



**A REPORT ON THE
INVESTIGATIONS DONE IN BUSHENYI DISTRICT
FOLLOWING THE MARBURG CASE EXPORTED TO THE
NETHERLANDS FROM THE 'PYTHON CAVES'**

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Background

The Ministry of Health received information from the World Health Organization (WHO) reporting a 40 year old Dutch tourist who died on July 11, 2008 following visit to the 'python caves' in Maramagambo Forest located in Bushenyi district between Queen Elizabeth National Park and Kabale district.

The tourist arrived in Kampala June 5, 2008, and entered the caves with friends on June 19, 2008 but her alone was hit by a bat. This cave is home to thousands of Egyptian Fruit eating bats.

She returned home on June 28, 2008 and later developed a fever on July 2, 2008 (2 weeks after contact with a bat); she was admitted to hospital on July 5, 2008 and her condition worsened on July 7, 2008 when she developed liver failure with severe bleeding and eventually passed away on July 11, 2008.

Studies done last year by CDC in similar caves in Kitaka mines, Kamwenge district, revealed that 5% of cave dwelling bats were positive for Marburg virus.

Following the report from the World Health Organization, the Ministry of Health Uganda was obliged to take appropriate steps nationally to investigate these events. The Ministry of Health with assistance from WHO, CDC, and AFENET therefore undertook these investigation so that the findings could inform the initiation of appropriate response to prevent further exposure of the local populations and tourists to the presumed source of the infection.

Objectives

The team visited the local health facilities in the vicinity of the python caves with the purpose of:

1. Determining the level of preparedness with regard to capacity for case detection, infection control and health education for Marburg hemorrhagic fever
2. Determine the availability of case definitions, case investigation forms, infection control guidelines and supplies for routine infection control
3. Review the patient registers for recorded cases of bleeding disorders like viral hemorrhagic fevers, dysentery or any other bleeding disorder of unknown cause
4. Sensitize the health facility on the guidelines for Marburg detection, investigation and response
5. Review the log of visitors at the UWA base so as to ascertain the health status of the persons who have visited the caves in the past ~4weeks.
6. Identify, interview and screen the local tour guide who accompanied the dead tourist to the caves
7. Map out all the different human activities in the vicinity if the caves.
8. Identify other local groups of persons with regular access to the caves e.g. traditional healers, miners, unlicensed tour guides so that these can be investigated for exposure to the bats and hence the infection.
9. Assess the knowledge and practices among the locals so as to inform the designing of an appropriate communication strategy

Methods

Team

A joint of experts from MoH, WHO, CDC, and AFENET conducted the investigations from July 29, 2008 to August 1, 2008 (annex 1 for the team members).

