AHEAD-GLTFCA WORKING GROUP – 6TH MEETING

Record of the 6th Meeting held on the 9th – 10th March, 2006

Pestana Kruger Lodge, Malelane, South Africa

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1. OPENING REMARKS AND WELCOME

The meeting opened at 09:00 hrs in the conference room at the Pestana Kruger Lodge with Dr. Danie Pienaar as Chair. He noted the importance of widening the range of disciplines involved in the programme and was pleased to see that participants from the medical, social and developmental sciences were at the meeting and would be making presentations.

Dr Carlos Pereira, (Carlos Lopes Pereira LMV, MSc. Unidade de Epidemiologia Veterinária, Departamento de Sanidade Animal, Direcção Nacional de Pecuária, Ministério da Agricultura e Desenvolvimento Rural, Moçambique), welcomed members of the Working Group to the 6th full Working Group Meeting and noted that the *AHEAD* concept, focusing on the interface between wildlife, livestock and human health, had come a long way over the last three years and there was greater awareness of the need for an integrated approach to animal and human health issues. There were nevertheless major challenges to be faced in conservation and development in the region. We are dealing with complex issues and processes that often produce surprising effects in response to our attempts to manage them. Both veterinary and medical perspectives were too narrow on their own. There is a need to consider the full range of variables involved and a failure to take a broad, integrated approach could all too easily result in inappropriate or incorrect decisions being taken. This was particularly likely to occur unless human-social factors in animal disease management and control were considered and understood. As a result, he particularly welcomed the *AHEAD* approach, and the input of social scientists and human medical health experts in the programme over the next two days – it was important to continue to widen our understanding of the system and to continue to develop a fully multidisciplinary programme. Dr Pereira thanked the organizers of the 6th Working Group Meeting and wished everyone an enjoyable and productive meeting.
The opening and welcome was followed by each of the 40 participants briefly introducing themselves.

2. INTRODUCTION AND BACKGROUND TO *AHEAD* (Steve Osofsky & Mike Kock)

Steve Osofsky, WCS Senior Policy Advisor for Wildlife Health, briefly reviewed the history of the ***A***nimal ***H***ealth for the ***E***nvironment ***A***nd ***D***evelopment (AHEAD) initiative since its inception at the World Parks Congress in September 2003:

"The Animal Health for the Environment And Development (AHEAD) initiative was launched at the World Parks Congress in September 2003. Many of you were involved, and many individuals and institutions have come on board since. Groups such as the IUCN Southern Africa Sustainable Use Specialist Group (SASUSG), Veterinary Specialist Group (VSG), AU-IBAR and others worked with WCS to co-organize that initial forum. Much of the material generated at the Durban meeting and since is available at www.wcs-ahead.org, including video of all formal talks and copies of all slide presentations given at the launch. Approx. 80 participants in Durban (veterinarians, ecologists, economists, wildlife managers and other experts from Botswana, Kenya, Malawi, Mozambique, Namibia, South Africa, Tanzania, Uganda, Zambia, Zimbabwe, France, the United States, and the United Kingdom) worked together to delineate landscapes of conservation priority across southern and East Africa with significant disease issues at the wildlife/livestock/human interface. To make a long story short, the Great Limpopo TFCA emerged among the group's highest priorities. The hope is that progress can be made in the GLTFCA through international and interdisciplinary collaboration, and that a successful applied research, development, policy, and outreach effort here could also potentially serve as a useful model for other places facing similar challenges in southern and East Africa, and potentially elsewhere. Just the fact that the AHEAD launch was able to be held at the World Parks Congress was significant. 'Our' issues have often not had a seat at the conservation table, and the significant sponsorship we received from agencies such as the US National Science Foundation (NSF), USAID, and others at a major event like the IUCN

World Parks Congress certainly helped raise awareness about the importance of animal and human health sciences to conservation success.

We wanted to utilize this unique opportunity at the World Parks Congress to address problems facing the regions' largest intact conservation areas, so we tried to focus the forum largely on the growing list of transfrontier conservation areas being developed in East and southern Africa, of which there are 20 or so envisioned to eventually encompass approximately 120 million hectares. These are large landscapes, many of which are grappling with health-related challenges to their success. The GLTFCA really is a fantastic model for addressing the types of challenges these TFCAs face in terms of disease issues and potential impacts on various sectors. As all of you know, there is no formal policy within SADC, for example, in terms of how to approach disease-related challenges at the livestock/wildlife interface in the context of TFCAs. Again, perhaps the work you are all here to continue to flesh-out could eventually inform such policy, another selling point, in my mind, for what we are all trying to do together: the AHEAD-GLTFCA programme is well placed to provide a model that could potentially be extended to other areas. And there has already been some interest in extending the AHEAD concept within the region. A workshop, facilitated by David Cumming and Mike Kock, was held in Namibia in November last year at the invitation of the Ministry of Environment and Tourism (MET). This workshop served to bring wildlife scientists and managers and colleagues from the agriculture sector together to discuss common issues, and to collaboratively look at approaches to disease control and management in Namibia. There is also the potential for AHEAD involvement in the KAZA TFCA.

There has been a lot of progress in the past year- for any of you who did not receive the new AHEAD book, the Proceedings from Durban entitled **Conservation and Development Interventions at the Wildlife/Livestock Interface: Implications for Wildlife, Livestock and Human Health**, I've brought some to this meeting- free for the asking. Many of you of course authored chapters in this volume, which seems to have been quite well received. We've also been able to raise awareness about the health-conservation linkages through a variety of other media- including a chapter in IUCN's new book on protected areas- both the AHEAD book and the chapter from IUCN Chief Scientist Jeff McNeely's Protected Areas book are available as free downloads on the AHEAD website. Those bold enough to do so can even purchase hard copies from IUCN! WCS and AHEAD make no money from the sale of the book- we just want to get the information into the hands of people who can use it.

We have also started to see some funding flow this year. As you'll be involved in over the next few days, support from USAID and the Sand County Foundation are helping us to proceed with the complex systems analytic framework effort as led by David Cumming and Harry Biggs, as well as the 'scenarios' module as led by Michael Murphree. These two efforts can be important foundations for the AHEAD GLTFCA initiative to enter what we hope will be an increasingly active and interactive phase in the region. And CASS appears to be on the verge of a significant funding success for scenarios and community work, which we will be hearing more about from Jeanette. The World Bank TFCA programme in Mozambique is also likely to provide support to help establish a wildlife veterinary unit in Mozambique, and to support some of the other work associated with disease issues in the Mozambique component of the GLTFCA.

I thought I'd put up the homepage of the AHEAD website for those of you who don't review it each night before you go to bed like I do. I also wanted to briefly describe what the Wildlife Conservation Society is for those who are not familiar with us. WCS is a not-for-profit US-based wildlife conservation organization with programs in over 50 countries. Our role in AHEAD has been and continues to be primarily that of catalyst, to help support meetings like this so regional colleagues can more easily share information and work together. WCS is also happy to support the coordinating role David Cumming was asked to take on by the Great Limpopo group initially assembled in Durban in Sept. 2003.

For those of you who don't have it (very few of you, I would hope), we've printed a few extra hard copies of the working draft of the concept paper, 'Sustaining animal health and ecosystem services in large landscapes – 2nd Draft – Concept for a programme to address wildlife, livestock and related human and ecosystem health issues in the Greater Limpopo Transfrontier Conservation Area.' We also have copies of the notes from our previous full Working Group meeting in Pretoria in February of last year, as well as an overview from the May 2005 'Frameworking' meeting and notes from the October 2005 interim meeting, both held at Skukuza. Of course materials generated from previous meetings are all made freely available on the AHEAD website.

I just want to conclude with a couple of personal thoughts on the AHEAD GLTFCA initiative at this point. I am only speaking for myself here- not for AHEAD as an initiative or anyone else. First, I think you- the members of the Working Group- need to actively decide whether the balance between research and applied work as

currently envisioned is where it needs to be. As conceived in Durban, AHEAD was never meant to be a research initiative per se- but much more than that. Policy engagement, technical assistance to managers, development-oriented activities, even science-based advocacy- a whole toolbox of activities is certainly possible given the incredible breadth and depth of professional and institutional expertise the AHEAD GLTFCA Working Group represents. Sound science will of course need to underpin whatever activities are undertaken, but my point is that AHEAD itself should likely continue to be seen as fostering an enabling environment for a range of activities related to conservation and wildlife, domestic animal, human, and ecological health that are needed to ensure that the GLTFCA is a successful and sustainable endeavor.

Second, I think we need to constantly ask ourselves if the work we are all doing, including the research we are undertaking, is moving fast enough to inform decisions that are being made on the ground in real time. I realize that I am a characteristically impatient American, and that there is a lot happening at various levels that we cannot necessarily influence- but what I am getting at is that it remains important for us to try and make sure that the science we have at our disposal informs, whenever possible, decisions related to fences coming down or going up, to vaccination programs, to wildlife being translocated, to cattle being moved, etc. And I of course recognize the critical role of the Conservation and Veterinary Subcommittee of the Joint Management Board, of which several of you are key members, in this regard. Again, my personal perspective is that AHEAD is about influencing such activities and related land-use decisions for the better- and timing is often a real issue, I think.

That's all I wanted to say. Thanks very much again to all of you for making the time to come and participate in what I believe will be a very productive few days, and to Merle Whyte and Jackey Deacon, our meeting coordinators, for helping to pull it all together and making logistics so easy. Thanks."

Dr. Mike Kock, WCS Field Veterinary Program, emphasized that the AHEAD programme was a cross-cutting, multi-disciplinary effort that was operating in various areas around the world, including Mongolia and East Africa. However, the other projects were not operating at the ambitious level of the AHEAD-GLTFCA programme. The workshop in Namibia in November last year had been very successful in a country where agriculture veterinarians and wildlife experts seldom sat down in the same room. The KAZA TFCA programme has also been interested in the concepts being developed in the AHEAD-GLTFCA programme. Many of the problems (e.g. bovine tuberculosis and HIV) facing the GLTFCA were being faced elsewhere, particularly in East Africa, and the dissemination of ideas from the AHEAD programme was taking place.

