expedition that Quincy, our expedition leader in 2004, mooted the

idea of a footbridge over the North Rukuru, to enable access into the park during the rains. Just one year later, a small team from Imperial College, London, started the building process and it was completed just before our arrival this year. The fit team, who had walked down from Jalawi, crossed the Chipome and the ridge into the far north of the park, conducting game surveys on the way, were greeted by the bus and celebrated the completion of both achievements at the same time. It was a fine way to end their experience of the park in 2007. They collected the Chisanga group on their return to the Zambian Rest House, where the whole team spent the last night together.

FROM NYIKA NATIONAL PARK TO VWAZA WILDLIFE RESERVE

Although we had been supplied with a trailer for the exit it was not the specified size and not quite large enough to take everyone and their baggage. Nevertheless, with a bit of very clever packing, using the back row of seats on the bus and juggling of personnel we did manage to make an exit, without leaving anyone behind. We needed some fuel to get us out so a trip to Chilinda on the last day was necessary. I took four scouts and all their kit with me and was kindly supported by Lucille Labuschage, who was heading down to Vwaza imminently. She was able to put all of the scout's kit on her roof and take two of the four with her as far as Thazima. I returned to base with Richard and Daniel and managed to find extra space on the bus as far as Thazima, to where they were keen to get. It seems Chilinda is too much on a limb to be useful to anyone, while Thazima offered imminent prospects of getting Alfayo and Faston back to Rumphi and beyond. Lewis had remained with the team, since he lives at Vwaza and was to be our guide for the two night stay there. We had a stroke of luck, in that our only puncture on the whole expedition was in one of the trailer tyres, just as we arrived at the Vwaza turn-off beyond Bolero. We were able to change wheels and send the spare off for repair with our driver with minimum delay.


Children at Bolero seized on our bottle tops for their games

AN UNFORTUNATE CHAIN OF EVENTS!

After some discussion we had agreed that no alcohol should be consumed whilst we were in the National Park. This decision was taken in deference to the scouts, who are not allowed to drink on duty and to make sure that no alcohol-related injury could ensue whilst we were in the wilderness. We had already organised the end of expedition party nights for a later stage. Crates of beer were smuggled on board the bus for the bridge celebration at Uledi, so I agreed that since after crossing the river, the 'A' team would be outside the park, the beer should remain, provided the empty crate was left at Nthalire on the way through, since it would take up much needed space and be a nuisance in the bus aisle. This did not happen; the crate was wrapped in a black bin liner and I took it off the bus at Chilinda to make space for the team, since we were already short of seats. An identical package was collected from the kitchen there. It contained much needed food supplies for Vwaza and was mistakenly assumed by one of the team, when we arrived at Thazima, to be the crate with the empty bottles. Here it was taken off the bus without further thought. The chef at the Kasuni Camp had no food for his customers, due to arrive the next day. I had agreed the food delivery in exchange for our essential fuel supplies at Chilinda, so we had to make a special round trip to Rumphi to replace the missing supplies. The event left us short of fuel to reach Mzuzu, since there was none to be had at Rumphi, and it had the overall knock-on effect of using up two hours of fuel and four hours of time; precious time which could have been used watching elephants! It could have left us stranded, but fortunately were able to locate 20 litres in small cans in a village. The fuel supply problems in Malawi were causing headaches in many quarters and we need to plan bigger back up reserves in future, despite the fact that we generally held 40 litres in the bus in containers.

All turned out well in the end and one can smile about these incidents in retrospect; but my prejudice against crates of drinks on the expedition bus has been enhanced; whether they contain beer or soft drinks is of little consequence!

MEDICAL NOTES

Sundry health problems have arisen from time to time, while the team is resting on the lakeshore at the end of the expedition. In the past we have put stomach and other acute complaints down to eating food off the street sellers in Mzuzu. Now it appears that the problem may well be located in the lake itself. Whilst the expeditions tend to be healthy environments due to the altitude and isolation, there are in the populated areas of the Lake many sources of infection. Most teams spend some time swimming in the lake and we suspect that the swallowing of the water could be responsible for past sickness, which also afflicted three team members this year. We are therefore cautioning all those who may choose to enjoy the lake in future to keep their mouths firmly shut and not to imbibe any water.

SUMMARY

There can surely be no real expedition, involving exploration and research in remote areas that can ever be considered easy. The very act of living and working in the bush creates logistical challenges in camping and feeding everyone without the convenience of shops, running water and ancillary services. Our group in 2007 were however, very focused on the job in hand and this reflects well on them. The team split into three groups, which enabled everyone to work most effectively, with slightly differing objectives. This was one of our best expeditions over the past 12 years. I feel the greater mix of ages and experience than has been normal in the past, played a major part in this success. We were “leadership-heavy”, which does not always work well but with a large team of 25 in the field this was an added safety net. Relationships were generally very good and team members attained their various personal objectives. The fact that so many of the team have been supportive and pro-active in getting this report completed shows that they have gained much from their expedition. It is worth mentioning here just how much work goes into putting the report together, since this is often overlooked. The summation of all the time put in by individual contributors and the editorial and technical work in its assembly, adds up to a major part of the whole expedition, totalling at least two hundred hours. Each report could be simply a continuation of its predecessor. However, we try to publish each one so that it stands alone and uses original photographic material from the current expedition, almost exclusively. We have had many excellent amateur photographers and I trust the reader will appreciate their work.

The report is a clear indication of our commitment to help the Department of National Parks and Wildlife and the cause of conservation in the Nyika National Park. Biosearch Nyika is a truely Responsible African Wildlife Conservation Expedition.

Marianne *Hilary Strickland*

THE EXPEDITION TEAM

Our team included scouts, wildlife officers, young people for whom this was a career move, experienced field workers and adults on a first expedition experience. For some the priority was scientific success. Others were seeking challenge and adventure in this Central African wilderness, whilst making a useful contribution to wildlife conservation in this developing country. Below the leader and in no particular order, we describe the full team. We are very grateful to Quincy Connell, who took most of the portraits whilst on expedition. This can be a very challenging job, since not everyone is easy to photograph when pre-occupied with other things.

C. PETER OVERTON BSc (Hons)
Project Director of Biosearch. Peter joined the Wye College Nyika Expedition (1972) to the northern extension of the Park (as it now is). He has long experience in project organisation and management in the UK, including nearly 30 years involvement with the wild game industry. For the British Trust for Ornithology, he co-ordinates a regional team of voluntary researchers, contributing to national records. *"I believe we were very lucky to have brought together such an outstanding team in 2007 which has taken us a step forward in assisting the Department of National Parks and Wildlife in monitoring this exceptional area."*

MARIANNE J. OVERTON BSc (Hons) PGCE CBiol MIBiol FRGS
Marianne, our science co-ordinator, was raised in East and South Africa and enjoyed leading field research expeditions in the Amazonas, Kenya, Arctic Norway, Yukon, Queensland and a series of expeditions to Malawi with Biosearch Nyika. Each expedition involved a wide range of ecological surveys with various sized teams, the largest being 81 in the field! She is a fellow of the Royal Geographical Society and has twice been regional chairman for the Institute of Biology in the U.K.

QUINCY CONNELL FSSDIP FRGS MLC
Quincy led previous Biosearch teams but in 2007 took the role of photographer. He previously led expeditions to Iceland, Indonesia, India, Guyana, Thailand, Malaysia and Honduras. He has had considerable input into the training and design of expeditions through the Duke of Edinburgh Award Scheme and the Young Explorers' Trust and he is a fellow of the Royal Geographical Society. Quincy spent twenty-one years as Scenes of Crime Officer with the Metropolitan Police, examining scenes for forensic evidence, preparing and presenting that evidence in courts of law. Recently he has added to his world travels by assisting with projects in Vietnam, Laos, China and Lapland.

ANDREW ALLEN
Andrew has recently graduated from Imperial College with a master of engineering. Being a British/Australian, born in Hong Kong and raised between Hong Kong and the U.K. Andrew has always had a passion for travel and adventure and, with an engineering/science background; expeditions seemed the perfect way to merge the two. He is now pursing further postgraduate studies at Sydney University, Australia.

KIT CLAYTON
Kit is currently a second year student at the University of Leicester studying Zoology. After university he hopes to take part in field research. This was his first expedition as well as the first camping trip and first time he has been outside Europe*. "I found the whole experience to be very enjoyable and hope to return to Malawi soon."*

FRED GLYN
Fred had just completed his second year at Imperial College, London, studying for a degree in Biology. He was one of the fittest members of the team, managing the steep climb up to the escarpment from the Mondwe Valley with relative ease.

JAMES HEBRON
James is currently a final year student at Nottingham Trent University, studying ecology and environmental management. His interest in science is more in the direct application in conservation and environmental protection as opposed to pure academia. He aims to become a secondary science teacher, with the hope of encouraging children to focus their minds to the increasing environmental problems facing this planet.

JAMES HERBERT
James is currently in his third year at Nottingham Trent University studying BSc (Hons) Environmental Science for Business. This is his first trip to Malawi, mainly to study the African Ecology and Botany. He hopes to gain knowledge from identifying Malawi's rare and secluded plant life, maybe even identifying new species along the way.

VIKKI HILL
"I am 20 years old. I left school after completing my A-levels and decided to explore the world. I wanted to live in the bush and experience a different lifestyle. I would recommend it to anyone. One tip: leave your phones at home!"

HELEN HITCHCOCK BSc
Helen recently graduated from the University of Greenwich with a degree in Environmental Science and aims to work in this field. Helen lives in Kent and is on the committee of the Society of Young Freemen of the City of London.

AMANDA K. JONES BSc (Hons)
Amanda was born and raised in North Devon, and attended Nottingham Trent University to study Ecology and Environmental Management. Biosearch Nyika was the first expedition embarked upon, in which her main focus was poaching activity in the National Park. Hopefully there'll be many more expeditions to come!

SYDNEY KAUNDA
Sydney has wide experience in many skills, including as a carpenter, screen printer and tailor. He now works with Ray Murphy and has become accomplished as an entomologist, being able to identify a large range of species.

ADAM LEE BA (Hons)
Graduating in Media and Cultural studies, Adam has a love of photography and travel; with a wealth of trekking and climbing experience already, this expedition was an opportunity to combine them all with a conservation project.

LAURA MILLER BSc (Hons) Assistant Leader
Laura, from Northampton, graduated from Nottingham University with a 2(1) in Environmental Science. A fun loving wild child of the 90's, who likes everything pink, that decided to take a couple of gap years before going to university where I gained a 2:1 in Environmental Biology. Travelling and living off the land are in my blood. Malawi brings out the best in me, hence this my third visit.

STEVEN MPHAMBA
Steven is a herbarium assistant at Zomba for the Forestry Research Institute of Malawi (FRIM). Since 2003 he has been collecting seed for the International Seed Bank and worked with the Darwin Initiative in Mozambique.

CHRIS NEAL
Chris, whose young heart is trapped inside an ageing body, was a valued member of the tough 2004 expedition, where he was a hit with both Malawians and students alike. He has a passion for politics and is blue to the core. A keen gardener, he has won many accolades for his skills, including second at the prestigious Chelsea Flower Show. He loved everything about the expedition especially seeing so many animals.

MICHAEL OVERTON
Michael has been on eight expeditions to the Nyika National Park. He is especially interested in herpetology and would welcome the opportunity to work alongside a Malawian herpetologist when possible. He hopes 2008 will provide this chance. He is currently studying for exams in the UK, with Design being his strongest forte.

BILL RENWICK
Bill describes himself as an 'old codger', still learning. He certainly taught the team a lot during his month of study in the bush! He has a part time job with a large store overseeing security. Over his long career he has travelled far in difficult conditions. His ability to record practically everything was immensely valuable to the expedition. Being the first person out of bed in the morning to get the fire going might have gone unnoticed by some but made him an outstanding expeditioner.

ADAM ROLLITT

Adam is currently in his third year at the University of Lincoln studying Animal Behaviour Science. Combining interests in wildlife conservation and travel, the expedition provided precious memories and experience in coordinating and carrying out ecological fieldwork, survival skills and of life in general!

HILS STRICKLAND BA (Hons)
A Fine Art graduate of Kingston Polytechnic, who now lives and works in Bath, as a designer/illustrator. With a love of travel, outdoors and wildlife, "I thoroughly enjoyed the expedition experience!" Hilary was sponsored by the Percy Sladen Memorial Fund.

KATH THOMAS BA (Econ) Hons
Kath took a Geography and Sociology degree at Sheffield University and has taught in a number of primary and secondary schools throughout England and Wales. She has a keen interest in the physical world and in environmental issues and works, on a voluntary basis, for the Lincolnshire Wildlife Trust. Kath has visited Kenya and Nepal and has trekked in the Himalayas.

LEWIS MTUMBUKA Senior Parks and Wildlife Scout
Lewis worked on the Nyika (8yrs), Kasungu (7yrs), Nkhota kota (1yr), Kasungu (1½yrs) and Vwaza (8yrs), where he is currently working on wildlife monitoring using aerial and roadside counts and transect walks 2km apart. He is interested in using the Biosearch monitoring techniques in other areas. He has now accompanied our team on three consecutive years and has proved an invaluable source of experience.

DANIEL ZYGAMBO
Daniel is a Senior Parks and Wildlife Scout from Nchena Nchena, where he is responsible for education and extension. He supports Wildlife Club visits to the Park and law enforcement in the communities. He has spent 8 years in the Nyika NP where he is involved with bee keeping project support.

RICHARD NYIRENDA Parks and Wildlife Scout
This was Richard's seventh expedition with us. This is a remarkable achievement and shows great enthusiasm by him to join the teams. His interest in birds is of significance, since it is of great importance in his role of supporting visitors to the Park and elsewhere in Malawi, which is noted for its abundance of bird life. His intimate knowledge of the northern valleys was put to good use to take the "A team" to Uledi from Jalawi in the final week.

FASTON PHIRI
Faston is a Parks and Wildlife Assistant from Munga. He has been educating the local community on the importance of conservation. His introduction to the expedition was to join the 'midwinter team' to the Nganda region in our first week as a sub group. Quite a baptism of fire, which he came through very well!

ALFAYO KUMWELA
A Parks and Wildlife Assistant based in Mzuzu Conservation Area. He has been helping with the bee keeping project.

ADAMSON BANDA
Has spent four years at Chilinda and worked for four years as a scout. He helped man our base camp for a week when the whole team was away and walked much of the way from Chilinda to get there! We much appreciate the support he gave Daniel to avoid a very lonely week for him.

DONIOUS CHAYERA
Donious was our intrepid bus driver throughout the expedition. In common with his predecessors, he had no idea what it would be like living and camping on the high Nyika for three weeks. After much persuasion we got him to take a blanket but it was not long before a second one was required. He came through his challenge well and managed to keep smiling.

PROVISIONS

Peter Overton

INTRODUCTION

The table of provisions given below is mainly a record of purchases made prior to the expedition but has been adapted to include amendments following the experience of usage in the bush during August 2007. We allowed for generous stock to cover the requirements for both the UK members and the Malawians who made up the full team. We had the opportunity to top up on rice, cooking oil and tea at Chilinda during the expedition but our plan to be totally self-sufficient, which is really essential for living in the Nyika, held up well. As usual, we distributed surplus supplies to the scouts, who had supported us so well, before we left the Zambian Rest house on the plateau. There was a further opportunity to collect supplies on our way to Vwaza, at Bolero, but for our brief stay we needed very little, just a few eggs, tomatoes and some bread.

The preference of most (but not all) of the Malawians for nsima for breakfast and supper, rice for lunch and their enjoyment of dried lake fish, meant we had to make some adjustments on our normal purchases. This year was the first year that we had fully integrated the scouts into our purchasing lists and apart from a shortage of tea at one point, which they kindly pointed out to us, we seemed to manage the challenge quite well.

Provisions for 24 people x 25 days

Item	Quantity
Apples	10 kg
Avocados	40
Bananas	120
Cabbages	30
Carrots	15 kg
Green beans	15 kg
Green peppers	10
Papaya	8
Pineapples	15
Baked beans	60 tins
Baking powder	1 tin
Biscuits (sweet)	40 packs x200g
Bread	20 loaves
Bread Rolls	1000
Cooking oil	15 litres
Cheese - cheddar	60 packs x 400g
Chilli hot sauce	1 bottle
Chocolate drink - Milo	40 x 250g cartons
Coffee	1 x 500g
Spam	50 tins
Instant custard powder	15 packs
Drink – fruit	8 x 5 litres
Eggs	150
Fish -kapenta	15 kg
Flour for bread	5 x 2.5kg
Fruit – dried mixed	6 x 1 kg
Fruit cocktail	60 tins
Herb mixture	2 small shakers
Orange squash	10 x 2l bottles
Juice - grenadilla	8x 2 litres
Juice – guava	8 x 2 litres
Macaroni	15 x 500g packs
Maize flour	15 kg
Margarine	25 x 500g tubs
Marsh Mallows	10 packs
Matches	2 x 6 box
Meatballs in gravy	70 tins
Milk – liquid sterilised	70 bottles
Milk powder – NIDO	4 x 900g tubs
Onions	20 kg
Orange squash-Sobo	4 x 2l bottles
Oranges	12 kg
Peanut butter	20 pots
Peanuts	2kg
Pepper	1 x 100ml pot
Porridge oats - Jungle	25 x 500g bags
Potato dried	25 packs
Potatoes	75kg
Provita biscuits	60 packs
Rice	5 x 5kg bags
Rusks	30 x 500g boxes
Salt	5 x 100g
Sardines/tom	30 tins
Sauce - Bolognese	5 packs
Sauce - Cheese	5 packs
Sauce - Pepper	5 packs
Sauce - Peri Peri	1 bottle
Sauce - Sweet & sour	5 packs
Sauce - white	5 packs
Soup – vegetable	24 packs
Soya – tomato & onion	6 packs
Spaghetti	15 x 500g packs
Sugar - brown	3 kg
Sugar – white	42 x 1kg
Tea Bags	240 bags
Tomato Sauce	3 bottle
Toilet rolls	70
Tomatoes	30 kg
Tuna	65 x 170g tins
Usavi mix – Royco	45 x 75g packs
W/U liquid	2 x 1.5l
Yeast – instant dried	2 pots
Water in bottles	100 x 500ml bottles

HARDWARE

Item	Quantity
Candles	4
Bowl plastic large red	1
Bowl plastic large blue	1
Bowl plastic small red	1
Bucket – green plastic	1
Bucket – red plastic	1
Grill /Mesh for fire	1
Trays – plastic	3
Machetes	3
Hoe	1
Ladle	1
Large platters for base camp	2
Birthday candles	1 box
Cheese Grater	1
Tinfoil	2
Cutting boards	2
Knives	3
Food bags reseal	2 packs
Fish slice	1
Frying Pan	1
Insulated box	1
Potato Peeler	2
Colander spoon	1
Omo powder	3
Pan scrubber	1 pack
Nest of Cooking pans	1x6
Mosquito net	1
Fire gloves	1 pr
AA batteries	Pack of 20
AAA batteries	4x2
Disinfectant - Dettol	1
Bin Liners	1 roll
Wire wool for pans	8
Bucket – 5 gallon for water	1
Base camp tin opener	1
Hessian sacking	1 roll
Potato Masher	1

ENVIRONMENTAL PROTECTION

Helen Hitchcock and Kathryn Thomas

INTRODUCTION

As in all previous Biosearch Nyika expeditions the aim was to carry out our fieldwork whilst minimising the effect of this activity on the environment and the habitats that we visited. Although on expedition, it is not always possible to leave the locality in a totally pristine condition, we made every effort to keep the effects of our intrusion to a minimum. This year for the first time, we have tried to reduce our carbon footprint, as a contribution towards a healthy global environment.

CAMPS

Everyone is together at base camp for a short time, so location was chosen with this in mind. Base camp was an area with previously cleared areas for tents and a “loo” pit, so no new intrusion into the habitat was required. Movement at base camp was kept to two established paths. When away from camp, we followed well-trodden animal paths as far as possible. Care was taken not to displace vegetation unnecessarily. Since our groups were generally no more than eight people, we are satisfied that damage caused by people traffic was minimal.

Care was also taken in the setting of tents. Fire is a major cause of long-term damage to trees on the Nyika and it is important that teams do not inadvertently cause an outbreak that can run out of control. In this respect and to ensure the safety of the team and their tents, these must always be sited well away from the camp fire and sufficiently separated from each other. The leader insisted on the re-pitching of tents away from the campfire when he considered that these essential safety precautions were not being adhered to sufficiently.

It was sometimes necessary to level small areas for the tent, with a machete or hoe when a camp is to remain only a few days. This does cause some local damage to the vegetation and top soil and is best avoided. The ground works were restricted to the immediate area of the small tent and restored on leaving as far as possible.

At our main base camp, which was the “Old Horse Camp”, we were able to dismantle a disused, wooden pole, shower block to construct our food bazaar for storage of provisions. Since the wood had been imported from Chilinda and was mainly non-native pine, we felt that we had actually enhanced the environment by reusing it and placing it in a less visible situation near the river. It was left on our departure for possible future use but may well be swept away by any river flooding when the rains arrive.

Cutting of live trees is futile and damaging. Any timber containing sap will produce a smoky fire and will be difficult to light, so in the short period of an expedition, with no chance to dry live wood sufficiently, the issue of tree cutting for fuel does not arise. All timber used on the expedition was either fallen or dead. Dry grass was used for kindling in the morning, where necessary. Collecting this kindling the previous day and storing it under a tent is recommended, since the dew can be significant at higher altitudes. Minimal cutting of green wood was for essential constructions, such as the toilet. For our main camp this was not necessary since we used a previously occupied site with facilities intact.

Water for cooking and washing up was obtained from the river and stored in large plastic containers, which are retained from year to year, being stored in Malawi. Water was boiled for tea, with only that for drinking bottles being treated with chlorine tablets.

WASTE DISPOSAL

All paper, cardboard and plastic was burned. Vegetable and fruit waste was buried. Tins were first burned to encourage rapid decay, and then buried, though removal from the park would have been preferable. Batteries were reused by the scouts. Glass does not decay and was removed from the park at the end of the expedition. Washing up water was poured into a sump, well away from any water course. Clothes washing was done near to the river for convenience but again all waste water was thrown away at a good distance from the river. This occasioned many beautiful butterflies to descend on the area to enjoy the salts contained in the suds. The camp site was generally kept tidy; it is important that this is a continuous process to avoid litter spreading and to avoid the loss of personal belongings. A litter monitor was appointed to help ensure this.

In the smaller sub camps, with short duration of occupancy, waste was buried in the toilet hole. It was impressed on the team that whilst in the bush no toilet paper should be deposited, since digging it in can be difficult. It should be burnt *in situ*; this was the purpose of a small lighter on the kit list.

Before departure from any camps, all waste holes were filled in properly and gardening work done to disguise the site, thus invisibly restoring it to its original state. A final and thorough litter check was made before departure from base camp.

HOW CAN AN EXPEDITION ADDRESS THE ISSUE OF CARBON EMISSIONS?

The complexities of this issue are immense but there is no doubt that our international flights are the main point of focus. The round trip from London is in excess of 10,000 miles. It is unfortunate that it is now difficult to fly direct to Lilongwe without flying through one of the two major African hubs, Nairobi or Johannesburg. We can but hope that in the future large efficient carriers will be able to fly direct with full loads but until that option becomes available there is intrinsic carbon inefficiency in any air travel to Malawi.

The next aspect we considered was whether the travel produced sufficient value to warrant the real cost in carbon emissions. For many years expeditions have tried to improve the value added to their host country by their visits. Scientific and research expeditions have grown in number in recent years. Biosearch Nyika has a ten-year track record of working closely with the Department of National Parks and Wildlife to produce useful results for the conservation of the Nyika National Park. It would be good for the period of the expedition to be extended to increase this value and the effect on carbon footprint, but the number of return flights would remain the same. The value of the work can be assessed by our hosts, but as long as the invitation to return remains, we must assume that we are adding real value and the carbon cost is, if not fully justified, at least mitigated to some degree.

We feel more positive about our carbon emissions in Malawi. Our main travel up country is by bus and once we are camped in the wilderness the use of vehicles is minimal. Biosearch Nyika is distinguished from most other expeditions in that the main focus of our work is travel on foot into remote areas that are not accessible by vehicle. If everyone from developed nations spent one month a year without the use of vehicles then we would certainly be moving in the right direction in reducing carbon emissions.

On a micro scale, our substantial use of local fresh produce and fallen timber for firewood for catering in camp was beneficial. We have been progressively reducing convenience packaged bush foods, since they are expensive to buy, nutritionally less satisfying and have more waste to be dealt with afterwards. In 2007 the proportion of fresh fruit and vegetables in our rations was the highest yet and mostly arrived in camp in cardboard boxes, which served as seats before eventually being buried or burnt. We envisage that single use plastic will almost cease to be used on our expeditions, with the possible exception of water bottles, which have multiple uses for scientific, catering and other purposes, once the contents have been consumed.

Many scientists would now agree that the destruction of ancient forests, worldwide has been a major factor in increased carbon emissions in recent years. Reinstating these trees as soon as possible is recognised as a practical way of compensating, in part, for our carbon footprint. There are organisations that will allow individuals to compensate by paying towards reforestation projects. Biosearch Nyika is fortunate to be able to connect each team member directly with this process by planting native trees in a designated secure area. This may be a small gesture but the solution to the major problem of carbon capture lies with many small gestures by people worldwide.

Brachytegia taxifolia *Hilary Strickland*

Nyika grasslands *Chris Neal*

CAMERAS AND PHOTOGRAPHY

Adam Lee

DIGITAL PHOTOGRAPHY

The majority of photographic equipment used on the expedition in 2007 was digital, the benefits of this included:

- Enhanced portability – the smaller and lighter hardware was easy to carry over long distances and difficult terrain
- Better image storage – memory card storage devices allowed for many photographs to be taken without demanding the care or space that sensitive film requires.
- Ease of use – modern zoom and auto focus capabilities make quality 'point-and-shoot' photography possible – a valuable asset on this expedition.

PHOTOGRAPHIC OBJECTIVES

Individuals naturally have their own goals for their photography, most want to share their memories and some want to express their artistic side. As a team, we were required to photograph scientific finds and convey the beauty of the Nyika National Park to those who share our passion for its conservation, as well as those who are not even aware it exists.

Hilary Strickland at the edge of the Great Rift Valley *Adam Lee*

HARDWARE

Usually adopting a leadership role, Quincy Connell wanted to further explore his passion for photography on the 2007 expedition, his Minolta Z2 and Canon PowerShot A710 IS rising to the challenge of documenting our time travelling Malawi. The Minoltas' impressive zoom (14x optical, 4x digital) proved useful in recording details of interest in vast landscapes, as well as capturing shots of wild and evasive animals. The Canon's downfall was that its extra lens could only be used in conjunction with the screen and the brightness of Africa made this near impossible. However, it took brilliant portrait and night flash shots.

Adam Lee took a Fuji Finepix 6500fd, which is a good example in a growing market of cameras, bridging the gap between compact and digital-Single lens reflex. With many of the options of a DSLR but with a fixed zoom lens, the Fuji offered clear images throughout its large focal range, a fast and reliable auto focus and the peace of mind that no dust would collect on the sensor during lens-swaps (a persistent issue for photographers in such an environment). Taking a camera of this size is however a commitment: Although smaller and lighter than traditional film SLR camera, modern digitals are still bulky. To capture images in the wilderness your camera must be at your hip – not the most comfortable of places when you are trekking cross-country with a campsite on your back!

Other cameras on the expedition were the Canon Powershot S5IS and the SONY DSC-H5, both of which were commended for their image stabilisation and ease of use. Sporting impressive zooms, these cameras only start to struggle when relying on their digital enhancement facilities when the lens is at is full length.

Examples of compacts used by expeditioners are the Samsung Digimax S500 and the Rollei Digital da7325Prego. These cameras boasted 5.1 and 7 mega pixels respectively, and illustrate that great detail can be achieved from a compact camera. Images from these cameras are crisp up to A4 size. Cheap, very portable and user-friendly, the use of this type of camera throughout the group produced a plethora of varied styles and images. The major limitation of the compact camera is the poor zoom, but this rarely meant that an opportunity was missed due to the diverse nature of the groups we were operating in.

A limitation also apparent in the compact camera is its reliance on a live-view screen instead of a viewfinder. This proved troublesome during the framing of scenes in the bright sunshine experienced in Malawi, but also strains the batteries. All cameras featured above used standard sized ‘AA’ batteries, which have downsides (namely disposability and bulk), but proved superior in the field as they did not require the mains/12v charging facility demanded by camera-based cells.

Examples of the wide range of equipment used on the 2007 expedition

ACCESSORIES

Tripods – a ‘full-size’ tripod was taken and proved useful for group & landscape photography, but was an unwelcome addition to an already full pack. The ‘Ultrapod‘ was definitely more suited to this expedition; a table tripod that also attaches to poles or trees with Velcro.

Lithium Batteries – seven times as long-lasting as their alkaline predecessors, many of the team championed these AA’s.

White pillowcase – compactable background for ‘forensic’ photographs.

Tape measure – for illustrating the scale of subjects.

Disposable cameras – light and cheap, worry-free photography!

WEATHER

Quincy Connell

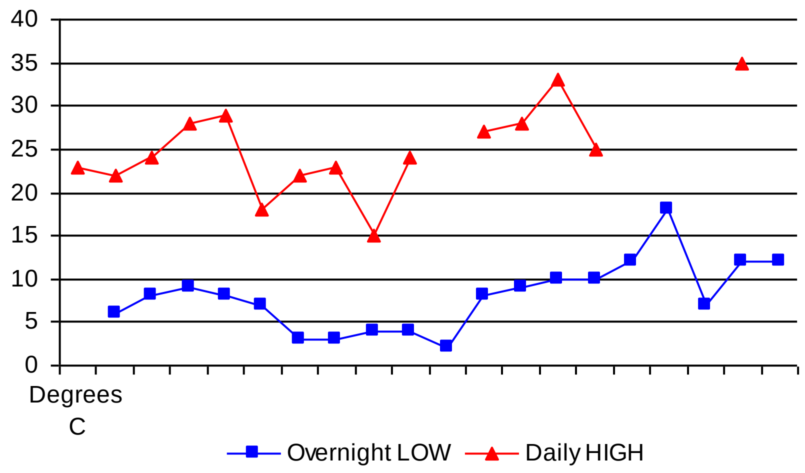
INTRODUCTION

There used to be a number of weather stations at scout camps around the Nyika National Park, but for some years this has diminished to one at Chilinda. Weather is bound to be of great interest to anyone living in the open and thus simple temperature measurements were made. These can compare with previous years. Two maximum and minimum thermometres were used, one managed by Quincy Connell kept at base camp and one by Marianne Overton. Thermometers were placed in the bushes in free flowing air in the shade, approximately 1.5m above the ground. Comparing the thermometres whilst both in base camp, indicated an error of up to 2 degrees. Ensuring shade throughout the day can be difficult and the higher figures in particular, are most likely to be due to sun moving between the leaves and falling on the thermometre and do not reflect the air temperature.

As it is the dry season, there is no expectation of rain on this north-west side of the plateau, and as expected, there was no more than a trace from low cloud.

RESULTS

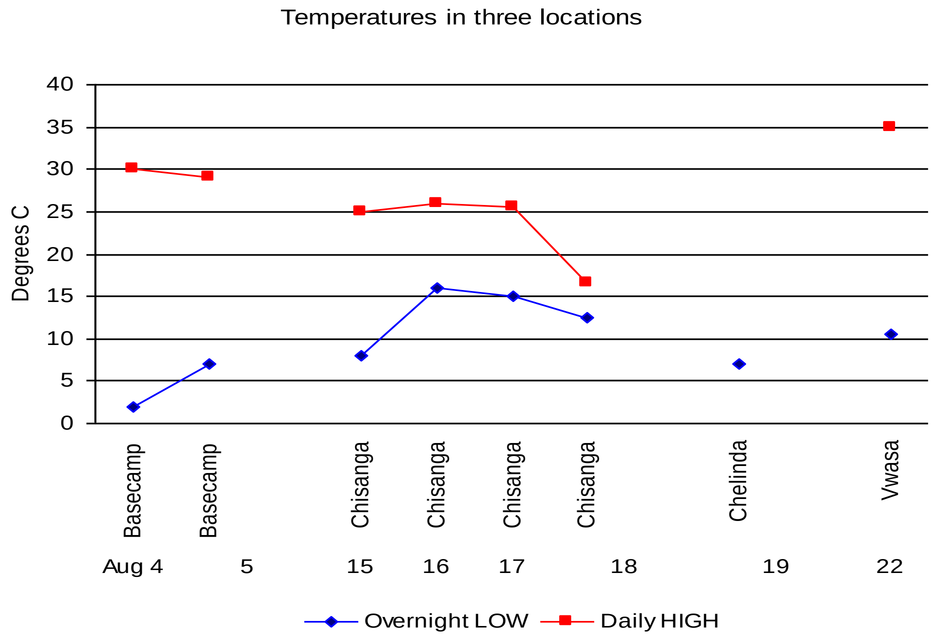
Fig 1. Temperatures recorded during the expedition by Quincy Connell



Locations

Day 1-6	Base Camp
Day 7-11	Nganda
Day 12-13	Base Camp
Data 14- 16	Zambian Rest house
Day 17	Uledi
Day 18-19	Vwaza Marsh

Fig 2. Temperatures recorded by Marianne Overton



CONCLUSIONS

The effect of altitude on temperature is dramatic. The valleys at 4,000-6,000ft experienced the least extremes, providing for the most comfortable living. The lowland Vwaza Marsh showed the largest temperature range, with very hot days and warm nights. Base Camp was on the mountain plateau at around 7,500 ft and was cool in this season.

Sunshine hours were not recorded. Frequently the teams could see the weather was sunny in the valleys and in cloud on the plateau. Vwaza was fair over the two days; sunny with intermittent cloudy spells and hot in the tents during the day. The weather on the plateau could be cool at night, but it was generally good walking weather!

Appendix 1 Quincy's Data

Day	Camped at:-	Night LOW	Daily HIGH	Remarks
1	Base camp	T	23	T=travelling, data not taken
2	Base camp	6	22	
3	Base camp	8	24	
4	Base camp	9	28	
5	Base camp	8	29	
6	Base camp	7	18	
7	Nganda	3	22	Felt cold, except in morning
8	Nganda	3	23	Very cold on hill
9	Nganda	4	15	
10	Nganda	4	24	Cold winds from SE
11	Nganda	2	T	Ground frost overnight
12	Base camp	8	27	
13	Base camp	9	28	
14	Zambian Rest house	10	33	
15	Zambian Rest house	10	25	
16	Zambian Rest house	12	T	
17	Uledi	18	T	
18	Zambian Rest house	7	T	
19	Vwaza	12	35	High taken from two thermometres
20	Vwaza	12	T	

RIVER FLOW

Andrew Allen

INTRODUCTION

Many third world countries wish to increase their energy output in the form of electricity but lack the resources and labour skills to achieve this goal. It is also of global interest that the power that is to be generated and potentially used by huge populations is clean and renewable. Malawi is mountainous in the north and laced within these mountains is an intricate river system. The flow of water, which mostly ends up in Lake Malawi, is an energy source which can be utilised to help satisfy the above energy criteria. Indeed there is already a hydroelectric power station within northern Malawi. However without the necessary research it will remain unknown if this renewable energy supply is being harnessed to its true potential.

North Rukuru River close to base camp *Marianne Overton*

The idea behind this project was to give a rough indication of the mass flow rate of water in strategic locations, tributary river intersection, in order to evaluate the potential power output from a hydro-electric dam if built in the area. Unfortunately because of equipment failure, which broke on the plane) and a lack of time spent along the rivers (my experiment was only one of many and much time was taken by travelling), not enough data was collected to make a recommendation for the originally proposed experiment. It should also be noted that when the equipment was repaired and used many design issues arose which made testing more difficult and slower than predicted. Some of these faults could only be learnt from experience in the terrain whilst some, I have to admit, were due to a lack of foresight on my part.

Chris Neal crossing the North Rukuru River *Marianne Overton*

So instead I shall lay the foundations of the experimental procedure and possible equipment that could be used with a description of the relevant physics behind them. I shall also discuss the advantages and disadvantages behind each of the procedures. The document can then be used for reference if any further research in the area is to be carried out. The design issues that were problematic whilst testing will have either been taken into account with the outlined designs, or mentioned for further thought.

APPARATUS AND THEORY

The main motivations behind the apparatus designs shown here are that they are simple to set up and very cost effective. (Cheap flow metres on the market are at least £300 each and are limited in the profile they can measure). The apparatus must also be able to measure the flow rates at different depths in order for a flow profile to be obtained to a reasonable accuracy. The term 'reasonable accuracy' will change depending on the experimental criteria and I use the word here in the context of the original proposed experiment outlined in the introduction.

List of Notation

H = height
d = distance/height
D = diameter
V = velocity
V = volumetric flow
p = pressure
ρ = density
A = Area
G = gravitational constant
The individual subscripts used are obvious from each of the diagrams

Apparatus 1- L-shaped pipe

The simplest set up that can be used is the L-shaped pipe, shown below in figure 1.

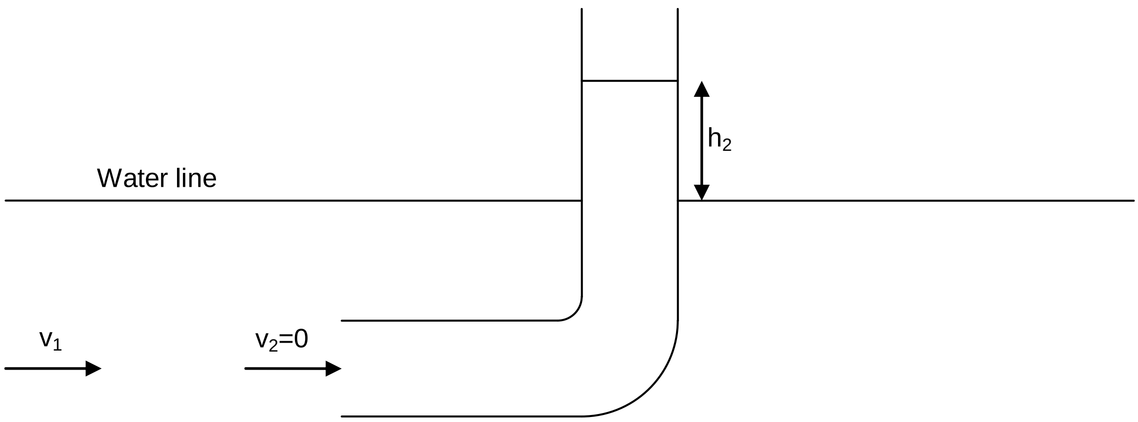


Figure 1. Diagram demonstrating the L-shaped pipe and equation notation

The velocity of the water approaching the pipe is slowed to zero at the mouth of the pipe causing a dynamic pressure head and the water in the pipe to rise proportionally to the velocity of the free stream (velocity of the water along the same stream line far enough away so as not to affect the flow).

This can be expressed quantitively using Bernoulli's equation stated as:

$$\frac{v^2}{2} + gh + \frac{p}{\rho} = const. \qquad (2.1.1)$$

Or in terms of the pipe as:

$$\frac{v_1^2}{2} + gh_1 + \frac{p_1}{\rho} = \frac{v_2^2}{2} + gh_2 + \frac{p_2}{\rho} \qquad (2.1.2)$$

Where points 1 and 2 are represented in figure 1.