Area of Study and health facilities visited

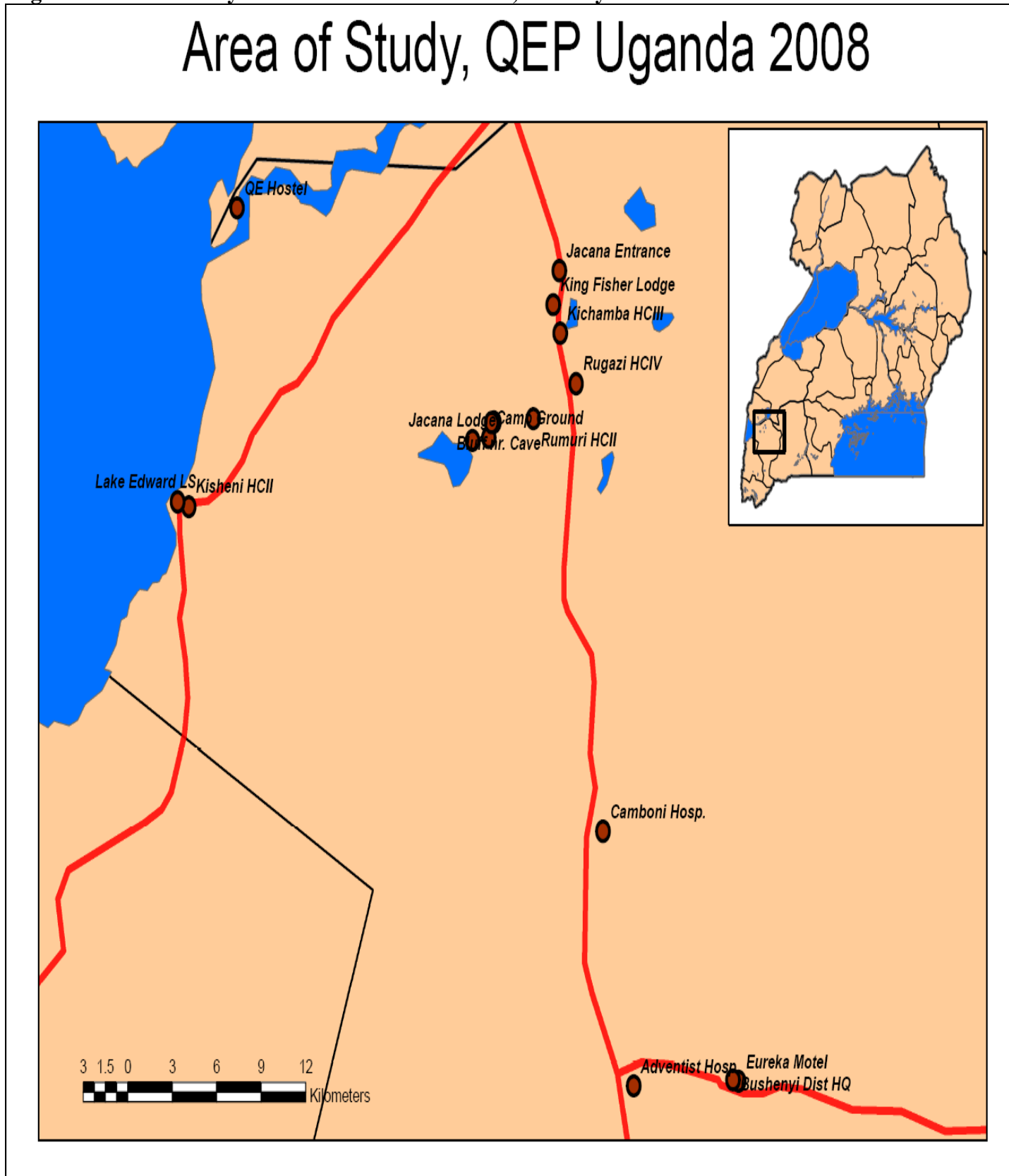
After paying the courtesy call to the District Health Office the embarked on visiting the local and referral health facilities that the communities around Maramagambo Forest use. The health facilities visited included Rumuri HCII, Kichwamba HCIII, Rugazi HCIV, St. Daniel Comboni Hospital, and Ishaka Adventist hospital. The team also visited the Uganda Wild Life Authority (UWA) camp in Maramagambo and later the 'Python Caves'. The local communities living around the National Park were also visited to obtain vital information for the investigation and to carry out sensitization.

Investigation Process

The team started by paying a courtesy call to the District Health Offices. The District Health Officer updated the team on the investigations done so far and provided an update on the performance of the district surveillance system. The team then proceeded to visit the local and the referral health facilities serving the communities around Maramagambo Forest and the 'Python Caves'.