NOTE: Most of the PowerPoint from the following presentations are available in PDF format on the AHEAD website at http://www.wcs-ahead.org/gltfca_march2006/agenda_march2006.html

3. COMPLEX SYSTEMS, CONCEPTUAL FRAMEWORKS & SCENARIOS

(Facilitator – David Cumming)

Previous Working Group Meetings were mostly concerned with programme design, institutional arrangements and funding issues. The agenda for the current Working Group meeting was designed specifically to bring a greater focus on the scientific aspects of the AHEAD-GLTFCA programme. The result is that a number of people were asked to make presentations that would provide a basis for wider and deeper discussion of the science involved in a wide range of disciplines in the programme. Speakers have been asked to limit their talks to about 20 minutes so as to allow ample time for discussion. The initial session will be concerned with wider issues of dealing with complex systems, conceptual frameworks and scenario planning followed this afternoon and tomorrow morning by more specific presentations on a wider range of disciplines.

3.1 An Introduction to Complex Systems Thinking and Research – Complexity 101

Harry Biggs

This is the abstract for an introductory talk on complexity, first presented in July 2005 by Harry Biggs at the 40th annual congress of the Grassland Society of southern Africa

Complexity theory has made a serious debut in resource management and ecology in the last decade. This is presumably a response to poor performance of existing paradigms, in the face of the increasing desire to try to see systems in their socio-ecological entirety.

Complicatedness is not the same concept – a jet aircraft or a microchip is complicated, and unless broken, delivers deterministic outcomes. Complex systems, ironically, often depend on only a few (usually three to five) main drivers, the essence of the complexity lying in the varying role of these drivers and their interrelationships. A savanna ecosystem (even before human socio-economy is factored in) is classically complex, with rainfall, herbivory, fire, and other drivers playing a tantalizing quasi-predictable game which is ever changing. Different combinations can lead to the same outcome; under other circumstances relatively small differences at the right time lead to major system state shifts, indicating a non-linearity in many responses. This complexity is further characterized by serious scale effects, including between-scale issues, which if construed as a hierarchy can be dealt with. Time lags also need to be taken into account. Feedbacks (strengthening a 'vicious circle' or counterbalancing it) are a standard feature, causing behaviour difficult to predict, and making scenarios of trajectories a more realistic tool than the predictions 'normal' science was meant to but cannot deliver.

Interactions between drivers compound in various ways to produce so-called emergent properties, making the system *adaptive and self-organising*. It now appears that ecologists and range managers have long appreciated, albeit tacitly, these qualities in complex adaptive systems and have in fact not been overwhelmed by this dynamism (change over time) and heterogeneity (patchiness over space). It may be time to formalize these concepts into our body of knowledge and so confront holism.

Today we see ourselves as involved in systems with not only biophysical but also social and economic drivers, and may thus benefit from considering the construct of the socio-ecological system (SES) which, because of human learning, could or should be particularly adaptive. This is based on resilience principles and the associated notion of alternate stable states as espoused in range management in recent decades. These states are analogous to cups (domains of attraction) and are reached when drivers force the "ball" over a ridge (or threshold). Today the notion has been expanded from the way most of us got to know it (say grassland cf. woodland cf. shrubland) to a wider formulation linking all drivers into one unified system. Such a unified model explores, through delivery of ecosystem services, the effect of ecosystem change on human livelihoods and, through human incentives and activities, their impact on ecosystems. The SES attempts to couple these (using the complexity principles above) into just one system, and through scenarios, to prepare us for a possible range of outcomes and responses. It turns out that southern Africa offers some of the best opportunities in understanding and using SES methodology, including a wide range of contrasts to test understanding of how systems function and what triggers their change.

Discussion:

1. *Chaos theory and complexity?* 'Chaos theory' is a branch of a wider mathematical theory of non-linear systems or dynamical systems theory. Chaotic systems can display deeper levels of patterned order and structure that is nevertheless not subject to precise prediction. Similarly complex systems often display cycles and feedback with the result that quite small changes can result in very large effects. The 'butterfly effect' being an often used example. Social-Ecological systems (SES) are considered to be complex adaptive systems and equilibrial (balance of nature) paradigms, still widely used to guide development and resource management policy, seldom apply to the real world of complex systems. Disease dynamics with thresholds and non-linear behaviour provide clear example where complex systems approaches are appropriate and where such aspects as spatial patchiness (e.g. in land uses), fences and control methods may interact in unpredictable ways.
2. *Diseases as responders and drivers*. Disease can respond to environmental or social condition, or both, but can also act as drivers of large-scale change. The rinderpest outbreak of the 1890s is a

clear example of an animal disease resulting in macro-scale effects. The "Spanish" flu pandemic of 1918 was another example and the current spread of avian flu has already had major effects in terms of mobilizing global attempts to contain its spread. Issues of spatial and temporal scales are important in these dynamics as are cross-scale effects (e.g. development interventions in Ghana may fail because they come at the wrong time, and a veld fire may be best managed by going home to think about it before rushing in to fight it).

3. *Managers and scientists.* One of the tensions between scientists and mangers arises from the fact that scientists abhor Type 1 errors (i.e. accepting results that may be false) which can lead to delays in obtaining suitable evidence or making recommendations. Whereas in managing resources it is often more important (precautionary) to avoid Type 2 errors (i.e. rejecting a result that may be correct). Managers lower their tolerance threshold for error and, depending on the importance of the issue, are more ready to take risks because they have to get on with the job. The most effective way around the problem is to adopt overlapping and varying strategies at different levels of risk – keep good science, avoid being "too obsessed with getting it right" and learn to manage for change.
4. *Disease and drivers of ecosystem dynamics*. It helps to think of pathogens as part of the food web and the complex interactions that normally accompany food web linkages and dynamics and what else is going on in the ecosystem. Sometimes these interactions dominate; at other times abiotic factors such as the weather (e.g. droughts) can dominate. It is impossible to measure everything and key drivers, variables and scales need to be identified.
5. The importance of values and their role in driving political and resource management decisions cannot be neglected. Values also change with time.
6. There is a need to bridge the gap between "Command and Control" and adaptive approaches to managing diseases and ecosystems and equally to deal with the issue of how institutions and their design may or may not match, or be able to deal with, complexity.
7. The knock-on effects of diseases on tourism need to be examined.

3.2 Developing Conceptual Frameworks, Models and Linkages between Themes and Modules for the AHEAD-GLTFCA Programme

David Cumming

The development of conceptual frameworks and models for the programme since its initial conception at the World Parks Congress (WPC) in September 2003 will be presented together with some additional models and frameworks that may be useful to the programme. The extent to which frameworks and conceptual models developed so far are useful in bridging disciplines within the programme needs to be critically examined.

The initial concept for the programme, outlined at the WPC, focused on disease in relation to wildlife-livestock-human health. The spatial boundaries of the GLTFCA (as opposed to the GLTNP) were ill defined but broadly included the Limpopo, Banhine and Zinave national parks and intervening areas in Mozambique, Gonarezhou NP, conservancies and some communal land areas in Zimbabwe, and Kruger NP and adjacent conservancies in South Africa. The western boundaries in both Zimbabwe and South Africa remain undefined. In Zimbabwe it may eventually extend westwards to link up with the Shashe-Limpopo TFCA.

By November 2005, at the first meeting of some members of the Working Group in Pretoria, an "ecosystem health" component had been explicitly added to the animal and human health components. The ecosystem health component included issues of land use and participatory research into landuse-disease issues. A key factor in the debate, at least in Zimbabwe, is the siting of FMD control fences and their impacts on landuse options – particularly wildlife and tourism and livestock marketing. These issues were seen as being intimately linked to national landuse and disease control strategies, thus adding an explicit policy dimension to the programme.

The broader conceptual framework outlined in "*Sustaining animal health and ecosystem goods and services in large landscapes*" (Cumming 2004 http://www.wcs-ahead.org/workinggrps_limpopo.html) has formed the basis of planning programme development, funding and the growth of the interdisciplinary nature of the Working Group over four meetings. Basically, the current programme comprises 6 themes. The core research themes are, (i) Animal health and disease (Theme #2), (ii) Land use, ecosystem goods and services (Theme #3), and (iii) Human livelihoods and animal and ecosystem health (Theme #4). The remaining three supporting themes are: (i) conceptual frameworks and scenarios (Theme #1), (ii) Policy and capacity building (Theme #5) and (iii) Communications and outreach (Theme #6). Within each theme 3 to 6 modules, under which a number of project may fall, have been explicitly identified.

The question of developing a more explicit conceptual framework that might more effectively serve to link disciplines involved in the programme was the purpose of a small workshop held in Skukuza in May 2005. An overview of those deliberations is provided in Appendix 2 and at http://www.wcs-ahead.org/workinggrps_limpopo.html. The Skukuza workshop explored a variety of approaches, including the start of a resilience analysis, the Millennium Assessment approach to assessing ecosystem goods and services, and a preliminary exploration of a systems model of an agro-pastoral system in the GLTFCA. Further conceptual diagrams of the key linkages between diseases, animal health and human wellbeing were developed for each of the research themes. A "stakeholder map" was also drawn up at the workshop (See Appendix 2).

Time lines indicating the major shocks to the GLTFCA social-ecological system over the last 500 years together with an indication of the major drivers involved (Appendix 2, pages 2-3) provide an indication of the key role played by diseases at several stages. The overriding role of political drivers is of course also apparent.

Additional examples of frameworks and models that might be useful in the AHEAD-GLTFCA programme include: (i) the Resilience analysis framework (Walker et al 2002), (ii) the Sustainable Livelihoods framework (Ashley and Carney 1999, Carney 2002) and, (iii) several more specific models dealing with alternative landuse issues and tradeoffs developed within the SELCORE programme in south eastern Zimbabwe.

The main reason for developing conceptual frameworks is to provide a heuristic understanding of the system and to identify key issues and areas where we lack understanding and information - there is unlikely to be a single framework that will capture everything, so several models or frameworks are likely to be required. Another important role of more detailed models (such as that devised for the agro-pastoral system) is to help us understand how things affect each other and where are the areas that are not understood (what are the positive and negative drivers in the system). The link between the frameworks project and the scenarios will most likely be in looking at resilience under different scenarios – with more explicitly identified variables, thresholds, processes - to improve understanding and change our description of the system - and also to lead to improved policy.