This can be simplified realizing $h_1=v_2=0$ and $p_1=p_2$. So:

$$\frac{v_1^2}{2} = gh_2 \tag{2.1.3}$$

Rearranging:

$$v_1 = \sqrt{2gh_2} \tag{2.1.4}$$

Therefore if the height the water that rises up the pipe is measured the free flow velocity can be measured.

Apparatus 2 – L-shaped pipe with an increased mouth area
This has the advantage of increasing the height that the water rises up the pipe, hence increasing the measurement accuracy for a particular measurement scale. Figure 2 below shows the set-up for this experiment.

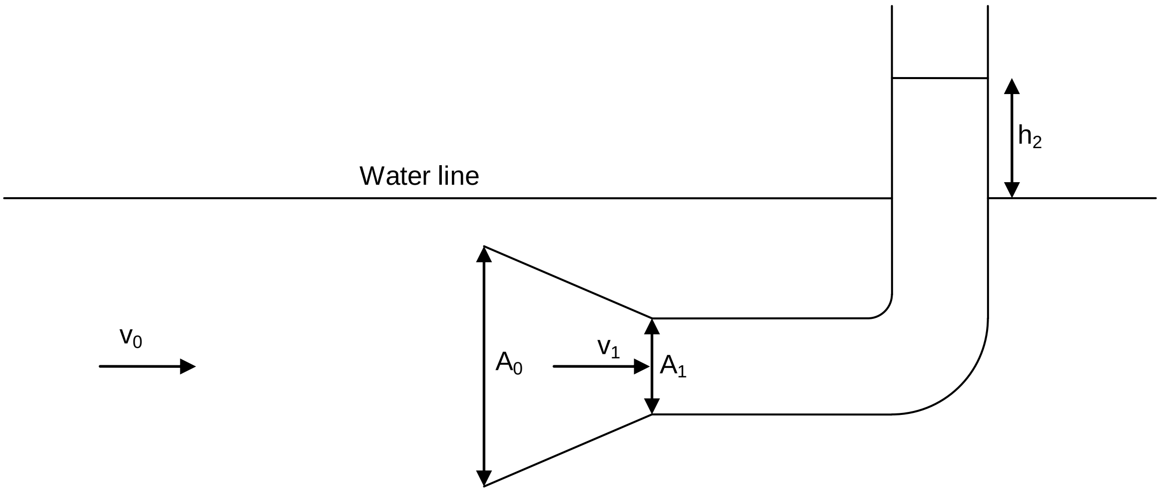


Figure 2. Apparatus 2 and notation.

Notice the notation has slightly changed from Figure 1.
The physics behind the set up follows that given above except that the increasing mouth entrance must be taken into account. The variable mouth size can be incorporated by realizing that the mass-flow rate into the increased area must be equal to the mass flow rate out of the narrower region. i.e.

$$\rho A_0 v_0 = \rho A_1 v_1 \tag{2.2.1}$$

Rearranging:

$$v_1 = \frac{A_0}{A_1} v_0 \tag{2.2.2}$$

Substituting equation (2.1.4) into (2.2.2):

$$v_0 = \frac{A_1}{A_0} \sqrt{2gh_2} \tag{2.2.3}$$

Please note that the explanation behind the physics here is not strictly accurate because once equilibrium has been reach there will be no flow into area A_0. However the above mass flow calculation can be taken as initial conditions and the results obtained will be correct for the equilibrium case.

Apparatus 3 – Utilising a siphon
As the title suggests the next set-up involves the utilization of a siphon. This is achieved by setting the mouth and exit of the siphon to a known height, which will allow the flow, for the predetermined potential height difference, to be calculated. By placing the mouth of the siphon into the required flow field the velocity of the flow in the siphon will increase in proportion to the river velocity. The method of flow measurement is via attaching a container to the siphon exit and timing how long it takes for the siphon to fill a predetermined volume. The set-up is shown in figure 4.

PRINCIPAL OF SIPHON AND THE MATHS
A siphon is a tube filled with fluid (in this case water) whereby one end is at a higher potential that the other (usually by a difference of height). The potential difference between the mouth and exit is what causes the fluid to flow from the direction of higher potential to that of a lower potential, the flow being proportional to the potential difference (the height gap causing a differential pressure). Another factor influencing the volume of fluid passing through the pipe in a given time is the diametre of the pipe. The larger the diametre the more fluid can pass through in a given time for a given potential difference. The mathematics behind the siphon also utilizes the Bernoulli equation, given above.

Figure 3 shows a typical siphon set-up. Assume the surface of the water is at atmospheric pressure and that the diametre of the container is very large compared to the diametre of the siphon (so that the change the surface water level is negligible).

Water surface

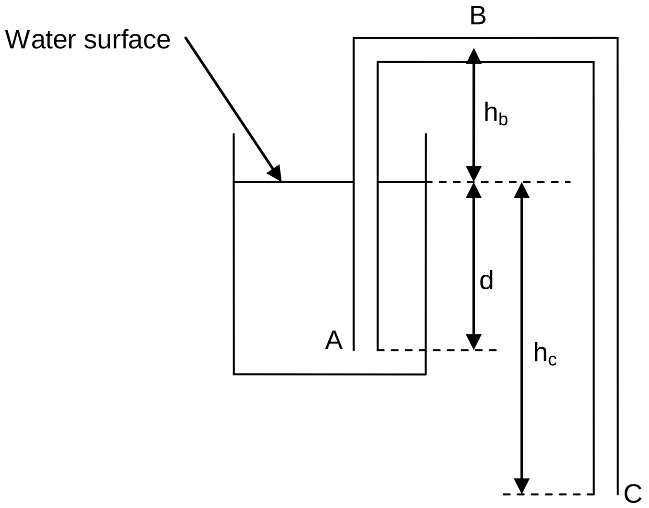


Figure 3. Diagram showing siphon notation (Reference)

Bernoulli's equation at the waters surface simplifies to:

$$\frac{P_{atm}}{\rho} = const. \qquad (2.3.1)$$

Application of Bernoulli's equation to point A:

$$\frac{v_A^2}{2} - gd + \frac{P_A}{\rho} = const. \qquad (2.3.2)$$

Application to point B:

$$\frac{v_B^2}{2} + gh_B + \frac{P_B}{\rho} = const. \qquad (2.3.3)$$

And finally to point C:

$$\frac{v_C^2}{2} - gh_C + \frac{P_C}{\rho} = const. \tag{2.3.4}$$

The siphon itself is a continuous single system so the constants to all four equations are equal. Equating equation (2.3.1) and (2.3.4):

$$\frac{P_{atm}}{\rho} = \frac{v_C^2}{2} - 2gh_C + \frac{P_{atm}}{\rho} \tag{2.3.5}$$

Rearranging:

$$v_C = \sqrt{2gh_C} \tag{2.3.6}$$

This is the velocity throughout the siphon so long as the siphon's diametre is kept constant. The volume of water coming out of the siphon per second can be measured by multiplying the siphons cross-sectional area by the fluid velocity. To see how the siphon set-up can be utilized to measure river flow, consider figure (4).

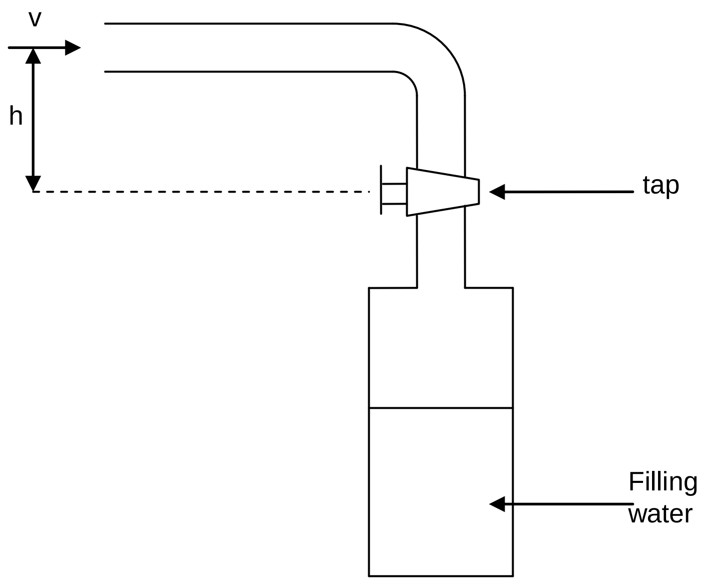


Figure 4. Diagram demonstrating the design of apparatus 3

The volume of water per second filling the base container due to the height difference between the mouth and exit of the siphon can be calculated by the above analysis. Any additional velocity within the siphon will therefore be solely due the velocity of the river itself. Hence if the time it takes to fill the base container to a predetermined volume is measured, the overall volumetric flow of water in the siphon can be calculated. The volumetric flow due to the differential height of the end of the siphon can be calculated by the above method and subtracted from the total volumetric flow to give the volumetric flow due to the rivers velocity. The rivers velocity at the siphon entrance can then easily be calculated from this result.

This can be expressed mathematically as:

$$V_T = V_R + V_H = Av_R + Av_H = A(v_R + v_H) \tag{2.3.7}$$

Rearranging:

$$v_R = \frac{V_T}{A} - v_H = \frac{4V_T}{\pi D^2} - \sqrt{2gh_C} \tag{2.3.8}$$

Where V_R is the volumetric flow in the siphon due to the river, V_H the volumetric flow due to the height difference, and V_T the total volumetric flow (v stands for the velocities with the appropriate subscripts).

CALCULATING THE MASS FLOW

The experimental procedure which follows is the same regardless of the apparatus used. The river breadth is measured and a predetermined ratio used to split the breadth into sections (shown in figure 5.) At each of these points the depth of the river is measured and is split into sections via a predefined ratio. The mouth of the apparatus to be used is centred at each of these depths and a measurement taken. The apparatus is then moved to the next breadth point and the experiment repeated. This procedure allows a flow profile to be built up over a cross-section of the river.

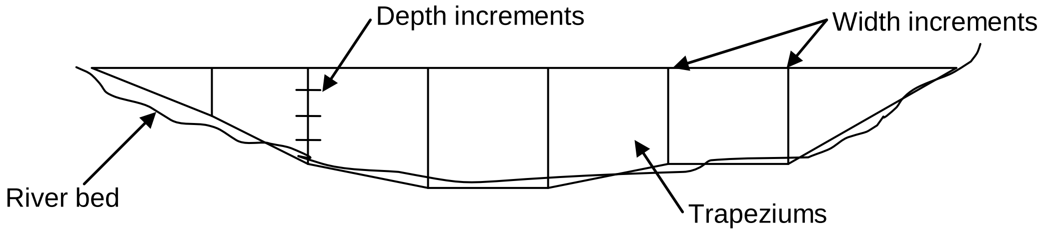


Figure 5: Diagram demonstrating river breadth, depth increments and trapezium examples.

The next step is to obtain the average volumetric flow through the chosen river cross-section. This is achieved by approximating the areas between the breadth measurements to be trapeziums (shown in figure 5. The cross-sectional area is then determined by trapezoidal integration (i.e. summing the trapezium areas). Average velocities are taken of each of the depth profiles then these in turn are averaged across the river breadth. The average water velocity is then multiplied by the cross-sectional area to obtain the volumetric flow. In addition the mass flow can be calculated by multiplication by the water density. It is recommended that the experiment is repeated at a number of different locations in the same river stretch and the mass flows averaged to increase the accuracy of the results. Once basic results have been achieved in a local area the experiments should be carried out at strategic locations, for instance where tributaries join the river to determine the in-flow of water throughout the whole catchment area.

APPARATUS TYPES

The following discussion is to analyse the advantages and disadvantages of the particular apparatus being considered. Some points are quite obvious while some can only really be brought to light by testing.

Before discussing each case it is very important to point out that not only must careful thought be put into the apparatus design but also into the design of the stands. This is due to the force that the river is capable of exerting on the apparatus especially if there is a significant surface area. In addition to this point the stand design must be able to adjust to differing river depths and it must satisfy the apparatus's need to adjust to differing measurement heights.

Apparatus 1 is highly attractive for the simplicity of its set-up. Simplicity is an important consideration when in the field as well as the robustness and weight of the apparatus. This particular piece of apparatus satisfies all of the above criteria. However with its simplicity comes quite a major disadvantage in that its measurement accuracy is limited. Rivers, although powerful because of their mass flow, do not, in general, have particularly large velocities. By referring to the theory of apparatus (1), this means that the water will not run particularly high up the pipe and the accuracy of the measurement will be compromised if using an incremental scale (i.e. the increment being millimetres so the measurement has an error of + or – 0.5mm. Obviously if the reading is 17mm the error is going to have a far more significant effect than on a reading of 170mm). The problem can be solved to some extent by selecting shallow, fast flowing sections of river in which to perform the experiments but it is recommended that the improved apparatus 2 is considered if accuracy is considered to be a major factor.

Apparatus 2 is very similar to 1 in the advantages of simplicity, robustness and lightness. Its advantage over set up 1 is that the height that the water rises up the pipe can be controlled simply by altering the ratio of the inlet and measurement pipe diametres. Thus the accuracy of the experiment can be changed to suit the user's requirements. It is recommended in most cases that this experimental set-up is used in preference to the former but it is also not without disadvantages. The first and foremost disadvantage is that with the increased diametre of the inlet pipe, in shallow sections, the number of depth measures that can be taken may have to be reduced. This is quite serious if the number of depth measurements is below 3 or 4. Three is important, because this is the minimum number of required measurements to form a quadratic depth profile. Again, river cross-section selection can, in many cases, help prevent this problem but the expedition is carried out in dry season and in some regions problems will occur. The second disadvantage is that with the diametre ratio will come increased frictional energy losses and this will prevent the water reaching its ideally calculated height. It is unlikely that this will be a major problem but test should be carried out to see if this factor can be taken into account in the calculation stage.

The third experimental set-up deviates in design from the previous two and thus the benefits and the problems associated with it. The advantage of this set-up is that increased accuracy can be achieved by an increase in the volume of the containment vessel (i.e. by increasing the time it takes to fill the container for a given water velocity). However unlike the previous two designs the accuracy of this design decreases for an increased water velocity for a given container size (less time to fill the container). In contrast both apparatus 1 and 2's accuracy increases with increased water velocity (measurement height increase for given increments). The second advantage is that the inlet pipe diametre is relatively small so it will not suffer from the problem of the number of depth measurements that can be performed as with Apparatus 2.

The set-up does however suffer from two quite serious disadvantages. The first is that initially the experiment suffers from positive buoyancy because of the filling container and this is quite a large hindrance when trying to perform the test. Obviously weights can be added but the problem remains because the depth of the siphon mouth must be maintained whilst maintaining the distance between the top of the siphon and the inlet to the filling tank. It is suggested that the holding stand is designed suitably to take this into account. The second and largest problem, which may have already been picked up on, is that if the siphon always has to be above the filling container, what happens when measuring near the bottom of the river? The obvious solution is to dig a hole and put the filling container in it. However, the river bed tends either to be almost solid rock (hard to dig) or very soft silt (fills in as soon as it's dug). A third final problem is how to see the filling mark underwater. I used goggles and a snorkel, but this is still difficult if the slit has been stirred and the river in the higher regions is freezing. A couple of further notes are that the air hole in the filling tank should be large enough so as not to cause any back pressure in the system and reduce the filling speed. Secondly if the measurement period is very small the initial inertia required to move the water occupying the siphon may be significant. However, as it was mentioned the accuracy of the experiment improves with a larger filling volume, and is unlikely to be a significant factor.

FURTHER DISCUSSION

It must be remembered that the expedition takes place in the dry season and that the rivers will be around their lowest. This is an important period if a hydroelectric power plant is to run the whole year around. If this is not possible then experiments and predictions should be made into the proportion of the year the plant could operate and whether it would be viable. Initial approximations could be made by rainfall records throughout the year. However these predictions could not replace experiments if any assessment were to be carried out. It is also a useful rule of thumb that the rivers that will be flowing in the dry season will only be those with tributaries that start at high altitudes. As a guide: the Chipome, Sawi, Guwu, Mpinditu and Rukuru rivers all had reasonable flows. However at the end of the dry season the Rukuru near its exit has been known to dry up. The Sororo had a small flow which probably dried up in October. The Mpero had no flow.

An additional experiment that could be performed would be to take temperature, atmospheric pressure and humidity readings. These would enable evaporation rates to be calculated and thus extend the model already created.

As a final note, from the experience that I gained, it is recommend that if the initial experiment outlined was to be attempted; it should be undertaken by a group of three. Three people would be a sufficient group to ensure that the apparatus could be set up with speed and ease and allow the group to operate on its own. To complete the originally outlined experiment, the amount of data required would necessitate the group to either be its own sub-group within the expedition, or attached to another group who would carry out experiments only along the river.

CONCLUSION

The developing world is greatly in need of support in order to develop. With environmental concerns the use of renewable energy would seem the ideal method to achieve this goal where possible. The physics and mathematics behind apparatus which would enable rough calculations to be performed for the mass-flow of water in river systems has been presented. These would enable a primary assessment of the energy available if hydroelectric power were to be considered as a power source. Two of the three apparatus designs involve the use of L-shaped pipes while one takes advantage of the siphon effect.

For the aid of those who may wish to perform the experiment the advantages and disadvantages of each of the apparatus designs have been discussed. The suggestions made from these discussions are based on scientific reasoning and from personal experience in the field. The apparatus that will be most appropriate will depend on the conditions in which it is to be used and the accuracy which is required. In addition the time of year and season in which the experiment is carried out and viability studies commenced for duration of the predicted running time. One further suggestion to expand the experiment is noted which involves taking evaporation rates in account.

BIRD REPORT

Peter Overton and Bill Renwick

INTRODUCTION

Over the past ten years bird reports have been presented in the Biosearch Expedition report only in 1997 and 2005. In 1997 we were fortunate to have two licensed bird ringers and to be present during the period March and April, when there was the opportunity of picking up one or two late Palaearctic and intra-African migrants. In 2005 the period of observation was largely in July and mainly at high altitude. The opportunity for achieving a substantial list at this time of year is reduced since many species have moved away from the high plateau and for most (but not all) species it is not a time for breeding, when activity becomes enhanced. This year our survey was conducted mainly in August. We had expected that this would prove more fruitful than July, with a real possibility of sightings of returning intra-African migrants at least. However, our allocated time was determined by the logistical requirements of running the overall expedition and this meant that virtually all records obtained from the Nyika National Park are from high altitude (above 6000ft and mainly above 7000ft). The *Brachytegia* woodland habitat was therefore excluded. Whilst some forest patches were included, they yielded very little, as it happens. The restraint was compounded by an exceptionally cold, cloudy and at times breezy spell of weather for much of our period on the plateau. On one afternoon we even had to abandon our work because low cloud was descending to 7000ft and we feared being lost on the mountain. Weather records from Chilinda may, perhaps, bear out our perception that the climate was unusual for August and most years we would have expected sunnier and warmer conditions. On one night only we experienced a white frost on the ground, with our air thermometre showing a low of 2 degrees Celsius; the generally large amount of cloud precluded frequent very low temperatures.

Figures 1 and 2 The highlight of a rather bleak week in the Nganda area, most of it spent above 7500ft, was the discovery of a Grass Owl nest with two young. We were reluctant to disturb the nest but retain one photo of the young in situ. Photos of the adults by Quincy Connell

METHOD

All observations were done on an opportunistic or random basis. Where possible we did early morning and late afternoon transects along lines of suitable habitat but these were not timed or standardised in any way. During the process of large mammal data gathering, bird records were added to the sheets. Because of this we have accurate map references for most sightings. This could be useful in the future for any detailed Atlas work that may be conducted in the Nyika National Park. However, we do not feel that the degree of precision is warranted in this report so we have broken down the records into three broad areas, based on our main camps. This defines the bird records to within a few square kilometres and also keeps a degree of confidentiality over the exact location of the breeding Marsh Owls, which may be used again and could become a site of disturbance if it is well known.

An MP3 player became a useful tool for confirming one or two calls. Unfortunately we had a restricted species range on the system, mainly from the Kruger National Park and it would have been useful to have specific sound recordings for the Nyika National Park, which can be done in future, given a little more preparation. An experienced bird surveyor can rapidly tune in to new species given quality recordings and a little focused time in the field. One factor that can be overlooked is that any given species can sound very different in a different geographical range and habitat, so recordings made in the Nyika National Park would be particularly useful.

DISCUSSION

The species for which we found some flocking were Waller's Red winged Starling (40 near Z) Yellow Eyed Canary (200+ Vwaza) and Guinea Fowl (100+ Vwaza). The maximum count of Quail in one group on the Nyika was eight. The Nyika lark was noticeably scarce this year and *the apparent absence of vultures has been noted elsewhere in the expedition report*. The results shown below indicate a relatively small species list for such an interesting place as the Nyika plateau but do not highlight the fact that the number of birds seen of any species was also very low, reflecting the apparently late season and weather conditions generally. Even allowing for unidentified calls from the bush and fleeting glimpses, which do not of course appear as confirmed sight records, the counts were disappointing. It was only when we descended to Vwaza for a day that birds became abundant. Thus, given the choice, we would recommend bird watching tours should, at this season, spend more time at the lower levels. However, the opportunity to see speciality high altitude species is always there and no two seasons are exactly alike, so Nyika is always a good place to include in any itinerary. The full list of species identified in the time available is given below.

RESULTS AND NOTATION

The three main locations indicated in the table of results are Nyika National Park, Vwaza Game Reserve and Makuzi on the lakeshore at Chinteche. The Birds of Malawi Number (BOM) is given for reference. Within the Nyika National Park we have given the camps occupied by the two observers during the expedition as:

N Nganda to old relay transmitter area
B Main base camp at the old horse camp on the North Rukuru River and surrounding area
Z Zambian Rest house area
C Chilinda area
Ch Chisanga Falls area

A CHECKLIST OF BIRDS RECORDED ON THE EXPEDITION

Common name	Species name	BOM	Mak	Vwaza	Nyika	Notes
White breasted Cormorant	*Phalacrocorax carbo*	4	M			1
Green backed Heron	*Butorides striatus*	14	M			
Grey Heron	*Ardea cinerea*	20		V		2
Black-Headed Heron	*Ardea melanocephala*	21		V		3
Hamerkop	*Scopus umbretta*	24	M		B	4
Hadeda Ibis	*Bostrychia hagedash*	34		V		
Glossy Ibis	*Plegadis falcinellus*	35		V		
Whitefaced Duck	*Dendrocygna viduata*	40		V		
Egyptian Goose	*Alopochen aegyptiacus*	41		V		
Yellow-Billed Duck	*Anas undulata*	46		V		
Lappet-Faced Vulture	*Torgos tracheliotus*	55			B,N	5
White-Backed Vulture	*Gyps africanus*	57			B	
Gymnogene	*Polyboroides typus*	63		V		
Augur Buzzard	*Buteo augur*	77			N,C	
Martial Eagle	*Polemaetus bellicosus*	81			Chisanga	
African Fish Eagle	*Haliaeetus vocifer*	90	M	V		
Yellow Billed Kite	*Milvus migrans*	91			Z	
Black Shouldered Kite	*Elanus caeruleus*	94			N	6
Rock Kestrel	*Falco tinnunculus*	106			N	7
Red-Winged Francolin	*Francolinus levaillantii*	110			N	
Red necked Francolin	*Francolinus afer*	112		V	Z	
Common Quail	*Coturnix coturnix*	115		V	B,N,C	9
Helmeted Guineafowl	*Numida meleagris*	118		V		
Denham's Bustard (Stanley's)	*Neotis denhami*	141			B,N,C	10
Blacksmith Plover	*Vanellus armatus*	146		V		
Greenshank	*Tringa nebularia*	161		V		
Common Sandpiper	*Tringa hypoleucos*	165	M	V		
Black Winged Stilt	*Himantopus himantopus*	178		V		
Water Dikkop	*Burhinus vermiculatus*	181		V		
Redwinged Pratincole	*Glareola pratincola*	184		V		
Rameron Pigeon	*Columba arquatrix*	194		Z		
Red Eyed Dove	*Streptopelia semitorquata*	197	M			
Cape Turtle Dove	*Streptopelia capicola*	199	M	V		
Blue Spotted Wood Dove	*Turtur afer*	203		V		
Green Spotted Wood-Dove	*Turtur chalcospilos*	204		V		
Schalow's Lourie	*Tauraco schalowi*	211		B		
Purple-Crested Lourie	*Tauraco porphyreolophus*	212				
Grey Lourie	*Corythaxoides concolor*	213		V		
Black Cuckoo	*Clamator clamosus*	219	M			
Klaas's Cuckoo	*Chrysococcyx klass*	224		V		
Burchell's Coucal	*Centropus burchellii*	231A	M	V		
Scop's Owl	*Otus senegalensis*	234		V		
Verreaux's (Giant) Eagle-Owl	*Bubo lacteus*	238		V		
Pel's Fishing Owl	*Scotopelia peli*	239	M			
Marsh Owl	*Asio capensis*	243			N	
Mountain Nightjar	*Caprimulgus poliocephalus*	246			NY	
Mozambique Nightjar	*Caprimulgus fossii*	248	M	V		
Palm Swift	*Cypsiurus parvus*	253	M	V	Ch	
White rumped Swift	*Afus caffer*	260			Z	

Common name	*Species name*	BOM	Mak	Vwaza	Nyika	Notes
Speckled Mousebird	*Colius striatus*	261	M	V	NY	
Giant Kingfisher	*Ceryle maxima*	265	M		NY	
Pied Kingfisher	*Ceryle rudis*	266	M			
Malachite Kingfisher	*Alcedo cristata*	268	M			
Brown Hooded Kingfisher	*Halcyon albiventris*	272			Z	
White fronted Bee eater	*Merops bullockoides*	279	M			
Hoopoe	*Upupa africana*	286		V	Th,Z	
Red Billed Woodhoopoe	*Phoeniculus purpureus*	287		V		
Grey Hornbill	*Tockus nasutus*	289		V	B	
Rufous naped Lark	*Mirafra africana*	325			B,Ch	
Angola Swallow	*Hirundo angolensis*	335			N,Z	
Wire tailed Swallow	*Hirundo smithii*	337	M	V		
Red Rumped Swallow	*Hirundo daurica*	342			B	
Rock Martin	*Hirundo fuligula*	346			B	
Eastern Saw-Wing	*Psalidoprocne pristoptera*	348	M		N	
Fork-Tailed Drongo	*Dicrurus adsimilis*	352		V		11
Black-Headed (Eastern) Oriole	*Oriolus larvatus*	355		V	B,Z	
White-Necked Raven	*Corvus albicollis*	358		V	B,N,Z	12
Black-Eyed Bulbul	*Pycnonotus tricolor*	371	M	V	B,N,Z	
Olive breasted Mountain Bulbul	*Andropadus tephrolaemus*	374			B,Z	
Common Stonechat	*Saxicola torquata*	384			B,N,Z	13
Kurrichane Thrush	*Turdus libonyanus*	407			Z	
Bleating Bush Warbler	*Camaroptera brachyura*	442	M			
Mountain Cisticola	*Cisticola nigriloris*	456			B,N,Z	14
Churring Cisticola	*Cisticola njombe*	461				15
Ayre's Cisticola	*Cisticola ayresii*	467			N	
Ashy Flycatcher	*Muscicapa coerulescens*	471			Z	
Chinspot Batis	*Batis molitor*	478			B,Z	
Black-Headed Tchagra	*Tchagra senegala*	492		V	B,Z	
Southern Boubou	*Laniarius ferrugineus*	493		V	B,N,Z	
Grey Headed Bush Shrike	*Melaconotus blanchoti*	498	M	V	B	16
African Pied Wagtail	*Motacilla aguimp*	503	M	V		
Grassveld Pipit	*Anthus cinnamomeus*	505		V	B,N	17
Fiscal Shrike	*Lanius collaris*	517		V		
Waller's Redwinged Starling	*Onychognathus walleri*	521			Z	
Lesser Blue Eared Glossy Starling	*Lamprotornis chlorpterus*	524		V		
Greater Double Collared Sunbird	*Nectarinia afra*	541			B,N,Z	18
Bronze Sunbird	*Nectarinia kilimensis*	549			B,N,Z	19
African Yellow White-Eye	*Zosterops senegalensis*	550			Z	
Golden Weaver	*Ploceus xanthops*	555	M			
Mountain Marsh Widow	*Euplectes psammocromius*	572			B,N	
African Firefinch	*Lagonosticta rubricata*	594			Z	
Yellow-bellied Waxbill	*Estrilda quartinia*	598			Z	20
Yellow-eyed Canary	*Serinus mozambicus*	612		V		21

Notes

1 Unusually, only a single bird on the rock 22/8
2 Up to six seen at one time on Lake Kasuni
3 Single bird
4 Unexpected sighting of single bird at over 7000ft altitude on the plateau
5 The total of only three vulture sightings on the plateau may be significant. No poacher kills?
6 Two sightings on different days may have been the same bird since within 3 km
7 One record
8 Single Bird calling
9 Maximum covey size noted was 8. Mostly in pairs
10 Maximum of three on one day
11 A common species at Vwaza
12 Maximum count of 14 at Nganda
13 Pairs located at each plateau site
14 Widespread but not very vocal because of the weather conditions
15 Probably the commonest of the Cisticolas on the high plateau, especially near bracken
16 This species was calling more than most during our stay
17 A group of 10+ was noted at Vwaza
18 Close examination of all sunbirds, when light conditions permitted, revealed only this species of double collared sunbird at high altitude.
19 Apparently the commonest sunbird species during our expedition
20 East African Swee
21 A flock numbering in excess of 100 at Vwaza

REFERENCES

Françoise Dowsett-Lemaire and Robert J Dowsett (2006) – The Birds of Malawi. An Atlas and handbook. Published by Tauraco Press and Aves a.s.b.l., Liege, Belgium

Medland, B. (1994) – *A Checklist of the Birds of Nyika National Park.* Published by the Wildlife Society of Malawi

Newman, K. (1983) – *Newman's Birds of Southern Africa.* Southern Book Publishers Ltd, Cape Town SA

Newman, K., Johnston-Stewart, N., Medland, B. (1992) – *Birds of Malawi. A Supplement to Newman's Birds of Southern Africa*. Southern Book Publishers (Pty) Ltd., Cape Town SA

Yellow-eyed Canary *Serinus mozambicus* in thorn at Vwaza Marsh *Quincy Connell*

PHOTO PAGES

1. Looking up the Mondwe Valley to the northern escarpment	*Chris Neal*
2. North Rukuru river near base camp	*Marianne Overton*
3. Elephant footprints leading to Lake Kasuni, Vwaza Marsh	*Adam Lee*
4. Faston Phiri on the western escarpment	*Marianne Overton*
5. Contrasting tree and sky showing the brilliant light in Vwaza	*Peter Overton*
6. The other view – Nyika with layers of cloud to the west	*Hilary Strickland*
7. Black headed Heron at Vwaza	*Quincy Connell*
8. Impala at Vwaza	*Hilary Strickland*
9. Elephant at Vwaza	*Adam Lee*
10. Chameleon near Thazima	*Marianne Overton*
11. Denham's Bustard on the Nyika	*Quincy Connell*
12. Zebra on the Nyika	*Hilary Strickland*
13. Team at sunrise on Lake Malawi after the expedition	*Adam Lee*
14. Hippo at Vwaza	*Chris Neal*
15. Expedition Leader, Peter Overton, with Director of National Parks and Wildlife in Malawi, Leonard Sefu	*Marianne Overton*
16. The team raise the flag of St Georgeafter the long climb from the Mondwe River up the escarpment to the tracker station	*Peter Overton*
17. Vicky Hill, Hils Strickland, Chris Neal and Lewis Mtumbuka photographing plants	*Marianne Overton*
18. Alfayo Kumwela, Michael Overton and Richard Nyirenda	*Quincy Connell*
19. Steven Mphanda crossing the North Rukuru upstream from Chisanga Falls	*Hilary Strickland*
20. Laura Miller preparing the camp supper	*Marianne Overton*
21. Clearing a campsite to leave it pristine	*Marianne Overton*
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23. Tree frog from the flooded forest in the Chisanga area	*Hilary Strickland*
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25. Newly hatched gecko at lakeshore	*Michael Overton*
26. Unidentified snake - with a full stomach!	*Marianne Overton*

27. Skink at the narrow bridge over the Rukuru in the Park	*Marianne Overton*
28. Variable Skink at the lakeshore that battled with a hornet-and won!	*Michael Overton*
29. Nymphalid Butterfly *Junonia terea*	*Michael Overton*
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34 Blister beetle *Myalabris oculata?*	*Michael Overton*
35 Acrididae butterfly *Acraea serena*	*Hilary Strickland*
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POACHING REPORT

Amanda Jones

INTRODUCTION

The Nyika National Park covers 3,142 square kilometres, most of which is made up of difficult topographic features. The terrain is often tough, which leads to difficulties in patrolling the area, but may also provide some protection for the park itself and any species within. This project gives critical support to provide the Park Scouts with back-up manpower to discourage poaching and to enable the scouts to spend time in the remote areas, gathering robust and detailed evidence that can be used in court. Also the information helps the Parks Authority to plan where their scarce anti-poaching patrol resources would be most effectively deployed.

Because of the poor access and difficult topography, there are probably relatively few people operating illegally in the Park. It is therefore worthwhile for the Parks Authority to target and track down these individuals. If the Park was more accessible, with new roads in the lower areas, it might make poaching a possibility for more people. The road would help with tourism and patrolling the Park but would also lead to better access, both in and out of the Park, for a higher number of poachers.

The most visible signs of poaching activity were the extensive burnt patches of ground; these were found frequently in almost all areas visited. The main reason for burning the land is to create an open, uncovered area, which will attract large mammals with regrown fresh plant shoots. The animals are then clearly visible to poachers which make them easier targets. On the plateau, the Parks Authority has its own burning programme in an attempt to ensure cooler, early season controlled burning, so that the later fierce poacher fires cannot occur. In this way damage is minimised as it is not as dry and there is less grass. This decreases the burning so that the fire does not penetrate the forests.

Figure 1 These two trees are tall and without lower branches, indicating that they grew up in forest and that the patch on the right used to be much larger. Burning has degraded the woodland, leaving the trees isolated and not very useful for shelter. This demonstrates the difference between a sheltered, wooded area on the right, where we found fresh signs of elephant, and an exposed, burnt area on the left.

Degraded forest edge *Hilary Strickland*

Poaching in the park can have a direct effect; there is a plethora of habitats which are being destroyed through the burning of vegetation, reed cutting and bark stripping. The decrease in habitat availability is, in turn, decreasing the large mammal populations. This then has a knock-on effect for the economy, which relies a great deal on tourism; particularly through safari and outdoor pursuits. There may be other indirect detrimental effects of burning large areas of land; burnt areas offer animals nowhere to hide. This not only makes them easy targets for poachers but also affects their recolonisation. Animals need shelter and protection to enable them to reproduce and rear their young. In an exposed area they are susceptible to many dangers, including poachers and predators.

AIM

The aim of this report is to identify any poaching activity that may be taking place in the Nyika National Park and exactly where it is occurring. This information is recorded and compared to past reports; to assess whether poaching is increasing or decreasing and where the most affected areas are.

METHOD

All signs of poaching were recorded as and when they were found, including during the large mammal population plots. The grid references were noted and the type of poaching activity identified, always with the assistance of the scouts. The results from the large mammal plots also gave an indication of whether poaching had affected the numbers of large mammals in any particular area, either directly or indirectly. The scouts were able to distinguish between illegal poacher activity and signs of authorised human activity, not included here. Some signs were identified as that of scouts and once, of our own group.

RESULTS

15/8/07-18/8/07 Chisanga Falls

16.08.07 Grid reference 748 348
Bark stripped from small saplings of *Brachystegia taxifolia* to make ropes for easier carrying.

Figure 2 *Brachystegia taxifolia*
Marianne Overton

Figure 3 Hollow tree previously occupied by bees
Hilary Strickland

17.8.07 Grid reference 749 353
Poacher attack on natural hive in tree, burnt area below tree, on path between falls and road to Kaperekezi.

17.08.07 Grid reference 743 352
Bare poacher footprint in mud at river where path crosses the river.

17.08.07 Grid reference 742 359
Two poacher stripped sticks used in fishing. Second stream at Kaperekezi at end of path.

Grid reference 742 362
This is a photograph of a *legal* bee farm; these may be set up illegally by poachers. One was found with the tree and hive destroyed.

Licensed beekeepers are accompanied by scouts when they are within the Park. This not only protects the beekeeper, but also prevents any poachers masquerading as beekeepers.

Figure 4 Legal beehive *Hilary Strickland*

Figure 5 Daniel with honeycomb from beehive, close to where it was attacked *Hilary Strickland*

17.08.07 Grid reference 751 354
Poacher attack on natural hive in tree mentioned earlier.

Sawi area A team between 6/8/07-11/8/07

Grid reference 973 562
Evidence of poacher fire at Sawi campsite.
Matches found, possibly used for making gunpowder. This was evident from the amount of matches, which were unused and had the tops scraped off.

Grid reference 997 583
Evidence of poacher fire on the survey plot around Sawi.

Grid reference 9553
Two holes in a tree on the way to Sawi, showing fire damage from honey collection by poachers.

Mondwe area Marianne's team 09/08/07

Grid reference 935519 (GPS Point 139)
Overnight sleeping place for two people, on a high slope in light woodland, just round the slope from the valley, with many signs of active Bushpig and Grysbok (Plot 10/1). Estimated to be very recent, within a week or two. Fireplace, bones from a meal, bee comb, cut wood to provide a support for a simple shelter and as a barrier between the sleepers on the slope and the fire at their feet.

Grid reference 937513 (Square 10, Plot 3)
Hollowed tree trunk with telltale fire below and broken green bushes to smoke bees and to take honey

Grid reference 935515 (GPS Point 140)
Poacher burnt area

Grid Reference 512929
Overnight fireplace in riverine vegetation adjacent to the stream. Large fire area for a group of people and much wood for supporting a shelter and for bridging the stream.

Grid Reference 932513 (GPS Point 141)
Poacher burning as far as the disused hilltop village marked with a huge fig tree.

The team felt awed at this site and were careful not to touch any of the historical artifacts. It is important these can be left preserved in their proper place, just as they are.

Grid Reference 922502 (GPS 144)
Poacher burnt area approximately 200 x 400m

Grid Reference 921503 (GPS 146)
Poacher footprint crossing wet gulley area where elephants had sheltered among the long reeds.

Figure 6 Poacher burnt area (GPS 141) *Chris Neal*

Figure 7 Self portrait, reflected in an elephant print, whilst photographing the print of a Serval and then finding a poacher footprint there too. *Marianne Overton*

Jalawi to Uledi A team 14/8/07-18/8/07

<u>Grid reference 873 595</u>
On way to Uledi, at first camp, evidence of poacher fire and drying racks - hair showed probable bushbuck killing. Found a list of names of nine poachers written on piece of paper.

Figure 8 Richard finding poacher fireplace *Michael Overton*

Figure 9 Cave with signs of poachers *Adam Lee*

<u>Grid reference 873 595</u>
Poachers' cave, with remains of pots for cooking maize, found near our first camp

<u>Grid reference 878 592</u>
Poacher fire on way to Uledi on a plot; had been washed away by rain so probably from around April.