At each of the health facilities, a meeting was held with the health facility administration to brief them about the looming risk of a Marburg outbreak following the case of Marburg exported to the Netherlands after a visit the python caves where she's believed to have contracted the infection. During the meeting, the team was briefed on the need to improve surveillance for VHF through providing the case definitions, and case investigation forms to facilitate early case detection. Emphasis was also laid on the need for the health facilities to improve and maintain routine infection control standards to prevent nosocomial transmission and hence epidemic amplification in the health facilities. The case definitions and case investigation forms were yet to be distributed to the health facilities and hence were found missing in all the health facilities visited. Copies of these were distributed to the health facilities with instruction to the district to distribute more and to the rest of the other facilities in the district. The records at these health facilities were reviewed to determine the disease patterns and to establish if there case documented with conditions like dysentery, viral hemorrhagic fevers, or any other bleeding disorders of unknown cause. Guidelines for Marburg case detection, investigation, infection control and response were also provided to the health facilities with copies left for the DHO to distribute to the rest of the other health facilities.

Figure 1: Area of Study and Health Facilities visited, Bushenyi District



All the health facilities visited were mapped using global positioning systems kits and entered into the arc GIS soft ware to produce the map of the study area (Figure 1)

The team visited Maramagambo Forest and the ‘Python Caves’ where the local tour guides were identified and screened for evidence of exposure to bats and any symptoms suggestive of Marburg Viral Hemorrhagic Fever and exposure history in the recent past.

The tour guide who accompanied the deceased tourist was sought to throw more light on the details of the trip.

While at the UWA base near the caves, the visitors log was reviewed to list all the persons who have visited the caves in the recent past (~4weeks). The aim is to identify these locals and verify their health status; while for the international visitors the WHO will alert their countries to ascertain their health status. Effort was also made to identify other groups with regular access to the caves and who by virtue of their activities in the caves could have been exposed to the bats.

There were key informant interviews with local leaders, traditional leaders, and traditional healers in the communities surrounding the National Park. Their different activities in the vicinity of the Park were mapped in order to establish groups at high risk of exposure to Marburg virus.

An assessment on the knowledge and practices that could predispose the persons living in these communities to Marburg infection was done so that the findings can inform the process for designing a communication strategy for Marburg preparedness.

The Findings

Key findings

At the District Level

The district received a report of a Marburg case in Holland suspected to have contracted the disease from a tourist attraction in the district on 14th July, 2008 from both the DGHS (MOH) and newspaper reports. A rapid response team composed of a DSFP, DHE and the Clinical officer in charge of the affected HSD was composed on 15th July, 2008 to verify the report. DRRT report attached. Review of the report and processes before and after the report indicated the following:

A) Strengths

- Rumour verification was made within 48 hours of report
- Outbreak investigation and findings are included in the log of rumours and outbreaks
- Documented outbreak investigation report
- Resources made available within the district to investigate the outbreak

B) Weaknesses

- Composition of the DRRT missed out critical competencies namely Laboratory scientist and environmental health officer
- Given the gravity of VHF, the team would have benefited from the expert opinion and presence of the DHO.

- Objectives of the outbreak investigation were limited to magnitude and cause of the Marburg epidemic and no details were made available on the methods of the investigation
- Ten steps in outbreak investigation were not followed (the report does not mention what case definition was used to search for possible cases in HF visited and communities and local response capacity was not assessed).
- Visited health facilities were limited to two (Kishenyi HC II and Rugazi HC IV) and thus missed out critical facilities like Rwandaro HC II, Kicwamba HC III, Rwenzori tea factory HC II and Rutoto HC II.
- No community visit was conducted for extended case searching and determination of awareness, knowledge and practices that promote risk of VHF transmission.
- Report not shared with ESD/MOH for a highly infectious disease whose response would require the intervention or technical support from outside the district.

At the Python Cave

Mr Twimukye Godfrey and a one Patrick received us at the park-based UWA office. The mission objectives and the investigation team was introduced to the local UWA office. The UWA local rangers/guides informed us that the Rock Python caves were opened about 10 years ago after a great exploration of the area to obtain tourist attractions. The two tourist guides were proud to note that they had been part of the team that opened up this tourist site and had never had any illness associated with any bleeding tendencies since.