References:

Ashley, C. and Carney, D. (1999) Sustainable livelihoods: lessons from early experience. London: DFID, Department for International Development.

Carney, D. (2002) Sustainable livelihoods approaches: progress and possibilities for change. London: DFID, Department for International Development. 64 pp.

Walker B, Carpenter S, Anderies J, Abel N, Cumming G, Janssen M, Lebel L, Norberg J, Peterson GD, Pritchard R. 2002. Resilience management in social–ecological systems: a working hypothesis for a participatory approach. *Conservation Ecology* 6(1):14. [online] URL: http://www.consecol.org/vol6/iss1/art14.

Discussion:

1. *Questions and frameworks.* Complex systems such as those we are dealing with cannot be viewed by a single framework and it is more sensible to start with the questions first and develop frameworks around the questions. However, the system needs to be described and defined at the same time as the formulation of questions and frameworks.

2. *Zoonoses*. Zoonoses cannot be lumped into a single package. Sixty percent of human diseases come from animals and 75% of newly emerging diseases are coming from animals – many of these are ~once-off events (e.g. HIV) after which the disease is transmitted between humans and can be regarded as "historically" zoonotic. Many other zoonotic diseases are not maintained in humans and required repeated infection – an extreme case is rabies. The key question is whether this is an accelerating process, is there sudden increase in emerging diseases or the incidence of zoonoses? Initial zoonoses occurred during domestication, but with increasing contact between people and wildlife and increasing movement of animals and products, changes are occurring.
3. *Central focus or central question of the programme? '*
    a. David Cumming's suggestion was "Do diseases behave differently over large landscapes? Or, do disease dynamics change with landscape fragmentation and under alternative landuse patterns?" The focus would be "large landscapes and disease dynamics."
    b. Gavin Thomson – Are landscape size and pattern important? Diseases can spread from a small source and have a huge impact – the initial event may not be linked to landscape size in which case the title of the programme is inappropriate. (But subsequent disease dynamics (i.e. after an initial event) may well be linked to size and pattern?)
    c. Mike Kock – What is the impact of TFCA management on the health of the ecosystem? It is difficult to answer this question when we don't even know what diseases are present in much of the TFCA.
4. *Values and science*. There is an underlying assumption driving the development of TFCAs, namely that larger areas under conservation will bring greater economic and other benefits than the existing systems of landuse. There is a need to bring scientific analysis to bear on the issues of the social, economic and environmental costs and benefits of alternative land uses. (See opening summary in the 2004 concept paper).
5. *Consequences of TFCA for animal, human and ecosystem health?* This question has implications well beyond the boundaries of the TFCA. There is the important corollary of the implications of animal health issues on the sustainability of the TFCA. When TFCAs were first developed disease issues were identified as a major potential constraint. An important associated question is "What is the systemic role of *disease management* in the GLTFCA?"
6. *Programmes and projects*. There is a need to distinguish between the programme and its constituent projects – people tend to focus too much on their own area of expertise and at a project level. Specific research questions are hung on each of the six Themes and their sub-questions. What we are searching for is the interdisciplinary linkages (conceptual framework) between these themes and their modules. Further work may be needed on some specific aspects in order to clarify overarching and more specific research questions.
7. *Political support*. While it is important to clarify research questions, the overall political support for the programme is equally important and could have a direct bearing on the extent to which research can influence policy, not only for the GLTFCA but also for the wider region and TFCA development in relation to animal disease issues.
8. *Viable projects*. Some projects within the programme are more viable than others and it is important to keep those going. There are still gaps in the social sciences and a need to develop models and multi-perspective approaches and ideas related to human health issues in particular. An alternative focus for the programme, as a one-liner, may be "Disease and TFCA sustainability."

3.3 Introduction to Scenarios

Michael Murphree *((Adapted by Mike Murphree from Richards Bay Minerals Scenarios 2005 – 2015, Institute of Natural Resources April 2005.)*

Scenario Planning has its early roots in post World War II military planning. It was taken up thereafter by Herman Kahn of the Rand Corporation and applied for business purposes. It was later developed into what is now known as decision scenarios by the Royal Dutch Shell group. The methodology was applied by Pierre Wack and his team to enable Shell to anticipate the oil shocks and crises in the 1970s. This was one of the reasons that Shell has become a leading oil company in the 21st century.

In the South African context the scenario methodology was used when Clem Sunter of the Anglo American group brought in Wack and others to help develop political and economic scenarios subsequently known as the High Road / Low Road scenarios. These scenarios fundamentally challenged the role of corporate business during the late *Apartheid* era.

There have since been many applications of Scenario Planning in various parts of the world, and there has been significant development, improvement and enrichment of the basic methodology to suit a variety of contexts.

It is important to note that Scenario Planning is not a forecasting tool, nor is it designed for prediction or optimisation. Rather the underlying philosophy is that the world is far too complex and subject to significant turbulence so as to prevent accurate forecasting except under very limiting conditions, controlled situations and only in the very short term. As a result the future is likely to be highly uncertain, subject to high levels of non-linear relationships and increasingly high levels of causal ambiguity.

Scenario planning is designed to surface and challenge current fundamental assumptions and mental models of decision making (default scenarios). When used by groups it helps develop a deep level of collective learning which results in understanding how the fundamental drivers in the environment could lead to future outcomes. This understanding then enables the decision making team to envisage how different futures (scenarios) may emerge with an appropriate level of confidence. It therefore provides them with an intellectual reconnaissance of the future and enables them to "rehearse the future" before the future arrives. Scenarios are a kind of future history. It enables one to make sense of the future in the same way that we use history to make sense of the past.

Scenarios are not merely a linear list of facts about the future. Scenarios are *narrative* accounts of the future that consider facts, but focus more on the deeper causal structures that are manifested in patterns, trends and events that give rise to the facts that we observe. In other words, scenarios address the inter-dependencies of key driving forces and underlying variables, and hence take into account non-linear relationships as well. Although a set of facts and trends may be useful, they quickly become dated and are often rendered meaningless when viewed in isolation from the deeper causal, structural relationships that drive them. More importantly however, when there are high levels of uncertainty and fast changing situations, the facts become somewhat obsolete. The narrative format of scenarios is important because it provides a framework for complex inter-relationships and dependencies that are not possible using, for example, a framework based on a set of simple equations. In complex environments subject to uncertainty and high levels of ambiguity, the scenario methodology and narrative framework are superior to forecasting and optimisation techniques, as they do not suffer from the extremely limiting restrictions of *ceteris paribus* (all other things being equal) assumptions.

Scenario Planning in AHEAD

There are two scenario planning processes operating in the AHEAD programme.

- Local level scenario planning, iterative assessment and adaptive management – this process is lead by CASS in collaboration with the INR this is a long term (five year) experimental process that will see the evaluation of scenario planning as a planning tool at the community

level. This process is being funded by the IDRC of Canada and indications are that this funding will be forthcoming.

- The second scenario planning exercise is linked to the first but at a more technical level and will work with the AHEAD partners in developing a set of scenarios in 2006. It will also feed into the methodologies to be applied to the longer-term programme. This process is being funded by USAID support to AHEAD and by the Sand County Foundation.

Approach

- Following the Pestana meeting a group of 15 – 20 AHEAD partners will meet (date and venue yet to be determined but most likely in June / July) to initiate the scenario planning process at the technical level. Several AHEAD partners have already indicated their interest in participating in this process. **Those who did not attend the Pestana meeting BUT are interested in participating in the process should contact Mike Murphree.**
- This meeting will also be used by those participating in the community level exercise to discuss methodologies and approaches. It will also be an opportunity to start identifying communities for participation in South Africa and Mozambique.
- In the interim those who will be participating in the process will be sent some 'homework" on scenario planning. And, in particular, participants will be asked to start considering a range of "key questions."

Discussion:

1. *There are so many possible scenarios* – how do you decide which is best? The general rule is to not to go beyond four, often contrasting, scenarios which are narrative rather than quantitative and thus not confined to details but rather to possible and likely alternative futures. This meeting is largely a technical group and likely to develop alternative scenarios that are very different to those that might be developed by communities. The question is, how do communities see themselves? Corporate and military sectors have produced many scenarios and with a lot of their own jargon. We also need to adapt the technique for communities of local people - and to find ways of linking it with technical inputs.
2. *Where to start?* It may be best to start at the community level and then to scale up from there. At a technical level there are clear linkages with veterinary concerns and the development of disease risk assessments and strategic operational plans in the event of outbreaks. Such technical plans need to be linked to the realities of local social and economic realities. Foe example, in Ethiopia in 1981-82 when an outbreak of rinderpest occurred people fled with their livestock because they feared their animals would be slaughtered with the result that they spread the disease. A similar phenomenon occurred recently in relation to FMD control in Zululand. These examples, and others, suggest that it is desirable to examine scenarios beforehand, particularly with affected communities. However, the development of techniques and approaches to using scenario planning at a village level have still to be developed and tested.
3. *Time scales?* The question of time scales has not been addressed. For many changes, particularly those relating to policy changes the time scale may be 20 years or more. It may take 15-20 years to establish the validity of chosen scenarios and adaptive approaches and learning will be of paramount importance.
4. *Boundaries in time and space*. Scenarios cannot answer all the questions and need to be carefully bounded in time and space. Scenarios developed under the Millennium Assessment programme may not be particularly useful at a local level.
5. Members of the group who wished to participate in scenario planning workshops during the course of the next few months were asked to sign a sheet being circulated.

4. UPDATE OF CONCEPTS / PROPOSALS AND RELATED PRESENTATIONS

(Facilitator: David Cumming)

The group worked through the Summary Table of Themes, Modules and Concepts that was last updated at the Interim Meeting held at Skukuza in October, 2005. The updated version from this meeting is appended as ANNEX 1. Additional points and discussion not included in the table were as follows.