<u>Grid reference 878 649</u>
Evidence of two poacher fires in a plot on way to Uledi.

<u>Grid reference 8666</u>
Upper Mpero area; evidence of recent reed cutting (within the previous three weeks) by a large group (probably 10 people). Trees cut, bark used for string. Evidence of numerous poacher fires.

<u>Grid reference 860 668</u>
Foot prints going to and from reed cutting area. Trees cut-bark used for string, June/July.

<u>Grid reference 834 707</u>
Evidence of poacher fire on way to Uledi

DISCUSSION

The biggest indication of poaching activity in the park was from the remains of campfires made by poachers (nine found in total), and the more extensive burning of vegetation. One campfire in particular also had evidence of a drying rack and animal hair nearby. The absence of traps and snares is a positive sign, but the fires show that poaching is still very much present in the Park.

There were six recorded instances of illegal honey collection from trees in the Park; three trees from which the bark had been stripped for use as rope; one recorded instance of reed cutting; two separate areas where bare footprints were found and signs of illegal occupation of a cave.

These are all activities which need to be continually addressed. The scouts mainly patrol on the plateau, with more limited patrolling of the lower areas. The lower areas were where most of the poaching activities were recorded, which indicates that there needs to be greater patrols in these areas. These areas are difficult to get to, but are less exposed than the plateau and have less risk of being caught, due to the limited patrols.

It was 2003 when Biosearch last travelled into the lowest valleys, when a great many snares were found. Compared to 2003, this expedition found a similar number of camps but no snares. Also the structures found in the past have been fairly substantial, huts and drying racks, but this time only very limited temporary shelter arrangements were found, such as a few poles with which to drape a plastic sheet. These were reasonably well-hidden in woodland or riverine vegetation. There was no attempt to hide the fire places and some were very recent indeed.

Observational skills honed on anti-poaching patrols also enabled us to better spot invertebrates in comouflage *Michael Overton*

LARGE MAMMALS

Adam Rollitt and James Hebron

ABSTRACT

Two methods, plots and transects, were used to collect data on mammals in the Nyika National Park. Five areas were the focus of data collection; the Nganda plateau grasslands, the Chisanga Falls area, the open woodland in the Mondwe valley and the lowland woodland around the rivers Sawi and Mpero. Between 2nd and 18th August 2007 a total of 87ha was surveyed in detail, using 100mx100m plots. The equivalent of a further 37 plots were surveyed by transects on foot. In total 12 transect surveys were recorded covering 135.9km. A further five forest and scrub patches were surveyed.

Signs of 28 large mammal species (over 2kg) were recorded. Smaller mammals recorded included Wild Cat and Tree Hyrax. Common Duiker was by far the most common species recorded, but Bushpig, Reedbuck, Roan Antelope and Eland were also common. Signs of Elephant were recorded in 26 plots and 2 herds of Elephant were sighted. There were signs of less common mammals in the plots including Leopard, Buffalo, Red Forest Duiker, Sharpe's Grysbok, Small-Clawed Otter and Honey Badger.

Signs indicated an increase in the populations of large mammals, both on the plateau as last year and for the first time an increase in the populations in the relatively inaccessible valleys off the edge of the plateau. Signs of elephant were up, especially hidden in sheltered forests and deep gullies, with few droppings and signs on the more exposed slopes in between. Kudu seem to be confined to the very lowest areas, closest to the populated parts near Uledi. Particular attention needs to be paid to their protection here. Signs of buffalo were very low compared to 1997 levels, apparently not recovering like the other mammals.

INTRODUCTION

This study aimed to investigate the large mammal populations within the Park and compare this to previous years, and for the first time to relate this to a botanical study. Over a four week period of field study in the Nyika National Park the project aimed to gather enough information to provide a valid and relevant profile of mammal populations within the Park. The additional study of plants in the area provided a more detailed picture of the community as a whole, as well as indicating interspecific relationships. The mammal study is ongoing and has been repeated over several years by Biosearch Nyika. The team size allowed for a good area of coverage. The team was able to split into smaller groups, assigned with respect to ability and skills. The inclusion of botanical data into the mammal survey enables the recognition of patterns of species distribution within plant community types.

This year, cooperation with the Millenium Seeds Trust at Mulanje, Malawi, was very valuable; providing us with our expedition botanist. The expedition was in partnership with the Park authorities, aiding conservation of the Park. This is achieved in two ways; firstly, the direct impact of the expedition is that additional resources are put at the disposal of the Park authority by the Biosearch team; and secondly, the expedition itself patrols an area beyond the coverage of regular scout patrols. Within this area any poaching activity is logged and any poaching activities destroyed (such as meat drying racks or huts). These areas are often those at-risk near to border habitations or those not regularly under the watchful eye of the conservation officers. In previous years arrests have been made in the presence of the Biosearch team, showing the frontline nature of this conservation effort. A further means by which the expedition supports conservation in the area is the provision of information to the Park authorities. Provision of patterns in animal movements and poaching activities may provide guidance to the success of management activities, such as controlled burns and scout patrols. This year a range of altitudes was surveyed, ranging from the open dry grasslands of the upland plateau at between 6000ft and 8000ft, littered with Protea and with the occasional wooded area, to the lower river valleys dominated by Brachystegia woodland down to below 4000ft.

The scope of the botanical investigation was defined by the movement of the expedition as a whole. As the expedition aimed to gather data on populations of large mammals, the botanical survey had to be conducted in a manner which did not limit or slow the progress of the large mammal study. The mammal survey was conducted using methods of previous surveys recommended by Sutherland (1996). This allows comparison with previous studies and benefits from the experience of previous work by individuals joining the 2007 team. The botanical survey for each plot was conducted at the same time as the large mammal survey. Identification was provided by the Malawian botanist Steven Mphamba, supported by the Sabonet book as a reference: Plants of the Nyika Plateau.

Nyika is remarkable for its high level of endemism. The area is within the southern end of the Eastern Afromontane hotspot, a global conservation priority area due to its very large number of endemic species and the extent of degradation (Burgess *et al*., 2006). Thirty-three strictly endemic plants are listed for the Nyika National Park, and a further 13 near-endemics found on the closest afromontane mountaintops (Sabonet, 2005). Several butterfly, amphibian and reptile species are endemic to the Nyika National Park (Johnson 1996).

THE NYIKA NATIONAL PARK AND ITS BIODIVERSITY

The habitat on the plateau above 6000ft is dominated by open grassland and has relic evergreen forests, which cover 2–4% of the plateau. Forest patches vary in size and appear mostly at valley heads, on slopes and in hollows. The eastern escarpment has extensive montane rainforests and Juniper Forest in the south of the Park. This is of particular conservation interest as it represents a very southerly stand of Junipers in eastern Africa and is potentially vulnerable to fire damage. The escarpments of the plateau are predominantly open woodland and make up an estimated 60% of the Nyika National Park. Total forest cover is estimated at c.6000ha by Francoise Dowsett-Lemaire and R. Dowsett (2006). The level of endemism is markedly higher in the montane grasslands than in the montane forests (Sabonet, 2005) but the forest patches contain much of Malawi's biodiversity (Dudley, 2005). Six types of forest on the Nyika Plateau have been described. (Dowsett-Lemaire, 1985). The Nyika National Park also contains the sources of three large rivers: the North Rukuru, the South Rumphi and the Wovwe, and is the most important water catchment area in northern Malawi.

The Nyika National Park is one of the wild areas of the region that have some measure of protection (Estes, 2001) for their valuable wildlife. One of the greatest threats to the wildlife is fire, as even controlled burning can get out of control, kill trees and threaten the remaining evergreen forests. Poaching activity still occurs although there is now more patrolling by scouts, particularly on the plateau.

IUCN listed large mammals in the Nyika Park include the African Elephant (Endangered). The Chequered Sengi or Elephant Shrew (*Rhynchocyon cirnei*), which is globally vulnerable, is widespread in forested habitats of Malawi. (IUCN)The African Elephant is now confined to the protected areas of Malawi (Chitaukali, 2005). Cheetah has not been recently recorded in the Nyika (Overton, 1997-2006), but Lion was recorded at least in 1998 and 2003 (Overton, 2003,2005), with other anecdotal reports outside the expedition periods.

SURVEY AREAS

Survey sites were chosen in consultation with the Department of National Parks and Wildlife with a view to combating poaching activity. The North Rukuru base camp formed a secure plateau starting point for training and also for comparison, as this area is occasionally patrolled. Sub camps from there enabled us to build skills and widen the area of survey. One group worked on the plateau near Nganda, above the Mondwe valley, one group worked down the top part of the valley, while the third group worked further down the valley and over the ridge into the Sawi area. On the plateau, some rainforest and scrub patches were surveyed and river transects completed to check if another method might identify any trends or further species, missed by the 100mx100m random plots. For the later part of the expedition, a camp was in the Chisanga falls area and the 'A' team travelled and surveyed right down to Uledi, trekking from above Jalawi and through the Chipome valley.

From each of the camps, an area was selected for survey. This area was designed to be manageable in the time available but reasonably representative of the area as a whole, covering a range of the habitats. The plots were in four clusters, which represented 3 different habitat types i.e. strata. One kilometre squares were then chosen within these four areas, using random numbers. Plot locations were also chosen within the squares, again using random numbers. They are called stratified, clustered plots.

In the Nganda area 4 or 5 plots were surveyed within each of the 8 kilometre squares studied. In the Mondwe 3-5 plots for each of 4 kilometre squares; in Sawi 5 plots were surveyed in 2 of the 3 squares, with 2 in the other square; in Mpero 1-2 plots were surveyed in each of the 6 squares; and around Chisanga Falls 2-5 plots were recorded in each of the 4 squares. So the total area surveyed was 87ha over 25 km², plus the 12 transects outside of these plots, covering 135.9km. The plots surveyed are summarized in Table 1 below.

Table 1 Summary of random hectare plots surveyed

Base camp area	Habitat and Altitude	No. of km sq	No. of plots	No. of plots in group
Nganda	Plateau >6000ft	5	20	35
North Rukuru	Plateau >6000ft	3	15	
Chisanga falls area	Plateau/woodland c.6000ft	4	14	14
Mondwe	Woodland 5000-6000ft	4	16	38
Chipome/Mpero to Uledi	Woodland 3900-4650ft	6	10	
Sawi-Guwu	Woodland 3950-4300ft	3	12	
Total		25	87	87

METHOD

Collecting mammal data solely using sightings in these habitats is not possible due to the landscape features and the need to collect data over a large area. Using tracks and other signs is the standard method and allows direct comparison between areas and with previous years. Because of the lack of rain in this season, the soil is very hard, so that a collection of prints from the previous wet season was recorded in the dried mud. Droppings, diggings, quills and signs of feeding were also evident. Identification was largely based on knowledge of the trained wildlife officers and scouts. This was moderated and enhanced by consultation in the field and by evening group sessions, looking at samples collected during the day and the established reference works: Apps (1996), Smithers (1997) and Stuart and Stuart (2000). Background information on mammals and tracks and signs was based on Johnson (1991), Ansell and Dowsett (1988) and Walker (1996). The large mammal survey was conducted by methods recommended by Sutherland (1996). This method was used to survey random plots of 100 square metres within a chosen area. A sweep of these areas was undertaken and all signs of large mammal activity recorded; this includes faeces, scratchings, burrows, diggings and lays.

Procedure

Within each plot ten members of the team, each 10m apart, walked 100 metres in a line looking 5 metres either side of their path and recording all sightings, damage, prints, droppings and other indication of mammal presence. When anything was not clear to the recorder, there was always a scout nearby who could help with the identification. Data was recorded using the Relative Abundance (RA) system used on previous Biosearch expeditions: for each plot a total is made of the number of piles of droppings, sightings and calls plus a maximum score of three for each of prints and damage. At the end of each day of survey, the data for each plot were collected on a data sheet. Interesting and unusual findings within the plots despite being “not large mammals” were recorded and mentioned separately. The data sheets also contained information about the habitat, i.e. the proportion of tree canopy, rocks, grass cover, bare ground and if the area was recently burnt or not.

Figure 1 Peter, Kath and Bill surveying near Nganda on the plateau *Quincy Connell*

Figure 2, 3 Marianne surveying in long grassland and in open woodland *Chris Neal*

Other supplementary methods

Signs of some species and especially sightings of larger animals were recorded only outside the plots. These data were recorded separately in a species list together with the grid references.

Transect data was collected in the same way, when the team walked, usually along animal paths, looking for and recording mammal signs, 10m either side of the line walked. The data was thus collected in a 20m transect belt. The habitat was recorded and the distances calculated from the maps. Vehicle transects relied on direct sightings.

Three forest and two scrub patches were also surveyed. For these denser areas, a winding route was chosen through the forest patches, with peripheral searches, thus encompassing likely areas.

The supplementary methods were indicative only. We aimed for around 30-50 plots in each of the two higher altitude ranges and achieved 38 and 35 respectively which appeared to be a reasonably representative. In the lowest range, we achieved a smaller sample of 12 plots.

RESULTS AND DISCUSSION

In total 36 mammals were recorded on the expedition. Thirty four of these were recorded within the plots, including 28 large mammals (species size range over 2kg), and seven smaller mammal taxa. Hippopotamus, Tree Squirrel and Tree hyrax were recorded on transects or around plots, but not within the plots. The actual species count would be somewhat higher, as some taxonomic groups could not be separated from their signs alone. Identifying small mammals, even when they are trapped, requires a specialist taxonomist, as scouts do not subdivide groups such as mice. However, in 2007, all large mammals were identified to species level. The larger mammals recorded in the Nyika National Park are listed in Table 2.

Common Duiker was by far the most common species recorded. Bushpig, Reedbuck, Roan Antelope and Eland were also common. Signs of Elephant were recorded in 26 plots and two herds of elephants were sighted. There were signs of less common mammals in the plots, including Leopard and Buffalo, Red Forest Duiker, Sharpe's Grysbok, Small-Clawed Otter and Honey Badger. The rare Blue Monkey was found near Juniper Forest in 2006 but was not recorded in the areas studied this year.

The evidence indicates an increase in the populations of large mammals on the plateau, as last year. For the first time, an increase is seen in the populations in the relatively inaccessible valleys off the edge of the plateau. Signs of elephant were up on previous years. The elephants spend much time hidden in sheltered forests and deep gullies, with few droppings and signs on the more exposed slopes in between. Kudu seems to be confined to the very lowest areas, closest to the populated areas near Uledi. Particular attention needs to be paid to their protection here. A number of mammals have increased over the past three years, but signs of Buffalo remain very low compared to 1997 levels, apparently not recovering in numbers.

Figure 3a Signs of Roan and Porcupine were common on the plateau.

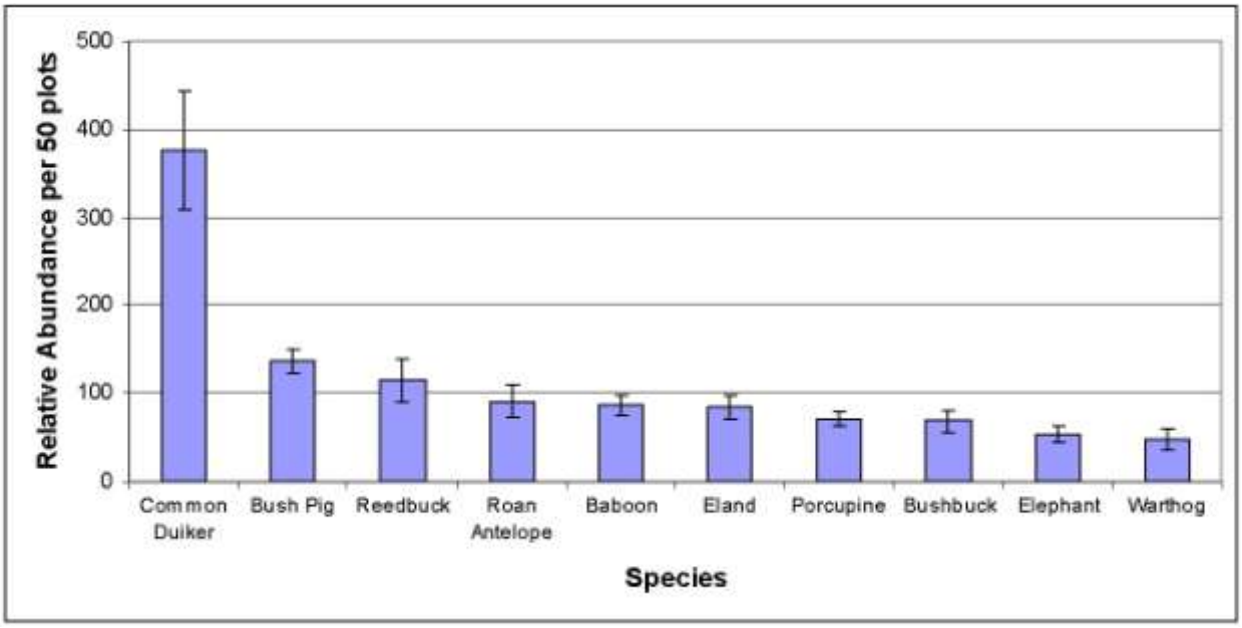
Table 2: Large mammal species recorded
(bold type indicates a sighting.)

English name	Latin Name
Aardvark	*Orycteropus afer*
African Buffalo	*Syncerus caffer*
African Elephant	*Loxodonta africanus*
Burchell's Zebra	*Equus burchelli*
Bush Pig	*Potamochoerus porcus*
Bushbuck	*Tragelaphus scriptus*
Civet	*Civettictis civetta*
Common Duiker	*Sylicapra grimmia*
Eland	*Taurotrogus oryx*
Greater Kudu	*Tragelaphus strepsiceros*
Hippopotamus	*Hippopotamus amphibious*
Honey Badger	*Mellivora capensis*
Klipspringer	*Oreotragus oreotragus*
Leopard	*Panthera pardus*
Porcupine	*Hystrix africaeaustralis*
Red Forest Duiker	*Cephalophus natalensis*
Reedbuck	*Redunca arundinum*
Roan Antelope	*Hippotragus equines*
Rusty Spotted Genet	*Genetta rubignosa*
Scrub Hare	*Lepus saxatilis)*
Serval	*Felis serval*
Sharpe's Grysbok	*Raphicerus sharpie*
Side-Striped Jackal	*Canis adustus*
Slender Mongoose	*Galerella sanguniea*
Small-clawed Otter	*Aonyx capensis*
Spotted Hyaena	*Crocuta crocuta*
Vervet Monkey	*Cercophitecus aethiops*
Warthog	*Phacochoerus aethiopicus*
Yellow Baboon	*Papio cynocephalus*

In addition, the team had two nights at Vwaza Marsh Reserve, getting close views of Hippopotamus, a herd of twenty-one Elephants and also a good number of Baboons at close quarters.

Figure 4 Relative Abundance of the most common mammals

The ten large mammal species with the highest Relative Abundance scores over all plots (n=87) are shown with Standard Error bars.



Trends in Vegetation

Table 3 shows the survey sites and their classification. In common with some of the earlier expeditions, these sites have been divided into three types:

Plateau grassland, which in this expedition was all over 7000ft
Wooded slopes and valleys between 5000 and 7000ft and
Lowland woodland below 5000ft.

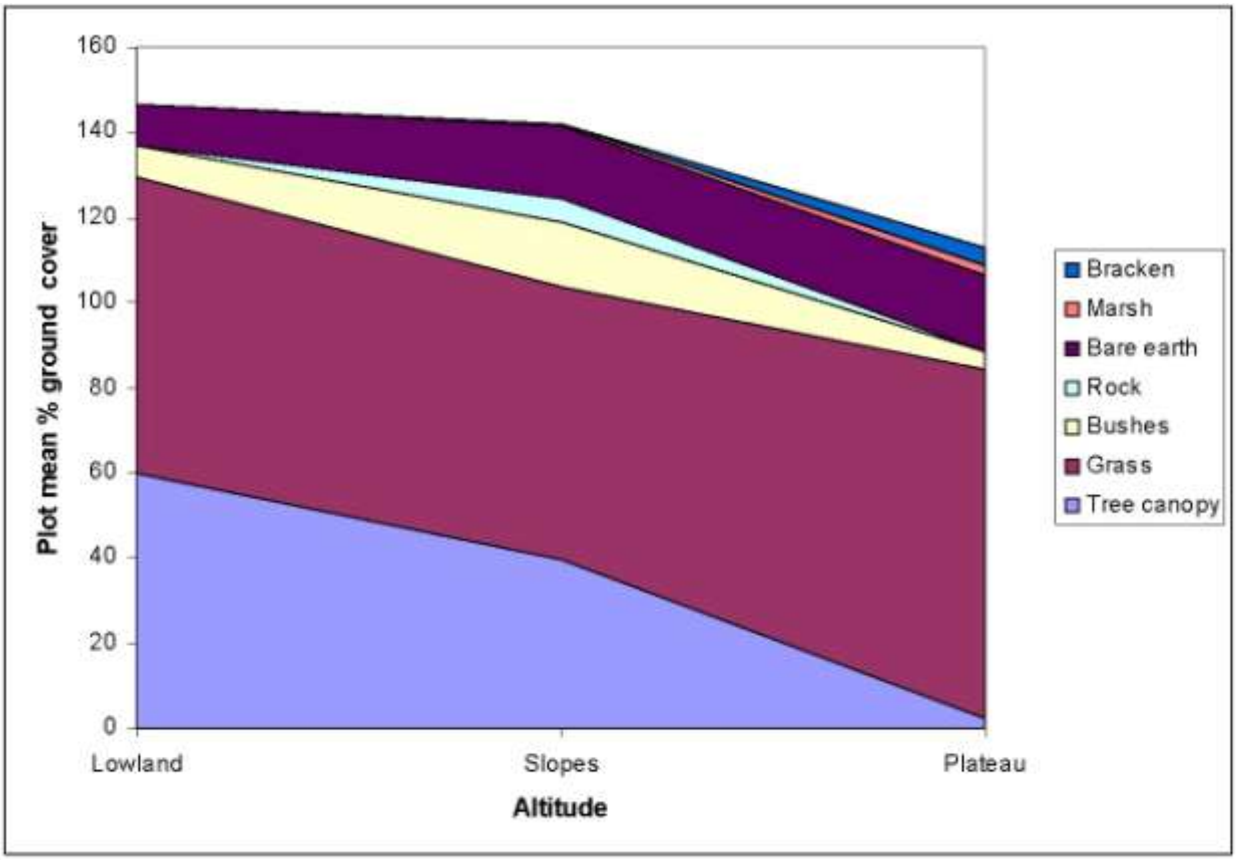
Table 3 Summary of the study sites and vegetation
Grid references refer to the first plot surveyed at that site.

Name of site	No. plots surveyed	Grid reference	Main vegetation type	Mean altitude (ft)	Type
Nganda and N.Rukuru	35	919450	Montane grassland	7525	Plateau
Mondwe Valley	16	924521	Miombo woodland	5704	Slope
Chisanga Falls	14	757357	Miombo woodland	6236	Slope
Sawi and Guwu Valleys	12	977568	Miombo woodland	4154	Lowland
Mpero and Chipome Valleys	10	871597	Miombo woodland	4280	Lowland

As expected, ground cover varied with altitude and topography. Figure 5 illustrates the changes in habitat with altitude. Tree cover decreases with altitude from 60% in the lowlands, to 2% on the plateau. Grass cover is high at all altitudes, forming an under-story below the tree canopy (of 70% cover) at lower altitudes, whereas at high altitude different grass species dominate the vegetation (82% cover). Bushes are a much less significant component of the vegetation, even on the mid-altitude slopes. Bracken is entirely restricted to discrete places on the high altitude plateau. Marsh or dambo also covers only a small part of the ground. Granite or quartzite rocks form outcrops, especially on the steep slopes.

Figure 5 Ground cover in the different habitat types

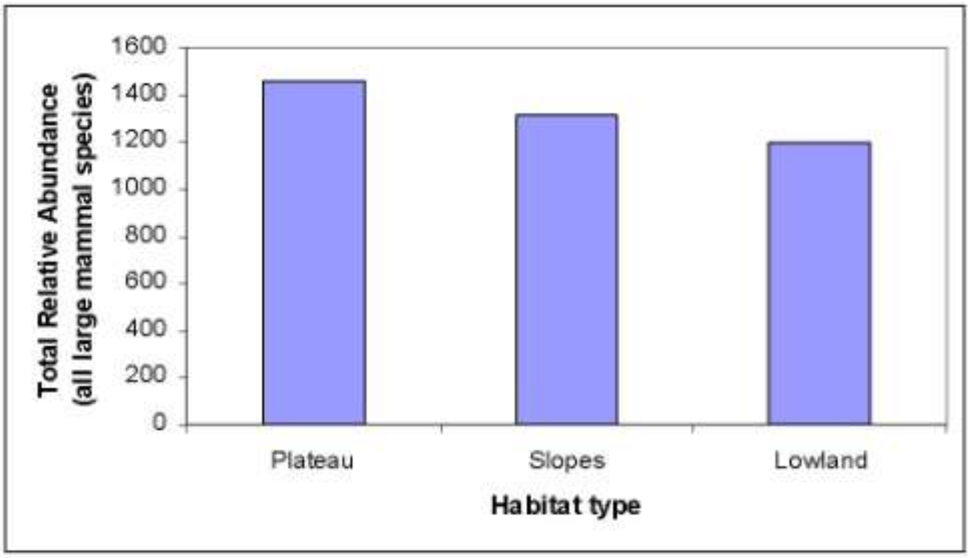
Note that the total land cover does not add up to 100% as there is sometimes more than one layer of ground cover, e.g. when tree canopy overhangs rock.



Food supply, cover and poaching pressure are the three main factors that control the distribution of mammals. These factors all vary with habitat type, and accordingly so did the species recorded in the transects. Overall, however, the number of mammals present remained approximately constant over the different habitat types. The total number of large mammal species recorded on the plateau was 19, while 21 were found on the slopes and 18 in the lowland. Similarly the total Relative Abundance Scores showed only a slight decrease with altitude, see figure 6.

There was significantly more sampling at the lowest and mid altitudes this year than last and only slightly more sampling at high altitudes (above 6000ft), where scouts patrol to prevent poaching. However, in total 23 large mammal species were recorded in the plots, compared with last year's total of 22 species.

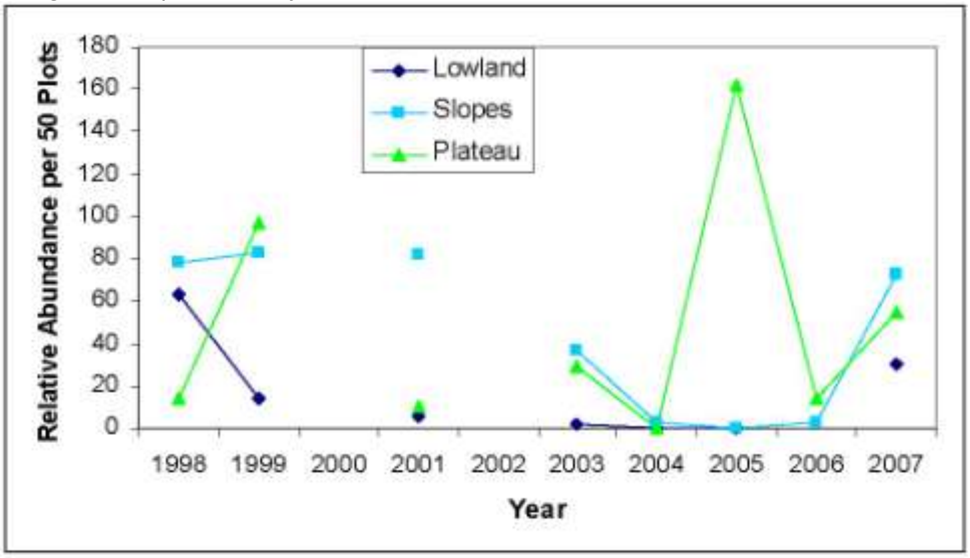
Figure 6 Total Relative Abundance count for all species over the different habitat types



Trends in individual species

Elephant

Figure 7 Elephant activity



The gaps in the graphs are because Biosearch did not conduct surveys in Nyika in 2000 or 2002. The high figure in 2005 on the plateau was largely in one valley where elephants congregated within the protective reach of scout patrols.

Elephants are seen as an important species for the conservation of Africa's wildlife and are important to the success of Nyika's tourism. Historically, elephants occupied practically every habitat type. Their ability to travel long distances allows them to use different habitats within a wide area and bypass areas that provide few resources (Ansell and Dowsett, 1988, Smithers,1986). They are increasingly constrained by human population encroachment and poaching (East, 1998, Smithers, 1986).
Not since 2003 had the survey revealed any appreciable elephant presence in the valleys. This year, the Mondwe and Chipome valley (slopes 4000ft-6000ft) saw an approximate increase of 100% in activity (Figure 7). The two years preceding a peak in activity on the

plateau (6000ft-7000ft) saw a fall in their presence. In comparison, this year witnessed around a threefold increase in relative abundance (RA), and also yielded two sightings of different herds.

While surveying we saw two herds of elephant and recorded elephant signs in 28 of the 87 plots surveyed. So this year's survey results are very encouraging, showing an increase in elephant activity at all altitudes compared with the 2006 results. While we must be careful not to over-interpret this data, which is vulnerable to the vagaries of site selection and statistical error, the overall Relative abundance per 50 plots of 55 is good news for the Park. The increased activity in the lowlands, the first substantial activity recorded here by our expeditions since 1999 could suggest that there is now less poaching in these woodlands. An alternative explanation for their activity this year is that they were forced into more dangerous lowland areas in search of food. The herd of 15 elephants in one herd that we saw on July 31st moving into a forest patch included only one youngster. The other small group sighted en route to Chisanga were all adults. This could suggest the habitat is not conducive to high levels of reproductive success. Distances between pockets of evergreen forest (offering food, water, shade and a degree of cover from poaching, perhaps) require the elephants to be relatively more mobile, thus leaving less time and resources to produce and sustain progeny.

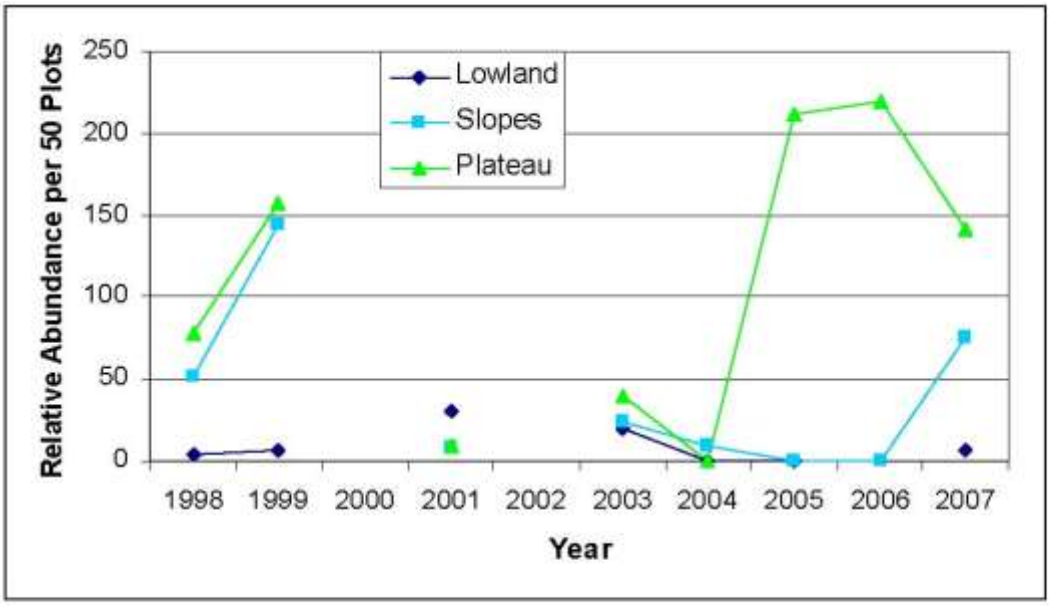
Eland

The Relative Abundance of Eland (Figure 8) describes a similar trend both in the valleys (4000ft-6000ft) and on the plateau (6000ft-7000ft) until 2005. Since 2003, Eland appear to be absent in the lowest areas.

The 2007 data shows a reduction in activity on the plateau; down by approximately a third but an increase on the slopes. It is likely that these results can be explained by the Eland's search for good grazing. They are found in woodland and open country and range over considerable distances and move in accordance with the quality of the forage (Ansell and Dowsett, 1988., Johnson, 1993). Thus, in the dry season, animals may split up into smaller herds, and migrate from the plateau to the lower woodland areas.

Compared to 2006, Relative Abundance of Eland increased by nearly 150% in the valleys (Mondwe = RA 120 and Chipome 57) and is at its greatest since 1999. Their presence on the plateau appears to be declining (RA 150, 35 plots in 2007) but there are still more signs on the open grassland of the plateau. Eland characteristically range across woodland and open country including montane grassland (Ansell & Dowsett, 1988).

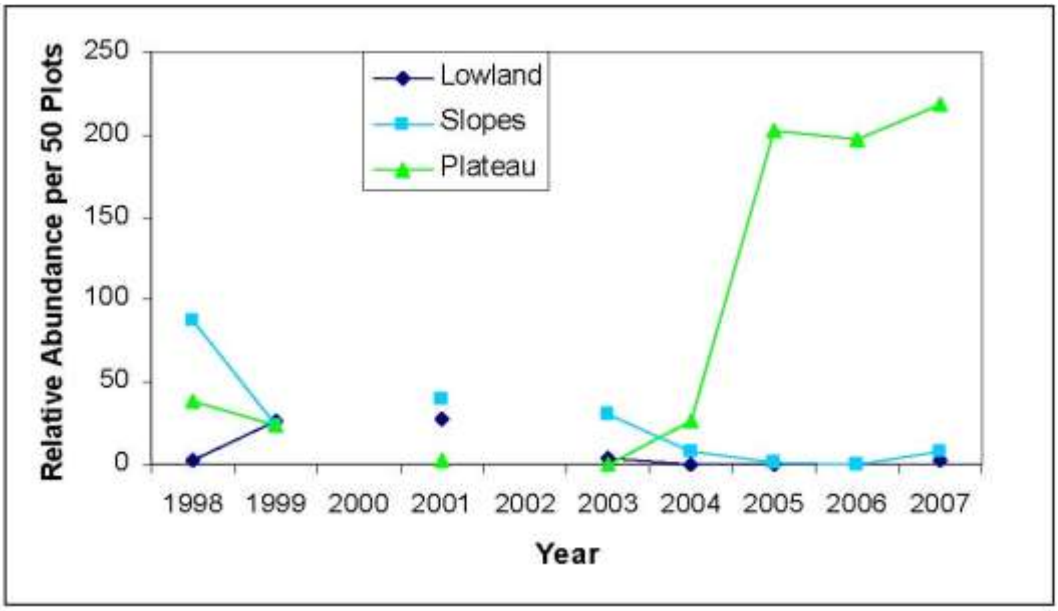
Figure 8 Eland activity



Roan Antelope

While Ansell and Dowsett (1988) report that Roan Antelope can be found in woodland, dambo, plains and montane grassland, our expedition data supports Smithers (1986) in his assertion that they have "strict requirements for lightly wooded savannah with open areas of medium-tall grass". Almost all Roan activity was recorded in the tall plateau grassland, see figure 9. The 2007 data was comparable with the 2005 and 2006 data, and suggests a large and stable population of Roan in Nyika. Unlike Eland, there was little evidence that Roan were migrating to the valleys, as has been observed by Johnson, 1993.

Figure 9 Roan Antelope activity



Kudu and Buffalo

Previous research (Overton, (ed), 2005 and 2006) had highlighted the apparent plight of these two animals. Kudu abundance (Figure 10), has described peaks (1999, 2003) and troughs until around 2005, when no evidence was found at any altitude. Generally preferring woodland and thickets, secondary growth (through elephant damage and cultivation) and also rocky slopes, it was somewhat unusual that in 1999, Kudu were dispersed across all altitudinal ranges (not just in their preferred habitat below 6000ft). However, recordings on the plateau declined markedly from 2001, and by 2005, had disappeared from the plateau.

Both Kudu and Buffalo (Figure 11) were recorded in the Mondwe and Chipome valleys and to a lesser extent, the lowest Sawi Valley (<4000ft)). In 2007, a solitary spoor indicated Buffalo presence in the Chipome, the only sign since 2004. Buffalo preferentially occupy areas less than 6000ft (Ansell and Dowsett, 1988., Smithers, 1986), including woodland, thickets, grasslands and also montane forest, which highlights an anomalously high recoding on the plateau in 1999. Buffalo have not been recorded here since 1999.