We obtained confirmation that the UWA office received several tourists in June that included a couple of people from Netherlands at the end of June. Confirmed that the Dutch tourists like most other people visited the Rock Python caves although the guides denied having had contact with the bats or walks into the rocks contrary to what had been earlier reported in the Marburg case report. We did not however determine the reasons or explanations for this controversy other than our assumption that this a coached approach of UWA to this outbreak investigation.

Other key observations at the park were:

- The cave was reportedly closed off to tourists since 13th July 2008 when reports of a suspected Marburg case arising from it was received by UWA
- Review of the records at the UWA offices revealed that a total of 94 tourists have visited the forest although none visited the python cave. Unfortunately, the log of tourists does not identify most of the tourists by name but rather by their respective tour agents. Secondly, we learnt that the tourist names can only be identified only if they visited the park un-guided by the tour agents. The register identified the following countries UK (39), Ugandans (14), Belgians (6), Rwanda (2), Dutch (1), Switzerland (1) and the rest of Africa (6). Detailed list of tour agencies and the respective nationalities involved attached
- At the python cave, we found two rock pythons, visible from outside the cave. The rock pythons measured around 3 metres long and 12-15 cm in diameter. We also observed several bats a majority of whom were roosting but a couple were flying about in the cave. No single bat was observed to have moved out of the cave. The cave is short up to about 30 metres with several nooks that house the rock pythons and several bats. The cave has a floor full of bat droppings which in turn looks like oily/slippery in addition to a fowl smell and hot air (estimated at 40°C) emitted that makes it repulsive for cave walks. We

also observed several bat skeletons at the outlet of the cave that would suggest bat deaths a couple of weeks earlier.

Visit to the communities

Two communities were visited namely Rwandaro and Kishenyi. Rwandaro is geographically closest to the Python Caves. It is located on the Rift valley escarpments just less than 1 Kilometer.

Rwandaro community is located East of the Python cave approximately 1 Km. Rwandaro residents described a long time existence between them and the forest/game reserve that included hunting, fruit gathering, lumbering, medicinal herbal collection and until recently collecting water from a spring located less than 50 meters from the Python cave. The Python cave and several other caves in the forest were described and known in the community. And although several caves were used for game meat conservation like roasting/smoking, the python cave has since before to date been associated with bats, pythons and fowl smell believed to be a cause of illness (as described in the miasmatic theory). For this reason, there was no documented contacts of this particular cave with the community. And given the high level of law enforcement in the part and forest areas, no single resident was willing to take us to any sites in the forest to enable us document/geo-map the activities.

Kishenyi community on the other hand is located on the extreme western end of the Maramagambo forest approximately 30 Kms from the cave. It has an estimated total population of 2,000 all located in an area less than 1 square kilometer. Not much was known about the Python cave as this population is mainly a fishing community along the Lake Edward shoreline.

In both communities, we documented a good understanding of VHF signs and symptoms although history of occurrence of the disease was not known in the last 2-3 years (we anticipated that a period beyond 3 years would be influenced by recall biases). We could neither document the last date of a VHF-like illness. Occasionally, the community mixed the clinical symptoms and local interpretation of VHF with Cholera and dysentery. Fortunately in both VHF and Cholera, the dead body handling was characteristically by burying on the same day the person dies using non-touch methods (*“we roll the dead body into the grave and burry him/her with the sticks used to roll the body”*).

Three traditional healers were identified and an in-depth discussion held with them. The discussions with the traditional healers indicated that their healing practices use herbs from the forest, have a thorough knowledge of VHF symptoms especially the documentation of “Ghost-like” appearance before death. With the above knowledge of clinical manifestations of VHF, we documented that not a single case of suspected to be VHF was seen by this sector of health services in the last year.

Health Systems Findings

Rumuri HCII:

Rumuri is a level II health facility that is located closest to the python caves in Maramagambo forest. The facility is located in Rumuri Parish, Kichwamba sub-county, Bunyaruguru County.