1. *Extension of BTB research programme*. The Berkeley BTB programme funded by NSF was for five years which ended in May 2005. A no cost extension has allowed it to go through to May 2006 but new funds are now needed to keep it going. PPF had undertaken to assist and Elissa Cameron, MRI Director, has taken responsibility for finding the necessary funding and has submitted a proposal and budget to PPF.
2. *Brucellosis*. Wayne Getz noted that a proposal has been submitted to NSF for work in Umfolozi but they will only hear the results of a very competitive bid in June.
3. *Spatial data*. Graeme Cumming pointed out that much of the research envisaged under required a great deal of spatial data with very precise records of such aspects as human and animal movements, tenure maps, land ownership and use. Much of the baseline work could be carried out by students.
4. *Animal management practices*. Development and government agencies tended to focus their attention on improving levels of animal production but there was need within the AHEAD-GLTFCA programme to focus on animal management practices that may contribute to reducing disease transmission (which are of course likely to also benefit production). There could be several traditional practices that contributed to inhibiting or exacerbating disease transmission between domestic animals and between wildlife and livestock. There was a need for the careful study and documentation of animal management practices at the household and village level within the TFCA.
5. *Communication*. In terms of communication and communication strategies, Tim Neary noted that the group loved their "acronyms", which, together with a high level of jargon, tended to exclude others. The non-initiated needed hooks on which to hang ideas and much more thought needed to be given to how the programme was communicated to potential donors and to the general public where the material and terminology needed to be kept simple and straightforward.

Short presentations:

1. Local level scenario planning, iterative assessment and adaptive management – Jeanette Manjengwa.

The scenario planning project initially developed by Professor Marshall Murphree and discussed at previous AHEAD-GLTFCA meetings has now been fully funded by the International Development and Research Council (IDRC) of Canada. The initial proposal was reviewed by IDRC and revised in the light of extensive comments from reviewers. The project has been funded at the level of $500,000 for a five-year period and is due to be implemented in the three countries within the GLTFCA, namely, Mozambique, South Africa and Zimbabwe. The Institute of Natural Resources (INR) at the University of Kwazulu-Natal will be the South African counterpart – a Mozambican has still to be identified. CASS has been involved in programmes of decentralization of natural resource management to local levels for over 20 years using participatory methodologies. An analysis of the record of community based natural resource management (CBNRM) is highly mixed with a few successes but many failures. The reasons for failure are many and complex and this project attempts to address some of these weakness and to develop scenario planning methodologies and approaches that can be adopted at a village level where natural resources are communally managed.

The principal objective of the project is to enhance the ability of local level natural resource managers to collectively manage and benefit from their natural resources through the methodology of scenario analysis. A specific objective is to improve the understanding of GLTFCA planners of the needs and aspirations of the resident populations and to ensure they are considered in all planning and implementation.

The methodology is a sequential process of:

Scenario modeling → implementation → self assessment → adaptation and iteration

Where scenario modeling involves incorporating community visions and aspirations that recognize complexities, constraints and the development of an action plan with input from technical/professional knowledge, and where self assessment depends on agreed criteria for comparing performance against expectations. This is in turn followed by an analysis of what went wrong or right, with appropriate adaptive changes to / revisions of the management plan.

2. An introduction into the methods and some very brief results of our integrated Assessment Techniques <http://www.nrel.colostate.edu/what/africaprogram.html>**.** James DeMartini

Most of our assessments use Michael Coughenour's Savanna model. The model has been used all over the world. In South Africa, there are applications for Kruger National Park and for the Vryburg region in the North-West Province. In East Africa, there are applications to the Serengeti National Park, Ngorongoro Conservation Area, southern Kajiado District, Kenya and an older application from Turkana. We won't have time to explain Savanna properly here, but I'll use a slide or two to introduce the model.

Slides (again, most of the PowerPoint from these presentations are available in PDF format on the AHEAD website at http://www.wcs-ahead.org/gltfca_march2006/agenda_march2006.html):

1. The flow chart of Savanna …
2. PHEWS is a rule-based representation of Maasai household decision-making. Sequential steps are followed by households to meet their energy requirements.
3. Savanna has a weekly time-step, and results are summarized by months.
4. Savanna keeps track of biomass through time …
5. And tracks spatial patterns as well. The area shown is Ngorongoro Conservation Area, Tanzania.
6. Savanna tracks herbivore populations through time, which are tied to their condition indices, and in turn tied to energy acquired.
7. And the locations of animals are tracked.
8. Examples of the types of analyses that can be conducted using SAVANNA.
9. A few examples of SAVANNA results ….
10. Here we looked at the effect of cultivation on wild and domestic ungulates, and on effects of human population growth. Cultivation in the NCA is now about 9,800 acres, which is a little less than 1% of the area defined for pastoral use, and about 0.5% of the entire area. We varied cultivation 0 to 50,000 acres, and looked at effects.
11. In general we could find no significant changes in wild or domestic ungulates in response to cultivation, even up to 5% of the area in agriculture. Didn't really make much difference and benefited the Maasai greatly.
12. By far the most ominous issue in NCA is human population growth. In about 1991 there were 35,000 people. By 2003 there were about 60,000. With relatively constant livestock populations that means people are living on fewer and fewer livestock – pastoralism is less and less central to their lives.
13. In Kajiado, we looked at the effects of isolating group ranches from the entire study area, and of smaller and smaller parcels. This area is in southern Kajiado, just north of Amboseli National Reserve (or national park, depending upon how lawyers decide the latest de-gazetting).
14. When analyses were done to compare sub-divided areas to intact ranches, results were interesting. Basically, changes in the number of livestock that could be supported when parcels were 196 km^2 were small (but enough to make Maasai less food secure). Changes when parcels were 1 km^2 were extreme. Eselenkei … a 25% decline in livestock that could be supported! Olgulului … a 20% decline.
15. Here, in NCA once again, we looked at the effects of reducing losses to East Coast Fever by 75%. In this analysis, livestock sales were disabled, to explore just the ecological

implications. Basically, the livestock do really well, but rangeland health declines, reflected here in a decline in palatable grasses.

16. With livestock sales enabled (PHEWS enabled), Maasai to sell extra animals (which adds to their cash box). Here, Maasai wealth increases (not shown), but the livestock populations stay more or less the same, and rangeland health remains good.

3. Malaria control in the Lubombo Spatial Development Initiative (LSDI) area.

Francois Maartens

A brief power point presentation showed the area covered by the LSDI and the various operational zones. The major recent focus was in Zones 1, 2 and 3 in Mozambique, much of it to the east of Kruger national Park and within the Limpopo National Park. The risk of malaria has been greatly reduced in the region from 250 to 20 cases per 1,000 people between 1938 and 2005. Results of the current campaign which started in 1999 also showed marked reductions in the incidence of malaria. This was an important factor for the tourism industry in the region. The major control method was spraying indoors with DDT and a key risk was the development of resistance in *Anopheles* mosquitoes. Resistance was carefully monitored and alternative insecticides were used for short periods if need be. DDT was, however, the most cost effective insecticide to use. The programme had a good GIS database with the positions of all houses treated and related information. Surveys are carried out before each spraying operation and local teams carry out the spraying.

5. CURRENT SCIENCE, DEVELOPMENT AND POLICY NEEDS IN THE GLTFCA

5.1 Animal Disease Threats and Priorities in the GLTFCA - a JMB Conservation and Veterinary Sub-Committee Perspective on 'Real World' Relationships between Management/Policy Decisions and Research – Roy Bengis, Markus Hofmeyr, Carlos Lopes Pereira and Chris Foggin. (*Representing the veterinary subcommittee of the GLTP JMB conservation management committee)*

Summary:

[Note: Much of the summary below is derived from notes from a recent meeting of the veterinary subcommittee of the GLTP JMB conservation management committee, and is not a transcription of actual discussions held within the 6th *AHEAD* GLTFCA WG meeting itself. –ed.]

Roy Bengis gave a brief discussion on the background and role of the veterinary subcommittee meeting in context with how it fits in with the Joint Management Board of the Greater Limpopo National Park and the most important disease issues being focused on:

GLTFCA JMB Veterinary Subcommittee and its mandate includes:

- The identification of potential animal health issues and challenges related to expansion of the geographic range of wildlife and their pathogens.
- Identification of potential conservation threats related to pathogens cycling in neighbouring livestock (in all 3 countries)
- Identification of the related human health and zoonotic issues
- Inclusion of these veterinary issues in the development of a Joint Management Plan for the GLTP
- To advise the Joint Management Board (JMB) on the management of animal health challenges, and prioritise appropriate activity areas to address these issues

Prioritisation of animal health challenges in the Great Limpopo Transfrontier Park:

A) Infrastructural needs:

- Centralised data base with GIS capability and data management system
- Communication network
- Technical equipment
- Diagnostic capability
- Training and capacity building
- Eastern Fence of the Limpopo National Park
- Development of a Wildlife Veterinary Unit in Mozambique

B) Disease surveillance and monitoring

1.) Bovine Tuberculosis (BTB) and Brucellosis:

- Monitor of BTB and *Brucella* status of cattle in the Sengwe corridor.
- Monitor of BTB and *Brucella* status of cattle in the Limpopo National Park
- Monitor of BTB and *Brucella* status of cattle on the KNP western boundary
- Monitor the BTB dynamics of the KNP buffalo herds.
- Buffalo translocations into Limpopo National Park

It was stressed that in the above surveys, funds must also be budgeted for compensation for positive animals that may be slaughtered. Some test-positive animals must be slaughtered to confirm the diagnosis and for TB strain fingerprinting.