Figure 10 Kudu activity

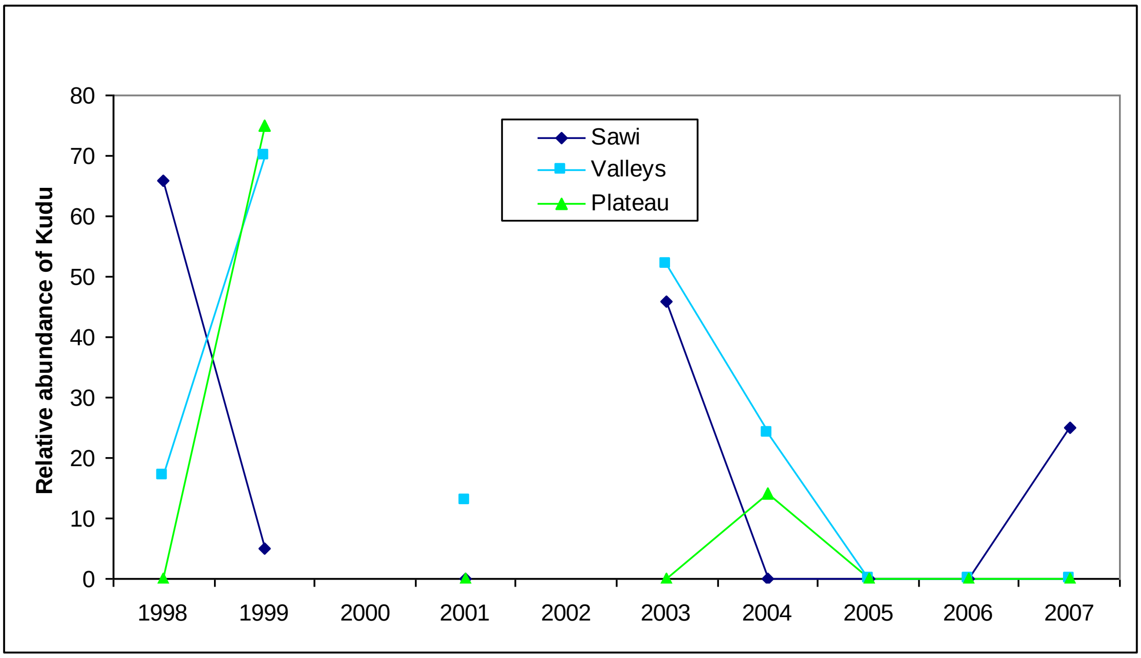
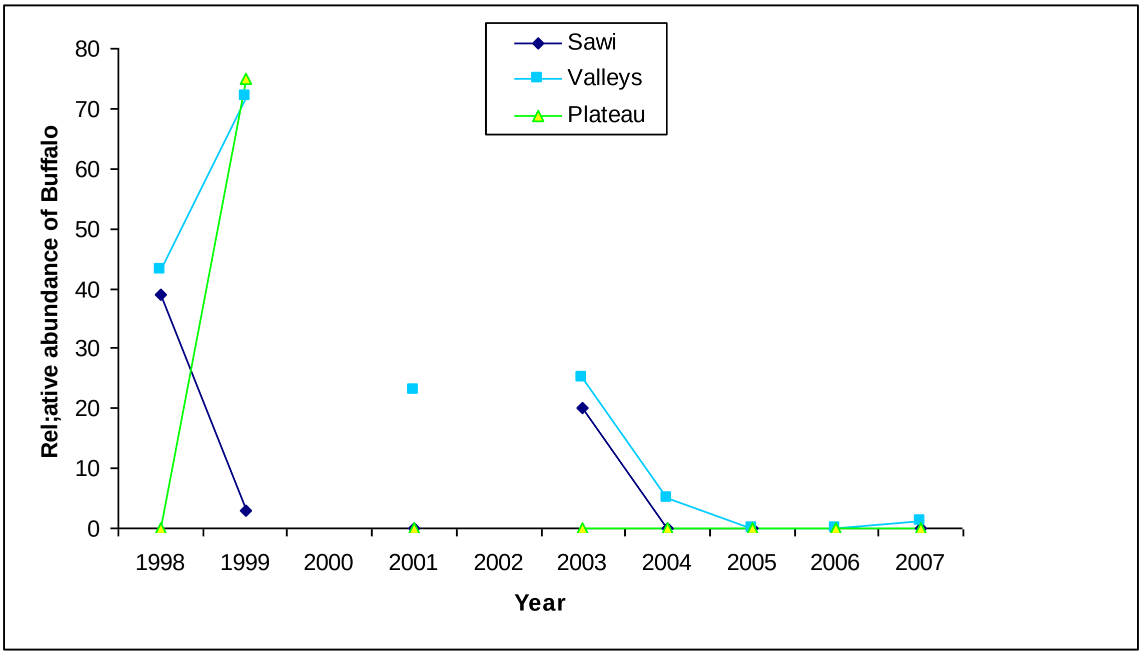


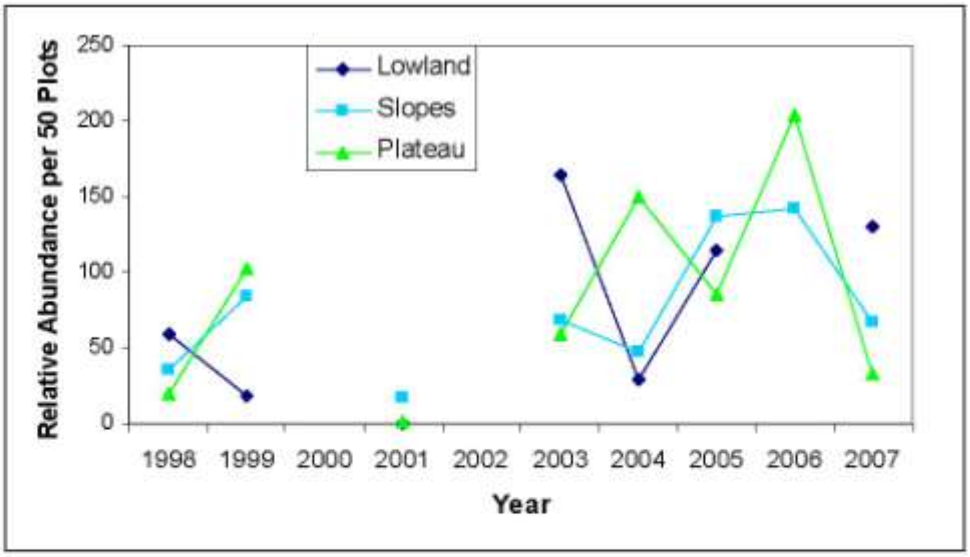
Figure 11 Buffalo activity



Bushbuck

Bushbuck activity was down on previous years' surveys, see figure 12. Plateau data showed a substantial drop in activity. On the slopes too there was less activity, and Bushbuck signs were spotted in only 2 of the 16 plots surveyed at Mondwe, bringing the Relative Abundance on the slopes down from last year's 142 to the 67 recorded this year.

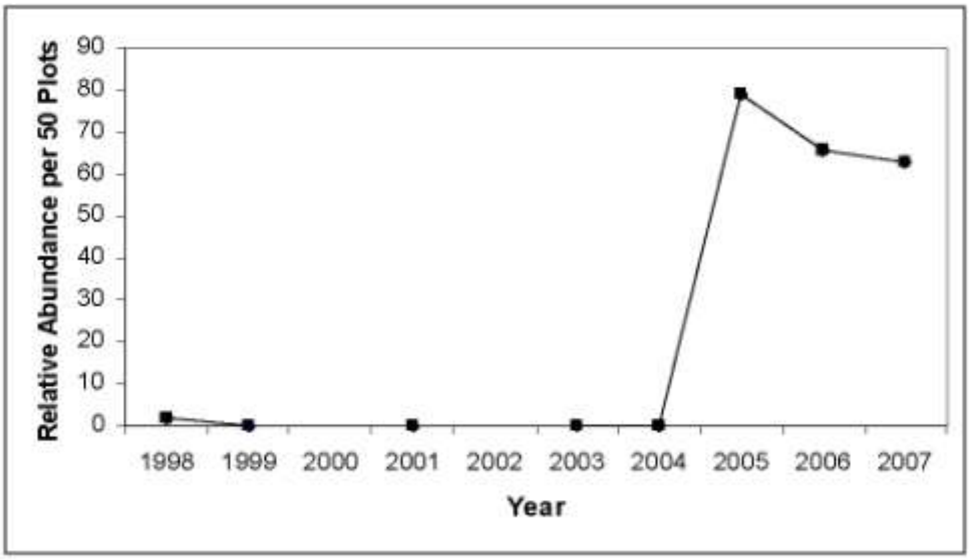
Figure 12 Bushbuck activity



Zebra

Zebra is a specialist, occupying grassland and woodland in areas largely above 6000ft (Ansell and Dowsett, 1988, Smithers, 1986). Before 2004 very little Zebra activity was found in Nyika by Biosearch expeditions and others (Munthali and Banda, 1992). This may be linked with an increased burning regime on the plateau (Munthali and Banda, 1992) but more work would be needed in different areas, as they do tend to congregate in particular areas. The trend is unlikely to be linked with rainfall (Georgiadis et al, 2003) which has been more erratic throughout the period (Biosearch 2004).

Figure 13 Zebra activity on the grassy plateau



Reedbuck and Leopard

Previous Biosearch expeditions have found very variable levels of reedbuck activity, which partly relates to rainfall of the previous year. (Biosearch Nyika 2004) In accordance with habitat preferences 2007 Reedbuck signs were particularly common on the grassy plateau at Nganda. What is interesting about the Reedbuck data is its co-variance with leopard activity, see figure 16 below. In some ways this is unsurprising as Reedbuck are the most significant prey of Leopards. (Johnson,1993). However Leopards are notoriously secretive, and prefer to spend their time in densely forested areas rather than on the open grassland of the plateau, so finding so much of the leopard activity on the plateau is surprising. Both species are absent from the lowland areas, perhaps as a result of the continued poaching activity in these areas.

Figure 14 Reedbuck activity

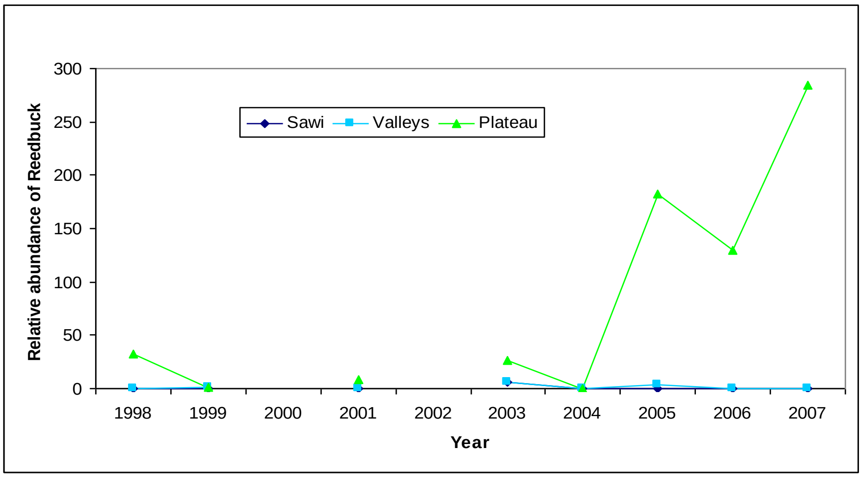


Figure 15 Leopard activity

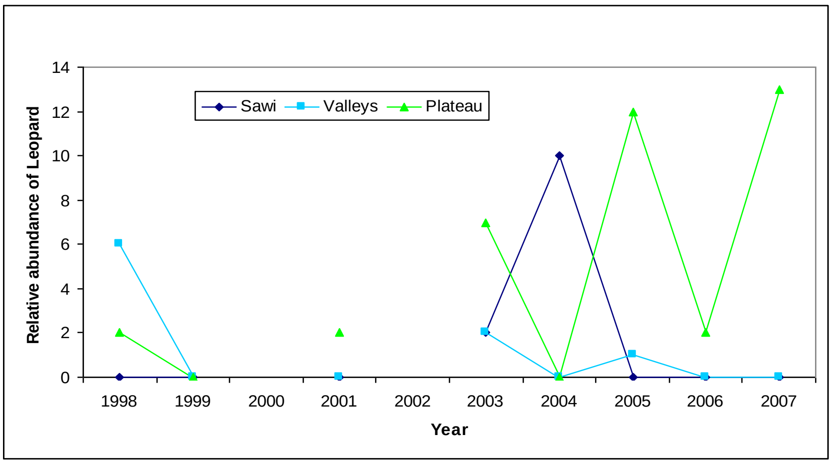
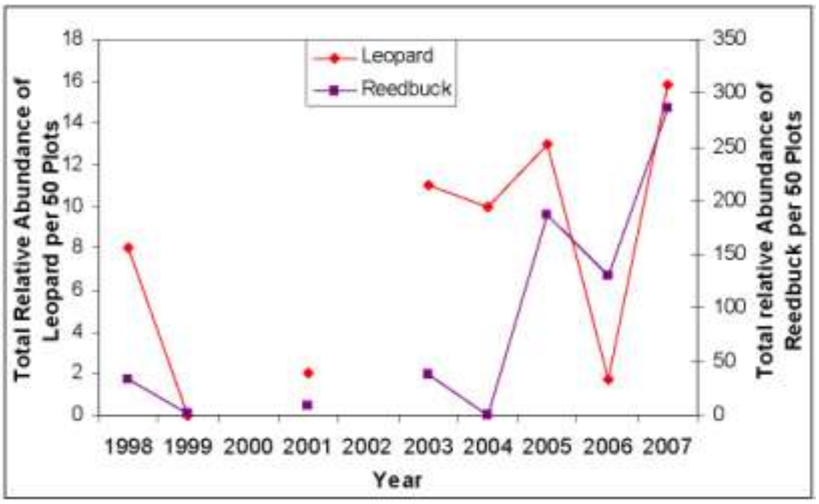


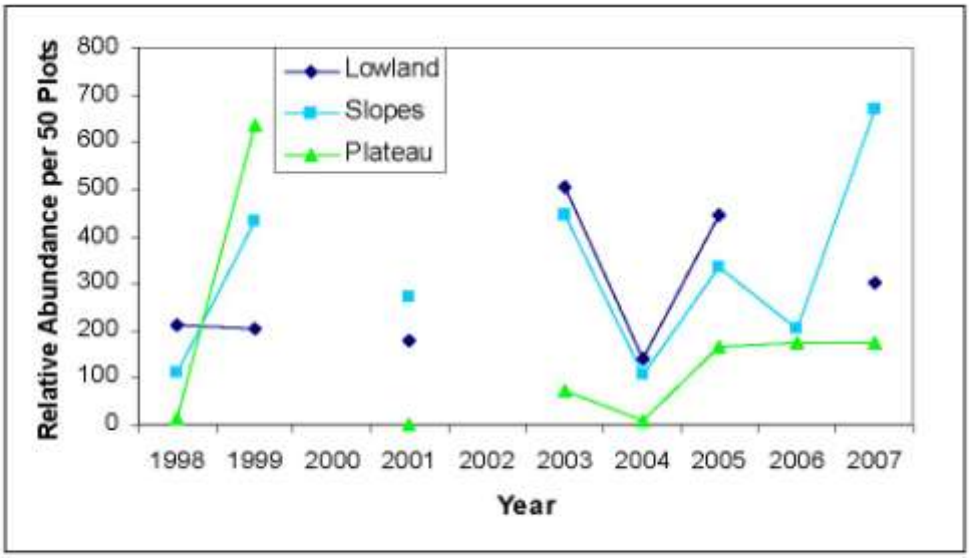
Figure 16 Co-variance of Reedbuck and Leopard



Common Duiker

Common Duiker is the most abundant species recorded in Nyika (see previous Biosearch Nyika reports). This year the overall Relative Abundance was up on recent years, with a mean RA over all habitats of 376 per 50 plots. There was a reduction in activity in the lowlands however. While Common Duiker is hardly a flagship species, small ungulates such as this are important in supporting populations of more charismatic carnivores, and in maintaining vegetation composition.

Figure 17 Common Duiker activity



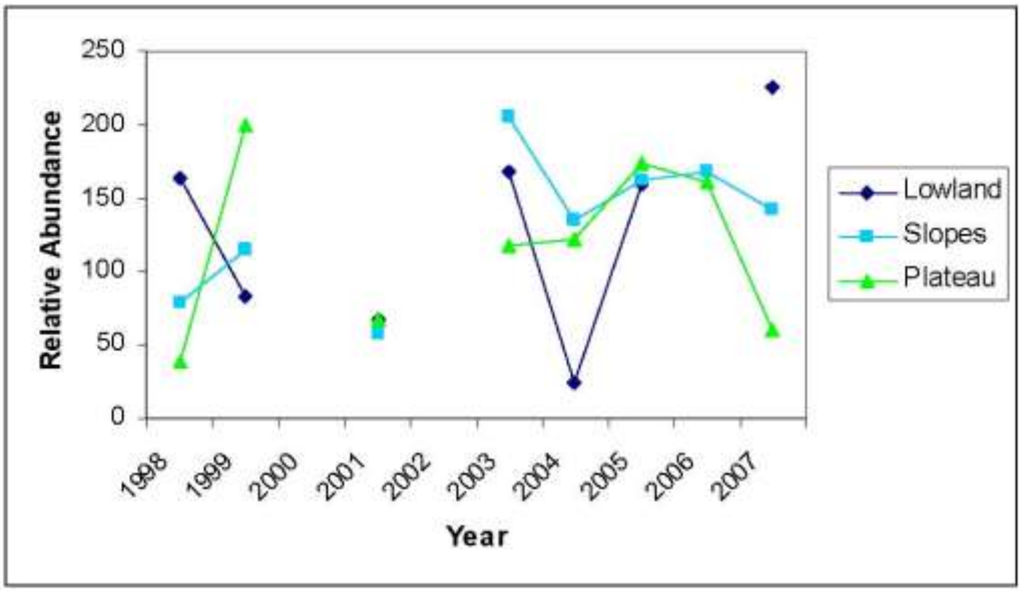
Bushpig and Warthog

These two species have contrasting habitat requirements. Bushpig, as the name suggests, likes secondary growth and its search for food often renders it an agricultural pest (East, 1998), making a nuisance of itself in cassava plots. This year's data, shown in figure 18, shows the most activity in the lowland (RA 255 per 50 plots), followed by the slopes (142), and the lowest activity on the plateau (60).

Figure 19 reflects the Warthog's preference for environments provided at over 7000m and avoidance of the steep sided valleys and lower environs. Aside from the anomalous data from 1998 and 1999, Warthog has been found exclusively on the plateau.

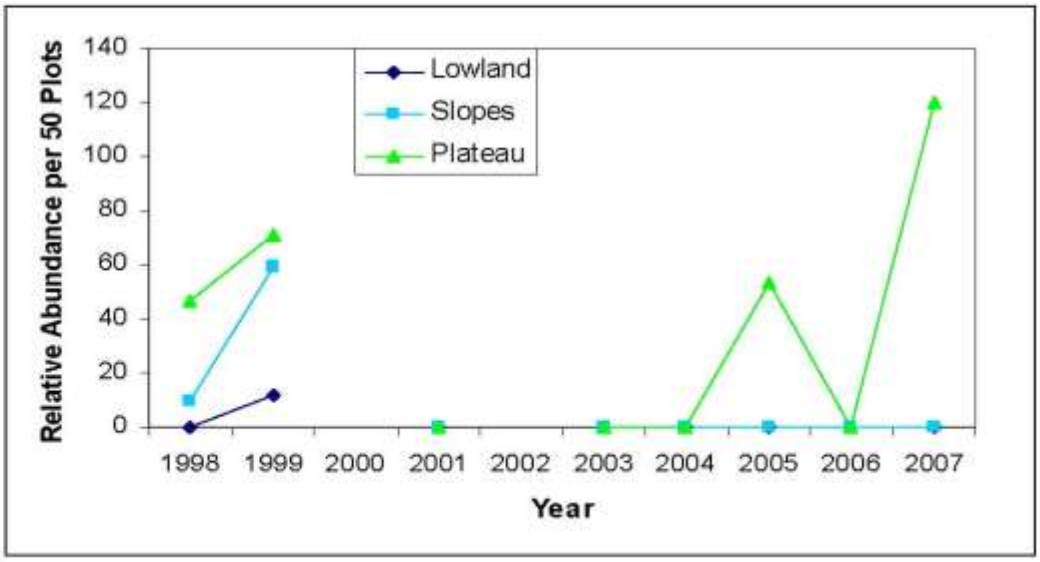
Warthogs on the Nyika *Nikki Vohra-Beulens*

Figure 18 Bushpig activity



Warthog

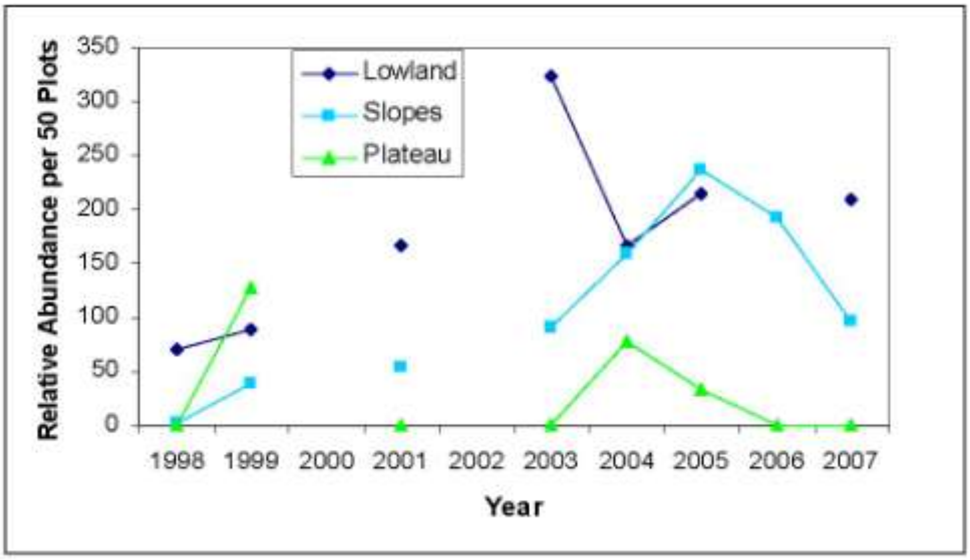
Figure 19 Warthog activity



Yellow Baboon

Baboons, like Bushpigs, are sometimes associated with humans and secondary habitats. The 2007 data (Fig. 13) shows their presence at lower altitudes, where there is more human activity and denser cover. Baboons are not usually found on the high plateau (Ansell and Dowsett, 1988). This year, unlike 1999, 2004 and 2005, we recorded no baboon activity in our plots on the plateau, the only sightings being near Thazima and at Chisanga Falls.

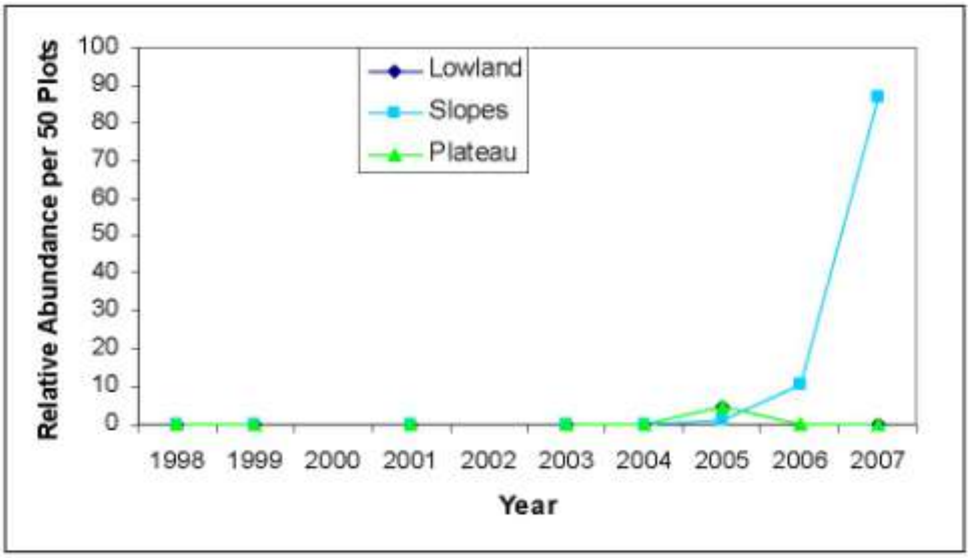
Figure 20 Baboon activity



Vervet Monkey

Vervet monkey has only been occasionally recorded in Biosearch plots in the past (Figure 21) in the lowland areas. The high level of activity in 2007 was only from records above 6000ft in the woodland of Chisanga. The monkeys may be associating with the picnic viewpoint on the dirt road above Chisanga and the gardens at the park gate at Kaperekezi. The lack of signs of Vervet Monkey (Figure 22) in the lowland areas is somewhat unexpected as is the high level of activity recorded above 6000ft (Chisanga).

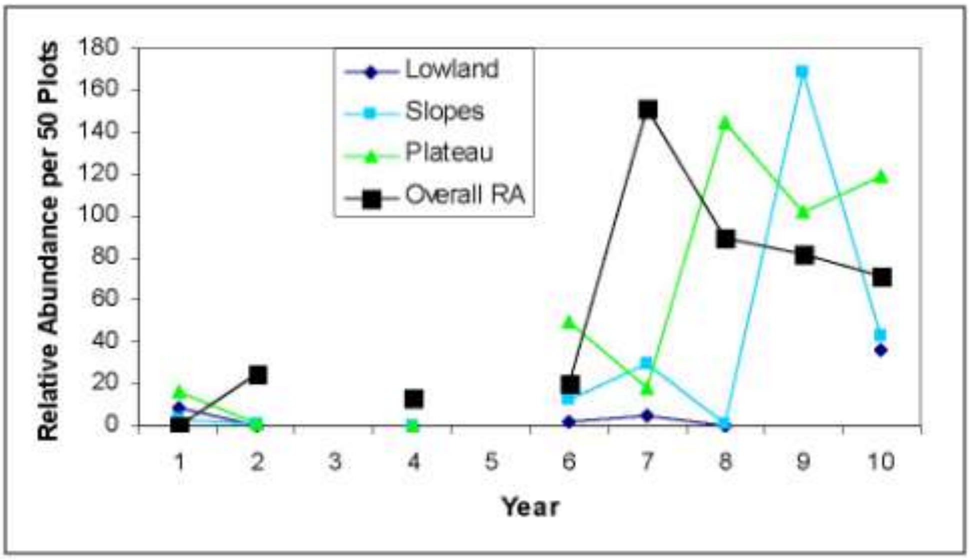
Figure 21 Vervet Monkey activity



Porcupine

Porcupine activity shows an unusual pattern of variability in Relative Abundance in different habitats, see figure 22.

Figure 22 Porcupine activity



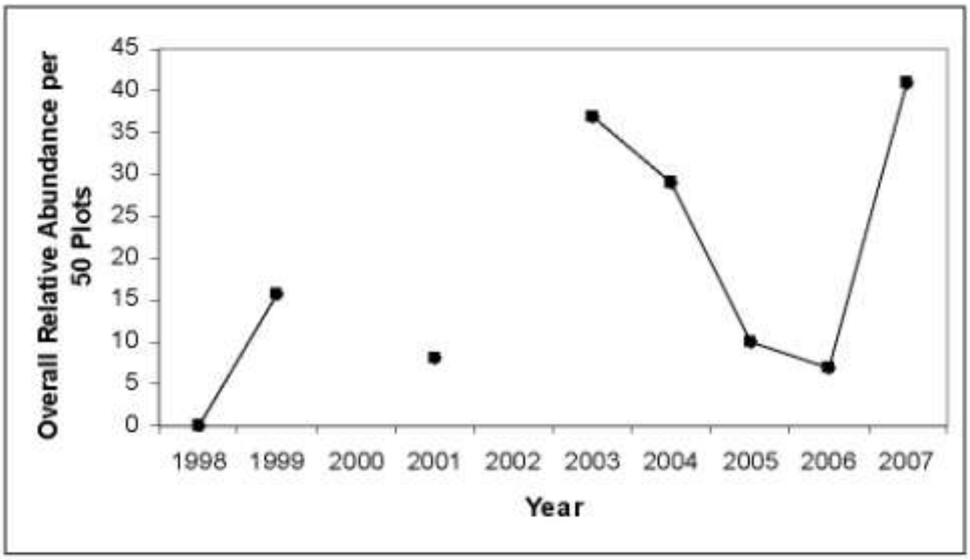
In 2007 Porcupine activity was mostly found on the grassy plateau (RA per 50 plots was 119) and at a level comparable with that of 2006 and 2005. From this we can conclude that the Porcupine population remains quite stable. The slope results of 2006 seem anomalous, as the slope relative abundance score was unusually high (RA 168 per 50 plots), down to 43 in 2007. The high porcupine on slope record for 2006 is from the Wovwe Valley, which is much lusher, with the higher rainfall on the eastern side of the Park. The prevailing wind from the south-east brings water from the lake, depositing mist and rain as it rises up the escarpment, even in the dry season.

Aardvark

The main habitat requirement for the aardvark is a supply of ants and termites for food. Thus they are found mostly in woodlands and open country (Ansell and Dowsett, 1988., Smithers, 1986). Biosearch data, see figure 24, shows very variable activity, suggesting that Aardvark populations are localised, rather than being found throughout Nyika. Interestingly, Hough (1982) stated that they do not occur above 6000ft. However, our surveys have revealed their presence at this altitude since 1998, with a marked rise in activity this year, up to a Relative Abundance of 86 per 50 plots at Nganda.

Figure 23 Empty Aardvark holes can be quite large and subsequently occupied by warthogs, bushpig or snakes, so checking first with a digital camera and torch on a stick is a good idea. The author is at the ready while Michael Overton tries out the empty hole for size.

Figure 24 Aardvark activity



Activity of the less abundant species

Signs of many other species were spotted in the 87 plots and 14 transects, but not at activity levels high enough for statistical or graphical analysis. Species of particular interest include Wild Cat, Small-Clawed Otter, Sharpe's Grysbok, Greater Kudu and Hippopotamus.

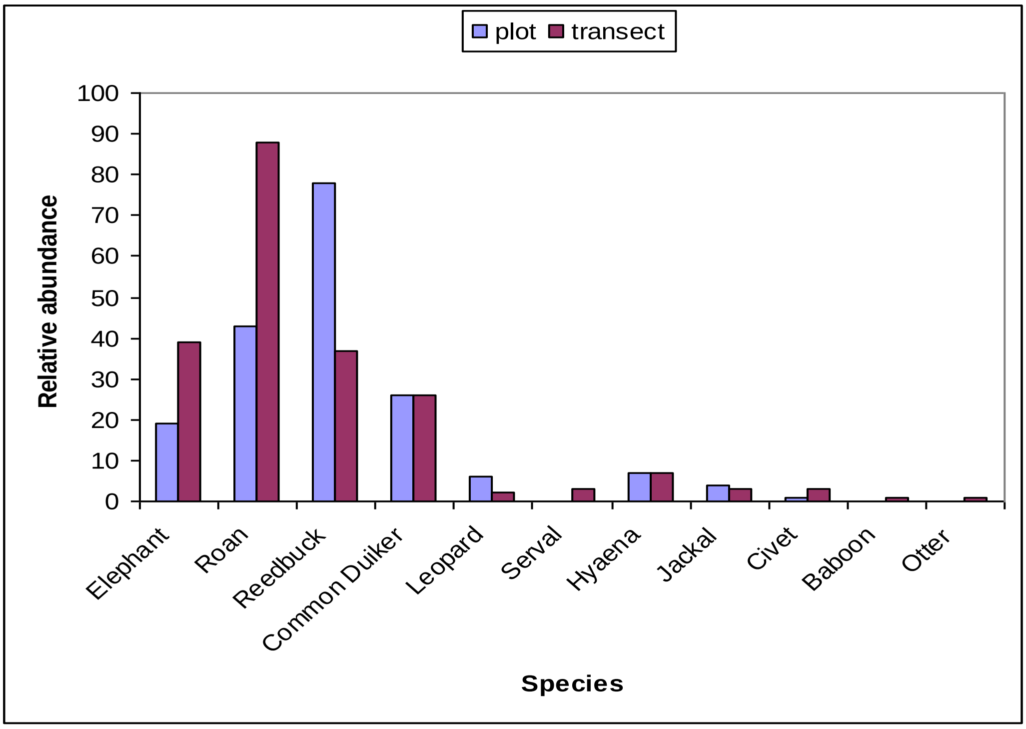
Table 4: Activity of the less abundant species

Species	Overall RA per 50 plots
Sharpe's Grysbok	44
Greater Kudu	34
Slender Mongoose	25
Scrub Hare	22
Hyaena	17
Honey Badger	9
Side-Striped Jackal	9
Serval	4
Civet	4
Klipspringer	3
African Buffalo	1
Red Forest Duiker	2
Small-clawed Otter	1

Biosearch 2007 yielded one sign of Small-clawed Otter activity at Guwu, in the Sawi cluster. Three riverbank transects totaling 0.4km, and one river crossing transect were conducted in order to more accurately comment on otter activity. During these, one further sign of otter activity was spotted (Figure 25). In 1999 an overall RA of 2 per 50 plots was found, and in 2006 that value was 1. Other expeditions found no evidence of otter, so it seems that the population is low and localized, at least at this time of the year.

Transect data. Several transects along river, animal track and vehicle tracks (n=14) were conducted on the plateau in order to assess the relative abundance of large mammals detected by this method in comparison with that detected by the plot method. To allow for greater standardization, 14 plots were selected at random from the plateau data (systematic sampling every other plot until 14 had been selected). Because the area covered by each transect differed from the next, statistical analysis to determine the significance in the quantity of species detected would not necessarily yield valid conclusions. However, it may be inferred that there exists some difference in the richness of species that can be detected. The river transects are a potentially valuable method for augmenting detection of soft-footed animals like the cats and canines. Indeed, Serval and Civet were found almost exclusively through the transects. Plots often are not inclusive of riverine habitats, so these transects would be useful in detecting species that call this type of habitat home; such as the small-clawed otter, here detected by a spraint on a large rock a few metres from the river. This highlights the importance of using a suite of complementary methods in order to build up a more comprehensive picture.

Figure 25 Comparison of data from plots and transects



Red Forest Duiker is another species with restricted habitat requirements and a low population. This year we found two signs of this species at Mpero, which is a lower frequency than the 2006 results, but shows that this species is clinging on, despite the threats of fire damage to its habitat (which we observed) and poaching.

Klipspringer in 2005 and 2006 scored highly (28 and 41 respectively) but were significantly down in 2007, recorded in plots only on one rocky outcrop at Chisanga.

The beautiful Sharpe's Grysbok scored very highly in the Chipome Valley towards Uledi. This may be partly due to better identification than in previous years, separating the signs from those of the Common Duiker, also found in woodlands.

Smaller mammals are likely to have been under-recorded in the survey, as their signs are easy to miss.

CONCLUSIONS

Signs indicated a general increase in the populations of large mammals, both on the plateau and for the first time since 1998, in the populations inhabiting the relatively inaccessible valleys off the edge of the plateau. The relative abundance of Elephant across all altitudes has increased since 2006. Accounting for methodological and statistical error that may confound the interpretation of such figures, the overall RA (per 50 plots) of 55 is encouraging. Elephants are deemed an important species, representing the conservation of African wildlife. They are a major draw for tourism, funding and resources for the Nyika. Their presence in the lowlands this year suggests a decrease in poaching activity in these areas (see poaching report).

Elephants were using the gullies and denser forest patches for food and shelter at all altitudes and it is critical that they are protected. The less fragmented the habitat, the less time the elephants have to be on the move between habitats to find suitable ones; increasing the amount of time and resources that could otherwise be devoted to reproduction.

There is evidence for this in the sighting of only a single sub-adult among one particular matriarchal group. Conservation efforts could perhaps target the maintenance and expansion of existing and regeneration of new woodland patches. Evidence for poaching however, was still recorded in the more remote lowlands, where elephants are starting to increasingly frequent. It is therefore necessary to maintain and increase patrols by scouts in such areas, as far as is practicable.

Finding so much leopard activity on the plateau was surprising in the light of supposed preferences for the densely forested areas. This may be explained by following the Relative Abundance of Reedbuck, which comprise a major portion of Leopard diet in the Nyika (Johnson, 1993), thus sharing an intimate trophic relationship. Accordingly, Reedbuck was common on the plateau. RA of Leopard decreased in the valleys.

Also notable is the increased presence of Kudu but they appear to be confined to the very lowest areas, closest to the populated areas near Uledi. Particular attention needs to be devoted to their protection in this area. Specifically, data from this region suggests that cattle continue to encroach on land within the National Park from populated areas abutting the boundary. Despite being illegal, mixing with domestic stock increases the potential for transmission of disease between the cattle and kudu and other ungulates. Rinderpest, transmitted from domestic cattle, in the late 19th century killed 75% of antelope, wildebeest and other ungulates in eastern and southern Africa. (Primack, 2002. See also Morell 1994 – transmission of canine distemper from domestic dogs to lions in the Serengeti NP, Tanzania). There has been no recent such cases, as far as we know. However, our data suggests that they and wild ungulates frequent the same areas, so the potential for disease transmission, albeit small, remains a threat.

The encouraging indications (including Elephant and Kudu) are tempered by the less encouraging ones. Although a single buffalo spoor was recorded in Chipome, numbers appear to remain very low. In addition, there is an apparent decline in Bushbuck.

References

Ansell, W.F.H., Dowsett, R.J (1988). *Mammals of Malawi: An Annotated Checklist and Atlas.* Trendine Press, Zennor, Cornwall.

Dowsett-Lemaire, F., Dowsett, R.J. (2006) *The Birds of Malawi, an Atlas and Handbook* Tauraco
Press and Aves Rue Fusch 3, B-4000 Liege, Belgium.

East, R (ed) (1998). *African Antelope Database*, The World Conservation Union (IUCN)

Georgiadis, N., Hack, M., Turpin, K (2003). The Influence of Rainfall of Zebra Population Dynamics: Implications for management. *Journal of Applied Ecology* 40 (1) 125-136

Hough, J. (ed) (1982). *Mammals of Malawi.* The Environmental Unit, Department of National Parks and Wildlife, Malawi, within Ansell and Dowsett (1988) above.