The facility is run by two health workers; an enrolled nurse and a nursing assistant. The catchment population is 7,000 persons and the health services offered at the facility include basic curative care, antenatal services, family planning services, and immunization services. The top five causes of morbidity at the facility using the data for June 2008 are: Malaria, Acute diarrhea, No pneumonia cough or cold and Intestinal worms. No cases of viral hemorrhagic fever or dysentery were reported on the past three months. The health facility recorded a total of 436 patients (260 being female) for the month of June 2008. Review of registers for dysentery cases revealed 5 cases for each of the months of January and February; 2 cases for March; 1 case for April; no cases for May and June, 2008.

There were no case definitions, infection control guidelines or health education materials on Ebola or Marburg

The facility has adequate supplies of materials for infection control

Two more caves (Nyakiyanga and Kyamulogo caves) infested with bats were reported in the vicinity of the health facility.

The health facility staffs were sensitized on the case definition, case forms and infection control guidelines and in addition, copies of these were left for display and future reference especially during the course of clerking patients.

Kichwamba HCIII:

This is the main referral facility in Kichwamba sub-county. On reviewing the patient log in outpatients department revealed that on average five (5) patients are seen in a day with the commonest causes of morbidity being Malaria and diarrhea. There were no patients with dysentery or viral hemorrhagic fever recorded in the past 3 months. Sensitization on response to Marburg hemorrhagic fever was provided and the relevant tools were left at the unit for display and future reference.

Rugazi HCIV:

This is the main referral facility for Bunyaruguru health sub-district with a catchment population of 382, 871 people. It has a total of 12 health facilities under its jurisdiction with the main cause of morbidity being malaria. Review of patient logs in the outpatients department showed that ~80 patients (range 80-100) are seen on a daily basis. A total of 17 patients with bacillary dysentery were seen between January and June, 2008; giving an average of 3 patients of dysentery per month.

Health education materials for Ebola in the local language were displayed in the health facility but not the case definitions. Sensitization on the surveillance and infection control tools was provided to the hospital administration and copies of these were left for displaying and future reference especially in the consultation rooms.

St. Daniel Comboni Hospital

The hospital is located in Igara West health sub-district serving a catchment population of 116,891 persons and a total of 14 health facilities under its jurisdiction. It is a 100 bed hospital and serves a total of 70-100 patients per day on average. The commonest cause of morbidity is malaria and dysentery cases are rare with one case of dysentery being seen in a period of 1-3 months. Review of patient logs for June 2008 had 10, 256 patients (6,116 females) and only 6

cases of dysentery between January and June 2008. The hospital had well established systems for infection control and was planning to hold a CME in two days time during which the administration promised to dedicate time to sensitize the health workers on the case definition and the infection control guidelines

Ishaka Adventist hospital

Located in Ishaka town, this 100 bed hospital mainly serves the clients from Ishaka town and a good number of other clients from other parts of the district. Review of patient logs revealed no cases of dysentery or viral hemorrhagic fever since January 2008. The surveillance and infection control tools were left with the administration for display and future reference.

Recommendations

Health System Improvement

District

1. The DHO needs to organize a CME on Marburg surveillance, investigation, infection control and response to the health workers in the district.
2. Case definitions, case investigation forms and infection control guidelines should be printed and distributed to all the health facilities in the district
3. Display the case definitions and infection control guidelines at all the service delivery points in the health facilities
4. There is need to establish and maintain systems for infection control in the health facilities to prevent nosocomial transmission and health facility amplification of outbreaks
5. Provide adequate supplies to enable all the health facilities meet the minimum standards for basic infection control
6. Active surveillance and notification of suspected VHF cases needs to be initiated with assistance of the Community Medicine Distributors
7. Networking with the wild life authorities to report animal deaths in the Park and prevent people from entering the caves
8. Develop a plan for key activities including radio talk shows, surveillance and distribution of IEC materials and surveillance tools and forward it to the Ministry of Health by August 6, 2008.
9. Provide sensitization and health education to the public on; the presentation of the disease; avoid eating of animals found dead in the Park, and reporting all suspected cases to the health facilities.