2.) Tsetse flies and Nagana
- Monitoring of tsetse fly activity and spatio-temporal spread in Gonarezhou National Park.
- Monitor the northern KNP and LNP for tsetse fly incursion

3.) Anthrax and Rabies surveillance and monitoring
- Report acute death situations in herbivores (wild and domestic)
- Collection of blood smears (with field data sheet)
- Reporting of animals with abnormal behaviour (wild and domestic)

4) Topotyping of foot & mouth disease viruses in buffalo in Gonarezhou and Limpopo National Park.
- Collect blood and probang samples from a significant number of buffalo in Gonarezhou and Limpopo National Park

5.) Foreign animal disease surveillance in wildlife
E.g. Rinderpest, Canine distemper, High Path Avian Influenza

6.) Surveillance for wildlife-related diseases in livestock
E.g. Foot and mouth disease, Theileriosis, African swine fever, Trypanosomiasis and malignant catarrhal fever

C) Primary Animal Health Care at the interface
- Vaccination of cattle against FMD and anthrax
- Vaccination of dogs against rabies and canine distemper
- Deworming of dogs (including Echinococcus)
- Regular dipping and inspection of cattle herds

***A brief summary of the various relevant country disease issues**:*

Bovine Tuberculosis
RSA - Markus Hofmeyr reported on the BTB and RVF survey carried out by SANParks. There was an approx. 4% increase in actual BTB found in the lethal survey conducted in the south of KNP after the culture results were received. The prevalence therefore for this sampling was 36 % (32% had macroscopic lesions) but this was importantly down from 38% in 1998. A random 10 % of herds were sampled. The rate of increase does seem to be slowing down, possibly as a result of good nutrition

and immunity? Many calves less than 6 months of age are infected, which is a concern indicating that young animals are now most susceptible to new infection. Few old animals were found, but those that were found were not infected. Additional infected lions and also warthog have been found. Further studies on the impact of the disease in lion on a population scale are required. This will become a focus of the future research in BTB in the KNP.

The Department of Animal Health will be looking at starting to use a Gamma-interferon test on cattle in the near future for general screening because of the difficulty of getting local communities to return to dip tanks 3 days later for TB skin test reading.

Future surveillance for BTB:
It has been confirmed that BTB has spread throughout the KNP after the diagnosis of a military case of BTB in a 4 year old buffalo bull in the Pafuri area of the KNP in 2005. There is a need to do prevalence studies in the North, but the question arises whether it is worth the financial costs of the exercise with the expected very low incidence. It may be crucial to look more carefully at the prevalence estimate at the KNP/Limpopo/Zimbabwe Park interface to better understand what level of BTB is currently at these country interfaces.

Chris Foggin had expressed a need to know what the number of buffalo in the area was, and to know what the number was that were crossing the Limpopo River annually. Concern was expressed at the lack of a coordinated action plan to deal with BTB in the sub-region.

Both Zimbabwe and Mozambique supported the idea of detailed sero-surveillance in the North of the GLTP. In the areas that are likely to be conflict/interface areas, this should be done every 3-5 years, but it is only necessary to do this every 5-7 years in other areas due to the slow spread of the disease. A detailed buffalo census needs to look at not only the population size, but also the age distribution of the animals.

Zimbabwe expressed the need to keep BTB out of Zimbabwe if at all possible, and fencing of the northern boundary of the Limpopo River will be considered.

It was noted that recommendations needed to be sent to the Veterinary services of each country emphasising that monitoring of cattle has to continue as there is currently no realistic way to stop the spread of the disease in buffalo. It was therefore identified that the best current risk mitigation action was to prevent the disease from spreading from buffalo to cattle. This should be the focus of BTB prevention in cattle in all interface areas of the GLTP.

There is a possibility that kudu and possibly warthog are becoming maintenance hosts of BTB, but this does not seem to be the case in other species such as cheetah or small mammals.

Mozambique supported the call by Zimbabwe to keep BTB out of cattle areas, and that a fence to prevent buffalo and cattle contact on the eastern boundary of the Limpopo River was necessary. A suggestion was made to conduct a study specifically in Biodiversity Corridors that have been identified on the eastern boundary of the Limpopo Park.

Zimbabwe & Mozambique: - no cases have been found in Zimbabwe and no further surveys have been conducted in Mozambique. There is a requirement for this however to better understand the risk in these countries, especially with BTB possibly about to enter these countries from Kruger with infected buffalo.

Brucellosis
RSA - The prevalence of brucellosis in buffalo in the KNP is about 25%, with some reproductive disorders. Massive swollen hocks have also been seen. The prevalence in adult breeding females is about 35%. There is some debate if this disease has entered an endemic stable cycle in buffalo in Kruger as the incidence has been at this level for 50 years.

Trypanosomiasis
Mozambique – Nothing reported in Gaza Province. The tsetse survey is continuing.

Zimbabwe - No reports, although it is probable that there are tsetse at the Save-Rundi rivers junction.

RSA - Nothing further to report except there is an increase of cattle, horse and dog disease in northern Kwa Zulu Natal, which is of concern. Nothing further to report from Kruger (no tryps present)

Anthrax

RSA - None has been reported in RSA. Markus Hofmeyr reported that the planned educational CD on anthrax detection and diagnosis from SANParks has not materialized yet. The number of rangers bringing in blood smears from investigation has decreased by 84%, which is a major concern. This has dropped from 600 annually to approximately 100. This is being addressed by the state vets in Kruger with a survey of the knowledge and understanding of rangers as well as training planned.

Mozambique - It is suspected in Gorongosa but could not be confirmed.

Zimbabwe - One severe outbreak was reported in Malilangwe, in the Save Conservancy and elsewhere in Zimbabwe in 2004. There was another outbreak amongst people and cattle in central Zimbabwe in 2005 with sporadic cases in the lowveld in wildlife (small numbers found). No resources are available for allocation to the problem areas, and it will not be possible to vaccinate in some of these areas in advance. Chris Foggin predicts that the problem will persist under the current chaos in Zimbabwe.

Rabies

RSA - Human cases have been reported in Venda and there is a large program to vaccinate dogs, and in the KNP 2 feral domestic dogs were destroyed that had confirmed rabies (same cases as reported in Oct 2005 meeting, when it was wrongfully presented that the dogs were negative for rabies).

Mozambique - In the Massingir region, dogs and people have been vaccinated. A problem has been identified with regard to the local word for rabies, and the negative impact this is having on the vaccination campaign with local people not wanting their dogs to be vaccinated. In the Nyassa region, 365 dogs have been shot, and 8-10 people have died.

Zimbabwe - In the Bubiana area, 3 packs of wild dogs have died possibly from rabies. Throughout Zimbabwe rabies is being found in domestic dogs, ongoing problem.

Distemper

RSA - This has been found in the N. Cape, and wild dogs have died from it. The wild dogs were probably infected by bat-eared foxes, and showed a pattern of slow intermittent mortality but the whole pack eventually disappeared after 6 weeks from the first death. This is the first confirmed case of distemper mortalities in free-range wild dogs in South Africa.

Foot and Mouth Disease

In *Zimbabw*e, this was found in the area south of the Chiredzi-Rundi River junction in cattle. Laboratory capacity in Zimbabwe is very bad at the moment. Testing procedures are being evaluated to differentiate vaccine response from active infection. The buffalo fence around Gonarezhou is being re-furbished. The re-establishment and redefining of the FMD zones is under consideration, which will take cognizance of the proposed Biosphere reserve. The estimated cost for this re-alignment will be in the region of US$ 8 million. This may have some impact on the status of farming areas in adjacent SA and Botswana and needs to be followed up with the respective NAHD of each country.

Mozambique - Vaccine has been obtained from Botswana, but is not being used. This is unexplained.

RSA – The Letaba outbreak has been contained. The fence has been re-aligned. Serological sampling in the Limpopo province has proved difficult, but Mpumalanga seems to be more organized. Lack of resources and proper allocation of staff has resulted in a lot of the routine monitoring, especially the Limpopo Province, not taking place anymore, which is a real problem, along the western boundary of the KNP and will have implications for the GLTP if important disease issues are missed or not well understood. These areas need support from the GLTP veterinary program and this will be communicated to any potential donors for veterinary projects (including PPF).

The Foot and Mouth control zone has recently been realigned and there is discussion ongoing on how best to classify the different zones. More information on this will hopefully be available by the next meeting.

Theileriosis

RSA - Markus Hofmeyr reported that a real-time PCR test is being developed, as Corridor disease is becoming a problem. The Welgevonden experience has shown infection varying from low to highly pathogenic. With the rapid expansion of buffalo throughout SA (due to re-introductions) there has been an increasing incidence of diagnosis of *Theileria* in many areas of the country. Due to the difficulty in specific and sensitive diagnosis this is becoming a real problem where decisions on the future of buffalo movements have to be made by the Department of Animal Health.

In *Zimbabwe*, the transmission is cow to cow on occasion (January Disease), and there is no point controlling this.

Mozambique: Theileriosis caused a number of mortalities in cattle around Limpopo NP in 2005 and was associated with a group of buffalo that came from the northern part of Limpopo NP. The problem was greatest where buffalo and cattle physically mixed near water or on pastures. Some of the buffalo have been destroyed but some may still be present in the area. The cattle deaths have had a negative impact on the attitude of local communities towards the GLTP development.

Major human livelihood/livestock/wildlife interface issues:

Zimbabwe - cattle are not vaccinated against FMD by any aid/government agency, yet are subject to elephant damage, and are expected to put up with it. It appears as if there have been lots of promises made to local farmers, without any concrete signs of aid or assistance. Structures are in place, but no vaccines or drugs are forthcoming, particularly in the face of FMD, rabies, and brucellosis. People are losing interest. Anti-malarial therapy, HIV/ART therapy and transport are desperately required. Biggest disease problem has been anthrax in livestock, and malaria and TB/HIV in humans.

Mozambique – The situation is much the same as described for Zimbabwe. Some progress is required – there are 20 000 people and 10 000 cattle in the park. There may been some voluntary movements of people out of the area, but resistance to movement is increasing, and conflicts are become regular, particularly with elephant. Cases of Corridor Disease have been found.

Bovine TB is less of a problem than human TB at this stage, but can become an issue.

Trichinella may become an issue, particularly if eating infected uncooked crocodile meat.

There is a degree of separation between cattle and buffalo, and there is some debate how infected buffalo will impact on cattle. People do drink un-pasteurized milk, and there are cases of straggler buffalo joining with cattle in some areas. At all times, communication between veterinary and medical health authorities must be maintained.

It was agreed that Peace Parks Foundation needs to be informed that one of the most important support actions that can be initiated by the veterinary program of the transfrontier parks was to support human and animal health programs on the boundary of the conservation areas, as these structures are very under-funded and not functional in most areas adjacent to TFCA's.