Johnson, S.A (1993)., *A Visitors Guide to Nyika National Park, Malawi.* Thembazi [Mbazi] Book Trust, Blantyre

Morrel, V (1994). Serengeti's big cats going to the dogs. *Science* 264: 23

Munthali, S.M., Banda, H.M (1992). Distribution and Abundance of the Common Ungulates of the Nyika National Park, Malawi. *African Journal of Ecology* 30:203-212

Overton, M.J (ed) (2005). *Scientific exploration of the Nyika National Park, Malawi.* Biosearch Nyika, Wayfarer Lodge, Welbourn, Lincolnshire, LN5 0QH, UK

Overton, M.J (ed) (2006). *Scientific exploration of the Nyika National Park, Malawi.* Biosearch Nyika, Wayfarer Lodge, Welbourn, Lincolnshire, LN5 0QH, UK

Primack, R.B (2002). *Essentials of conservation biology, Third Edition*. Sinauer Associates, Sunderland, Massachusetts, U.S.A. Pp 289

Smithers, R.H.N (1986). *Smithers' Mammals of Southern Africa, A Field Guide*, Southern Book Publishers, Rivonia

Appendix 1. Large mammal Field Records (1)

Square	Plot	Grid Ref	Date in August	Altitude in feet	Burnt	Tree Canopy	Grass cover	Bush	Rock	Bare earth	Marsh	Bracken	Slope
Plateau grassland >6000ft													
1	1	919450	7	7500	0	0	25	25	0	20	25	25	
1	2	914450	7	7700	100	0	40			60			
1	3	919453	7	7600	0		100			20			
1	4	913453	7	7650	0		100			30			
2	1	910462	8	7650	0		100						
2	2	917462	8	7500	0		80	10			10	10	
2	3	912464	8	7600	0		100						
2	4	911467	8	7750	0		100						
2	5	910463	8	7600	0	15	90						
3	1	909476	9	7900	0		100			20			
3	2	907474	9	7750	0		100			20			
3	3	903473	9	7800	0		100			20			
3	4	902473	9	7900	0		100			20			
3	5	904471	9	7750	0		30				50	20	
4	1	904468	10	7600	0		100			20			
4	2	908468	10	7900	0		100			20			
4	3	906465	10	7700	0	20	30	50		10			
4	4	909465	10	7750	0		100	15		10			
4	5	909462	10	7650	0		100			20			
5	1	917475	9	7800	0		100			20			
6	1	831425	2	7350	100		30			70			
6	2	830429	2	7500	100		100						
6	3	833424	2	7350	80	5	80	20		40		80	
6	4	832421	2	7272	0		97	1	2				
6	5	838425	2	7275	40	5	100	5			5		
7	1	828408	3	7000	70	30	60	5	1	30			
7	2	824409	3	7100	100		40	5	1	60			W
7	3	828401	4	7250	100		60			40			
7	4	829401	4	7250	100		60			40			
7	5	825402	4	7238	90	5	60	10		30			
25	1	840434	3	7350	0		100						
25	2	845431	3	7450	100		100						
25	3	844430	4	7350	100		85		5			10	
25	4	841432	4	7300	100		100						
25	5	845436	3	7300	0		100						
Relative abundance scores per 50 plots (n=35) Plateau grassland >6000ft													

Square	Plot	Elephant	Eland	Roan Antelope	Kudu	Reedbuck	Bushbuck	Common duiker	Grysbok	Red Forest Duiker	Warthog	Bushpig	Zebra	Leopard	Serval	Hyaena	Jackal	Civet	Baboon	Porcupine	Otter	Aardvark	Mongoose	Hare	Genet	Honey Badger	Vervet monkey	Klipspringer	Wildcat	Rock hare	Cane rat	Mole rat	Mouse	Shrew	Tree squirrel	No. of large mammal species
1	1			2				2				1										2		2							3	3				7
1	2		2	8		17		5			1					1				2		3		8							4	3	8			12
1	3		1	1		2		1			3											3	1								5	3	1			10
1	4			2		3		3			4									3		3	2								3	3	4			10
2	1		1			8														4		1									1	3				6
2	2		3	4		8										1				3			1									3				7
2	3		1	2		2					1									3			2			1						3				8
2	4			3		6		2			6									5		2										3				7
2	5			2		4					5									3		3		3								3				7
3	1		1	2		1		8												3		2	1									3	1			9
3	2		5	2		4						2								1		1									1	3				8
3	3			4		6	5	4			7									3											3	3	3			9
3	4		2	3		3	1	2			3									3		1									3	3	2			11
3	5			1		6		8			8	3								3																6
4	1			5		3		3			5									3		1									3	3				8
4	2		2	4		11	1	2			6									4		1									1	3				10
4	3		5	5		1					3	1				1				3											3	3				9
4	4			2		6		9			1									3		1										4				7
4	5		1	2		1		5			6									4		3										3	2			9
5	1			5		1														3											4					4
6	1	8	5	4		7		2			9	5	3	4		3	1	1				3				2			1							15
6	2		3	13				8				3	2							2		1		2		3										9
6	3		4	3		7	3	9			5	4	3			2						3	3													11
6	4	3	3	3		2	2	1			3						1					3														9
6	5	2	10	8		5	4	2				1	3				2			3		3									1	3	2			14
7	1	5	4	3		5					3		3	1						3		1	3								1	3				12
7	2	7	5	4		6	3					3	3	2		1	1			3		3	3								2	3				15
7	3		9	20		5	1	9				7	3			1						3				1						3	3			12
7	4		11	11		4		2			1	1	9		1					2		1	2			1							3			13
7	5	7	4	9		3	3	4			1	4	3	1		1				4		3	2									3	3			16
25	1		1	1		5		5				3								3		3														7
25	2		5	3		22		10				1	3							3																7
25	3		4	9		23		7					3	1						3		3														8
25	4	3	3	3		7		5				3	4									3														8
25	5	3	4			5		4			3		2				2			1																8
Relative abundance scores per 50 plots (n=35) Plateau grassland >6000ft		54	141	219	0	284	33	174	0	0	120	60	63	13	1	16	10	1	0	119	0	86	29	21	0	11	0	0	1	0	54	100	46	0	0	469

Appendix 2. Large mammal Field Records (2)

Woodland slopes <6000ft

Square	Plot	Grid Ref	Date in August	Altitude in feet	Burnt	Tree Canopy	Grass cover	Bush	Rock	Bare earth	Marsh	Bracken	Slope	
8	1	924521	7	5700	0	20	70			10				
8	2	925522	7	5650	0	30	70			30				
8	3	924524	7	5600	0	30	95			5				
8	4	924528	7	5500	0									
8	5	920528	7	5617	0	40	70			30				
9	1	920506	8	5779	0	40	50	20		50				
9	2	9250	8	5841	0	70	70	5		30				
9	3	9250	8		0	70	70	5		30				
10	1	935522	9	5650	0	90	80			20				
10	2	935519	9	5650	0									
10	3	937513	9	5750	0	70	70			30				
10	4	936513	9	5630	0	5	100	5		30				
11	1	921505	10	5750	0	10	90	10		10				
11	2	922504	10	5800	0	60	80	5		10				
11	3	923504	10	5800	0	60	80	5		10	5			
11	4	928502	10	5850	0	20	80		20	20				
12	1	977568	7	4200	0	50	30			20				
12	2	973569	8	4250	0	90	10	10						
13	1	991582	8	4100	0									
13	2	995580	8	4100	0	50	50							
13	3	999582	8	4000	0		100							
13	4	991587	8	3950	0	60	30			10				
13	5	992585	8	4000	0	60	30			10				
14	1	970572	9	4300	0	90	80			3				
14	2	978570	9	4250	0	70	30			70				
14	3	979577	9	4150	0	80	80							
14	4	979570	9	4250	0		80	40	5	15				
14	5	972571	9	4300	0	50	85			15				
15	1	871597	15	4600	0	80	80	20		10				
15	2	870590	15	4650	0	80	80	20		20				
16	1	867620	16	4650	0	75	90	10						
16	2	860622	16	4450	0	20	90			10				
17	1	866640	16	4400	50	50	100							
18	1	860682	16	4250	0	90	100							
19	1	841684	17	3950	0	80	98			2				
19	2	843685	17	4000	0	70	99			10				
20	1	836708	18	3950	100	50	50	50						
20	2	834702	18	3900	100				30					

Square	Plot	Elephant	Eland	Roan Antelope	Kudu	Reedbuck	Bushbuck	Common duiker	Grysbok	Red Forest Duiker	Warthog	Bushpig	Zebra	Leopard	Serval	Hyaena	Jackal	Civet	Baboon	Porcupine	Otter	Aardvark	Mongoose	Hare	Genet	Honey Badger	Vervet monkey	Klipspringer	Wildcat	Rock hare	Cane rat	Mole rat	Mouse	Shrew	Tree squirrel	No. of large mammal species
8	1	3	1					64				3							1																	5
8	2	4	4									4							3			3														5
8	3	3	1					39											5			1														5
8	4		3					7				3					1		5			1														6
8	5	3	4					9				2		1					6																	6
9	1	3						3				3							3			1		1												6
9	2	2	2					7				1								1																5
9	3	2	3					1				5																								4
10	1	1	6					7				7							1														3			6
10	2		1									3							3																	3
10	3		7					37				3		1					3																	5
10	4		6	2			6	28				3							3						1						22					8
11	1	3	2					17				3							4	3																6
11	2	4						21				1							4																	4
11	3	3					6	7				3			2				4	1																7
11	4	3		3				8				4																								4
12	1							4	1			4							3	3		1														6
12	2						3	3	3			4							3	2																6
13	1				2		1	17				7							4																	5
13	2						1		1			3				3			3																	5
13	3				3		2	2	1			4									1															6
13	4						4	9	2			9							4			1														6
13	5						1	6	2			12							5	1																6
14	1						3	3				5							3	3		1														6
14	2							4	2			5							7																	4
14	3						3	5	5			3							3	3																6
14	4						3	23	10			3							9	1		2														7
14	5				1		1	6	6			10							4	2																7
15	1	3			3			11	1			6				1			4																	7
15	2	4	3	1			2	12	3			6				2			4																	9
16	1	3					2	10	2			5							4																	6
16	2	3			5			2		2		4							5					1												8
17	1				10		7	5				4					1		6																	6
18	1				3		4	3				3							4	1																6
19	1				1		4	4				4							5																	5
19	2				6		7	3				5							5			1	1													7
20	1						1		3			3							3																	4
20	2						8	1	1			3							4					3												6
Relative abundance scores per 50 plots (n=38) woodland <6000ft		62	57	8	45	0	91	511	57	3	0	211	0	3	3	8	3	0	180	28	1	16	1	7	1	0	0	0	0	0	29	0	4	0	0	288
Relative abundance scores per 50 plots (n=12) Sawi alone woodland <5000ft		0	0	0	25	0	92	342	138	0	0	288	0	0	0	13	0	0	200	63	4	21	0	0	0	0	0	0	0	0	0	0	0	0	0	
Relative abundance scores per 50 plots (n=16) Mondwe alone woodland 5-6000ft		106	125	16	0	0	38	797	0	0	0	150	0	6.3	6.3	0	3.1	0	141	16	0	19	0	3.1	3.1	0	0	0	0							

Appendix 3. Large mammal Field Records (3)

Square	Plot	Grid Ref	Date in August	Altitude in feet	Burnt	Tree Canopy	Grass cover	Bush	Rock	Bare earth	Marsh	Bracken	Slope	Elephant	Eland	Roan Antelope	Kudu	Reedbuck	Bushbuck	Common duiker	Grysbok	Red Forest Duiker	Warthog	Bushpig	Zebra	Leopard	Serval	Hyaena	Jackal	Civet	Baboon	Porcupine	Otter	Aardvark	Mongoose	Hare	Genet	Honey Badger	Vervet monkey	Klipspringer	Wildcat	Rock hare	Cane rat	Mole rat	Mouse	Shrew	Tree squirrel	No. of large mammal species
Chisanga Falls Area Around 6000ft																																																
21	1	757357	15	6200	0	5	100	25												1				3																				2				3
21	2	756351	15	6100	0	95		65		5									3	8				3															2									4
21	3	758350	15	6100	0	50	90	5		10				3				1		5				4						3																		5
21	4	750350	15	6100	0	60	80	5	10	5				3					1	1				3							3											1	1					7
21	5	752354	18	6000	0	70	80	50		10									3	8				3								3					4		5				1					7
22	1	755342	16	6450	0	60	20	30	10	10				3					2	21												4					1		3				1			3		8
22	2	759342	16	6500	0		100	20		5					2									3																			3	1				4
22	3	759341	16	6400	0		100	20		5					3									3																			2					3
22	4	753342	16	6450	0	20	15	5	60	15									12	5							1				1	3				2			6									7
22	5	753347	16	6100	0	60	30	25	1	50	1			1					3	6				3								3							4					3				7
23	1	740359	17	5750	0	50	70	25	1	30										1				3							3	3			3				7				2					7
23	2	749354	17	5860	0	50	20	10	50	30			NW							2				3											1			1	8			6	2			1		8
24	1	745344	19	6700	0	60	40	40	20	20										84	1			3							5	2							14	3		4	3					9
24	2	745342	19	6600	0		100	70		5									4	3				3							1	3							3				3	3				8
Relative abundance scores per 50 plots (n=14) Chisanga Falls 6000ft														36	18	0	0	4	100	518	4	0	0	132	0	0	4	0	0	11	46	75	0	0	14	7	18	4	186	11	0	39	64	32	0	14	0	311

KEY:

Square = Random kilometer square, Plot = 100m x 100m

Vegetation is recorded in % cover, in 25% intervals (eg 100 indicates 76-100% cover)

Transects

Transect	Distance of transect	Grid Ref	Date in August	Altitude in feet	Burnt	Tree Canopy	Grass cover	Bush	Rock	Bare earth	Marsh	Bracken	Slope	Elephant	Eland	Roan Antelope	Kudu	Reedbuck	Bushbuck	Common duiker	Grysbok	Red Forest Duiker	Warthog	Bushpig	Zebra	Leopard	Serval	Hyaena	Jackal	Civet	Baboon	Porcupine	Otter	Aardvark	Mongoose	Hare	Genet	Honey Badger	Vervet monkey	Klipspringer	Wildcat	Rock hare	Cane rat	Mole rat	Mouse	Shrew	Tree squirrel	No. of large mammal species
1	5km	799402	3	7000	100									1		1		1		1						2				1		1																7
2	3km	799402	4	6850	0		50	20	10	10	10			2	6	2		3		1										1		3			1													8
3	5km	799402	15	7000	100									2	10	6		4	1	4			3	1			3	3		1		3										3						13
4	0.2km	799402	14	6800	100										3	7		3	4	6					3				2			3				2												9
5	0.1km	799402	14	6800	100										3	3		3	2	4				1	1			3				4	1															10
6	0.1km	799402	14	6800	100										4	5		3	1	5												8																6
7	1.5km	768317	18	7200	100										1	1		1	1	1					6			1				1														1	1	10
8	2km	354 to 739	17	6250	0	60	80	50	10	20														3							1	1			3		2		7									6
9	70km		30											14		4		14		2			1		3				1																			7
10	n/a		3													23			1				2																									3
11	25km	799402	6	7250	80										11	8		1		1			5																									5
12	20km	799402	17	7000	80											28		4		1																												3
13	3 plots (150x200m		14		100									19	2				5					8													4											5
14	2 plots	799402	15	6800	0									1	7									5								2											1	2				6

Appendix 4. Summary of lowland records 1998-2005 (Relative abundance scores per 50 plots)

All July/Aug Expeditions 1998-2007

Lowland below 4,000ft	Elephant	Eland	Roan	Kudu	Reedbuck	Bushbuck	Common Duiker	Grysbok	Red Forest Duiker	Buffalo	Warthog	Bushpig	Zebra	Leopard	Serval	Hyaena	Jackal	Civet	Baboon	Porcupine	Otter	Aardvaark	Mongoose	Hare	Genet	Honey Badger	Vervet Monkey	Klipspringer	No.species
1998 Sawi (40 plots)	63	4	3	66	0	59	210	23	0	39	0	164	0	0	14	25	20	23	71	9	0	46	88	0	0	0	0	0	17
1999 Sawi (50 plots)	14	7	26	5	0	18	204	0	0	3	12	84	0	0	0	2	12	2	88	0	0	13	105	4	0	0	0	0	15
2001 Sawi (25 plots) 4-4,500ft	6	30	28	0	0	0	176	0	0	0	0	68	0	0	0	0	0	10	166	0	0	16	46	0	0	0	0	0	9
2003 Sawi (25 plots)	2	20	4	46	6	164	504	22	0	20		168	2	2	6	2	0	0	324	2	6	26	176	38	0	10	0	0	21
2004 Mpanda (10.5plots) 3-4,000ft	0	0	0	0	0	29	138	10	0	0	0	24	0	10	0	5	0	0	167	5	0	0	38	33	0	0	0	0	10
2005 Chisanga (10 plots) 4-5,000ft	0	0	0	0	0	114	445	0	0	0	0	160	0	0	0	0	0	10	215	0	0	10	175	0	25	0	5	0	8
2007 Sawi (12 plots)	0	0	0	25	0	92	342	138	0	0	0	288	0	0	0	13	0	0	200	63	4	21	0	0	0	0	0	0	10
Slopes 4-6,000ft	Elephant	Eland	Roan	Kudu	Reedbuck	Bushbuck	Common Duiker	Grysbok	Red Forest Duiker	Buffalo	Warthog	Bushpig	Zebra	Leopard	Serval	Hyaena	Jackal	Civet	Baboon	Porcupine	Otter	Aardvaark	Mongoose	Hare	Genet	Honey Badger	Vervet Monkey	Klipspringer	No.species
1998 Chipome (50 plots)	78	51	87	17	0	36	108	3	0	43	10	79	0	6	16	8	24	8	2	3	11	16	38	32	7	0	0	0	22
1999 Chipome (25 plots)	83	144	24	70	1	84	430	0	2	72	59	115	0	0	1	20	32	3	39	1	4	19	95	49	1	0	0	0	22
2001 Chipome (30 plots)	82	8	40	13	0	17	270	20	0	23	0	57	2	0	0	10	0	2	53	0	0	3	20	67	0	0	0	0	16
2003 Chipome (50 plots)	37	24	30	52	6	68	446	81	0	25	0	206	0	2	2	2	0	13	90	12	3	5	107	82	4	0	0	0	22
2004 Mpanda (43.5plots)	3	9	8	24	0	47	106	2	0	5	0	134	0	0	0	2	5	7	159	30	0	6	40	5	0	0	0	0	17
2005 Chisanga (34 plots)	0	0	1	0	4	137	332	0	0	0	0	163	0	1	0	0	0	24	237	1	0	9	107	29	1	10	1	4	16
2006 4 sites (19 plots)	3	0	0	0	0	142	203	0	11	0	0	168	0	0	0	0	3		192	168	0	32	87	0	0	26	10.5	8	13
2007 Chipome (38 plots)	62	57	8	45	0	91	511	57	3	1	0	211	0	3	3	8	3	0	180	28	1	16	1	7	1	0	0	0	21
2007 Mondwe alone (16 plots)	106	125	16	0	0	38	797	0	0	0	0	150	0	6	6	0	3	0	141	16	0	19	0	3	3	0	0	0	14
Plateau 6-7,500ft	Elephant	Eland	Roan	Kudu	Reedbuck	Bushbuck	Common Duiker	Grysbok	Red Forest Duiker	Buffalo	Warthog	Bushpig	Zebra	Leopard	Serval	Hyaena	Jackal	Civet	Baboon	Porcupine	Otter	Aardvaark	Mongoose	Hare	Genet	Honey Badger	Vervet Monkey	Klipspringer	No.species
1998 Chipome	14	78	38	0	33	20	12	0	3	0	47	39	2	2	2	14	9	2	0	16	6	46	14	15	1	0	0	0	21
1999 Chipome	97	158	24	75	1	102	634	0	2	75	71	199	0	0	1	22	44	5	127	1	4	32	200	53	1	0	0	0	22
2001 Chipome (25 plots)	10	9	2	0	9	1	2	1	1	0	0	67	0	2	0	1	0	0	0	0	0	51	4	1	0	0	0	0	14
2003 Chipome (50plots)	29	40	0	0	26	59	73	10	0	0	0	118	0	7	0	0	5	4	0	50	1	84	27	30	0	0	0	0	15
2004 Mpanda (17plots)	0	0	27	14	0	150	9	0	0	0	0	123	0	0	0	0	0	0	77	18	0	5	27	0	0	5	0	0	10
2005 Chisanga (29 plots)	162	212	202	0	183	86	164	0	0	0	53	174	79	12	2	7	0	2	33	145	0	9	117	52	7	9	5	55	22
2006 4 sites (29 plots)	14	219	197	0	129	203	174	0	0	0	0	160	66	2	3	5	7	2	0	102	0	5	60	76	7	17	0	57	20
2007 Plateau (35 plots)	54	141	219	0	284	33	174	0	0	0	120	60	63	13	1	16	10	1	0	119	0	86	29	21	1	11	0	0	20
2007 Chisanga alone(14 plots)	36	18	0	0	4	100	518	4	0	0	0	132	0	0	4	0	0	11	46	75	0	0	14	46	18	4	186	11	18
RA/ 50 plots (n=38) woodland <6000ft	62	57	8	45	0	91	511	57	3	1	0	211	0	3	3	8	3	0	180	28	1	16	1	7	1	0	0	0	21
RA/50 plots (n=12) Only Sawi woodland <5000ft	0	0	0	25	0	92	342	138	0	0	0	288	0	0	0	13	0	0	200	63	4	21	0	0	0	0	0	0	10
RA/50 plots (n=16) Only Mondwe woodland 5-6000ft	106	125	16	0	0	38	797	0	0	0	0	150	0	6	6	0	3	0	141	16	0	19	0	3	3	0	0	0	14

VEGETATION COMMUNITIES

Steven Mphanda, James Hebron and James Herbert

THE SPECIATION AND VARIATION OF PLANT LIFE

The Nyika Plateau forms a high grassy island at the head of a split in the Great Rift Valley, Lake Malawi down wooded hills to the east and the Luangwa Valley to the West. Raised mainly above 6000 and 7000 feet, the Nyika has an isolation that has led to speciation. The Nyika is classified as one of Africa's centres of Plant Diversity (WWF and IUCN 1994). Over 1,800 species of plants are recorded on the plateau and its foothills. There are 33 endemic plant species, found only on the Nyika. A further 13 species are near-endemic, found here and on just a few other mountaintops. Most species of the Nyika are associated with grasslands and 44% of the species in the top ten genera are orchids. None of the endemics are trees. Most have adaptations which enable them to withstand grassland fires, such as underground storage organs. Nevertheless, *Brachystegia* woodlands and pockets of evergreen forest make up an estimated 60% and 3% of the Park, respectively. (Sabonet 2005)

In this study the main aim was to explore plant life associated with differing ecosystems and to consider the links between plant life and wildlife. Certain animals may use very particular types of plant, so by knowing a particular plant species habitat it can help find these animals. Using line transects to look at the plant species present, enables the geological profile of a slope to be recorded and conclusions drawn to the plant life depending upon the gradient of the slope. This technique can also show the progressive succession between plant species where one ecosystem merges into another. By exploring montane grassland and evergreen forest habitats, Miombo and Dambo areas, a large variety of plants can be found.

The plant life of Nyika National Park is of huge importance in sustaining habitats for often rare and endangered animals. Some insects and animals travel long distances to feed on the rare plant species the park has to offer. It is for this reason that it is important to conserve and protect these plant species by taking samples for storing in the international seed banks. Using relative abundance scores an indication of species population and survivorship can be given in a particular habitat. With forest fires all too apparent around these areas, the information obtained can help preserve species for the future.

Figure 1 *Aeschynomene sp*. was the specific food of the larvae of the Acrididae butterflies and here a brilliantly camouflaged Praying Mantis lies in wait for insect prey amongst the sticky glandular pods. *Hilary Strickland*

METHODOLOGY

The objective of the study is to initially look at the plant species variety and succession patterns at different gradients and environments. We decided use line transects to demonstrate the change with slope. This method involves moving down a slope at intervals of constant depth, identifying and recording the plant species at each point. By using a measuring tape, the ground distance covered from the last point of interest to the next could be recorded, plotted in a graph and used with the abundance of plant species found.

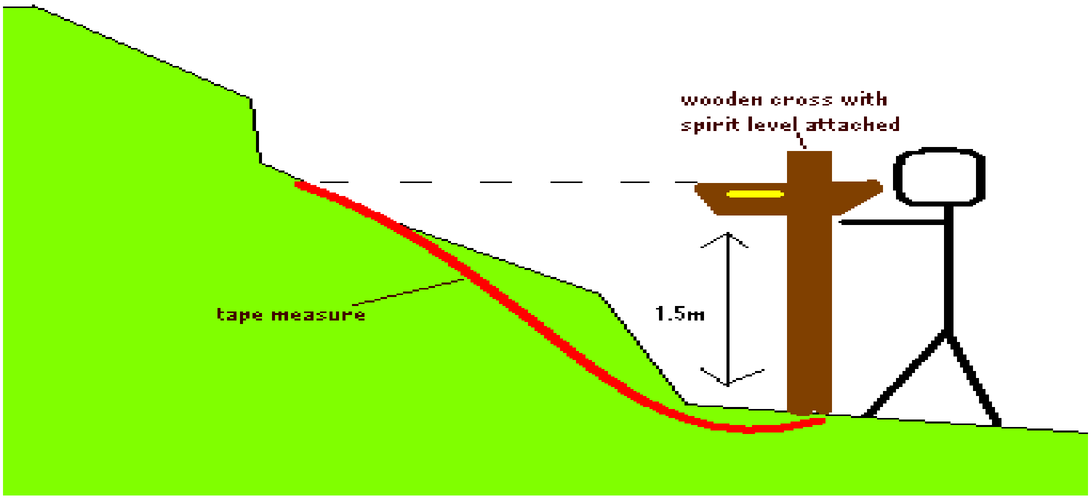


Figure 2a and b Line transect method *James Herbert*

In most cases the vertical distance used was 1.5m. This was seen to cover enough area to show a difference in species, whilst not compromising the accuracy of the results. This vertical distance however did change slightly in some cases due to the gradient and nature of the slope. At each point a 2m x 2m quadrat square was used as a representative sample of the area. Where species could not initially be identified, specimens were taken for later identification with the help of Steven Mphamba and the rest of the Forestry Research Institute of Malawi (F.R.I.M).

All transects were based on a random selection depending on where the sample point fell, but slight horizontal adjustment ensured that it was reasonably representative of the overall nature of the habitat involved. The gradient can then be plotted and the corresponding abundance of species using kite diagrams. These abundance scores ranged from 1 to 10. The species being very densely populated in the area scored 10 and 1 represented only a single individual being found. Due to the magnitude of the results, a conclusive graph displaying all species found could not be used. Instead the graphs show species that have appeared in more than one plot on the same line transect. Although this primarily looks at the dominant species, it is the dominant species that primarily make up the habitat.

Figure 3 Identifying Orchid *Calanthe sylvatica* for contribution to the Millennium Seed Bank *Marianne Overton*

Whilst undertaking this method, a watchful eye was cast on any species around the area of particular interest that have not been previously recorded. Tree and shrub species were hard to include in the line transect as it mainly looked at ground cover, so to cope with this the canopy layer was also included in the 2m x 2m quadrat. Along with this, dominant species of all plants were noted along with specific observations. These included the altitude, direction of slope and the situation. All can give us an indication as to why certain species are found whilst other are not.

THE HABITATS

Montane plateau

Figure 4 Montane Plateau above 6000ft *James Herbert*

Most if not all of the highland areas studied had been burned. This made plant identification hard at times, as plants had not begun flowering yet. These areas are unsheltered and at high altitude, where temperatures fall below freezing point. The soils are acidic and receive very little rainfall for long periods of the year. Along with the constant threat of animals grazing, plant species need to be resilient to survive.

Miombo or *Brachystegia* Woodland

The miombo areas make up the majority of the Mondwe Valley and are apparent for their dense *Brachystegia* woodland. Soils in this area are also poor and very dry. Whilst some areas have been burnt in the Mondwe Valley, most of the area remains untouched, with its dry baron grassland. The area often has a steep rocky profile covered only by thin layers of soil at times. This occurs below 6000ft, except on the wetter Eastern escarpments.

Figure 5 Miombo habitat; here roots exposed by erosion forming deep gulleys
Marianne Overton

Dambo wetlands

Dambo's are wetland areas usually found near streams and rivers. In the Modwe valley they account for most of the area's plant species diversification. They consist of predominantly herbaceous flora and are dominated often by Cyperaceae (sedge family). Plants associated include The Giant Lobelia (John Burrows and Christopher Willis, 2005).

Figure 6 Dambo area, here dominated by Giant Lobelia *Lobelia milbraedi*

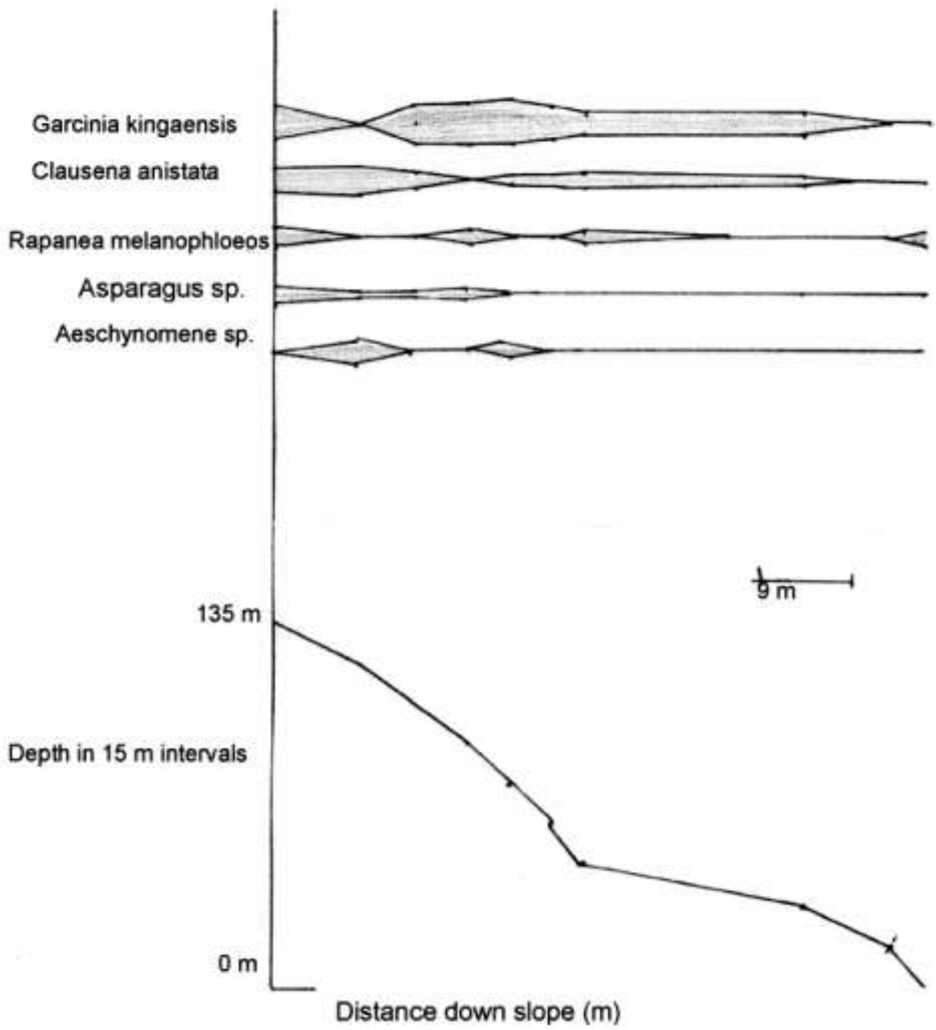
Evergreen forest

The evergreen forests are located on the highlands. Due to forest fires their locations are often sheltered from that of wind and extreme sun exposure. They require better soil than the *Brachystegia* woodlands and so can be found around Dambo areas. Dominant plant species include *Garcia kingaensis* and *Clausena inisata.*

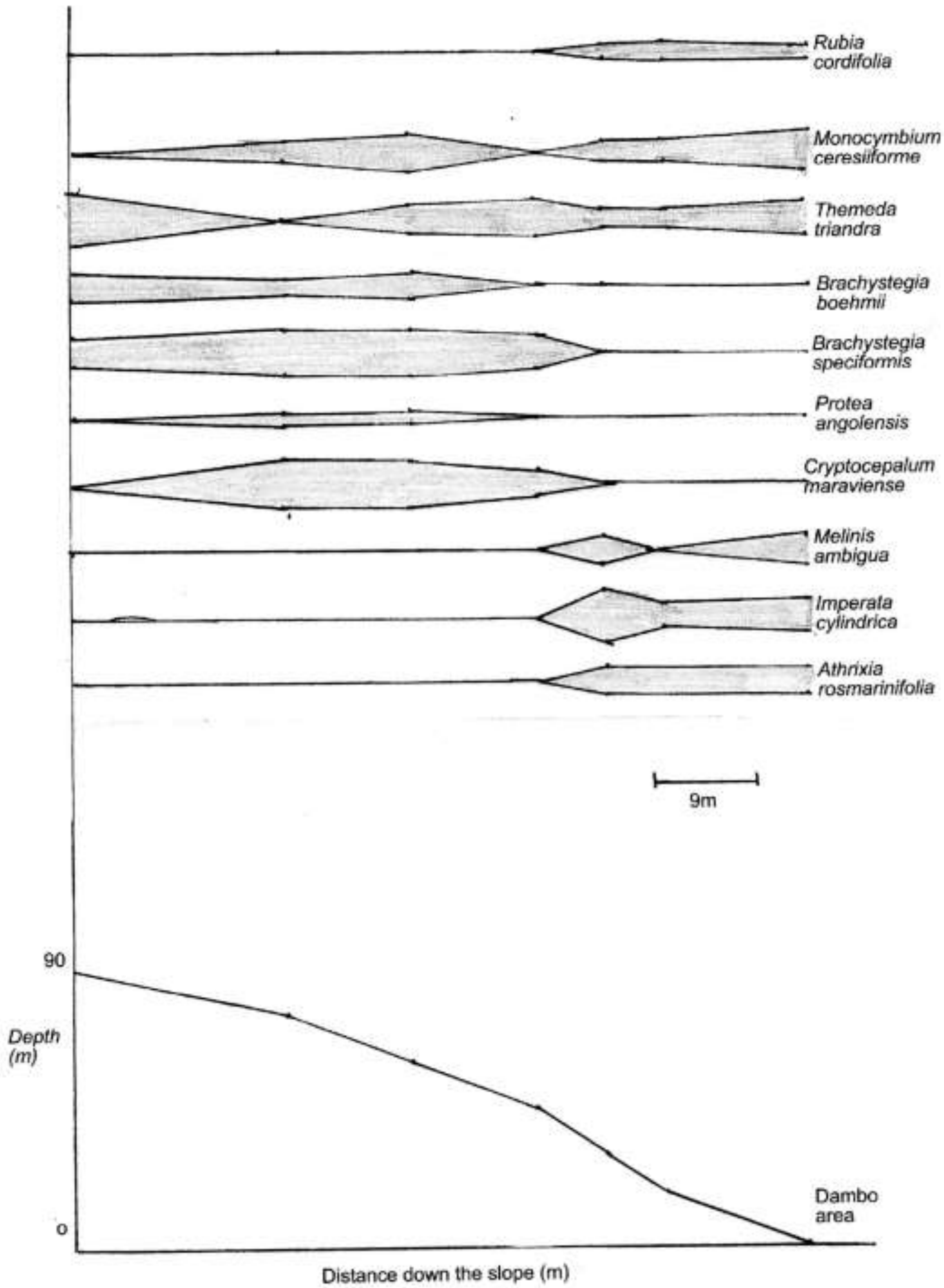
Figure 7a and b Steven collecting seeds for the Millennium Seed Bank from the evergreen forest patch close to our first base camp on the Nyika Plateau *Marianne Overton*

Figure 8 Evergreen forest patch on the Nyika Plateau, a walk from our first base camp, contained tree squirrel and signs of elephant. *Marianne Overton*

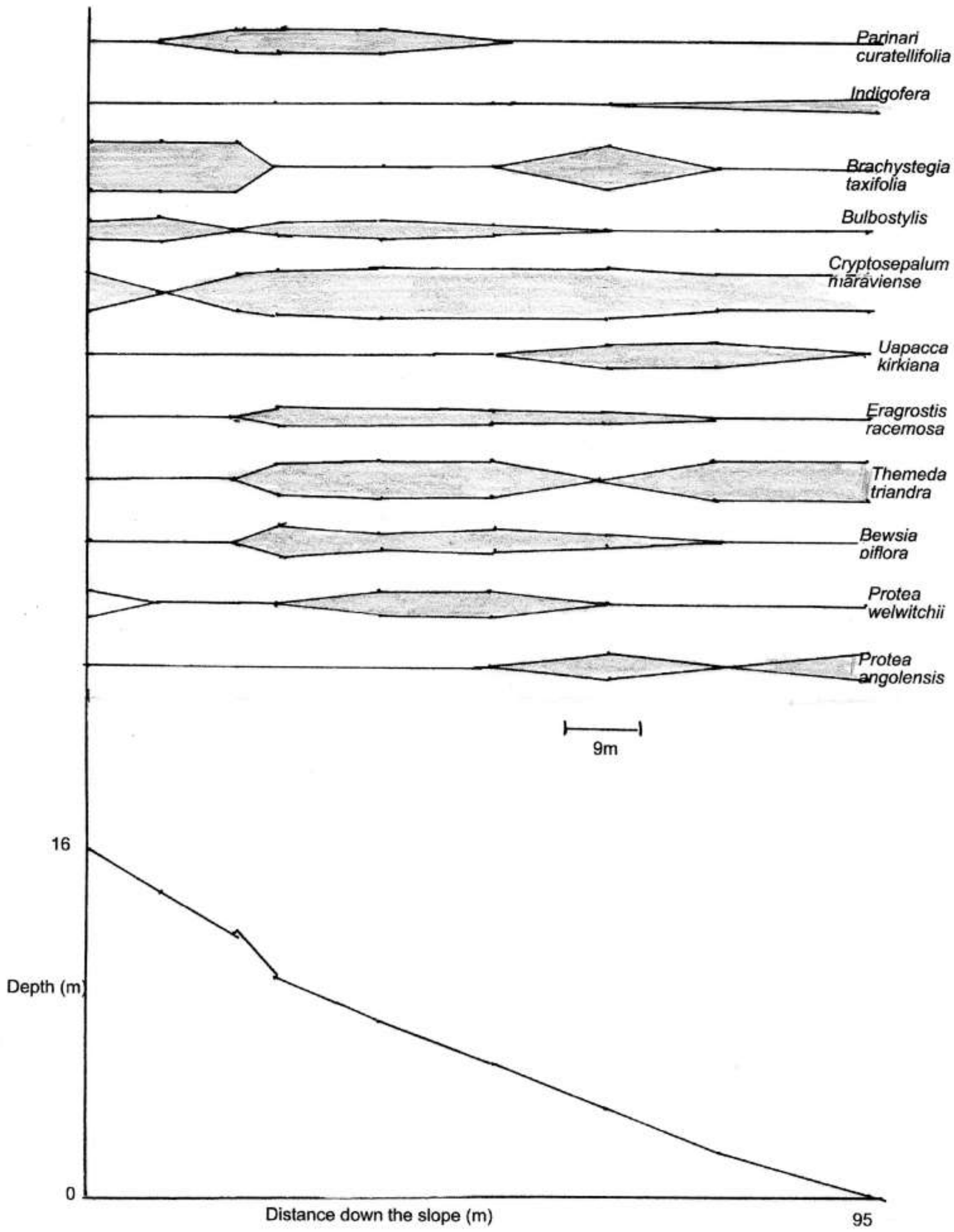
Graph 1 Evergreen Species Kite Diagram with Slope Profile



Graph 2 Slope Profile and Species Kite Diagram
Map references 922504 to 923504



Graph 3 Slope Profile and Species Kite Diagram
Map reference 937519



IDENTIFICATION

Whilst identification of species was one of the more difficult tasks, especially in a remote location such as the Nyika National Park, where we were uncertain of our identification, samples were taken out in plant presses for checking later**.** Once identified, with some degree of confidence, the details were e-mailed to England and matched with photographs.

ANALYSIS

The differing habitats produced a range of plant life around the Nyika National Park, particularly in the Mondwe valley. Tables 3 and 4, along with graphs 2 and 3 show cases of zonation, succession, inter-specific and intra-specific competition.

In Graph 2 the relationship in terms of location between *Brachystegia bohemii* and *Brachystegia spiciformis* is apparent. Both survive on the less steep slope, higher up the hillside where there is less competition from other tree species. The trees have adapted to cope with the harsh environment. The *Brachystegia* species found were usually found together, with the exception of *Brachystegia taxifolia*. This species was able to dominate high rocky outcrops, where others failed. It seems that *B taxifolia* is able to withstand the harsh conditions and thrive without inter-specific competition from its counterparts. The steep gradient of the slope, (as in graph 3) requires long roots to keep trees stable and obtain water in these conditions.

Figure 9 Young leaves emerging red on *Brachystegia spiciformis,* Mondwe Valley *Marianne Overton*

Figure 10 *Brachystegia taxifolia* forming a shaded grove of stunted trees on higher rocky slopes, Mondwe Valley *Marianne Overton*

The habitat variation in the Mondwe valley can be seen clearly in graph 3. *Brachystegia taxifolia* starts as the dominant species. After 20m down the slope the *Brachystegia taxifolia's* numbers quickly decrease. With this decrease comes the introduction of grasses like *Themeda triandra* and trees such as *Parinari curatellifolia.* More evidence that *Brachystegia taxifolia* survives where others do not, and on the steepest part of the slope (graph 3). The species abundance then changes again further down the slope with the re-introduction of *Brachystegia taxifolia* and another type of tree, *Uapaca kirkiana*. Between 68 and 80 metres the *Uapaca* species thrives. This may be due to the species preferring lowland forest, growing in clearings and gaps (www[1]).

Figure 11 Ripening fruits of *Uapaca kirkiana,* Mondwe Valley *Marianne Overton*

Cryptosepalum maraviense thrived in areas of dry soil (graph 2) away from dense grass and shrub layers, scoring high average relative abundance scores in both tables 3 and 4. The species seemed to have either high population numbers in certain areas or no trace of the species at all. This shows a very narrow spectrum for adaptation and alteration.

The Dambo habitat and the species within it can be seen on graph 2. Species such as *Melinis ambigua, Imperata cylindrica* and *Athrixia rosmarinfolia* all seemed to grow well deep into the Mondwe Valley. The graph shows the zonation between species very clearly with all the species changing except for grasses as the slope progresses from a *miombo* to a dambo area. These flora and fauna need plenty of water and so cope well with better conditions.