National level

1. Develop and standardize the IEC materials and health education messages
2. Produce and disseminate the case definitions, case investigation forms, and infection control guidelines to the district.
3. Develop a training curriculum for a CME session on Marburg hemorrhagic fever surveillance, investigation, and response.

Community

1. Increase community awareness and education through;
 - supplying IEC material in key public places
 - community film shows on VHF risk reduction
 - Radio messages and talk shows

Uganda Wild Life Authority (UWA)

1. Create a viewing platform with a barrier to prevent the tourists from entering the cave
2. Put up a risk notice for the tourists not to proceed beyond a certain distance of the cave to prevent the risk of getting in contact with the bats.
3. Intensify surveillance and investigation of clustering of illness/ deaths in the Park and share reports with the Ministry of Health (Epidemiology and Surveillance Division).
4. The division of monitoring and research should develop a tourist tracking log that captures identity details (name, gender, place of origin, plus or minus passport number) of all the tourists who visit the Park.

Annex 1: Investigation Team

Name	Organization
Dr. Wamala Joseph F	Ministry of Health
Mr. Atek Kagirita	Ministry of Health
Mr. Matthew Cummings	Ministry of Health/ Siena College
Mr. Mutungi Pantaleo	DSFP_Bushenyi
Dr. Namukose Esther	MPH Officer
Dr. Mbabazi William	World Health Organization
Dr. Ndungutse David	African Field Epidemiology Network
Dr. Tom Kziazek	CDC, Atlanta

Annex 2: List of Tourists/ Tour Agencies who have visited the Maramagambo Forest in the past 3 weeks

No	Name or Contact Travel Agent	No of Persons	Date of Visit	Age	Sex	Country of Origin	Visited the Python Cave
1	Dan	1	7/19/2008	Adult	M	Uganda	No
2	Asynut Safaris (12 people)	12	7/20/2008	2 Children and 10 Adults		Uganda (2) and UK (10)	No
3	Scarth (4 People)	4	7/21/2008	Adult		UK (3) and Uganda (1)	No
4	Catherine Dianne W (3)	3	7/21/2008	Adult			No
5	Gorrilla Tours (10)	10	7/22/2008	2 children and 8 adults		UK (8) and Uganda (2)	No
6	Nile Safaris	5	7/23/2008	Adults		Belgium (4) and Uganda (1)	No
7	Robbin and Emma	2	7/23/2008	Adults	F(1) & M(1)	UK (1) and Uganda (1)	No
8	Landman	4	7/25/2008	Adults	M	Netherlands	No
9	Mr Nathu	4	7/25/2008	Adults	M	Rest of Africa (3) and Ugandan (1)	No
10	Mr Nathu	1	7/25/2008	Adult	F	Rest of Africa (3) and Ugandan (1)	No
11	Gonget	5	7/26/2008	3 Adults and 2 children		UK (3) and Uganda (2)	No
12	Liza	4	7/26/2008	Adults		UK (4)	No
13	Patrick T	4	7/27/2008	Adults	M(2) and F (2)	Belgium (2) and Rwanda 2	No
14	Hellena	4	7/27/2008	Adults	M(1) and F (3)	Switzerland	No
15	Hemmangs	5	7/29/2008	4 adults and 1 child		UK (5)	No
16	Global Interlink tours	3	7/29/2008	3 adults	M92) F (1)	Uganda (1) etc	No
17	Magic Safaris	8	7/11/2008	Adults		?????	No
18	Escar Safaris	4	13th/07/2008	Adults		?????	No
19	Elizabeth Musoke	2	7/14/2008	2 Adults	F	UK (1) and Uganda (1)	No
20	Amazing Safaris	3	7/15/2008	Adults		UK (3)	No
21	Nile Safaris	2	7/24/2008	Adults		????	No
22	End	2	7/27/2008	Adults	M(1) and F(1)	UK	No
23	Great Lakes Safaris	2	7/28/2008	Adults		NA	No