Emerging diseases*:*

Avian Influenza:

Mozambique - 11 Rapid Reaction teams exist, one National, 10 Provincial. Funds are available from both the veterinary and medical sides. A joint workshop between medical and veterinary professions was held during Feb. Wildlife monitoring takes place in certain areas. Scenario planning exercises are currently being carried out, with a budget of US$2 million available. Serology gets sent to Kenya, because if it is sent to RSA, then there are cost implications. There was concern that RSA is charging Mozambique for these tests.

Zimbabwe - A Notifiable Avian Influenza Task force is present, which meets every 2 weeks. Updates distributed by press release. Wetlands have been identified that are likely to be a risk, and serological determination of the status of the disease is possible in Zimbabwe. A recent outbreak in ostriches has found H5N2, but virus has not been isolated. Backyard chickens are a concern, particularly with the population's general status of HIV infection.

RSA – a summary of the status of South Africa was given, with a situation similar to that described in ostriches in Zimbabwe. The disease was controlled and eradicated in ostriches in the E Cape and W Cape provinces. A National Contingency Plan is available. Monitoring of specific wetland areas is currently happening, and surveillance of poultry establishments is extensive. Quarantine requirements for the import of all avian species have been stepped up considerably.

Classical Swine fever:

An update was given on the Classical Swine Fever situation in the E Cape and W Cape, and that a compartmentalization approach was going to be adopted to all internal movements and exports. The export of all pork products and live pigs are currently banned from South Africa. Tests will soon be conducted in warthog and bush pigs to determine their role in the pathogenesis of the disease. The outbreak in SA has not been brought under control yet.

Exports through Giriondo border gate in Kruger is becoming an issue, as there are no quarantine officials at the border post. The next veterinary subcommittee meeting was planned to coincide with the March JMB meeting to be held in Maputo.

Discussion:

1. *Breakdown in veterinary services*. Major problems have arisen within the GLTFCA when veterinary services have broken down, for example, during periods of civil war or economic declines. The problems are particularly acute when vaccination programmes break down, for example in the control of rabies. An associated problem is the re-allocation of resources to the latest crisis as is happening in the current bird flu scare.
2. *Lack of information*. The major challenge facing the GLTFCA in terms of disease management is the lack of information on the status of many diseases in Mozambique and Zimbabwe.

5.2 The Challenges of Getting Real Data on Bovine Tuberculosis; the Wildlife / Livestock / Human interface. Claire Geoghegan, Wayne Getz, & Mark Robertson

Disease ecology, health and conservation

In 1933, Aldo Leopold wrote;

'*The role of disease in wildlife conservation has been radically underestimated*'.

Yet, despite 70 years of scientific research and conservation planning, similar sentiments are found in present day literature, including the following statement:

'*Conservation efforts worldwide are still being hampered because of a critical flaw in the overall approach: the failure to recognize the critical role that health plays in animal population dynamics, species survival and the follow-on impacts on the human condition.*' (Kock, 2005)

Modern concerns regarding emerging zoonotic pathogens, including H5N1, Ebola, SARS and HIV, suggest it is necessary to address animal and human health issues on an international scale.

Awareness of health issues within the broader scientific community has spawned new approaches towards disease research; including the philosophies of 'One Medicine' or 'One Health' (Kock, 1996, Schelling *et al.*, 2005). These methods seek to link human and animal health research with

biodiversity parameters; a concept that is popularly referred to as 'Conservation Medicine' (Meffe, 1999). Therefore, when conducting research to investigate zoonotic pathogens that are transmitted between wildlife, domestic animals and humans, it is important to collect quantitative data in order to fully understand the infective routes of transmission.

Taylor *et al*. (2001) have reported that the proportion of pathogens that are considered to be zoonotic is ~75%, while pathogens that can move from livestock to wildlife (54%) and between humans and wildlife (44%) are considerable (Daszak *et al*., 2000). This doubles the likelihood that if a pathogen can infect wildlife, it will cause an emerging human disease.

Pathogens, including viruses, prions, bacteria and helminths can infect a wide range of hosts, including humans, herbivores, carnivores and scavengers. However, the causes of infection are diverse and poorly understood. Recent publications have attempted to identify the drivers of emerging and re-emerging human pathogens (Woolhouse *et al*., 2005). When ranked with respect to the number of associated pathogen species, changes in land use or agricultural practices, poor population health (HIV, malnutrition), pathogen evolution (increased virulence, drug resistance), failure of public health programmes and climate change are identified as the most significant factors for the spread of disease (Woolhouse *et al*., 2005). Many of these drivers are the consequence of global changes in food systems and resource use and accordingly, affect the poorest and least influential regions. It is therefore vital that world health programmes aim to redress this imbalance and tackle the emergence and spread of disease from a holistic and multi-disciplinary perspective.

The role of tuberculosis on human health

Tuberculosis (TB) is an ancient disease with a global distribution. Over one-third of the human population is infected with the bacilli, which leads to 8 million newly diagnosed cases per annum (WHO, 2002). This results in over 3 million deaths per year, making TB the third highest killer of man (WHO, 2002). Recent estimates published by the World Health Organisation (WHO, 2005) indicate that TB incidence rates are highest in developing countries, which represent over 80% of the global disease burden. Sub-Saharan Africa has the highest concentration of cases with over 300 per 100,000 people, 3% of the world's active TB and consequently the third highest global cumulative case load (WHO, 2005). As an estimated 90% of Africans have been exposed to the TB bacilli, it is not surprising that the increase of infection in South Africa has been 10% per year since 1980 (WHO, 2002). However, given the correct daily treatment, TB is not only a preventable, but also a curable disease. However, this relies on the capacity and commitment of countries to provide reliable and widespread health care services.

T*he role of bovine tuberculosis in animal health*

Although many animal species can carry a range of Mycobacteria, *M. bovis* (bovine tuberculosis, BTB) is frequently considered to be the most problematic for animal health. The chronic nature of BTB causes a reduction in animal productivity, which together with the increased mortality of infected animals can prevent trade and severely impact on the economic status of the livestock owner (Ayele *et al*., 2004).

Bovine tuberculosis has a global distribution, and is considered to be an invasive species in many places, including Africa. It has a wide host range, infecting ruminants, predators, scavengers and small mammals, including threatened, endangered and commercially valuable species (Thoen *et al*., 1995). Consequently, it is difficult to eradicate as the pathogen may remain in reservoir and spill-over hosts after the removal of sentinel and maintenance species (Ayele *et al*., 2004).

Despite being listed as a Category B disease by the *Office International des Epizooties* (OIE), and as such requiring active surveillance and reporting for effective control, data on BTB from many developing countries is often not available. Investigations by Ayele *et al*. (2004) found little reported data from 43 African countries and none for the remaining states. In the same paper, data from South Africa 'estimated' a low sporadic general occurrence, while Mozambique and Zimbabwe both reported 'small occasion problems' in the mid 1990s. Therefore, the extent to which BTB may influence animal health is officially unknown throughout the region. However, reports from national park managers and private game reserves throughout southern Africa indicate that the spread of BTB

is one of the primary concerns for maintaining sustainable conservation in the region (Michel *et al*., 2006).

Disease dynamics: How is BTB transmitted and what are the risks for public health?

As bovine tuberculosis is found in a wide range of wildlife and domestic animals, methods of transmission may vary between species depending on location and environmental factors. Many animal-to-animal infections result from direct or indirect contact at watering points and on communal rangelands. Smaller wildlife species may cross park boundaries due to poor perimeter fencing or as a result of fluctuating environmental conditions like flooding and fire. These conditions can enhance the potential for disease transmission between wildlife and livestock herds on farming land adjacent to the park boundaries. Additionally, Mycobacteria may survive in the environment (in water, soil, mud and on pasture) for extended periods of time, facilitating further routes of transmission given favourable circumstances (Wray *et al*., 1975)

Transmission from animals to humans is attributed to two primary routes; inhalation and ingestion of bacilli (Daborn *et al*., 1993). Aerosol infection results from direct contact with infected animals via livelihood practices including sheep herding, milking and sleeping in bomas overnight to prevent stock theft. Ingestion of bacilli is primarily via the consumption of infected meat, bushmeat, unpasteurised milk and other dairy products made from infected milk. As 90% of the total milk produced in Africa is consumed raw or soured, (Walshe *et al*., 1991) and is often consumed within 30 minutes of milking, the risk of infection is likely to be highest in communities with small scale dairy production (Karimuribo *et al*., 2005). Farmers who keep cattle and goats for food, hides, bride wealth or ritual slaughter purposes may also be at an increased risk of infection.

In order to estimate the likelihood of zoonotic disease transmission it is important to quantify the extent of close association between humans and animals. In 2002 it was estimated that over 80% of Africans lived in rural areas and were solely dependent on livestock for both food and financial security (AU / IBAR, 2002). By 1997, the simultaneous population explosion of the previous decade had resulted in over 180 million undernourished people, who were consequently at an increased risk of disease. It is therefore of concern that 29% of the world's land surface is used for livestock production, but over 80% of the animal and human population are located in areas without active health and disease surveillance services (Cosivi *et al*., 1998). Hence, it may be concluded that due to the number of infected animals that will remain undetected, BTB incidence is likely to be grossly underestimated on a global scale. Thus, as the levels of association between humans and animals inevitably increase with land use change and increasing population densities, the risks of zoonotic disease (including BTB) infection will be further amplified. Strong links between human and animal health services will be ever more critical in order to tackle the problem of zoonotic pathogens in a timely and effective manner.

Zoonotic TB (BTB): Why should we be concerned?

Although tuberculosis that infects the respiratory system can often be cured with long-term medication, bovine tuberculosis presents many challenges for effective treatment in humans. As BTB is often transmitted via the ingestion of bacilli, the clinical manifestation is often in areas other than the lungs, referred to as extra-pulmonary (EPTB). Consequently EPTB often remains undiagnosed for lengthy periods, during which the patient may be infectious and transmit the bacteria to other individuals (Ayele *et al*., 2004). Unfortunately, BTB is drug resistant to an increasing number of front-line drugs (Guerrero *et al*., 1997), resulting in prolonged illness, expensive treatment regimes and high levels of mortality. It may also reactivate latent TB and co-infect patients with other strains of TB which further complicates possible treatment options (Prasad *et al*., 2005). It is estimated that 9.4% of the global TB burden is extra-pulmonary; (Gervois *et al*., 1972) however there is no data available to delineate how much of this may be attributable to BTB.