In graph 1 the dominant evergreen species show little variation, as the area is dense, well developed forest protected by a fire break. It had time to develop and establish tall trees such as *Garcinia kingaensis*. Little variation is seen throughout the line transect, only perhaps on the outsides of the forest where sunlight can be found. Very tall grasses and ground coverage was found here, sheltered by dense upper canopy.

Figure 12 Standing amid fresh elephant droppings, photographer Chris Neal teases Daniel and Marianne outside the leopard's forest lair.

Animal and plant interactions were found throughout the study. Smaller animals and insects like the 'Plant Pot Wasp' used *Aeschynomene spp* to produce small nests. Other large animals used trees and forests. On the highlands a leopard's layer was found in evergreen forest, sheltered from the sun. Also in this region Elephant damage was found where the elephant had been eating a lone *Maesa lanceolata*, a tall tree that had managed to survive the intense fires that had encroached.

BIBLIOGRAPHY

www[1] - http://www.fao.org/docrep/X5327e/x5327e1r.htm
J.Barrows, C.Willis Plants of the Nyika Plateau (2005), South African Botanical Diversity Network Report N^{o} 31
Lawson George .W, John Plant Ecology in West Africa (1985), Systems and Processes, Wiley and Sons ltd

RESULTS

TABLE 1 Montane plant species list
Key Montane grasslands 1; Miombo 2; Dambo 3; Evergreen forest 4

Species	Locations Found
Aeschynomene spp	1,2,3,4
Aeschynomene nyassana	2
Aeschynomene oligophylla	
Adiantum spp	4
Adiantum porettii	
Alcalypha spp	1,4
Allophylus abyssinicus	
Afrocarum imbricate	1
Agarista salicifolia	1
Anisopappus spp	1,2
Anisopappus chinensis	1
Andropogon spp	1
Antherotoma naudinii	2
Anthrixia rosmarinfolia	2,3
Arthropteris spp	4
Asparagus spp	4
Aster spp	2
Aristida junciformis	
Atermisia atra	1
Berkheya spp	1,2
Berkheya zeyheri	1
Bewisea biflora	2
Biophytum spp	2
Biophytum nyikense	2
Blepharis grandis	2
Brachypodium flexum	
Brachystegia boehmii	2
Brachystegia floribunda	2
Brachystegia speciformis	2
Brachystegia taxifolia	2
Bridria micricrantha	3
Brillantaisia spp	
Buddleja salicifolia	1
Bulbostylis spp	2
Cirsium buchwaldii	1
Clausena inisata	4
Combretum molle	2
Commelina spp	2
Conyza aegyptiaca	
Cryptosepalum maraviense	2
Cyperus spp	1
Cyperus angolensis	2
Cyperus leptocladus	
Cythia spp	3
Dalbergia nyassae	2
Dicoma spp	2
Dicoma anomala	2
Digitalia spp	2
Diospyros whteana	1,4
Dissotis princes	3
Dissotis speciosa	2
Droogmansia pteropus	2
Elephantopus scaber	1,3
Emeria spp	2
Emilia spp	2
Emirlia integrifolia	2
Eragrostis spp	2
Eragrostis racemosa	2
Erica benguelenis	2
Erica benguelensis	2
Eriocaulon spp	1
Eriosema affine	
Eugenia spp	1
Euphoribia spp	1
Fadogia spp	2
Faurea rochetiana	2,3
Faurea saligna	2
Garcinia kingaensis	4
Geniosporum paludosum	
Gnidea spp	1,2
Gnidea goetzei ?	1
Gnidia involucrata	
Halleria lucida	
Hebenstratia angolensis	2
Helichrysum spp	1,2,3
Helichrysum nitens	1
Heteromorpha spp	1
Heteromorpha arborescens	2
Hypericum quartinianum	
Hypericum revolutum	1
Hypoestes spp	4
Hypoestes forskaolei	
Hyporrenia spp	1,2,3,4
Hypoxis spp	1
Hypoxis goetzei	1
Imperata cylindrica	3
Indigofera spp	2
Inula spp	1,2
Isobelinia angolensis	2
Julbernadia paniculata	2
Kohautia coccinea	2

Table 1 (Continued)	
Lanea discolour	2
Lepedagandhis sparsiceps	2
Lethalis grandis	2
Lobelia heyneana	
Loudetia simplex	1
Macaranga lapensis	4
Maesa lanceolata	1,4
Maytenus senegalesis	1,4
Melinis spp	2,3
Melinis ambigua	2,3
Melinis nerviglumis	1,2
Monocymbium ceresiiforme	1,2,3
Moraea macrantha	
Morella salicifolia	1,4
Neoboutonia macrocalyx	4
Ochna spp	2
Ozoroa insigns	2
Panicum spp	1,3,4
Parinari curatellifolia	2
Pentanesia schweinfurthi	1
Pentas spp	2
Phragmites mauritianus	2
Phyllanthus spp	2
Piper capensis	
Plectranthus spp	1
Polygala exelliana	
Protea spp	1,2
Protea angolensis	2
Protea heckmania	1
Protea welwitshii	2
Psorosperum febrifugum	2
Psychotria spp	4
Psychotria peduncularis	
Pteridium aquilinum	1
Pycnostachys urticifolia	
Rapanea melanophloes	4
Rhamnus priniodes	4
Rhus spp	2,3,4
Rubia cordifolia	3
Satureja spp	2
Schistostephium artemisiifolium	
Sida spp	2
Smilex anceps	4
Spermacose spp	
Stomatanthes africanus	
Syzygium cordatum	3,4
Tapiphyllum spp	2
Themeda triandra	1,2,3
Torenia goetzei	
Trachypogon spicatus	1
Trichilia spp	4
Trichopteryx fruticulosa	
Trideria spp	2
Tristachya bequaertiii	
Veronia spp	1,4
Vernonia melleri var. superba	
Vernonia wollastonii	
Uapaca kirkiana	2

Note: Plant species without locations are ones that have either been recorded randomly or sent away for identification.

Table 2 Evergreen forest species

Downwards sloping area with dambo at the bottom. Area sheltered from wind and extreme sun exposure due to its deep valley situation. Quadrats taken every 1.5m, starting at the top of the slope.

Species	**Average Score**
Aeschynomene spp	3
Adiantum spp	1
Alcalypha spp	2
Arthropteris spp	5
Asparagus spp	1.8
Clausena inisata	2.8
Diospyros whteana	1
Garcinia kingaensis	6.3
Table 2 continued	
Hypoestes spp	6
Macaranga lapensis	2
Maesa lanceolata	2
Maytenus senegalesis	2
Morella salicifolia	5
Neoboutonia macrocalyx	2
Panicum spp	1
Psychotria spp	2
Rapanea melanophloes	2.3
Rhamnus priniodes	2
Rhus spp	3.5
Smilex anceps	1
Syzygium cordatum	3
Trichilia spp	4.7
Trideria spp	2.5
Veronia spp	6

Table 3: Mondwe Valley (922-504/923-504)

A downwards-sloping South to North directional area leading to a river at the bottom. Quadrats started in a Miombo area before leading to a Dambo area (hence some of the diversity in plant species).

Species	Average Relative Abundance Score (out of 10)
Aeschynomene spp	1.5
Anasopapas spp	3.3
Andropogon spp	4
Anthrixia rosmarinfolia	4
Aster spp	1
Bewisea biflora	2
Brachystegia boehmii	3.3
Brachystegia floribunda	2
Brachystegia speciformis	5.8
Bridria micricrantha	4
Bulbostylis spp	6
Commelinaceae spp	4
Cryptosepalum maraviense	6
Cythia spp	3
Digitalia spp	1
Dissotis princeps	6
Droogmansia pteropus	2
Elephantopus scaber	4.7
Eragrostis racemosa	1.8
Faurea rochetiana	2
Gnidea spp	2
Helichrysum spp	3
Imperata cylindrica	5.7
Melinis spp	2
Melinis ambigua	4
Monocymbium ceresiiforme	4.2
Ozoroa insigns	1
Panicum spp	2
Parinari curatellifolia	3.5
Phragmites mauritianus	6
Protea angolensis	2
Rhus spp	6
Rubia cordifolia	2.3
Syzygium cordatum	2
Themeda triandra	4.8

TABLE 4: Mondwe Valley Species Table (937-519)

Compass bearings: S 10° 23.118, E033° 51.247
West to East heading downhill at an initial altitude of 5642ft.
Each quadrat was taken every 2m in depth.

Species	Average Relative Abundance Score (out of 10)
Aeschynomene .sp	3
Andropogon .sp	2
Antherotoma naudinii	2.5
Bewisea biflora	3.4
Biophytum nyikense	3
Brachystegia taxifolia	7.7
Bulbostylis .sp	2.8
Combretum molle	2
Cryptosepalum maraviense	6.9
Droogmansia pteropus	1
Elephantopus scaber	2
Emeria .sp	1
Emilia .sp	1
Eragrostis racemosa	2.6
Erica benguelenis	2
Faurea saligna	2
Helichrysum .sp	3.3
Indigofera .sp	1.5
Kohautia coccinea	1
Melinis nerviglumis	4
Monocymbium ceresiiforme	4
Parinari curatellifolia	4
Pentas .sp	1
Plectranthus .sp	2
Protea angolensis	4
Protea welwitshii	4
Sida .sp	1
Tapiphyllum .sp	3.3
Themeda triandra	5.8
Uapaca kirkiana	4

NEW PARK RECORDS

Figure 1 New Park Record confirmed near Chisanga Falls; Candelabra *Euphorbia ingens GPS* 155 6038m 10º32.416'S 33º 41.311'E *Marianne Overton*

Figure 2 Unidentified specimen 132 New Park record? *Quincy Connell*

Figure 3 Steven with new Park record confirmed near Chisanga Falls *Albisia adianthifolia GPS* 155 6038m 10º32.416'S 33º 41.311'E *Marianne Overton*

1 Dombeya burgessiae Sterculiaceae

2 Cyperus angolensis Cyperaceae

1

3 Spermacoce dibrachiata Rubiaceae

4 Aster bakerianus Asteraceae

5 Berkeya zeyheri Asteraceae

6 Calanthe sylvatica Orchidaceae

7 Vernonia gerberiformis Asteraceae

8 Identification unsure

9 Hypoxis goetzei Hypoxidaceae

10 Pentanisia schweinfurthii Rubiaceae

11 Ipomoea sp. Convolvulaceae

12 Blepharis grandis Acanthaceae

13 Vigna unguiculata Papilionoideae

14 Dissotis princeps Melastomataceae

15 Protea angolensis Proteaceae

16 Ficus verruculosa Moraceae

17 Vernonia praemorsa Asteraceae

18 Cyperus nduru Cyperaceae


19 Hypoxis goetzei Hypoxidaceae


20 Biophytum nyikense Oxalidaceae


21 Aeschynomene oligophylla Papilionoideae


22 Kotschya aeschynomenoides Papilionoideae


23 Hypericum quartinianum Guttiferae


24 Indigofera mimosoides Papilionoideae


25 Dicoma plantaginifolia Asteraceae


26 Hibiscus rhodanthus Malvaceae


27 Lepidaganthis sparsiceps Acanthaceae


28 Syzygium cordatum Myrtaceae


29 Myrica salicifolia Myrtaceae


30 Rhus natalensis Anacardiaceae


31 Tecomaria capensis Bignoniaceae


32 Vernonia wollastonii Asteraceae


33 Fadogia stenophylla Rubiaceae


34 Hypoxis villosa Hypoxidaceae


35 Thunbergia alata Acanthaceae

36 Vernonia melleri Asteraceae

37 Athrixia rosmarinifolia Asteraceae

38 Gerbera viridiflora Asteraceae

39 Kalanchoe elizae Crussuraceae

40 Helichrysum kirkii Asteraceae

41 Emilia coccinea Asteraceae

42 Biophytum nyikense Oxalidaceae

43 Osteospermum monocephalum Asteraceae

44 Morea schimperi Liliaceae

45 Holostylon baumii Labiatae

46 *Hibiscus debeerstii* Malvaceae

47 Indigofea atriceps Papilionoidae

48 Pycnostachys urticifolia Labiatae

49 Humalaria descampsii Papilionoideae

50 Moraea natalensis Iridaceae

51 Cyperus nduru Cyperaceae

52 Trichodesma physaloides Boraginaceae

53 Vigna sp. (r.h. plant unknown)

54 Gnidia chrysantha Thymelaeaceae

55 Chamaecrista kirkii Papilionoideae

56 Aeschynomene oligophyla Papilionoideae

57 Aeschynomene oligophyla Papilionoideae

58 Impatiens assurgens Balsaminaceae

59 Cineraria grandiflora Asteraceae

60 Holostylon katangense Labiatae

61 Lobelia heyneana Lobeliaceae

REVISED 2006 LIST OF PLANT SPECIES

We are grateful to Dr R. Brummitt of Kew Herbarium for amendments to spellings and identification of our published list of plants in the 2006 report.

Plants identified in the Fingira area in 2006

Plant name	Sq	pl	% cover	Ra
Artemisia afra	1	1		
Berkheya zeyheri	1	1	2	1
Clematis villosa	1	1	20	3
Clutia whytei	1	1	2	1
Dombeya burgessiae	1	1	10	2
Eriosema ellipticum	1	1	50	4
Helichrysum plantaginifolium [correct name H. nudifolium]	1	1	5	1
Helichrysum kirkii	1	1	10	2
Hyparrhenia cymbaria	1	1	2	1
Inula glomerata	1	1	5	1
Maytenus	1	1	5	1
Protea welwitschii	1	1	5	1
Spermacoce dibrachiata	1	1	5	1
Stomatanthes africanus	1	1	2	1
Themeda triandra	1	1	80	5
Thunbergia lancifolia	1	1	5	1
Andropogon eucomus	1	2	25	3
Argyrolobium africanum	1	2	15	2
Eriosema ellipticum (see above)	1	2	2	1
I suspect Polygala but can't find an imbricata	1	2		
Loudetia simplex	1	2	75	5
Melinis repens	1	2	5	1
Protea angolensis	1	2	5	1
Pteridium aquilinum	1	2	2	1
Stomatanthes africanus (see above)	1	2	20	3
Dombeya burgessiae	1	3	20	3
Eriosema montanum	1	3	2	1
Hyparrhenia cymbaria	1	3	80	5
Imperata cylindrica	1	3	10	2
Inula glomerata	1	3	2	1
Lippia plicata	1	3	20	3
Melinis repens	1	3	50	4
Psophocarpus ?lancifolius	1	3	10	2
Sonchus ?? oleraceus	1	3	2	1
Syzygium guineense	1	3	2	1
Croton macrostachyus	1	3		
Brachystegia taxifolia	2	1	5	1
Crassula alba	2	1	1	1
Droogmansia pteropus	2	1	5	1
Eragrostis sp.	2	1	75	5
Loudetia simplex	2	1	50	4
Protea angolensis	2	1	7	2
Vernonia sp.	2	1	5	1
Allophylus africanus	2	2	5	1
Arthropteris sp.	2	2	1	1
Brachystegia taxifolia	2	2	10	5
Carex sp.	2	2	15	3
Clematis sp.	2	2	1	1
Nelsonia sp.	2	2	20	3
Syzygium guineense subsp. afromontanum	2	2	5	1
Albuca sp.	2	3	1	1
Clematis villosa	2	3	5	1
Dolichos kilimandscharicus	2	3	10	2
Eriosema ellipticum	2	3	20	3
Hyparrhenia cymbaria	2	3	50	5
Imperata cylindrica	2	3	30	4
Inula glomerata	2	3	1	1
Lippia plicata	2	3	15	3
Melinis repens	2	3	15	3
Protea petiolaris	2	3	10	2
Psophocarpus sp.	2	3	5	1
Pteridium aquilinum	2	3	10	2
Smilax anceps	2	3	5	1
Themeda triandra	2	3	20	3
Clutia whytei	2	4	5	1
Eriosema ellipticum	2	4	45	4
Fadogia sp.	2	4	5	1
Helichrysum kirkii	2	4	15	2
Hyparrhenia cymbaria	2	4	30	3
Imperata cylindrica	2	4	5	1
Inula glomerata	2	4	10	2
Lippia plicata	2	4	5	1
Pimpinella sp.	2	4	1	1
Pteridium aquilinum	2	4	5	1
Themeda triandra	2	4	70	5
Alepidea peduncularis	3	1	20	3
Andropogon eucomus	3	1	5	1
Clutia whytei	3	1	5	1
Dierama ?? longistylum	3	1	5	1
Eriosema ellipticum	3	1	10	2
Melinis repens	3	1	75	4
Protea angolensis	3	1	5	1
Themeda triandra	3	1	80	5
Albuca	3	2	1	1
Arthropteris sp.	3	2	2	1
Berkheya zeyheri	3	2	2	1
Clutia whytei	3	2	4	1
Crotalaria goetzei	3	2	1	1
Cussonia arborea	3	2	1	1
Dombeya burgessiae	3	2	5	1

Droogmansia pteropus	3	2	10	2
Helichrysum kirkii	3	2	10	2
Hyparrhenia cymbaria	3	2	60	5
Imperata cylindrica	3	2	1	1
Inula glomerata	3	2	15	2
Lippia plicata	3	2	10	2
New Compositae (Sample to Zomba)	3	2	1	1
Ozoroa insignis subsp. reticulata	3	2	5	1
Protea angolensis	3	2	20	3
Themeda triandra	3	2	40	4
Bothriocline longifolia	3	3	5	1
?? Platostoma	3	3	1	1
Cussonia arborea	3	3	1	1
Helichrysum kirkii	3	3	10	2
Helichrysum plantaginifolium [correct name H. nudifolium]	3	3	5	1
Hyparrhenia filipendula	3	3	5	1
Protea angolensis	3	3	10	2
Rubia sp.	3	3	20	3
Stomatanthes africanus	3	3	1	1
Sopubia ?eminii	3	3	2	1
Themeda triandra	3	3	80	5
Thunbergia lancifolia	3	3	10	2
Becium grandiflorum	3	4	1	1
Bothriocline longifolia	3	4	10	2
Clematis sp.	3	4	1	1
Eriosema ellipticum	3	4	10	2
Helichrysum kirkii	3	4	5	1
Loudetia simplex	3	4	10	2
Monocymbium ceresiiforme	3	4	60	5
Protea angolensis	3	4	10	2
Stomatanthes africanus	3	4	3	1
Themeda triandra	3	4	40	4
Thunbergia lancifolia	3	4	5	1
Vernonia sp.	3	4		1
Bothriocline sp.	4	1	10	2
Brachystegia sp.	4	1	4	1
Clematis sp	4	1	5	1
Gnidia kraussiana	4	1	5	1
Crassocephalum sp.	4	1	2	1
Dicoma [can't match]	4	1	3	1
Droogomansia pteropus	4	1	1	1
Erica benguelensis	4	1	2	1
Exotheca abyssinica	4	1	10	2
Faurea rochetiana	4	1	1	1
Helichrysum kirkii	4	1	10	2
Indigofera sp	4	1	1	1
Tephrosia ? ??interrupta ?	4	1	1	1
Themeda triandra	4	1	60	5
Alectra sessilifolia	4	2	5	1
Aspilia mossambicensis	4	2	5	1
Bothriocline longifolia	4	2	5	1
Brachystegia boehmii	4	2	3	1
Buchnera sp.	4	2	5	1
Gnidia kraussiana	4	2	20	2
Clematis sp.	4	2	5	1
Dombeya rotundifolia	4	2	5	1
Erica benguelensis	4	2	2	1
Eriosema ellipticum	4	2	5	1
Exotheca abyssinica	4	2	20	2
Helichrysum longifolium	4	2	5	1
Hyparrhenia cymbaria	4	2	5	1
Indigofera sp.	4	2	5	1
Inula glomerata	4	2	2	1
Julbernardia globiflora	4	2	25	3
Monotes africana	4	2	5	1
Protea angolensis	4	2	3	1
Spermacoce dibrachiata	4	2	2	1
Tephrosia interrupta ?	4	2	1	1
Themeda triandra	4	2	60	5
Uapaca robynsii	4	2	25	3
Andropogon eucomus	4	3	20	3
Apiacea family	4	3	2	1
Bothriocline longifolia	4	3	2	1
Brachystegia spiciformis	4	3	20	3
Brachystegia boehmii	4	3	5	1
Buchnera sp.	4	3	3	1
Campanulaceae family	4	3	4	1
Ginidia kraussiana	4	3	2	1
Crotalaria goetzei	4	3	5	1
Erica benguelensis	4	3	40	5
Erythrocephalum zambesianum	4	3	2	1
Faurea rochetiana	4	3	5	1
Faurea saligna	4	3	2	1
Helichrysum nudifolium	4	3	6	1
Indigofera sp.	4	3	1	1
Themeda triandra	4	3	10	2
Vernonia whyteana	4	3	3	1
Becium grandiflorum	4	4	1	1
Brachystegia boehmii	4	4	1	1
Cassia sp.	4	4	2	1
Commelina africana	4	4	2	1
Droogmansia pteropus	4	4	5	1
Exotheca abyssinica	4	4	2	1
Helichrysum buchananii	4	4	1	1
Helichrysum kirkii	4	4	5	1
Loudetia simplex	4	4	40	4
Monotes africana	4	4	25	3
Spermacoce dibrachiata	4	4	2	1
Tephrosia interrupta ?	4	4	2	1
Themeda triandra	4	4	60	5
Uapaca robynsii	4	4	10	2
Zonotriche inamoena	4	4	5	1

APPENDIX II

PLANTS IDENTIFIED NEAR ZUNGWARA

Plants	sq	pl	% cover	Rank
Aeschynomene africana	1	1		
Bothriocline longipes	1	1	5	1
Eriosema ?psoraleoides	1	1	1	1
Exotheca abyssinica	1	1	5	1
Helichrysum nudifolium	1	1	10	2
Inula glomerata	1	1	2	1
Loudetia simplex	1	1	5	1
Stomatanthes africanus	1	1	5	1
Thesium whytei	1	1	60	5
Bothriocline longipes	1	2	4	1
Exotheca abyssinica	1	2	5	1
Helichrysum nudifolium	1	2	10	2
Loudetia simplex	1	2	5	1
Stomatanthes africanus	1	2	3	1
Thesium whytei	1	2	60	5
Buddleja salviifolia	1	3	30	3
Helichrysum patulifolium	1	3	40	4
Hyparrhenia cymbaria	1	3	18	2
Indiogofera sp.	1	3	5	1
Loudetia simplex	1	3	10	1
Panicum sp.	1	3	10	1
Pteridium aquilinum	1	3	70	5
Rhynchosia sp.	1	3	6	1
Rubia sp.	1	3	10	1
Rubus rigidus	1	3		
Rumex abyssinicus	1	3	8	1
Setaria sphacelata	1	3	10	1
Tecomaria capensis	1	3	10	1
Bothriocline longipes	1	4	5	1
Stomatanthes africanus	1	4	5	1
Thesium whytei	1	4	70	5
Bothriocline longipes	1	5	6	1
Carduus sp.	1	5	10	2
Clematis villosa	1	5	3	1
Clematis sp.	1	5	10	2
Euphorbia depauperata	1	5	1	1
Exotheca abyssinica	1	5	10	2
Helichrysum kirkii	1	5	5	1
Helichrysum splendidum	1	5		
Melinis repens	1	5	50	5
Spermacoce dibrachiata	1	5	5	1
Stomatanthes africanus	1	5	5	1
Themeda triandra	1	5	50	5
Thunbergia petersiana	1	5	2	1
Alepidea gracilis	2	1	1	1
Andropogon eucomus	2	1	5	1
Berkheya zeyheri	2	1	2	1
Biophytum nyikensis	2	1	5	1
Eragrostis sp.	2	1	2	1
Erigeron sp.	2	1	5	1
Euphorbia sp.	2	1	3	1
Exotheca abyssinica	2	1	30	4
Galium sp.	2	1		
Helichrysum nudifolium	2	1	3	1
Hypoxis goetzei	2	1	2	1
Loudetia simplex	2	1	50	5
Protea heckmanniana	2	1	1	1
Spermacoce dibrachiata	2	1	2	1
Thesium whytei	2	1	4	1
Eragrostis sp.	2	2	5	1
Exotheca abyssinica	2	2	50	5
Helichrysum nudifolium	2	2	1	1
Hypoxis goetzei	2	2	1	1
Loudetia simplex	2	2	50	5
Protea heckmanniana	2	2	1	1
Stomatanthes africanus	2	2	3	1
Artemisia afra	2	3	40	4
Asparagus virgatus	2	3	2	1
Blepharis grandis	2	3	2	1
Bothriocline longipes	2	3	10	2
Buddleja salviifolia	2	3	50	5
Diplolophium buchananii	2	3	10	2
Helichrysum herbaceum	2	3	3	1
Hypoestes capitata	2	3	1	1
Imperata cylindrica	2	3	10	2
Kniphofia grantii	2	3	1	1
Psoralea sp.	2	3	3	1
Rhynchosia sp.	2	3	5	1
Rubia sp.	2	3	5	1
Rubus sp.	2	3	2	1
Tecomaria capensis	2	3	25	3
Vernonia cinerea	2	3	5	1
Cussonia spicata	2	4		
Cyphostemma sp.	2	4		
Maesa lanceolata	2	4		
Myrica serrata	2	4		
Mystroxylon aethiopicum	2	4		
Nuxia sp.	2	4		
Syzygium guineense	2	4		
Alepidea gracilis	2	5	10	2
Artemisia afra	2	5	5	1
Asparagus racemosus	2	5	3	1

Buddleja salviifolia	2	5		
Clematis simensis	2	5	1	1
Galium sp.	2	5	5	1
Geniosporum sp.	2	5	20	3
Geranium sp.	2	5	4	1
Gerbera sp.	2	5	5	1
Guizotia scabra	2	5	10	2
Helichrysum longifolia	2	5	5	1
Helichrysum setosa	2	5	5	1
Hyparrhenia cymbaria	2	5	5	1
Imperata cylindrica	2	5	10	2
Indiogofera lyallii	2	5	5	1
Inula glomerata	2	5	1	1
Panicum sp.	2	5	10	2
Pteridium aquilinum	2	5	5	1
Setaria sphacelata	2	5	1	1
Alepidea gracilis	3	1	3	1
Berkheya zeyheri	3	1	10	2
Bothriocline longipes	3	1	5	1
Clutia whytei	3	1	10	2
Droogmansia pteropus	3	1	5	1
Dyschoriste sp.	3	1	2	1
Euphorbia depauperata	3	1	1	1
Geniosporum sp.	3	1	10	2
Gladiolus dallenii	3	1	1	1
Gloriosa superba	3	1	1	1
Inula glomerata	3	1	3	1
Leonotis can't match	3	1	10	2
Melinis repens	3	1	2	1
Rhus longipes	3	1	1	1
Themeda triandra	3	1	50	5
Trichodesma physaloides	3	1	3	1
Vernonia cinerea	3	1	3	1
Andropogon eucomus	3	2	10	2
Bothriocline longipes	3	2	5	1
Clematis villosa	3	2	5	1
Helichrysum nudifolium	3	2	5	1
Loudetia simplex	3	2	20	3
Melinis repens	3	2	10	2
Parinari curatellifolia	3	2	50	5
Stomatanthes africanus	3	2	5	1
Artemisia afra	3	3	10	2
Berkheya zeyheri	3	3		
Blumea alata	3	3	2	1
Bothriocline longipes	3	3	5	1
Buddleja salviifolia	3	3	10	2
Cyphostemma sp.	3	3	2	1
Diplolophium buchananii	3	3	2	1
Dombeya burgessiae	3	3	20	3
Dombeya rotundifolia	3	3	2	1
Euphorbia (Sample to Zomba)	3	3	2	1
Heteromorpha trifoliata	3	3	1	1
Hyparrhenia cymbaria	3	3	20	3
Hyparrhenia rufa	3	3	5	1
Ipomoea sp.	3	3	2	1
Lippia sp.	3	3	5	1
Psorospermum sp.	3	3	10	2
Rhoicissus tridentata	3	3	30	4
Rhus longipes	3	3	50	5
Rumex abyssinicus	3	3	2	1
Solanum sp.	3	3	2	1
Tecomaria capensis	3	3		
Thunbergia alata	3	3	2	1
Aeollanthus sp.	3	4	3	1
Albuca sp.	3	4	1	1
Alepidea gracilis	3	4	5	1
Andropgon eucomus	3	4	80	5
Arthrospermum sp.[can't find this]	3	4	4	1
Berkheya zeyheri	3	4	5	1
Blumea alata	3	4	5	1
Bothriocline longipes	3	4	5	1
Buddleja salviifolia	3	4	5	1
Clematis villosa	3	4	2	1
Helichrysum herbaceum	3	4	10	2
Heteromorpha trifoliata	3	4	5	1
Kniphofia sp.	3	4	2	1
Melinis repens	3	4	10	2
Pentanisia (Sample to Zomba)	3	4	6	1
Protea angolensis	3	4	5	1
Spermacoce dibrachiata	3	4	5	1
Stomatanthes africanus	3	4	5	1
Themeda triandra	3	4	20	3
Trichodesma physaloides	3	4	1	1
Inula glomerata	3	5	5	1
Themeda triandra	3	5	5	1
Bothriocline longipes	3	5	5	1
Melinis repens	3	5	5	1
Clematis villosa	3	5	2	1
Hyparrhenia cymbaria	3	5	5	1
Tecomaria capensis	3	5	2	1
Blumea alata	3	5	5	1
Stomatanthes africanus	3	5	3	1
Pteridium aquilinum	3	5	50	5
Blepharis grandis	3	5	40	4
Helichrysum setosum	3	5	5	1

APPENDIX III

PLANTS IDENTIFIED NEAR WOVWE

Plant	sq	pl	% cover	rank
Brachystegia allenii	1	1		
Annona senegalensis	1	1		
Asparagus racemosus	1	1		
Brachystegia floribunda	1	1		
Combretum collinum	1	1		
Combretum molle	1	1		
Desmodium repandum	1	1		
Dolichos kilimandscharicus	1	1	2	1
Droogmansia pteropus	1	1	28	3
Hyparrhenia cymbaria	1	1	50	5
Inula glomerata	1	1	2	1
Themeda triandra	1	1		
Vernonia (sample to Zomba)	1	1	2	1
Eriosema affine	1	2	5	1
Erythrocephalum zambesianum	1	2	1	1
Gnidia glauca	1	2	2	1
Helichrysum herbaceum	1	2	10	2
Hyparrhenia cymbaria	1	2	20	3
Inula glomerata	1	2	10	2
Maytenus buchananii	1	2	2	1
Protea sp.	1	2		
Pterocarpus angolensis	1	2		
Temnocalyx obovata	1	2	2	1
Themeda triandra	1	2	80	5
Brachystegia floribunda	1	3		
?Crepisephala [can't find this] mossambicensis	1	3	5	1
Desmodium repandum	1	3	5	1
Dicoma sessiflora	1	3	5	1
Dolichos kalimandscharicus	1	3		
Droogmansia pteropus	1	3	20	3
Erythrocephalum ?thunbergianum	1	3		
Helichrysum kirkii	1	3	20	3
Hyparrhenia cymbaria	1	3	10	2
Indigofera lyallii	1	3	2	1
Inula glomerata	1	3	5	1
Monotes africana	1	3		
Pennisetum unisetum	1	3	10	2
Protea petiolaris	1	3	3	1
Pterocarpus angolensis	1	3		
Temnocalyx obovata	1	3	2	1
Themeda triandra	1	3	10	2
Thunbergia lancifolia	1	3	5	1
Vernonia (Sample to Zomba)	1	3	5	1
Annona senegalensis	1	5		
Aspilia mossambiceniss	1	5	5	1
Bridelia mollis	1	5		
Clematis villosa	1	5	5	1
Combretum molle	1	5		
Dalbergia lactea	1	5		
Dioscorea dumetorum	1	5		
Dombeya shumpangii ?[can't match]	1	5		
Faurea saligna	1	5	2	1
Imperata cylindrica	1	5	10	2
Inula glomerata	1	5	5	1
Lippia plicata	1	5	10	2
Smilax kraussiana	1	5	5	1
Andropogon eucomus	2	1	50	5
Arthrixia rosmarinifolia	2	1	5	1
Clematis villosa	2	1	5	1
Clerodendrum myricoides	2	1	5	1
Combretum fragrans	2	1	5	1
Dolichos kilimandscharicus	2	1	5	1
Eriosema affine	2	1	5	1
Helichrysum Sample to Zomba)	2	1	3	1
Helichrysum kirkii	2	1	10	2
Heteromorpha trifoliata	2	1	2	1
Inula glomerata	2	1	10	2
Lightfootia ?variegata	2	1	3	1
Lippia plicata	2	1	5	1
Protea petiolaris	2	1	5	1
Spermacoce dibrachiata	2	1	2	1
Themeda triandra	2	1	50	5
Thesium whytei	2	1	4	1
Thunbergia lancifolia	2	1	5	1
Acalypha sp.	2	2	1	1
Aspilia mossambicensis	2	2	4	1
Blepharis grandis	2	2	2	1
Brachystegia spiciformis	2	2		
Catha edulis	2	2	5	1
Clematis villosa	2	2	1	1
Dolichos kilimandscharicus	2	2	3	1
Droogmansia pteropus	2	2	5	1
Helichrysum kirkii	2	2	10	2
Heteromorpha trifoliata	2	2	3	1
Hyparrhenia cymbaria	2	2	5	1
Hypoestes forssakaolii	2	2	10	2
Imperata cylindrica	2	2	1	1
Inula glomerata	2	2	3	1
Lightfootia ?variegata	2	2	1	1
Lippia plicata	2	2	1	1
Rhus longipes	2	2	2	1
Tecomaria capensis	2	2	10	2
Themeda triandra	2	2	5	1
Uapaca kirkiana	2	2	1	1
Vernonia sp.	2	2	10	2
Aeschynomene sp.	2	3	1	1
Clematis villosa	2	3	1	1

Cryptosepalum maraviense	2	3	2	1
Dalbergia nitidula	2	3	2	1
Dicoma sessiflora	2	3	4	1
Droogmansia pteropus	2	3	1	1
Erythrocephalum zambesianum	2	3	2	1
Eriosema affine	2	3	3	1
Helichrysum kirkii	2	3	5	1
Imperata cylindrica	2	3	1	1
Indigofera lyallii	2	3	1	1
Inula glomerata	2	3	5	1
Monotes africana	2	3		
Pycnostachys stuhlmannii	2	3	1	1
Themeda triandra	2	3	10	2
Thunbergia lancifolia	2	3	1	1
Uapaca kirkiana	2	3		
Vernonia (Sample to Zomba)	2	3	1	1
Becium grandiflorum	3	1	2	1
Blumea alata	3	1	5	1
Brachystegia floribunda	3	1	10	2
Clematis villosa	3	1	5	1
Cryptosepalum maraviense	3	1	5	1
Dolichos kilimandscharicus	3	1	5	1
Erythrocephalum zambesianum	3	1	5	1
Galium sp.	3	1	2	1
Helichrysum nudifolium	3	1	5	1
Hyparrhenia cymbaria	3	1	30	4
Indogofera lyallii	3	1	3	1
Inula glomerata	3	1	5	1
Lippia plicata	3	1	5	1
Melinis repens	3	1	20	3
Tephrosia (Sample to Zomba)	3	1		
Tephrosia interrupta ?	3	1	10	2
Themeda triandra	3	1	70	5
Uapaca kirkiana	3	1	10	2
Acalypha ornata	3	2	5	1
Annona senegalensis	3	2	50	5
Crotalaria natalitia	3	2	5	1
Desmodium repandum	3	2	20	3
Dicliptera sp.	3	2	50	5
Hyparrhenia cymbaria	3	2	30	4
Indigofera lyallii	3	2	3	1
Lippia plicata	3	2	20	3
Rhus longipes	3	2	5	1
Smilax kraussiana	3	2	10	2
Themeda triandra	3	2	20	3
Blumea alata	3	3	5	1
Brachystegia floribunda	3	3		
Crotalaria ?erecta	3	3	5	1
Cussonia sp.	3	3	2	1
Droogmansia pteropus	3	3	5	1

Eriosema affine	3	3	2	1
Erythrocephalum zambesianum	3	3		
Helichrysum kirkii	3	3	3	1
Hyparrhenia cymbaria	3	3	70	5
Indigofera lyallii	3	3	10	2
Inula glomerata	3	3	5	1
Pennisetum unisetum	3	3	5	1
Tephrosia interrupta ?	3	3	3	1
Themeda triandra	3	3	5	1
Thunbergia petersiana	3	3	5	1
Uapaca kirkiana	3	3		
Vernonia (Sample to Zomba)	3	3	5	1
Alepidia gracilis	3	4	5	1
Bothriocline longipes	3	4	5	1
Brachystegia floribunda	3	4		
Brachystegia longifolia	3	4	10	2
Crotolaria natalitia	3	4	50	4
Cryptosepalum maraviense	3	4	15	2
Cussonia sp.	3	4	5	1
Eriosema affine	3	4	5	1
Erythrocephalum zambesianum	3	4	5	1
Helichrysum kirkii	3	4	10	2
Hyparrhenia cymbaria	3	4	30	3
Hypoestes forsskaolii	3	4	5	1
Indigofera lyallii	3	4	10	1
Inula glomerata	3	4	5	1
Lippia plicata	3	4	5	1
Tephrosia interrupta ?(Sample to Zomba)	3	4	5	1
Themeda triandra	3	4	60	5
Uapaca kirkiana	3	4	50	4
Becium grandiflorum	3	5	10	2
Bothriocline longipes	3	5		
Brachystegia floribunda	3	5		
Cryptosepalum maraviense	3	5	10	2
Cyphostemma sp.	3	5	1	1
Eriosema affine	3	5	10	2
Erythrocephalum zambesianum	3	5	5	1
Faurea saligna	3	5	10	2
Helichrysum kirkii	3	5	50	5
Hyparrhenia cymbaria	3	5	40	4
Inula glomerata	3	5	5	1
Monotes africana	3	5		
Pennisetum unisetum	3	5	10	2
Pterocarpus angolensis	3	5		
Tephrosia interrupta ?	3	5	10	2
Themeda triandra	3	5	60	5
Thunbergia petersiana	3	5	5	1

APPENDIX IV

PLANT SPECIES FOUND IN EVERGREEN FOREST PATCHES

Plant species identified in forest 1, Fingira. 6985 +/- 56ft 10°43.515 S, 33°47.623 E

Species	DBH (cm)	% cover	rank
Allophyllus africanus	67		
	37+3		
	2+1.5		
	5+6		
	42+2		
	2+68		
	+24+		
	18		
	12+3		
Clerodrendrum sp.	10		
	1.2		
Bersama abyssinica	22+2		
	6+32		
	22+8		
	24		
Olinia rochetiana	12+3		
Cyperus sp.		50	5
?Nelsonia canescienis		30	3
Bersama abyssinica		20	2
Clerodendrum		2	1
Stephania abyssinica			
Kalanchoe sp.			
Heteromorpha trifoliata			