Considering the widespread distribution of TB and BTB, and the heavy reliance on unpasteurised milk in developing nations, it is likely that the true levels of infection are greater than currently thought (WHO, 2002). For example, in South Africa and Zimbabwe, over 25% of all new TB cases reported in 2003 were extra-pulmonary infections, as well as over 34% in Ethiopia, 20% in Tanzania

and 12% in Mozambique (WHO, 2005). Studies from Tanzania by Kazwala *et al*. (2005) indicate the real potential for BTB to act in a zoonotic capacity. Results confirm that 28.6% of all tuberculosis within the study group was attributable to *M. bovis* infection; 86% of which went on to develop extra-pulmonary disease. These results clearly signify the urgency with which the links between BTB and EPTB should be explored, quantified and addressed in southern Africa.

The role of HIV: a driver of TB disease or merely a contributing factor?

Eighty-six percent of the global caseload of TB / HIV co-infections is located in southern Africa (Corbett *et al*., 2003). South Africa has the highest level of dual infections, with over 50% of TB patients being concomitantly infected with HIV (WHO, 2005). As over 75% of the world's HIV cases are located in southern Africa (Corbett *et al*., 2003), there is tremendous potential for Mycobacteria, including BTB, to infect the population due to people's compromised immune status. Data suggest that HIV contributes to the risk of TB infections, and over 20% of HIV patients display multi (TB) drug-resistance while over 15% have extra-pulmonary disease; both of which are part of an increasing trend (WHO, 2005). It is unknown if these patterns are directly connected to *M. bovis* infections as adequate tests are rarely performed. However it is imperative that the capacity for BTB to act preferentially as a zoonotic pathogen in HIV patients be quantified so that this may be factored in to future disease control programmes.

Why is zoonotic TB (BTB) ignored?

Although BTB had a major influence on human health in Europe and the USA in previous centuries (Cosivi *et al*., 1995), most developed countries have successfully eliminated the public health risks associated with BTB. This has been achieved by implemented and enforcing strict milk pasteurizing and meat inspection regulations at the national scale. Consequently, BTB has received scant attention from western pharmaceutical companies, resulting in poor advances in prevention and treatment since the development of the BCG vaccine in the 1940s (Ayele *et al*., 2003).

Unfortunately, in many developing countries, the implementation of measures required for disease control is hindered by generally poor infrastructure and a lack of trained professionals. Despite a national policy for vaccinating children against TB in South Africa, only 58% of the annual BCG vaccinations were administered in 2004 (WHO/ UNICEF Report, 2004). From the animal health perspective, South Africa is under pressure with only 2306 registered veterinarians to cover multiple-disease testing for the commercial, private and rural health sectors (Personal communication, South African Veterinary Council). In short, many remote areas do not have a permanent, reliable health care service. Thus, under the constraints of restricted time, location and manpower resources, the issues of zoonotic disease may be considered a low priority in southern Africa. This is especially disconcerting given the overwhelming incidence of HIV (6.2 million cases and 0.52 million deaths in 2003) and TB (0.23 million new cases in 2003 and 2005 - WHO). It is imperative that research be conducted on the potential role of BTB in public health, so that an accurate assessment of the disease's impacts can be factored in to future public health decisions and programmes.

The way forward: priorities for research

In order to understand of the role of BTB in human and animal health, the following points have been identified as priorities for research.

Firstly, it is important to quantify the prevalence of *M. bovis* in:

a. Wildlife maintenance hosts
b. Communal livestock herds, especially species used for meat and dairy products
c. High-risk human populations, including immuno-compromised individuals with HIV/AIDS, farmers and persons living in close association with animals in rural communities.

Secondly, it is important to assess the practical risk factors and relative importance of multi-directional infective routes between each group. This should include investigating the influence of

socio-economic factors on the risk of zoonotic tuberculosis infection, and also on access to animal and human healthcare.

Finally, steps should be taken to effectively map Mycobacteria-related disease data and develop predictive, spatially explicit models for zoonotic disease transmission in southern Africa. Only by combining the human and animal health data in a user-friendly and easily understood medium will multi-disciplinary research be encouraged over the longer term. Without the sustained commitment of professional health workers, the capacity to implement prevention and control programmes based upon the research findings will be compromised. It is hoped that the development of a simple health database will bridge the current gaps noted in disease control and surveillance, and lead to more effective health provisions for people and animals.

How does this apply to the GLTFCA?

In order to move forward in disease control, it is essential that quantitative data on the current status of disease both within and adjacent to the existing and proposed GLTFCA park boundaries be obtained. Participants linked to the initiative should be willing to work in a cross-disciplinary manner and be ready to actively engage a range of stakeholders, including park personnel, veterinarians, medical professionals, social scientists, policy makers, government officials, health economists and members of the local communities. Only by addressing and integrating the priorities of each group will effective disease control programmes be established, and only through this will the longevity of the GLTFCA be assured. A healthy park and healthy environment cannot be attained without the involvement of the local stakeholders, and as such it may be justifiably concluded that disease has the ability to make or break the future of the GLTFCA. Disease increases the pressure on resources, communities and park conservation priorities, so it is fundamental to the success and sustainability of the GLTFCA to consider health as a top priority. With good scientific data, cross-disciplinary discussion, and the necessary political commitment, the 'health' of the GLTFCA can be secured.

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Discussion.

1. *Funding*. The biggest immediate problem is funding. We are looking for areas of interaction between humans, livestock and wildlife and have information on humans and wildlife but not on livestock movements and levels of BTB infection. So the first challenge is to establish the facts and for that R5 million is needed to carry out the appropriate surveys, obtain the GIS data needed and do the modeling.
2. *Role of social change*. In Mozambique, during the war years (1972-1982), the incidence of BTB in the cattle population that was tested was reduced from 55% to 13.5%. Since 1994, and the introduction of a democratic government, it has escalated and had again reached the 55% level in 2002. Social change can thus be an important factor.

5.3 Report on Sengwe Communal Land BTB Survey. Lisa Marabini and Keith Dutlow

Summary

A prevalence survey of bovine tuberculosis (BTB), foot and mouth disease (FMD), and brucellosis, and a disease detection survey for trypanosomiasis were undertaken in cattle in the Sengwe communal land between November 2004 and June 2005. The institutional home of the PPF-funded study was the Wildlife Veterinary Unit (WVU), Division of Livestock and Veterinary Services (DLVS), Harare and the project was supervised by Dr Chris Foggin.

The survey included the completed TB testing of 2000 cattle (excluding 111 which either could not be found on the reading day or whose data were incomplete) by the comparative intradermal tuberculin test using DEFRA guidelines. The latter state that if the reaction at the bovine site is more than 4mm greater than the reaction at the avian site, the cow is considered a positive reactor; if the bovine reaction is between 1 and 4mm greater than the avian reaction the animal is considered to be an inconclusive reactor and should be retested in three months; if the bovine reaction is less than 1mm greater than the avian reaction the animal is considered negative.

Cattle were tested at the six DLVS diptanks in the south east corner of Zimbabwe (Dumisa, Samu, Davata, Pesvi, Chikwarakwara, and Chipise). The DLVS issues stock cards to all cattle owners who dip their cattle and thus a tally of stock in the area is kept. The total cattle population of the area was estimated from these figures, and then the proportion needed from each diptank to achieve the target figure of 2000 cattle was estimated. Individuals were selected randomly each day (usually every third animal depending on the day's target and the turn out), although only the quartile with the lowest body condition scores were selected for *tryps* testing. The GPS co-ordinates of all the homesteads of the tested cattle's owners were recorded after reading the results on day 3.

Five hundred and eight EDTA blood samples were collected for *tryps* testing, and thick and thin blood smears were made daily for this purpose. These were submitted to the parasitology department of Central Veterinary Laboratories for analysis.

Two thousand and two sera samples were also collected for FMD and *Brucella* testing. These have only recently been sent to OVI, therefore the results are not yet available.

Results:

A total of 6164 cattle were seen (this is the total of all stock on all cards presented), and as 2000 were tested, this represents a sampling fraction of 32.45%. There were no positive reactors, although there were 17 inconclusive reactors of which 4 were at Dumisa, 6 were at Samu, 3 were at Davata, 2 were at Pesvi, and 1 each was at Chikwarakwara and Chipise. Unfortunately, despite our recommendations, we were not given an opportunity to retest these animals due to funding constraints, although their details and homestead GPS co-ordinates have been submitted to the WVU.

The total number of owners seen was 420, and the DLVS figures for the total number of cattle owners is 624, so this represents a sampling fraction of 67.3%. The average herd size was 15 (this compares to 15.5 in a CESVI survey done in the area), and the projected cattle population in the area is 9158.

According to the basic statistics the level of confidence to detect disease at a prevalence of 1% would be 100% (expected error 0.38% at 95% confidence interval) for the cattle we tested, and a similar figure of 100% with 0.39% error would be expected for the projected population.**Recommendations:**

- The 17 inconclusive reactors should be retested as soon as possible and, if suspicious, culled for BTB sample collection and the owners compensated.
- The buffalo in the Limpopo corridor that cross between Zimbabwe and South Africa should be tested for BTB as a matter of urgency.
- If indeed no positive reactors are found in the above tests the necessity for a fence on the Northern border of the Zambezi becomes more urgent.

- A continuous BTB surveillance system needs to be set up by the veterinary forces in the region so that cases could be eradicated as they are found. To this end some serious funding for capacity building and testing facilities in the area is crucial.

Discussion

1. BTB and fences. The presence of BTB in the Sengwe communal land or elsewhere in the SE lowveld of Zimbabwe would increase the chances of a fence being built to separate Kruger from Zimbabwe. Elephant do move between Kruger and the Gonarezhou and there is almost certainly exchange of buffalo between the two areas – not directly but through southeast / northwest movement via Mozambique. Increased surveillance is certainly needed.
2. In the late 1960s on Liebig's Ranch in the SE of Zimbabwe there was a major BTB problem and some 40,000 cattle were tested annually. In 1978/79 the country was declared BTB free and none has been detected in abattoirs.
3. A fence separating Kruger NP from much of the Sengwe Communal Land in SE Zimbabwe is likely to be constructed which has little to do with the presence of BTB or other disease issues. There are plans to erect a fence along the edge of the Limpopo riparian on the northern bank so that both banks will fall within a protected area and so create a protected riparian area covering both southern and northern banks that will be attractive to tourists. The plan for the "Limpopo Strip" is part of the development of the Sengwe Corridor linking Kruger to Gonarezhou.