Plant species identified on the outside edge of forest 1, Fingira area

Species	DBH (cm)	% cover	rank
Abutilon sp.	5	2	1
Argyrolobium sp.		3	1
Artemisa afra	6.5	20	3
Blepharis grandis		5	1
Buddleja salvifolia	9		
?Cosmosa [??]		15	3
Cyperus sp.		3	1
Dombeya burgessiae	10	15	3
Galium sp.		5	1
Geniosporum		20	3
Helichrysum longifolium		15	3
Hyparrenia cinbera		4	1
Leonotis nepetifolia		60	5
Nelsonia canescens		60	5
Panicum		13	2
Pteridium aquilinum		7	1
Vernonia adoensis		20	3

Plant species identified inside forest 2, Fingira area. 7206 +/- 64ft, 10° 43.231 S, 33° 48.126 E

Species	DBH (cm)	% cover	Rank
Myrica serata	58		
	133+110		
Nuxia oppositia	+24		
Syzigium guineense	46		
	10		
	9		
	7		
	9+6		
	6		
	5		
Cissus	2		
	18+7		
	+16		
Keetia	+12+13		
	10		
Diospyros ?zombensis	4		
Ochna holstii			
Arthopteris sp.		5	1
Maesa lanceolata		5	1
Asparagus africanus		1	1
Acalypha sp.		10	2
Anisotes sp.		1	1
Nuxia sp.		1	1
Diospyros ?zombensis		1	1

Plant species identified on the outside edge of forest 2, Fingira area. 7282ft 10°43.115 S, 33° 48.085 E

Species	DBH (cm)	% cover	rank
Argyrolobium sp.		5	1
Artemisia afra		20	2
Blepharis grandis		5	1
Buddleja salviilifolia		2	1
Blumea alata		3	1
Dombeya burgessiae		6	1
Dyschoriste sp.		5	1
Guizotia scabra		1	1
Helichrysum longifolia		30	3
Indigofera sp.		3	1
Kniphoffia sp.		5	1
Pteridium aquilinum		60	5
Solanum nigrum		10	2
Sparrmannia ricinocarpa		15	2
Stephania abyssinica		3	1
Themeda trianda		20	2

Plant species identified inside forest 3, Fingira area. 7129=/- 31ft, 10° 43.119 S, 33° 47.835 E

Species	DBH (cm)	% cover	rank
Buddeja salicifoilia	27		
Psydrax whytei	5+8+7		
Diosporos zombensis	8+7+5		
Syzygium guineense	409		
Rapanea ?melanophloeos	5		
	3		
	2		
	6		
Diospyros ?guinensis	8+2+2		
	3+5+2 9+10+ 4+5		
Maytenus heterophylla	12		
Adiantum sp.		10	2
Arthopteris sp.		5	1
?Diospyros zombensis		1	1
Oplismenus sp.		1	1
Panicum sp.		2	1
Rapanea melanophloeos		3	1

Plant species identified on the outside edge of forest 3, Fingira area

Species	DBH (cm)	%cover	rank
Acalypha cvan't match			
Allophyllus africanus		10	2
Ageratum ?houstonianum			
Arthropteris sp.			
Clematis simensis			
Clutia whytei			
Cyperus sp.			
Diospyros ?zombensis			
Dissotis princeps	5+6	30	3
Geranium whytei			
Helichrysum longifolium			
Hyparrhenia sp.			
Rubus iringanus		10	2
Stephania abyssinica			
Vernonia porphyrolepis			

Plant species identified inside of forest 4, Fingira area. 7099 =/- 24ft, 10° 43.231 S, 33° 47.825 E

Species	DBH (cm)	%cover	rank
Rapanea melanophloes	28		
	34		
	35		
	26		
	30		
	9		
Syzygium cordatum	12		
	16		
Ekebergia sp.	11+21		
	9+12+4 +7		
Allophyllus chaunostachys	9		
	5+3+ 6+4+4+ 4+3		
Osyris sp.	35+24 +14		
	5		
Diospyros zombensis	10+9+5	5	1
Dissotis princeps		10	1
Pteridium aquilinum		20	2
Adiantum sp.		6	1
Panicum sp.		7	1
Cyperus sp.		10	1

Plant species identified on the outside edge of forest 4 7099 +/- 66ft, 10° 43.231 S, 33°47.825 E

Species	DBH (cm)	% cover	rank
Artemisia afra		15	2
Themeda triandra		60	5
Blepharis grandis		5	1
Dombeya burgessiae		50	4
Pteridium aquilinum		10	2
Indigofera sp.		2	1
Hyparrhenia cymbaria		20	3
Allophylus africanus		2	1
Melinus repens		2	1
Bothriocline longifolia		2	1
Rhynchosia sp. (pink)		2	1
Guizotia scabra		2	1
Leonotis nepetifolia		10	2
Helichrysum longifolium		2	1

Plant species identified inside of forest 5, Juniper area. 7508 =/- 36ft, 10°44.741 S, 33°54.175 E

Species	DBH (cm)	% cover	rank
Myrica sp.	169		
Syzygium guineense	231		
	238		
	129		
	18		
	62		
	52		
	6.5		
Diospyros sp.	4		
Podocarpus sp.	31		
	15		
	4		
	12+7		
Maytenus sp.	53+7+5		
Apodytes dimidiata	52.5		
Psychotria sp.	3.5+10+8		
Rapanea sp.	4.5		
Asparagus africanus		1	1
Cyperus sp.		40	5

Plant species identified on the out side edge of forest 5, Juniper area 7551 =/- 25ft,10° 44.654 S, 33° 54.226 E

Species	DBH (cm)	%cover	rank
Dombeya ?florida			
Cyperus sp.		5	1
Commelina africana		15	2
?Cyanodysum [what is this ?]		1	1
Cyperus sp.		20	2
Clausena anisata		15	2
Erica benguelensis		5	1
Eragrostis sp.		20	2
Geranium sp.		2	1
Hebenstretia sp.		2	1
Hypericum revolutum		5	1
Impatiens sp.		4	1
Indigofera sp.		2	1
Maesa lanceolata		1	1
Panicum sp.		10	1
Pimpinella ?whytei		1	1
Pteridium aquilinum		40	4
Rhynchosia trifolia		70	5
Sparrmannia ricinocarpa		1	1

Plants identified in the inside of forest 6, Juniper area, 7495 +/- 34ft, 10° 44.998 S 33° 54.384

Species	DBH (cm)	% cover	rank
Syzyium guineense	4.5		
	3		
Apodytes dimidata	48		
	27		
Psychotria sp.	2.5		
	3		
	4		
	5.5		
	5.5		
	4		
	5		
Bersama abyssnica	130		
Strychnos sp.	6		
	13		

Plants identified on the outside edge of forest 6, Juniper area

Species	DBH (cm)	% cover	rank
Chlocephalum sp		5	1
Cyperus		20	2
Exotheca abyssinica		10	1
Hebenstretia		10	1
Loudetia simplex		10	1
Psychotria stuhlmannii		20	2
Rhynchosia sp.		40	5
Senecio sp.		15	2
Sonchus ??		15	2
Tecomaria sp.		20	2

Plants identified on the southwest edge of Juniper forest. 7308 +/- 35ft, 10° 45.288 S, 33°53.170 E

Species	DBH (cm)	% cover	rank
Acalypha ornata		2	2
Arthrixia sp.		5	1
Bothriocline longifolia		2	1
Clutea whytei		2	1
Dyschoriste sp.		1	1
Dicliptera sp.		2	1
Euphorbia depauperata		2	1
Helichrysum longifolium		10	1
Helichrysum plantaginifolium		4	1
Hypoestes forskaolii		5	1
Juniperus procera		10	1
Melinus repens		5	1
Maesa lanceolata		30	4
Nuxia sp.		30	4
Pteridium aquilinum		45	5
Tecomaria capensis		10	1
Tephrosia sp.		1	1

Plants identified inside of juniper forest. 7300ft 10°45.288 S, 33°53.175°E

Species	DBH (cm)	% cover	rank
Strychnos sp.	227		
	40		
Juniperus procera	471		
	381		
	279		
	325		
	261		
	375		
	279		
Erythroxylum sp.	14.5		
	7		
	11.5		
	13		
	15.5		
	5		
	5		
	14.5		
Nuxia sp.	233		
	50		
?Rawsonia lucida	6		
Asparagus africanus		1	1
Cyperus sp.		1	1
Clausena anisata		5	1
Hypoestes forsskaolii		5	1
Clausena anisata		5	1
Psychotria sp.		5	1
Podocarpus sp.		1	1
Diospyros sp.		1	1

APPENDIX V

Plants identified in Dambo regions

Plants identified in Dambo region 1, Juniper area. 7462 +/- 28ft 10°44.863 S, 33°54.355 E

Species	%cover	rank
Bothriocline sp.	10	1
Carduus sp.	2	1
Cyathea sp.tree fern	5	1
Cyperus sp.	5	1
Desmodium sp.	5	1
Galium sp.	2	1
Geniosporum sp.	8	1
Guizotia scabra	70	5
Helichrysum sp. (sample taken)	5	1
Leonotis nepetifolia	2	1
?Psorea	20	2
Selago sp.	15	2
Setaria grandis	5	1

Plants identified in Dambo region 2, Juniper area. 6909 +/- 50ft, 10°44.855 S, 33°53.015 E

Species	%cover	rank
Agarista salicifolia		
Allophyllus chaunostachyus	2	1
Asparagus sp.	1	1
Buddleja salviifolia		
Catha edulis	1	1
Clausiena sp.	1	1
Cyperus sp. (big leaf)	10	1
Cyphia dregeana		
Diospyros ?whyteana	2	1
Euphorbia depauperata	1	1
Heteromorpha trifoliata	2	1
Hypoestes forsskaolii	2	1
Ilex mitis		
Kalanchoe sp.	6	1
Liliaceae family	30	3
Lobelia mildbraedii	50	4
Panicum sp.	10	1
Rapanea sp.	3	1
Rhamnus ?priniodes		
Setaria anceps	10	1

Note:

All plant identification has been done by Hassam Patel with transcription by Laura Miller. Inevitably, under expedition conditions, there will be some inaccuracies but all names have been checked against the SABONET Guide for spelling consistency.

Where we have mentioned a genus not in this guide we place a question mark in front of the genus. This may signify a new species for the park, an old name no longer used, a specimen taken to Zomba for clarification or simply a mis-understanding at the point of writing down the record. Where the genus seems sound but the species does not appear in the guide then the question mark appears in front of the specific name; again the same criteria apply.

No attempt has been made to do ecological analysis with the appendix data at this stage. However, it is hoped that the precise location reference and relative frequency of each species will prove useful for future potential atlas mapping of the park.

REFERENCES

All previous Biosearch reports, Contact Biosearch www.biosearch.org.uk

Burrows, J.E. & Willis,C.K. (eds) 2005. *Plants of the Nyika Plateau; an account of the vegetation of the Nyika National Parks of Malawi and Zambia.* Southern Africa Botanical Diversity Network Report No. 31 SABONET, Pretoria.

Baumann, Günter, 2005 *Photographic guide to wildflowers of Malawi* Wildlife and Environmental Society of Malawi Bag 578, Limbe, Malawi

Moriarty, Audrey 1975 Wildflowers of Malawi Purnel & Sons, 70 Keerom St, Cape Town, South Africa

BOTANICAL DRAWINGS

Hilary Strickland

Gerbera viridiflora
Asteraceae

Vernonia gerberiformis
Asteraceae

Platostoma rotundifolium
Lamiaceae

Unidentified

Pentanisia schweinfurthii
Rubiaceae

Vigna unguiculata
Papilionoideae

Blepharis grandis
Acanthaceae

Dewildemania Sp?
Asteraceae

Emilia coccinea
Asteraceae

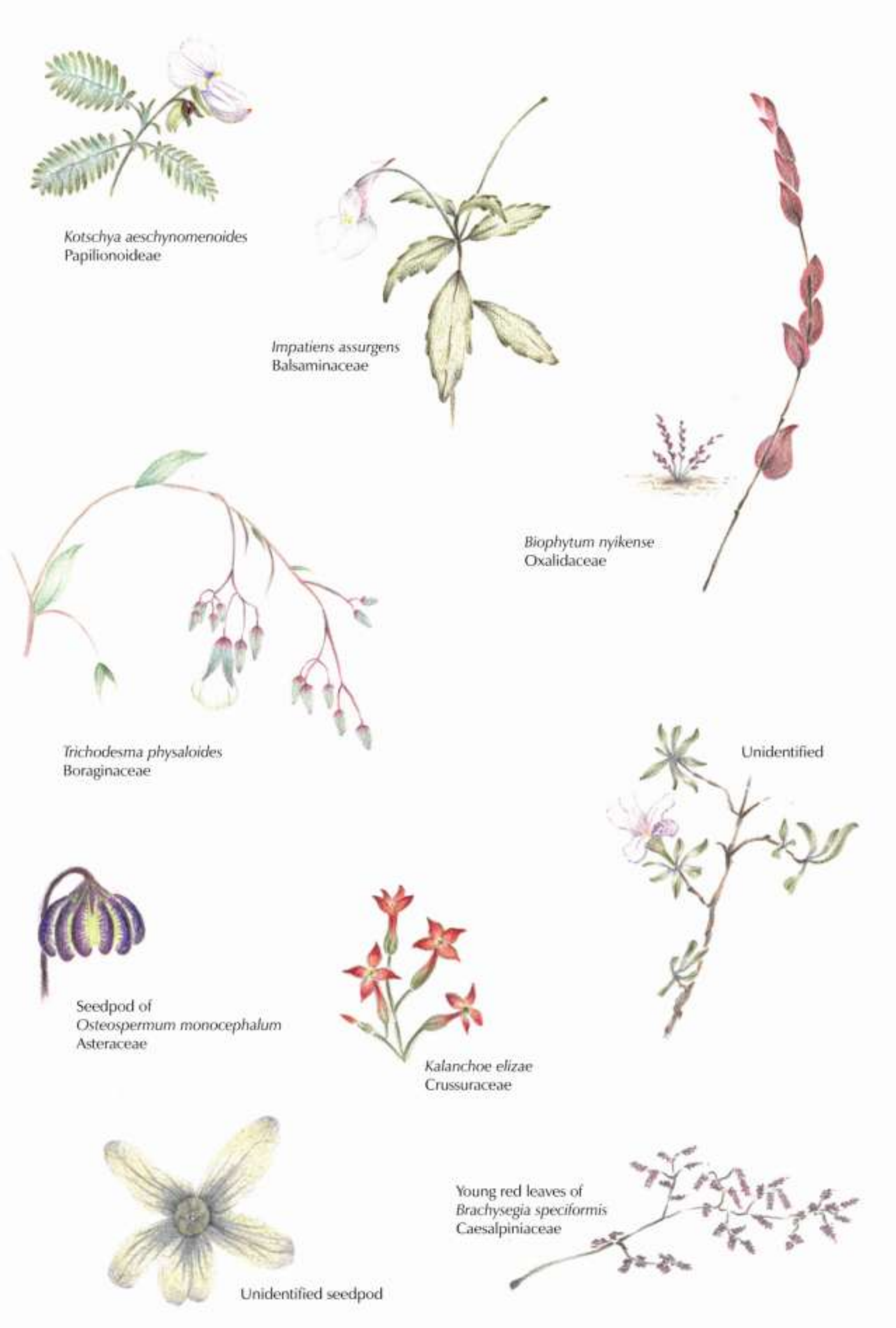
Athrixia rosmarinifolia
Asteraceae

Indigofea atriceps
Papilionoidae

Hypericophyllum compositarum
Asteraceae

Helichrysum Splendidum
Asteraceae

Helichrysum kirkii
Asteraceae


Kotschya aeschynomenoides
Papilionoideae
Impatiens assurgens
Balsaminaceae
Biophytum nyikense
Oxalidaceae
Trichodesma physaloides
Boraginaceae
Unidentified
Seedpod of
Osteospermum monocephalum
Asteraceae
Kalanchoe elizae
Crussuraceae
Young red leaves of
Brachysegia speciformis
Caesalpiniaceae
Unidentified seedpod

LIST OF IDENTIFIED INSECTS FOUND IN NYIKA NATIONAL PARK AS AT 15TH OCTOBER 2007

R.J.Murphy F.R.E.S.

The arrangement of main families is in systematic order but sub families, genera and species are in alphabetical order for ease of reference.

Odonata (Dragonflies)

Zygoptera (Damsel flies)

Agriidae
Phaon iridipennis (Burmeister 1839)

Chlorocyphidae
Chlorocypha consueta (Karsch 1899)

Platycypha caligata caligata (Selys 1853)

Chlorolestidae
Chlorolestes conspicua Selys

Coenagriidae
Aciagrion gracile (Sjostedt 1909)

Enallagma subfurcatum Selys 1876
Pseudagrion spernatum spernatum Selys 1881

Lestidae
Lestes pallidus Rambur 1842

Protoneuridae
Chlorocnemis marshalli marshalli Ris 1921
Chlorocnemis montana maccleeryi Pinhey 1969

Anisoptera (Open winged dragonflies)

Aeshnidae
Aeshna ellioti usambarica Forster 1906

Anax imperator mauricianus Rambur 1842

Anax separatus Hagen 1867
Hemianax ephipigger (Burmeister 1839)

<u>Gomphidae</u>
Notogomphus zernyi (St Quentin 1942)

Paragomphus cognatus (Rambur 1842)

Libellulidae
Atoconeura biordinata Karsch 1899
Crocothemis sanquinolenta (Burmeister 1839)
Orthetrum caffrum caffrum (Burmeister 1839)

Orthetrum julia Kirby 1900

Orthetrum julia falsum Longfield 1955
Palpopleura jacunda Rambur [1842]

Palpoleura lucia (Drury 1773)
Pantala flavescens Fabricius 1798
Porpax risi Pinhey 1958
Tramea basilaris Palisot de Beauvios 1817
Trimethis annulata (Beauvois 1805)
Trimethis arteriorosa (Burmeister 1839)
Trimethis furva Karsh 1899

Trimethis werneri Ris 1912

Blattodea (Cockroaches)
Derocalymna versicolor Burmeister
Pseudopeltis neavei Princes 1963

Isoptera (Termites)

Separate report by Dr Sarah Donovan

Mantodea (Praying Mantises)

Mantidae
Metentella mervensis Sj
Rhomboderella scutata (Bolivar 1889)
Tarachodes sanctus (Saussure 1871)

Dermaptera (Earwigs)

All specimens awaiting determination

Orthoptera (Grasshoppers)

Encifera ***(Crickets)***

Tettigoniidae

Enaliopsis petersi Schaum

Ruspolia vicinus Walker
Zabalius orientalis Karsch

Caelifera ***(Grasshoppers)***

Acrididae

Abisares viridipennis (Burmeister 1838)
Acorypha laticosta (Karsch 1896)
Acrida acuminata Stal 1873
Acrophymus sqamipennis (Brancsik 1897)
Anthermus ebneri Ramme 1929
Cannula greacilis (Burmeister 1838)
Catantops axillaries (Thunberg 1815)
Coryphosima stenoptera (Schaum 1853)
Cyrtacanthacris septemfasciata (Serville 1838)
Faureia milanjica (Karsch 1896)
Gastrimargus acutangulus (Stal 1873)

Gastromargus africanus (Saussure 1888)
Gymnobothrus linea-alba I Bolivar 1889
Heteropternis couloniana (Saussure 1884)
Leptacris monteiroi monteiroi (I.Bolivar 1890)
Machaeeridia bilineata Stall 1873
Morphacris fasciata (Thunberg 1815)
Orthochtha dasycnemis (Gerstaecker 1869)
Poecilocerastis tricolor (I.Bolivar 1912)
Pseudoarcyptera cephalica (I.Bolivar 1914)
Rhytidacris tectifera (Karsch 1896)
Tmetonota abrupta (Walker 1870)
Tylotropidus gracilipes Brancsik 1895

Lentulidae

Usambillia olivacea Sjostedt 1909

Pamphagidae

Losbosceliana gilgilensis I Bolivar 1915

Pyrgomorphidae

Maura bolivari Kirby 1902
Phymateus viridipes Stal 1873
Phyteumas purpurascens (Karsch 1869)

Separate report by Karim Vahed on a further 60? species.

Phasmatodea (Stick insects)

All specimens awaiting determination

HEMIPTERA

Heteroptera (Stink bugs / Assassin bugs)

Belastomatidae

Lethocerus niloticus Stal

Coreidae

Anoplocnemis curvipes Fabricius
Anoplocnemis dallasiana L & S
Anoplocnemis montandorii Distant
Mirperus tongorma
Petascelis remipes Signoret

Lygaeidae

Lygaeus lemniscatus Stal
Spilostethus rivularis Germar

Pentatomidae
Agonoscelis pubescens Thunberg
Antestiopsis cincticollis Schaum
Atelocera attenuata Distant
Atelocera foveata Dallas
Dalsira atricostata Distant
Dismegistus royeri Jeanneli
Dysdercus fasciata Signoret
Encosternum delegorguei Scopoli
Natalicola delegorguei Spin
Nazara viridula Fabricius

Reduviidae

Coranopsis vittata Horvath

Ectomocoris cruciger Fabricius
Etrichodia crux (Thunberg)
Rhinocoris albopunctatus Stal
Rhinocoris erythrocnemis Germar
Rhinocoris neavei Bergoth 1912
Vitumnus scenicus Stal

Rhopalidae

Serinetha amicta Germar

Scutelleridae

Callidea drgii Germar
Deroplax silphoides Thunberg

Homoptera (Plant bugs)

Cicadidae

Ioba leopardina Distant
Koma bombifrons Karsch
Monomatapa insignis Distant
Orapa nyassana
Ugada nutti Distant

Circopidae

Ptyelus flavescens Fabricius
Ptyelus grossus Fabricius
Locris jugalis Jacobi
Locris incarnata Walker

Coccidae

Gascardia brevicauda (Hall)
Saissetia oleae (Bernard)

Eubrybrachidae

Mesonitys fuelleborni
Paropioxys bellus Distant

Fulgoridae

Benamatapa marshalli Distant
Zanna clavaticeps (Karsch 1890
Zanna pustulosa Gerstaecker

Zanna Tenebrosa Fabricius

Neuroptera (Ant Lions)

Acalaphidae

Tmaesibasis lacerata Hagen

Mantispidae

Mantispa tenella Erichson

Myrmeliontidae

Banyutus idoneus (Banks)
Banyutus lethalis Walker
Banyutus posterior Navas 1931
Centroclisis brachygaster (Rambur 1842)

Hagenomyia lethifer (Walker)

Palpares normalis

Palpares obsoletus Gerstaecke
Palpares sparsus McLachlan 1867

Psychopsidae

Silveria marshalli McLachlan

Coleoptera (Beetles)

Adephaga (Predatory Beetles)

Carabidae

Callistomimus rufiventris Brett
Cypholoba graphipteroides Guerin
Cypholoba tenuicollis Horni
Eccoptoptera cupricollis Chandois
Galeritiola inversa Basileusky
Psecadius obertheuri Gestro
Scarites senegalensis Dejean
Sterestoma stuhlmanni Kolbe

Cicindelidae

Cylindera marshallisculpta (W Horn 1913)

Dromica gracillis W Horn 1909
Elliptica laticornis disperseflavescens (Horn 1913)
Foveodromica laterodeclevis (W.Horn 1929)

Foveodromica nicolae Monfort & Weisner 2007
Lophyra saraliensis saraliensis (Guerin-Meneville 1849)
Prothymidia angusticollis angusticollis (Boheman 1848)
Pseudodromica marshalli Peringuey 1894

Rhopaloteres grandis interruptoabbreviatus (W Horn 1921)
Trichodela diversilabris Cassola 1995

Dytiscidae

Hydaticus flavolineatus Boheman

Polyphaga (Leaf eating & other Beetles)

Anthribidae

Xylinada meculipes Fahroeus

Buprestidae

Acmeodera subprasina Mars
Alissoderus nodicollis

Hoplistura disjuncta Fabricius
Meliboeus carinatus

Psiloptera albomarginata Herbst
Psiloptera coleopteroides Sol

Psiloptera iridiventris Kerremans
Spenoptera longiusula
Sterapsis amplipennis Fahraeus

Sternocera orissa variabilis Kerremans 1886

Cantharidae

Lycus murrayi Bourgoin

Cerambycidae

Aulocopus natalensis White 1853

Calanthemis cf conradti Kolbe

Ceroplesis hauser conjunctai Hintz
Ceroplesis thunbergi Fahraeus

Chromolizus leucorhaphis (Gerstaecker 1855)
Coptoeme krantzi (Distant 1898)
Deroplia simplex (Fairmaire)

Dirphya leucostigma (Harold)
Erioderus pallens
Eunidia piperita Gahan
Eurysops insignis Aurivillius

Hecyra obscurator Fabricius

Hecyra tenebrionides Fahraeus

Idactus strandi Breuning
Laziopezus nigromaculatus (Quedenfeldt)
Macrotoma natala Thomson 1860
Mimophrisma livingstonei Sudre & Teocchi 2001
Monoxenus bicarinatus Aurivillius
Noserius aenescens Aurivillius

Oligosmerus limbalis Harold

Phantasis avernica Thomson

Phyllocnema mirifica (Parc)

Prosopocera luteomarmorata Breuning
Prosopocera marshalli Aurivillius
Prosopocera schultzei Kratz

Purpuricenus laetus Thomson 1864
Stromatium barbatum Fabricius

Tragocephala ducalis White

Tragocephala frenata Gerst

Tragocephala variegata Bertoloni 1849

Xystrocera skeletoides Breuning 1957

Zoographus lineatus (Quedenfeldt 1882)

Chrysomelidae

Asbecesta duviviari Jacobi
Bradlema neavei Heinze
Cassida suspiciosa Weise
Chrysomela saegeri Burgeon 1941
Corynodes dejeani Bertoloni
Gastrida abdominalis Chap
Hypercantha deverani Weise
Idacantha conifera Fairmaire
Phaedoria areata Fabricius

Cleridae

Dieroplesis 4 maculatus

Coccinelidae

Cheilomenes aurora (Gerstaecker 1781)
Cheilomenes lunata (Fabricius 1775)
Chnootriba similis (Thunberg 1781)
Declivitata olivieri (Gerstacker 1862)
Epilachna ardiosiaca (Sicard 1912)
Epilachna dregei Mulsant 1850
Henospilachna bifasciata (Fabricius 1781)
Henospilachna quadrioculata (Kolbe 1897)
Lioadalia intermedia Crotch 1874

Curculionidae

Lixus areicatus

Elateridae

Anisomerus lamellicornis Fairmaire

Calais antinorii Candeze
Calais lecordieri Girard
Propsephus apiculatus Boheman
Propsephus nigrifrons *Calais* Basilewsky

Propsephus cf castaneus Fleutiaux

Erotylidae

Plagiopisthen laevistriatus Arrow

Histeridae

Hister jeanelli Desbordes
Hister mechowi Schmidt
Kissister congoensis Burgeon
Tribalus floridus Vienna

Staphylinidae

Staphylinus subaenus Roth

Hispidae

Dactylispa pallipes (Kratz)

Hydrophilidae

Sphaeridium scarabaeoides Linnaeus

Lucanidae

Nigidius laticornis Boileau 1911

Meloidae

Coryna katonensis Pic
Coryna maivashana Pic
Coryna mylabroides Lap
Decatoma sobrina Peringuey
Mylabris amplectens Gerstaecker
Mylabris dicincta Berbl
Mylabris holocericea Klug
Mylabris occidentalis Harold

Mylabris tripartita Gerstaecker
Mylabris tristigma Gerstaecker
Synhoria cephalotes Ol

Melyridae

Apalochrus malachioides Fairmaire
Ebaeus confluens
Melyris atricornis Champ
Melyris nigripes Hav

Scarabaeidae

Aphodiinae
Aphodius bucolicus Bordat
Aphodius ciprianii Balthasar
Aphodius critchlowi Bordat
Aphodius gorillae Bordat
Aphodius humilis Roth
Aphodius kanemicus Endrodi
Aphodius kaszabi Endrodi
Aphodius koracsi
Aphodius lacunosus Schmidt
Aphodius leoninus Schmidt
Aphodius malawiensis Bordat
Aphodius noehaematiticus Landin
Aphodius Nyika Bordat
Aphodius pauliani Endrodi
Aphodius pseudourostigma Balthasar
Aphodius punctiger Endrodi
Aphodius rothschildi Schmidt
Aphodius schoutedeni Boucomont
Aphodius strangularis Bordat
Aphodius teter s.l. Roth
Lorditomaeus horni (Balthasar)
Notocaulus machatshkei Endrodi
Notocaulus schoutedeni Boucomont

Cetoniinae
Ceratorrhina preissi Moser 1912
Chondrorrhina picturata Harold 1878
Coelorrhina loricata loricata Janson 1877

Cosmiophaenia rubescens Brancsik 1914

Daedycorrhina bidenticornis Allard 1985

Diplognatha gagates Forster 1771
Eudicella euthalia oweni Allard 1985

Gnathocera cruda pilicollis Kolbe 1901

Gnathocera trivittata costata Ancey 1833

Heteropseudinca moseri Hauser 1904

Heteropseudinca wentzle heckmannae Kolbe 1901

Leucocellis adspersa (Fabricius 1801)

Leucocellis cupricollis Kratz 1880
Leucocellis diversiventris Moser 1913

Leucocelis rufithorax
Melenesthes jocquei Allard 1968

Pachnoda upangwana Moser 1918

Pachnodoides murphyi Alexis & Delport 2002

Plaesiorrhinella undulata Bates 1881

Poecilophila maculatissima Boheman 1860

Stethodesma strachani servillei White 1856

Stephanorrhina princeps Oberthur 1880

Tmesorrhina runsorica rubripes Allard 1991

Coprinae
Caccobius inconspicuous Fahraeus 1857
Caccobius ocellipennis D'Orbigny 1913
Catharsius mossambicanus Ferreira 1960
Catharsius satyrus Kolbe 1893

Copris amyntor Klug 1855
Copris dudleyi Cambefort
Copris insidiosus Peringuey 1900
Copris integer Reiche 1847
Copris mesacanthus Harold 1878
Diastellopalpus fuelleborni (Kolbe 1900)
Diestellopalpus thomsoni (Bates 1888)
Heliocopris hamifer Harold 1878
Heliocopris hermes Gillet
Onitis sulcipennis Felsche 1907
Onitis vanderkelleni Lansberge 1886
Onthophagus abruptus D'Orbigny 1913
Onthophagus albipodex D'Orbigny 1902
Onthophagus biconifor D'Orbigny 1905
Onthophagus cinctipennis Quedenfeldt 1884
Onthophagus clitellarius D'Orbigny 1908
Onthophagus cribripennis D'Orbigny 1902
Onthophagus crucenotatus D'Orbigny 1905
Onthophagus dinoderus D'Orbigny 1913
Onthophagus foraminosus D'Orbigny 1902
Onthophagus gradivus Balthasar 1966
Onthophagus granosus D'Orbigny 1913
Onthophagus insignis Peringuey 1896

Onthophagus laminidorsis D'Orbigny 1902
Onthophagus naevius D'Orbigny 1913
Onthophagus parumnotatus Fahraeus 1857

Onthophagus perniger Boucomont 1930
Onthophagus picatus d'Orbigny 1902

Onthophagus quadrimaculatus Raffray 1877
Onthophagus simulator D'Orbigny 1905
Onthophagus subhumeralis D'Orbigny 1902
Proagoderus biarmatus D'Orbigny 1908
Proagoderus brucei (Reiche 1847
Proagoderus chrysopes (Bates 1888)

Proagoderus Dudley Cambefort 1980

Dynastinae
Cyphonistes vallatus (Wiedeman 1823)

Pycnoschema corpulenta Peringuey

Pycnoschema scrofa Harold 1880
Temnorrhynchus coronatus (Fabricius 1781)

Rutelinae
Popillia bipunctata (Fabricius)
Popillia browni Kolbe

Scarabaeinae
Anachalcos procerus Gerstaecker 1874
Garreta azureus Janssens

Garreta malleolus (Kolbe 1895)

Tenebrionidae

Catamerus rugosus Gahan
Catamerus sulcatus Fabricius
Distretus variabilis Gib
Lagria villosa Fabricius

Trogidae

Trox caffer liliana Scholtz
Trox nyansanus Haaf

Diptera (Flies)

Asilidae

Lamyra gulo Loew 1851
Laxenecera albicincta (Loew 1852)

Bombyliidae

Bombylius haemorrhoidalis Bezzi 1921
Exoprosopa magnipennis Bezzi 1924
Lithorhinia basalis Ricardo 1901

Eristalinae

Senapsis dibapha Walker 1849

Platystomatidae

Bromophila caffra Macqart 1846

Syrphidae

Senapsis dibapha Walker 1849

Tachnidae

Dejeania bombylans Fabricius 1798

Mecoptera (Hanging flies)

Bittacus livingstoni Londt 1981
Bittacus montanus Weeler
Bittacus tuxeni Byers

Trichoptera (Caddis Flies)

All species awaiting determination

Lepidoptera (Moths & Butterflies)

Heterocera (Moths)

Arctiidae

Amerilia bubo (Walker 1855)
Argina Amanda (Boisduval 1847)
Cyana pretoriae (Distant 1897)
Diacrisia lutescens (Walker 1855)
Diacrisia testacea (Walker 1855)
Eyralpenus scioana (Oberthur 1880)
Galatra doriae (Oberthur 1879)
Macrosia chalybeata Hampson 1901
Nyctemera leuconoe leuconoe Hopffer 1858
Seriarctia metaxanthia Hampson 1909

Spilosoma lutescens Walker 1855
Spilosoma sulphurea Bartel 1903
Teracotona metaxantha (Hampson 1909)

Tumicla sagenaria (Wallengren 1860)

Cossidae

Azygophleps aburae Plotz
Azygophleps coffea Aurivillius
Eulophonotus myrmelion Felder 1874
Macrocossus toluminus (Druce 1887)

Ctenuchidae

Syntomis cereera Linnaeus

Epilemidae

Leucoplema triumbrata (Warren 1902)

Geometridae

Ennominae
Aphilopota interpellans (Butler 1875)

Argyrophora confluens Kruger 1999

Argyrophora trofonia (Cramer [1779])
Argyrophora variabilis Kruger1999
Ascotis reciprocaria (Walker 1860)
Chiasmia assimilis (warren 1899)
Chiasmia brongusaria brongusaria (Walker 1860)
Chiasmia johnstoni (Butler 1894)
Chiasmia paucimacula Kruger 2001

Chiasmia procidata semispurcata (Walker [1863])
Chiasmia rectistriaria (Herrich-Schaffer 1854)

Chiasmia rhabdophora (Holland 1892)

Chiasmia semicolor (Warren 1899)

Chiasmia simplicilinea simplicilinea (Warren 1908)
Chiasmia streniata streniata (Guenee [1858])

Chiasmia trizonaria (Hampson 1909)

Cleora betularia (Warren 1897)

Coenina dentataria Swinhoe 1904
Colocleora divisaria divisaria (Walker 1860)
Colocleora faceta (Prout LB 1934)
Coleocleora leucostephana Prout
Cophophlebia olivata Warren 1894
Drepanogynis glaucichorda Prout LB 1916
Epigynopteryx anopthalma
Epigynopteryx flavedinaria Guenee
Epigynopteryx maeviaria maeviaria (Guenee 1857)
Epigynopteryx termininota Prout 1934

Erastria madecassaria (Warren 1897)

Iodes flexilinea Warren 1898

Isturgia deeraria (Walker 1861)

Isturgia exospilata (Walker 1861)
Menophra aborta aborta (Warren 1898)

Micrologia lutetincta Prout LB 1916
Micrologia murphyi Kruger 2002
Nopia flexilinea Warren
Oedicentra albipennis Warren 1902
Odontopera integraria Guenee
Odontoptera ochroneura dicyrta Prout 1938
Omizodes ocellata Warren 1894
Oreometra vittata Aurivillius 1910
Pareclipsis anopthalma Prout LB 1916

Plateoplia acrabelia (Wallengren 1875)

Psilocera pulverosa (Warren 1894)
Psilocera semirufa Warren 1901
Pycnostega obscura Warren 1905
Rhodophthitus thespinus Prout LB 1931

Semiothisa subcurvaria Mabille 1897
Sphingomima variosa Prout LB 1915
Xanthis tarsispina Warren
Xanthisthisa fulva Warren 1902

Xenimpia maculosata (Warren 1897)

Xylopteryx arcuata (Walker 1862)
Xylopteryx aucilla Prout LB 1926
Xylopterix interposita Warren
Xylopteryx gibbosa Herbulot 1973
Zamaranda arguta Fletcher 1974
Zamerada crysopa Fletcher 1975
Zamarada densisparsa Prout LB 1922

Zamerada dentigera Warren 1909
Zamerada dorsiplaga Prout LB 1922
Zamerada euerces Prout LB 1928
Zamerada fessa Prout LB 1912

Zamerada glareosa Bastelberger 1909

Zamerada metroscaphes Prout LB 1912

Zamarada psammites Fletcher DS 1958

Zamerada purimargo Prout LB 1912

Zamerada rubrifascia Pinhey 1962
Zamerada rufilineria Swinhoe 1904
Zamerada scintillans Bastelberger 1909

Zeuctoboarmia hyrax (Townsend 1952)

Zeuctoboarmia octopunctata (Warren 1897)
Zeuctoboarmia werneri Rebel 1917

Geometrinae
Celedomphax anaplaga (Warren 1905)
Chlorosterrha semialba Swinhoe
Hetororachis prouti Bethune-Baker 1913
Heterorachis simplicissima (Prout LB 1912)
Lophorrhachia rubricorpus (Warren 1898)
Mixocera xanthostephana Prout LB 1912

Omphacodes punctilineata (Warren 1897)
Paragathia albimarginata Warren 1902
Pingassa abyssinaria (Guenee [1858])
Pingassa murphyi Herbulot 1994
Prasinocyma nereis Townsend
Rhodophthitus roseovittatus Butler
Victoria mirabilis Warren 1911

Larentiinae
Asthenotricha dentatissima Warren 1899
Eupithecia gradatilinea Prout LB 1916

Eupithecia infectaria (Guenee [1858])

Gonanticlea meridionata meridionata (Walker 1862)
Larentia cf bitrita (Felder & Rogenhoffer 1875)

Larentia sublesta Prout
Mimoclista annulifera Warren
Mimoclysta pudicata (Walker 1862)

Piercia bryophilaria (Warren 1903)
Piercia ciliata Janse 1933
Piercia impunctata Janse
Piercia pracinaria (Warren 1901)
Pseudolarentia megalaria (Guenee 1858)

Scotopteryx nictictaria (Herrich-Schaffer 1855)

Xanthorhoe exorista Prout LB 1922

Sterrhinae
Chlorerythra rubiplaga Warren 1895

Problepsis aegretta Felder & Rogenhoffer 1875
Problepsis catonaria (Guenee [1858])

Scopula latitans Prout LB 1920

Scopula opicata (Fabricius 1798)
Somatina sedata Prout LB 1922

Hepialidae

Antihepialus keniae Holland
Gorgopsis abbotti Holland
Gorgopsis caffra Walker 1856

Lasiocampidae

Bombycopsis indecora Walker 1865
Diapalpus congreganus Strand 1913
Dipluriella songeana Strand 1913
Epicnapteroides lobata Strand 1913

Eutrica seriofasciata Aurivillius 1921
Gonometa griseocincta Hampson 1910
Lebeda mustelinia Distant 1899
Nadiasa cuneata (Distant 1897)
Odontocheilopteryx myxa Wallengren 1860

Odontocheilopteryx pattersoni Tams 1926
Opisthodonta cymographa (Hampson 1910)
Pachymetana sanquicincta (Aurivillius 1901*)*
Philotherma rufescens Whichgraff 1921
Pseudolyra lineadentata (Bethune-Baker 1911)
Shausinna affinis Aurivillius 1910
Streblote craterum

Streblote fusca (Aurivillius 1905)
Streblote pachyla Tams
Streblote vesta Druce 1888

Limacodidae

Chrysopolominae
Chrysopoloma isabellina Aurivillius 1895

Ectropinae
Ectropa ancilis Wallengren 1863

Limacodinae
Afraltha chionostola (Hampson 1910)

Afrobirthama reducta Herring M. 1928

Coenobasis amoena (Felder 1874)

Crothema gloriosa Hering
Crothema mormopis Meyrick

Ctenolita melanosticta (Bethune-Baker 1909)

Ctenolita anacoapa Karsch

Latoia furfurca Hering
Lembopteris neglecta Hering
Omocena dollmani Westwood

Pantoctenia gemmans Felder 1874
Panoctenia prasina (Butler 1896)
Parasa lanceolata Hering
Parasa latisriga Walker
Parasa Tamara Hering
Parasa vivida (Walker 1865)

Rhypteira hyperocha Tams

Stroter dukei Janse 1964
Susicina pyrocausta Hampson 1910

Lymantriidae

Agyrostagma niobe Weymer
Aroa discalis Walker 1855
Cimola opalina Walker 1855

Cropera stilpnarona Herring 1926
Euproctis crocosticta Hampson 1905

Eudasychira goodi Holland

Hyaloperina erythroma Coll
Laelia basalis (Walker 1855)
Laelia bifascia Hampson 1905
Laelia cuvivirgata (Karsch 1895)
Laelia fracta Shaus & Clements 1893
Leucoperina impuncta Butler
Narona varipes (Walker 1865)

Psalis pennatula (Fabricius 1793)
Pteredoa monosticta (Butler 1898)
Rhypopteryx rhodalipha (Felder 1874)
Rhypopteryx rubripunctata Weymer 1892
Schalidomitra ambages Strand 1911

Stilpnaroma venosa Hering

Metarbelidae

Teragra guttifera Hampson 1910

Salengena narses Fawcett 1916

NOCTUIDAE

Transferred Arctiids
Asota speciosa (Drury 1773)

Acontiinae
Amyna punctum (Fabricius 1794)
Eublemma baccalix (Swinhoe 1886)

Ozarba heliastis (Hampson 1902)
Ozarba megaplaga Hampson

Agaristinae
Agoma trimeni (Felder 1874)
Brephos nigrobasalis (Bartel 1903)
Brephos nyassana Bartel 1903

Crameria amabilis (Drury 1773)
Ovios capensis (Herich-Schaffer [1854])
Pseudopais nigrobasalis Bartel 1903

Tuerta rema Druce

Amphypyrinae
Busseola fusca (Fuller 1901)
Callopistra maillardi (Guenee 1862)
Callopistra yerburii Butler 1884
Conservula alambica Gaede 1915
Conservula minor Holland 1896
Mazuca roseistriga Fletcher

Phalerodes cauta (Hampson 1902)
Spodoptera littoralis (de Boisduval 1833)
Tumidifrontia casteneotincta Hampson 1902

Catocalinae
Achaea finita (Guenee 1852)
Anomis flava (Fabricius 1775)

Anomis sobulifera Guenee 1852
Anticarsia irrorata (Fabricius 1781)
Audea fatilega (Felder & Rogenhoffer 1874)
Cyligramma latona (Cramer 1775
Davea humeralis (Hampson 1902))
Dysgonia angularis de Boisduval 1833
Dysgonia derogans (Walker 1858)
Ericeia inangulata (Guenee 1852)
Gracilodes caffra Guenee 1852
Halochroa eudela Fletcher DS 1963
Heliophisma maculilinea
Hypersypnoides congoensis Berio 1854
Hypocala deflorata (Fabricius 1794)
Hypropra capensis (Herrich-Schaffer 1850)
Maxera marchalii (de Boisduval 1833)
Mocis undata (Fabricius 1775)
Ophiusa tirhaca (Cramer 1780)
Oraesia emarginata Fabricius 1794)
Orthreis divitiosa Walker 1869
Orthreis fullonia (Clerck 1764)
Orthreis materna (Linnaeus 1767)
Pandesma robusta (Walker [1858])
Rhandiphora cinctigutta (Walker 1862)
Remiga repanda (Fabricius 1794)
Serrodes partita (Fabricius 1775)
Sphingomorpha chlorea (Cramer 1777)
Trigonodes hyppasia (Cramer 1779)
Ulothrichopus hardyi Clifton

Eutellinae
Caligatus angasii Wing [1850]
Eutelia bowkeri (Felder & Rogenhoffer 1874)

Hadeninae
Brithysana speyeri (Felder & Rogenhoffer 1874)
Diaphone eumela (Stoll 1781)
Diaphone lampra Karsch 1894)
Leucania prominenus Walker 1856
Leucania tacuna (Felder 1874)
Leucania uncinata (gaede 1916)
Rougeotia praetexta Townsend
Vietteania torrentium (Guenee 1852)

Heliothinae
Helicoverpa armigera (Hubner [1809])
Heliothis xanthiata Walker 1865

Hypeninae
Dichromia mesomeleana (Hampson 1902)
Hypena laetalis Walker [1859]

Hypena senialis Guenee 1854
Hypena srtigata (Fabricius 1798)
Rhynchina tinctalis (Zeller 1852)

Noctuinae
Agrotis segatum (Dennis & Schiffermuller 1775)
Agrotis contiguens (Warren 1914)
Amazonides ruficeps (Hampson 1903)

Mentaxya atritegulata (Hampson 1902)
Mentaxya ignicollis (Walker 1857)

Plusiinae
Chrysodexis acuta (Walker 1858)
Plusia fracta Walker 1858
Plusia limbiralea Guenee
Plusia sestertia (Felder & Rogenhoffer 1874)
Syngrapha circumflexa (Linnaeus 1767)
Tricoplusia orichalcea (Fabricius 1775)

Sarrothripinae
Blenina albifascia Pinhey 1968
Blenina squamifera (Wallengren 1860)

Notodontidae

Achaera ochribasis (Hampson 1910)
Antheua simplex Walker 1855
Cerurina marshalli (Hampson 1910)

Chlorocalliope calliope (Hampson 1910)
Clostera violacearia (Janse 1920)

Desmeocaria congoana Auivillius 1900

Disracha persimilis (Hampson 1910)
Hampsonita esmeralda (Hampson 1910)
Heraia thalassina (Hampson 1910)
Odontoperas voeltzkowi Aurivillius
Polienus albescens Gaede
Scalmicauda bicolorata Gaede
Scalmicauda tessmanni Strand 1911
Tronotus bettoni Butler 1898

Pterophoridae

Pterophorus candidalis (Walker 1864)

Pyraloidea

Crambidae

Musotiminae
Panoctima angustalis Hampson

Noordinae
Viettessa margaritalis (Hampson 1910)

Nymphulinae
Argyractis sambesica (Strand 1909)

Pyraustinae
Calamochrous flavimarginalis Hampson 1913
Loxostege plumbialis (Zeller 1852)
Loxostege venustalis Cramer 1782
Pyrausta incoloralis (Guenee 1854)
Uresiphita polygonalis (Dennis & Schiffermuller 1775)

Spilomelinae
Aetholessa floridalis (Zeller 1852)
Bocchoris inspersalis (Zeller 1852)
Dichocrocis polystidzalis Hampson 1918

Epipagis cancellalis (Zeller 1852)
Eurrhyparodes tricoloralis (Zeller 1852)
Filodes costivitralis Guenee 1862
Ischnurges lancinalis (Guenee 1854)
Maruca vitrata (Fabricius 1787)
Marwitzia centiguttalis Gaede
Nausinoe argyrosticta (Hampson 1910)
Nausinoe geometralis (Guenee 1854)
Pagyda salvalis Walker 1859
Pagyda traducalis (Zeller 1852)
Palpita unionalis (Hubner 1796)
P1lochrosis dichocrosialis Hampson 1912
Spoladea recurvalis (Fabricius 1775)
Syllepte ovalis (Walker 1859)
Syllepte purpurascens Hampson 1899
Syllepte sinuata Fabricus
Synclera traducalis (Zeller 1852)
Syngamia convulsa Meyrick
Syngamia fervidalis Zeller 1852

Pyralidae

Phycitinae
Cadra cautella (Walker 1863)
Dysphilia viridella Ragonot 1888

Pyralinae
Aglossa rhodalis Hampson 1906

Saturniidae

Athletes gigas Sonthonnax 1904
Athletes semialba Sonthonnax 1904
Aurivillius seydelli Rougeot 1962
Bunaea alcinoe (Stoll 1780)
Cirina forda (Bouvier 1927)
Decachorda fulvia (Druce 1886)
Decachorda rosea Aurivillius 1898
Epiphora imperator Stoneham 1933
Gonimbrasia conradsi (Rebel 1906)
Gonimbrasia macrops (Rebel 1917)
Gonimbrasia macrothyris (Rothschild 1906)
Gonimbrasia murphyi Darge 1992
Gonimbrasia rectalineata (Sonthonnax 1899)
Gonimbrasia wahlbergi (Boisduval 1847)
Gynanisa albescens Sonthonnax 1904
Holocerina smilax (Westwood 1849)
Imbrasia ertli Rebel 1904
Lobobunaea phaedusa falcatissima Rougeot 1962
Ludia delegorguei (Boisduval 1847)
Ludia orinoptena Karsch 1892
Micragonei nyasae Rougeot 1962
Orthogonioptilum adiegatum dollmanni Jordan 1922
Pseudaphelia ansorgei (Rothschild 1898)
Pseudobunnaea callista Jordan 1910
Pseudobunnaea irius Fabricius 1793
Pseudobunnaea tyrrhena maculata Bouvier 1930
Tagoropsis hannintoni Butler 1893
Tagoropsis ikondae nyikensis Bouyer 2002
Ubaena dolabella (Druce 1886)

Sphingidae

Acherontia atropus (Linnaeus 1758)
Agrius convolvuli (Linnaeus 1758)
Andriasa contraria contraria Walker 1856
Andriasa mitcheli Hayes 1973
Basiothia charis (de Boisduval [1875])
Basiothia medea (Fabricius 1781)
Basiothia schenki Moschler 1872
Cephanodes hylas virescens (Wallengren 1858)
Chaerocina dohertyi meridionalis Carcasson 1968
Coelonia fulvinotata (Butler 1875)
Daphnis nerii Linnaeus 1758
Dovania poecila Rothschild & Jordan 1916
Euchloron megaera Linnaeus 1758
Falcatula falcatus Rothschild & Jordan 1903
Hippotion celerio (Linnaeus 1758)
Hippotion eson (Cramer 1779)

Hippotion osiris (Dalman 1823)
Leptoclanis pulchra Rothschild & Jordan 1903

Leucophlebia afra Karsch 1891

Leucostrophus alterhirundo D'Abrera 1987
Lophostethus dumolinii dumolinii (Angas 1849)
Macroglossum trochilus (Hubner 1823)
Macropoliana ferax (Rothschild & Jordan 1916)
Neopolyptychus compar Rothschild & Jordan 1903
Nephele accentifera Beauvois 1805
Nephele comma Hopffer 1857
Nephele lannini Jordan 1926
Nephele peneus (Cramer 1776)

Nephele vau (Walker 1856)
Polyptychopsis marshalli (Rothschild & Jordan 1903)
Polyptychus baxteri Rothschild & Jordan 1907

Polyptychus coryndoni Rothschild & Jordan 1903
Praedora plagiata Rothschild & Jordan 1903

Pseudoclanis kenyae Clark 1928
Rhodafra marshalli Rothschild & Jordan 1903
Sphingonaepiopsis ansorgei Rothschild 1904
Temnora burdoni Carcasson 1968
Temnora elegans polia Rothschild 1904
Temnora funebris (Holland 1893)
Temnora plagiata fuscata Rothschild & Jordan 1902
Temnora pseudopylas Rothschild 1894
Temnora pylades tangaNyikae Clark 1928
Temnora marginata (Walker 1850)
Theretra orpheus (Herrich-Scaffer 1854)

Thyretidae

Automolis laterita Herrich-Schaffer 1855
Automolis pallens Bethune baker
Thyretes negus Wallengren

Thyrididae

Chrysotopus dawsoni Distant 1897

Yponomeutidae

Yponomeuta strigillata Zeller 1852

Zygaenidae

Saliunca esmeralda

Saliunca styx (Fabricius 1775)

Rhopalocera (Butterflies)

Hesperiidae

Abantis paradisea (Butler 1870)
Abantis zambesiaca (Westwood 1874)
Acada biseriatus (Mabille 1893)

Acleros mackenii (Trimen 1868)

Ampitta capenas capenas (Hewitson 1863)
Artitropa milleri Riley 1925
Artitropa reducta Aurivillius 1925
Borbo borbonica borbonica (Boisduval 1833)
Borbo fallax (Gaede 1916)
Borbo gemella (Mabille 1884)
Borbo micans (Holland 1896)
Borbo perobscura (Druce 1912)
Borbo sirena (Evans 1937)
Calleagris hollandi (Butler 1897)
Calleagris jamesoni jamesoni (Sharpe 1890)
Celaenorrhinus galenus (Fabricius 1793)
Celaenorrhinus handmani Berger 1976
Celaenorrhinus zanqua Evans 1937
Chomdrolepis niveicornis Plotz 1883

Chondrolepis telsignata (Butler 1896)
Coeliades forestan (Stoll 1872)
Coeliades pisistratus (Fabricius 1793)
Fresna nyassae (Hewitson1878)
Gegenes niso brevicornis (Plotz 1884)
Gomalia elma (Trimen 1862)
Gorgyra bibulous Riley 1929
Gorgyra johnstoni (Butler 1894)
Kedestes barbarae barbarae (Trimen 1873)
Kedestes brunneostriga (Plotz 1884)
Kedestes callicles (Hewitson 1868)
Kedestes wallengrenii fenestratus (Butler 1894)
Metisella decipiens (Butler 1896)
Metisella formosus formosus (Butler 1894)
Metisella medea Nyika Evans 1937
Metisella orientalis orientalis (Aurivillius 1925)
Metisella perexellens perexellens (Butler 1896)
Metisella quadrisignatus quadrisignatus (Butler 1894)
Meza larea (Neave 1910)
Parosmodes morantii morantii (Trimen 1873)
Platylesches ayresii (Trimen 1889)
Platylesches lamba Neave 1910
Platylesches picannini (Holland 1894)
Platylesches rasta rasta (Evans 1937)
Platylesches robustus robustus Neave 1910
Sarangesa astrigera Butler 1894
Sarangesa lucidella lucidella (Mabille 1881)
Semalea arela (Mabille 1891)
Semalea pulvina (Plotz 1879)
Spialia depauperata depauperata (Strand 1911)
Spialia dromus (Plotz 1884)
Spialia mafa mafa (Trimen 1870)
Spialia spio (Linnaeus 1764)
Tagiades flesus (Fabricius 1781)
Teniorhinus harona (Westwood 1881)
Zenonia zeno (Trimen 1864)

Papilionidae

Papilio dardanus tibullus Kirby 1880
Papilio demodocus demodocus Esper 1798
Papilio jacksoni Nyika Cottrell 1963
Papilio mackinnoni isokae Hancock 1984
Papilio nireus lyaeus Doubleday 1845
Papilio ophidecephalus mkuwadzi Gifford 1961
Papilio pelodurus vesper Le Cerf 1924
Papilio phorcas Nyikanus Rothschild & Jordan 1903
Graphium angolanus angolanus (Goeze 1779)
Graphium leonidas leonidas (Fabricius 1793)

Pieridae

Appias Sabina phoebe (Butler 1901)
Belenois aurota aurota(Fabricius 1793)
Belenois creona severina (Stoll 1781)

Belenois rubrosignata kongwana Talbot 1943
Belenois thysa (Hopffer 1855)
Belenois zochalia agrippinedes (Holland 1896)
Catopsilia florella (Fabricius 1775)
Colias electo Strecker 1900
Colotis antevippe gavisa (Wallengren 1857)

Colotis danae annae (Wallengren 1875)

Colotis dissociates (Butler 1897)

Colotis eris eris (Klug 1829)
Colotis euippe omphale (Godart 1819)
Colotis evenina casta (Gerstaecker 1871)
Colotis regina Trimen 1863
Eurema brigitta brigitta (Stoll 1780)
Eurema desjsrdinsii marshalli Butler 1898
Eurema hecabe solifera (Butler 1875)
Eurema mandarinula (Holland 1862)
Eurema senegalensis (Boisduval 1836)
Leptosia alcesta inalcesta Bernardi 1959)
Mylothris agathina agathina (Cramer 1779)
Mylothris crawshayi crawshayi Butler 1896
Mylothris ruppellii rhodesiana Riley 1921
Mylothris sagala dentatus Butler 1896
Nepheronia argia mhondana (Suffert 1904)
Nepheronia thalassina sinalata (Suffert 1904)
Pinacopteryx eriphia eriphia (Godart 1819)

Nymphalidae

Acraeinae

Acraea acrita Hewitson 1865

Acraea acuta Howarth 1969

Acraea aganice nicega (Suffert 1904)
Acraea anacreon bomba Grose-Smith 1889
Acraea anemosa Hewitson 1865
Acraea caecilia pudora Aurivillius 1910
Acraea calderena calderena Hewitson 1877
Acraea encedon encedon (Linnaeus 1758)
Acraea epaea melina (Thurau 1903)
Acraea eponina (Cramer 1770)

Acraea goetzei Thurau 1903

Acraea insignis insignis Distant 1880
Acraea johnstoni johnstoni Godman 1885

Acraea leucopyga Aurivillius 1904
Acraea perenna thesprio Oberthur 1893
Acraea periphanes Oberthur 1893
Acraea pharsalus pharsaloides Holland 1892
Acraea pudorella detecta Neave 1910

Acraea scalivittata Butler 1896

Acraea ventura ventura Hewitson 1877
Hyalites parei orangica Henning 1996

Pardopsis punctatissima (Boisduval 1833)

Daninae

Amauris albimaculata latifascia Talbot 1940
Amauris crawshayi crawshayi Butler1897
Amauris echeria serica Talbot 1940
Amauris ellioti junia (Le Cerf 1920)
Danaus chrysippus eagyptus (Schreber 1759)
Tirumala Formosa formosa (Godman 1880)

Satyrinae

Aphysoneura pigmentaria obnubila Riley 1923
Bicyclus anynana anynana (Butler 1879)
Bicyclus campina campina (Aurivillius 1901)
Bicyclus cooksoni (Druce 1905)
Bicyclus cottrelli Van Son 1952
Bicyclus dancklemani (Rogenhoffer 1891)
Gnophodes betsimena diversa (Butler 1880)
Henotesia simonsii (Butler 1877)
Henotesia ubenica Thurau 1903
Melanitis leda helenae (Westwood 1851)
Melanitis libya Distant 1882
Neita extensa (Butler 1898)
Neocoenyra gregorii Butler 1894
Physcaeneura pione Godman 1880
Ypthimomorpha itonia (Hewitson 1865)

Argynninae
Issoria smaragdifera smaragdifera (Butler 1895)
Lachnoptera ayresii Trimen 1879
Phalantha aethiopica Rothschild & Jordan 1903

Nymphalinae
Antanartia dimorphica dimorphica Howarth 1966
Antanartia schaeneia dubia Howarth 1966
Catacroptera cloanthe cloanthe (Stoll [1781])
Cynthia cardui (Linnaeus 1758)
Junonia antilope (Feisthamel 1850)
Junonia archesia (Cramer 1779)
Junonia artaxia Hewitson 1864
Junonia cuama Hewitson 1864
Junonia hierta cebrene Trimen 1870
Junonia natalica (Felder 1860)
Junonia octavia sesames (Trimen 1883)
Junonia orithya orithya (Linnaeus 1758)

Junonia terea elgiva Hewitson 1864
Junonia touhilimasa Vuillot 1892
Junonia tugela aurorina Butler 1894
Salamis anacardii nebulosa Trimen 1881
Salamis parhassus (Drury 1782)
Vanessa cardui Linnaeus 1758

Limenitinae
Bebearia orientis orientis (Karsch 1895)
Byblia anvatara acheloia (Wallengren 1857)
Byblia ilithya (Drury [1773])
Crenidomimas concordia (Hopffer 1855)
Cymothoe cottrelli Rydon 1980
Cyrestis Camillus sublineata Lathy 1901
Euphaedra crawshayi Butler 1895
Eurytella dryope angulata Aurivillius 1898
Euritella hiarbas lita Rothschild & Jordan 1903
Hamanumida daedalus (Fabricius 1775)
Harma theobene blassi (Weymer 1892)
Neptidopsis ophione ophione (Cramer [1777])
Neptis alta Overlaet 1955
Neptis aurivillii Schultz 1930
Neptis incongrua incongrua Butler 1896
Neptis laeta Overlaet 1955
Neptis melicerta (Drury 1773)
Neptis saclava marpessa Hopffer 1855

Pseudacraea deludens murphyi Hecq 1991
Pseudacraea lucretia expansa (Butler 1878)
Pseudargynnis hegemone (Godart 1819)
Sallya amulia rosa (Hewitson 1877)
Sallya boisduvali boisduvali (Wallengren 1857)
Sallya garega (Karsch 1892)
Sallya morantii morantii (Trimen 1881)

Charaxinae
Charaxes achaemenes achaemenes Felder & Felder 1867
Charaxes acuminatus Nyika Van Someren 1963
Charaxes ameliae amelina Joicey & Talbot 1925
Charaxes ansorgei levicki Poulton 1933
Charaxes aubyni australis Van Someren & Jackson 1957
Charaxes baumanni whytei Butler 1894
Charaxes bohemani Felder & Felder 1859

Charaxes brutus natalensis Staudinger 1885
Charaxes candiope candiope Godart 1924

Charaxes castor flavifasciatus Butler 1895
Charaxes chinteche Van Someren 1975

Charaxes dilutus veneris White & Grant 1989

Charaxes dowsetti Henning 1989
Charaxes druceanus proximans Joicey & Talbot 1922
Charaxes fione Henning 1977
Charaxes guderiana guderiana (Dewitz 1879)

Charaxes jasius saturnus Butler 1866

Charaxes macclounii Butler 1895

Charaxes nichetes leoninas Butler 1895
Charaxes nyikensis van Someren 1975
Charaxes phaeus Hewitson 1877
Charaxes pollux geminus Rothschild 1900
Charaxes protoclea azota (Hewitson 1877)
Charaxes varanes vologesis (Mabille 1876)
Charaxes violetta melloni Fox 1963
Charaxes xiphares ludovici Roussseau-Decelle 1933

Lycaenidae

Actizera lucida (Trimen 1883)
Actizera stellata (Trimen 1883)
Alaena nyassa major Oberthur 1888
Alaena reticulata Butler 1896
Aloedes conradsi angoniensis Tite & Dickson 1968
Aloedes griseus Riley 1921

Aloedes molomo handmani Tite & Dickson 1973
Anthene amarah amarah (Guerin-Meneville 1847)
Anthene definita definita (Butler 1899)

Anthene kersteni (Gerstaecker 1871)

Anthene lasti (Grose-Smith & Kirby 1894)
Anthene ligures (Hewitson 1874)
Anthene liodes (Hewitson 1874)
Anthene lunulata (Trimen 1894)
Anthene rubricinctus anadema (Druce 1905)
Aphnaeus erikssoni rex Aurivillius 1909
Aphnaeus marshalli Neave 1910

Axiocerces amanga amanga (Westwood 1881)
Axiocerces Nyika Quickelberge 1984
Axiocerces punicea punicea (Grose-Smith 1889)
Axiocerces tjoane tjoane (Wallengren 1857)
Azanus jesous (Guerin 1847)
Azanus mirza (Plotz 1880)

Azanus moriqua (Wallengren 1857)
Azanus natalensis (Trimen 1887)
Cacyreus lingeus (Stoll 1782)
Cacyreus palemon (Stoll 1782)
Cacyreus virilis Stempffer 1936

Capys brunneus brunneus Aurivillius 1916
Capys connexivus connexivus Butler 1987
Cupidopsis cissus (Godart 1824)
Cupidopsis Jobates jobates (Hopffer 1855)
Deudorix antalus (Hopffer 1855)
Deudorix caerulea Druce 1890

Deudorix camerona Katanga Clench 1965
Deudorix dinochares Grose-Smith 1887
Deudorix diocles Hewitson 1869
Deudorix kafuensis Neave 1910

Deudorix lorisona coffea Jackson 1966
Deudorix magda Gifford 1963
Deudorix Montana (Kielland 1985)
Deudorix zeloides Butler 1901

Eicochrysops eicotrochilus Bethune-Baker 1924
Eicochrysops messapus mahallakoaena (Wallengren 1857)
Euchrysops barkeri (Trimen 1893)
Euchrysops dolorosa (Trimen 1887)
Euchrysops subpallida Bethune-Baker 1923

Euchrysops unigemmata (Butler 1895)
Harpendyreus hazelae Stempffer 1973

Harpendyreus juno (Butler 1897)
Harpendyreus marungensis marungensis (Joicey & Talbot 1924)
Hemiolaus caeculus caeculus Hopffer 1855

Hypolycaena buxtoni Hewitson 1874

Hypolycaena auricostalis auricostalis (Butler 1897)
Hypolycaena pachalica Butler 1888
Hypolycaena philippus philippus (Fabricius 1793)
Iolaus (Epamera) alienus alienus Trimen 1898
Iolaus (Stugeta) bowkeri nyasana (Talbot 1935)
Iolaus (Epamera) congdoni Keilland 1985
Iolaus (Argiolaus) lalos lalos (Druce 1896)
Iolaus (Epamera) nasisii (Riley 1928
Iolaus (Argiolaus) pamelae Heath 1983

Iolaus (Epamera) sidus Trimen 1864
Iolaus (Argiolaus) silarus Druce 1885
Iolaus (Argiolaus) stewarti Heath 1985

Iolaus (Epamera) violacea (Riley 1928)
Lachnocnema bibulus (Fabricius 1793)
Lachnocnema durbani Trimen 1887
Lampides boeticus (Linnaeus 1767)

Lepidochrysops chalceus Quickelberge 1979
Lepidochrysops cupreus (Neave 1910)

Lepidochrysops desmondi Stempffer 1951

Lepidochrysops handmanni Quickleberge 1980
Lepidochrysops intermedia cottrelli Stempffer 1954
Lepidochrysops Nyika Tite 1961

Lepidochrysops solwezi (Bethune-Baker 1922)
Leptotes jeanneli (Stempffer 1935)
Leptotes marginalis (Stempffer 1944)
Leptotes pirithous pirithous (Linnaeus 1767)
Lycaena phlaeas abbottii (Holland 1892)
Mimacraea marshalli marshalli Trimen 1898
Ornipholidotes peucetia peucetia (Hewitson 1866)
Pentilla tropicalis (Boisduval 1847)
Phlaria heritsia virgo (Butler 1896)
Spindasis homeyeri (Duitz 1887)
Spindasis mozambica (Bertolini 1850)
Triclema nigeriae (Aurivillius 1905)
Tuxentius calice calice (Hoppfer 1885)
Tuxentius ertli (Aurivillius 1907)

Pseudonacudaba sichela sichela (Wallengren1857)
Uranothauma antinorii felthami (Stevenson 1934)
Uranothauma cordatus (Sharpe 1892)
Uranothauma crawshayi Butler 1895)
Uranothauma cuneatum Tite 1953
Uranothauma falkensteni (Dewitz 1879)
Uranothauma nubifer (Timen 1895)
Uranothauma poggei (Dewitz 1879)
Uranothauma vansomereni Stemffer 1951
Uranothauma williamsi Carcasson 1961
Zizeeria Knysna (Trimen 1862)
Zizula hylax (Fabricius 1775)

Riodinidae

Abisara neavei cf congdoni Keilland 1985

Hymenoptera (Bees & Wasps)

Bees

Anthrophoridae

Amegilla acraensis Fabricius1793
Amegilla torrida Smith
Anthrophora plumipes Fabricius
Mesotrichia flavorufa D & G
Xylocopa caffra Linnaeus 1767
Xylocopa corinata Smith 1874
Xylocopa flavobicincta Grib
Xylocopa lugubris Gerstaecker 1857
Xylocopa nigrita (Fabricius 1775)
Xylocopa senior senior (Vaehal 1899)

Apoidae

Apis mellifera monticola Smith
Apis mellifera scutellata Lepeltier
Thyreus abyssinicus (Radoszkowsky)
Thereus calceatus (Vaehal)

Megachilidae
Chalicodoma bombifrons (Gerstaecker 1857)
Chalicodoma pseudomegachile kigonserana (Friese 1903)
Megachile felina Gerstaecker

Wasps

Brachonidae

Archbracon servillei Brulle
Serraulax decemmaculatus Szepligeti 1911

Ichneumonidae

Asprynchotus guenzii (Tasch)
Enicospilus pacificus

Mutillidae

Stenomutilla cf beroe Peringuey

Pompilidae

Anopilus fuscus
Hemipepsis dedjas Guerin
Hemipepsis imperialis Smith
Hemipepsis ochropus Stal
Hemipepsis tamisieri Guerin
Psammochares plumbeus Fabricius
Psammochares cf semirufus Haupt
Pseudogenia flavotegulata Bingh

Scolidae

Campsomeris hymenaea Gerst
Megameris labilis Schulz 1906
Scolia erithropyga
Scolia morio Fabricius
Scolia Tropicana nigersima

Sphecidae

Ammophila benniensis (Palisot de Beauvois)
Ammophila punctaticeps (Arnold)
Chalybion laevigatum Kohl
Chlorion haemorrhoidalis Fabricius
Chlorion pelopoeformis Dahlboom
Liris pempesiana Bisch
Philanthus stygius Gerstaecker
Philanthus triangulatum diadema Fabricius
Podolonia tydei Le Guillay
Scelifron spirifex Linnaeus
Trachysphex ambiguous Arnold 1923

Vespidae

Ancistrocerus lineaticollis Cam
Antipiona silgos (Saussure)
Belognaster clypeata Kohl 1894
Belognaster dubius Kohl
Belognaster fascialis du Buysson 1906
Belognaster filiventris Saussure 1853
Belognaster griseus Fabricius
Belognaster laevigatum Kohl
Belognaster nobilis Gerstaecker
Belognaster vasseae du Buysson 1906
Delta emarginata
Delta pulchemimum
Eumenes maxillosus De Geer
Odynerus ardens var junodi Gribodo 1895
Odynerus radialis Saussure 1854
Odynerus ventralis Saussure
Polistes marginalis Fabricius
Polistes smithi Saussure
Trachymeus cf vulneratus
Synagris prosperina niassae Stadel

Formicoidae (Ants)

Report by Dr C.B.Cottrell in Biosearch 2000 edition

Pyrops claviticeps

Epilachna dregei

Noctuid moth Rhandiphora sp.

Photos above by Michael Overton

Entomological Samples found, Nyika Expedition 2007		
Ref.Photo	Latin Name If described	Family
21	*Acraea Punctatissima*	Acraeinae
22	*Acraea Goetzei*	Acraeinae
23	*Acraea*	Acraeinae
24	*Papilio Thuravi Cyclopis f*	Papiliomidae
25	*Vanessa Cardui m*	Nymphalidae
26	*Mylothris Agathina*	Pieridae
27	*Neptis Laeta*	Nymphalidae
28	*Left – Cupidopsis Cissus f* *Right – Euchrysops Malathana f*	Lycaenidae
29	*Byblia Anvatara Acheloia m*	Nymphalidae
30	*Danus Chrysippus Aegyptus f*	Danaidae
31	*Precis Octavia*	Nymphalidae
32	*Harpendyreus Juno f*	Lycaenidae
33	*Uranothauma Cranshayi f*	Lycaenidae
34	*Osprynchotos Guinzii*	Ichneumondiae
35	*Eurema Mandarinula f*	Pieridae
36	*Refer 6 to Karim Vahed for id*	Acridae
37	*Pseudargynnis Hegemone m*	Nymphalidae
38	*Junonia Orithya Madagascariensis f*	Nymphalidae
39	*Psiloptera Albomarginata*	Buprestidae
40	*Hecyra Obscurata*	Cerambycidae
41	*Catamerus Rugosus*	Tenebrionidae
42	Carabidae galeritini	Carabidae
43	*Unknown species*	Dynastinae
44	*Acraea Encedon m*	Acraeinae
45	*Acraea Sotikensis*	Acraeinae
46	*Dalpax Postica*	Flatidae
47	*Acraea Anacreon*	Acraeinae
48	*Camptotypus – undertermined*	Ichneumondiae
49	*'probably' Acraea Ventura larvae*	Acraeinae
50	*'probably' Acraea Calderena larvae*	Acraeinae
51	*Junonia Touhilimasa f*	Nymphalidae
52	*Precis Actia f*	Nymphalidae
53	*Zanna Claviticeps*	Fulgoridae
54	*Belognaster Dubius*	Vespidea
55	*Belognaster – undetermined*	Vespidea
56	*Synhoria probably Senegalensis*	Meloidae
57	*Pachnoda Upangwana*	Cetoniidae
58	*Noitis Virdulus*	Scarabaeidae
59	Specimen not found	Tenebrionidae?
	Assassin Bug – photo only	Redviidae

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There are still many species awaiting determination.

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REFERENCES

Allard V. 1991 - *Les Coleopteres du Monde.* Vols 6, 7, 9, 11, 12, 17, Sciences Nat. 2 Rue Andre Mellene, 60200 Venette, France.

British Museum Natural History 1980 - *Catalogue of the Diptera of the Afrotropical Region.*

Callaghan C.J. 2003 – *A revision of the African species of the genus Abisara* Felder & Felder (Lepidoptera: Riodinidae) *Metamorphosis* Vol. 14 No. 4 Dec 2003 (Journal of the Lepidopterists Society of Africa)

Carcasson R.H. 1995 – *Carcassons African Butterflies*. Cisro Publications, PO Box 89, East Melbourne, Victoria 3002, Australia.

Clarke and Holm 1985 – *Insects of Southern Africa*. University of Pretoria, RSA

D'Abrera B. 1986 (Reprinted 1997) – *Butterflies of the Afrotropical Region*. Hill House Publishers 2/157 Bluff Road, Black Rock 3193, Victoria, Australia.

D'Abrera B. 1986 – *Sphingidae Mundae*. E.W. Classey Ltd, Faringdon, Oxon SN7 7DR, UK

Dirsch V.M. 1965 – *The African Genera of Acridoidea*. Cambridge University Press.

Gifford D. 1965 – *Butterflies of Malawi.* The Society of Malawi, Blantyre.

Henning S.F. 1988 – *The Charaxinae Butterflies of Africa*. Aloe Books, PO Box 2017, J'burg, RSA

Henning S.F. & Henning G.A. 1966a – *A review of the Genus Axiocerces*. (Lepidoptera Lycaenidae) *Mtamorphosis* Occassional Supplement No.1 Oct 1966 (Journal of the Lepidopterists Society of Africa)

Henning S.F. & Henning G.A. 1966b – *A review of the Hyalites (Auracraea) Anacreon Species of Southern Africa. Metamorphosis* 7: No.2, June 1966. (Journal of the Lepidopterists Society of Africa).

Holm E.& Marias E. 1992 – *Fruit Chafers of Southern Africa.* Ekogilde CC, PO Box 178, Hartebeespoort 0216, RSA.

Kruger M. 2001 – *Arevision of the tribe Macariini (Lepidoptera: Geometridae) of Africa*. NHM London Vol 70 No.1, 28 June 2001.

Kruger M. 2002 – *Additional revisionary notes on Afrotropical Ennominae of the Drepanogynis group. Metamorphosis* 13: No.2, June 2002. (Journal of the Lepidopterists Society of Africa)

Johnson S.A. 1993 – *A Visitors Guide to the Nyika National Park, Malawi.* 148pp. Thembazi [Mbazi] Book Trust, PO Box 1438 Blantyre, Malawi.

Keilland J. 1990 – *Butterflies of Tanzania.* Hill House Publishers, 2/157 Bluff Rock, Black Rock3193, Victoria, Australia.

Lee R.F. 1971 – *An Annonated List of Malawi Forest Insects.* Government Printer, Zomba, Malawi.

Mitchell M.N. 1973 – *An Annonated Check List of Zambian Hawkmoths.* Zambia Museums.

Monfort A. & Wiesner J. – *Records of Tiger Beetles collected in Malawi* Lambillionea CVII. 2 June2007 Pages 309 - 318

Pinhey E. 1956 – Th*e Emporer Moths of East Africa.* Journal of the East African Natural History Society, XXX111: No.1

Pinhey E. 1962 – *Hawkmoths of Central & Southern Africa.* Longmans S.A. (Pty) Ltd, PO Box 2875 Johannesburg, RSA.

Pinhey E. 1966 – *A Checklist of Dragonflies (Odonata) from Malawi*. *Arnoldia* No.33 Vol 2-26.

Pinhey E. 1972 – *The Emperor Moths of Southern & South Central Africa.* C. Struik (Pty) Ltd. Capetown, RSA.

Sudre J. & Teocchi P. 2002 – *Contribution a la connaissance des longicormes du Malawi.* Les cahiers Megallanes, No.14. 10 Rue de la Gare, 78570 Andresy, France.

Vari L. Kroon D. and Kruger M. 2002 – *Classification and Check List of the Species of Lepidoptera Recorded in Southern Africa*. PO Box 572, Sasolburg 1957, RSA.

Werner K. and Dudley C. 1998 – *Contribution to the knowledge of the Cicindellidae of Malawi. Lambillionea* XCV111: 4 Dec.

WHAT IS THIS?

Found by the “A” team in the lower Sawi Valley.
Any ideas, please let us know!

www.biosearch.org.uk

The Happy Clappy Song

Kath Thomas

2. We gather wood, we light a fire, we make a meal,
Soon we find we're knee-deep in potato peal,
Slicing and a-chopping and then into the pot,
Stirring and a-stirring till it's good and hot.

We all agree the meals out here are really ace,
Nothing short of haut cuisine, it's in your face,
Lots of hungry mouths to feed, we raid the store,
All you ever hear is "Please sir, can I have some more?"

CHORUS

3. We've students and we've scientists to grace the scene,
The greatest troop of talent there has ever been,
Stephen knows his plants and flowers very well,
Hils paints pretty pictures that look oh so swell.

Young Sidney waves his net to catch the butterflies,
His love of bugs and beetles surely never dies
James's holy cross makes all his plots come true
But weighs him down and crucifies him too.

CHORUS

4. We're slowly changing colour to a shade of brown,
So dirty and so grimy how our mums would frown.
Ask us are we bover'd and the answer's no,
We're having too much fun and we're enjoying the show.

Laura's prancing round the camp in her sarong,
Vikky's stuck in mud and wondering what went wrong,
James has double helpings and nsima too,
All in all we're such a jolly crew.

CHORUS

This song was inspired by a track I heard on the bus as we journeyed between camps. It was performed by an African group with a reggae style called Ndirande Anglica Voices and I found it very catchy. I used the first line of the song as a sounding board and went from there. The song has a 'feel good' factor and is meant to reflect the very enjoyable, fun time we all had on the expedition.

Biosearch 2007: The Complete Team

Photo by Adam Lee