5.4 BTB roundtable update on current research, major findings, unanswered questions and research plans/priorities in the GLTFCA. Wayne Getz, Markus Hofmeyr, Nick Kriek, Anita Michel, Roy Bengis, Carlos Pereira, Lisa Marabini, Keith Dutlow, Claire Geoghegan.

The discussion was initiated by Wayne Getz and the following points arose:

1. There could well be a resurgence of BTB in the region comprising the GLTFCA but the most frustrating part is the lack of information on the distribution and incidence of the disease. This is major gap in knowledge and it may well be present in rural populations and linked to the HIV-AIDS pandemic.
2. The costs of stopping BTB in Kruger when it was discovered would have been extremely high. There is an urgent need to continue monitoring and given the lack of information, which applies worldwide, it is very difficult to quantify the risks- and the tools to control are not presently available. Part of the problem is that it is a slow disease and it takes time to get a handle on it.
3. There needs to be a special focus on maintenance hosts, and smaller mammals are more likely to pose a risk for zoonotic potential. Monitoring does not necessarily help but vaccination programmes are critical. There is an urgent need for more practical diagnostic tests that can be applied in the field to animals at all stages of the disease. Surveys are nevertheless difficult because false negatives can occur even in the advanced chronic stages of the disease.
4. The BTB problem is a good example of complexity! A multi-host disease in a multi-species system.
5. It is difficult to contain buffalo within the Kruger NP and there are almost daily reports of them breaking out. Surveillance of cattle populations will begin in July. On the Mozambique side sustainable monitoring of 10,000 animals is required. Current information is that the incidence is low but this needs to be confirmed.
6. By comparison with the rest of Africa, Kruger has a level of knowledge about the disease and the research here is of great value to the rest of the continent.
7. Given the risk to humans, why can't we frame a decent argument to attract funds and political support? A major constraint seems to be the major division (separation?) between animal and human health. There is clearly a need to expose these problems.

8. Current beliefs about the disease, such as single infections and latency in humans, are incorrect. People can be subjected to multiple infections- and the diagnostic material for detecting such infections are not available but are needed.
9. There is an need to draft a brief (3-page) document that makes a good case for supporting BTB surveillance, monitoring and research that can be taken to the major donors to tackle the problem. Much of the argument needed can be based on the data presented here today by Claire Geoghegan. Wider issues are at stake, both social and ecological, and there should be wider interest in the problem.

5.5 Foot and Mouth Disease Epidemiology and Research Needs in the Greater Limpopo Transfrontier Conservation Area (GLTFCA)

Wilna Vosloo and Gavin Thomson

Summary

Foot and mouth disease (FMD) within the Greater Limpopo Transfrontier Conservation Area (GLTCA) is unlikely to have any serious negative effect on wildlife because SAT1-3 viruses are historically endemic to the region; unless, of course, new virus types/variants enter the ecosystem. The real problem posed by FMD viruses is that they are capable of spreading to the intensive livestock production areas of countries of the region where the effects are potentially two-fold: (1) lowering of the productive capacity of intensively farmed cattle and pigs and (2) disruption of trade in livestock commodities within and out of the region.

This situation is not new to southern Africa and Zimbabwe, particularly, has suffered repeatedly from the trade effects of FMD in the last 40-50 years as is currently the case; Zimbabwean beef has been prohibited access to markets in the European Union for the last 4-5 years because FMD is perceived to be out of control in that country. What is new is that novel topotypes of SAT viruses were introduced into south-eastern Zimbabwe in the 1980s -1990s by translocation of buffalo from the north of the country. Depending on how efficiently these new topotypes propagate within the buffalo population of the GLTFCA, the control of FMD through vaccination could become more complicated. Thus research is urgently needed to understand to what extent these topotypes are still present in the Gonarezhou and possibly more widely.

Control of FMD in southern Africa has historically been based, with considerable success, on (1) separating buffalo populations from wildlife using game fencing of various types, (2) bi-annual vaccination of cattle populations close to buffalo infected with SAT-type viruses and (3) complex zoo-sanitary controls on the movement of cloven-hoofed animals and products derived from them. In South Africa, FMD control was greatly facilitated by the erection of a perimeter fence around the Kruger National Park (KNP) in the 1960s. The problem is that keeping buffalo within the KNP has become increasingly difficult for a variety of reasons. This has resulted in two serious outbreaks of FMD in South Africa in the last 5 years which originated from buffalo within the KNP, one of which spread to the FMD-free zone of the country and to Swaziland.

Because of the complex zoo-sanitary measured imposed by animal health authorities to control FMD in Mozambique, South Africa and Zimbabwe, the possibilities for livestock production and marketing from areas adjacent to the GLTFCA are likely to remain constrained. Furthermore, these measures will likely be rendered still more complex because the GLTFCA fence will *de facto* become the international border of each country with its neighbours. Thus the present contentious issues around the KNP perimeter fence on the South African side (animal disease and problem animal control) will be complicated by the need to control the movement of people as well as animals and their products. This is apt demonstration that the idea that animal disease control issues can be based exclusively on narrow technical considerations is long gone. Unfortunately, some national and international organisations involved in animal health still do not recognise this reality. This is therefore an area where considerable extension work, if not actual research, is required.

On the other hand, there is growing realisation that new concepts such as "compartmentalisation" and "commodity-based trade" offer possibilities for a diversified approach to FMD control, as well as control of other diseases. The basic point is that through these approaches and thus adaptation of a new attitude towards problems associated with credible certification of traded commodities, there are new opportunities for simultaneously improving animal disease control while lessening the impact of diseases like FMD on trade in livestock commodities and, thereby, on rural development. International events such as the current hysteria around avian influenza, FMD, bovine spongiform encephalopathy (including atypical scrapie), although they muddy the water, will increasingly push the development of alternative approaches to animal disease control and their interaction with socio-economic realities. The reason is that currently propagated approaches to controlling these problems are progressively being shown to be inadequate or at least in need of radical improvement. More rational, affordable and socially justifiable solutions are therefore called for. In our opinion, this need will lead inevitably to more diversified approaches that will not be the exclusive preserve of animal health authorities.

In this context the establishment of the GLTFCA creates both a problem and an opportunity:

- How to develop more effective animal disease control strategies for FMD (and other diseases) that are less inhibitory to rural development;
- An opportunity for southern African countries to lead the initiative towards developing efficient and effective animal disease control integrated with broader development goals.

Discussion:

1. *Meat exports.* How important is the meat export trade to the southern African region? The Botswana meat industry is bankrupt. Is it worth pursuing high standards? Would it not be better to focus on trade within Africa?
    a. Huge amounts are being spent in South Africa to maintain disease-free status and be able to export meat but the cost / benefit analyses do not seem to have been done.
    b. Despite the investment in maintaining FMD free zones, South Africa is still not able to export game meat to Europe because of suspicion that it is not fully controlling FMD.
    c. The full economic (as opposed to financial) costs to the country of maintaining FMD free status need to be examined – perhaps the expenditure is only benefiting a small segment of the country's economy.
    d. South Africa is now a net importer of meat. Trade in embryos is also important but the key question is, where does SADC want to be in 20-30 years time? Presently the meat industry contributes about 4% to GDP.
2. *Beef exports and wildlife*. In Zimbabwe an enormous amount was spent on supporting veterinary services to facilitate the export of beef to Europe at favourable prices while the wildlife industry, with virtually no support from Government, was earning more foreign exchange from safari hunting than were beef exports.
3. *Vaccination.* In the aftermath of the UK FMD outbreak the consensus has now moved towards using vaccination as a control method in place of trying to maintain disease-free status without vaccinations. South America has convinced Europe that vaccinated cattle are disease-free and exports beef to Europe. The political dimensions to FMD control and trade barriers and preferences clearly affect imports from Africa.
4. *Compartmentalisation*. Hygiene and disease control standards are eventually going to apply to all pathogens threatening food safety, and instead of attempting to control disease over vast areas of the countryside it may be more prudent to involve compartmentalisation in spatially limited high production units or zones. In contrast to a compartmentalisation approach, Tanzania is presently

considering fencing programmes along the lines of the Botswana model which would have huge adverse impacts on pastoral societies and wildlife.

5. *Bushmeat*. If more meat derived from livestock were sold in Africa it could have an impact on the bushmeat trade.
6. The TFCA would benefit from a trade strategy that did not require fences but could benefit buyers and traders in other ways – e.g. "green beef." Certification systems are being developed in relation to tourism and its social and environmental impacts and implications. These certification schemes are likely to have an impact on the viability of tourism over the longer term. The principles are presently being developed, and Anna Spenceley indicated that they would be willing to share these- could be applied to commodities like beef? [This is being done in Namibia- "cheetah friendly beef" program of the Cheetah Conservation Fund. – ed.]

5.6 Tick-borne Diseases: Some Perspectives and Research Opportunities in the GLTFCA

Graeme Cumming

Summary.

I first presented some background and results from published work on ticks at broad scales. To summarize, these results show that tick-host relationships are complex and not necessarily unique, with most ticks feeding on a range of different hosts. At continental scales, tick occurrences seem to be driven primarily by climate. At finer scales, other factors such as host distributions and vegetation structure are likely to become increasingly more important. The problem is made more difficult by the need to understand spatial distributions of hosts and parasites simultaneously before a reliable picture of trophic interactions can be developed.

In the GLTFCA, I suggested that many of the key questions involve relating changes in habitat, host communities, tick communities, and pathogen communities to one another. Most research questions of interest will involve addressing the management of tick-borne diseases in the park while improving scientific understanding of tick biology and host-parasite-pathogen dynamics.

There are a number of possible focal questions for research. I consider the following hypotheses to be of particular interest:

1. H: Overall tick abundance will be of far greater importance for the spread of disease than tick community composition, because 'problem' tick species are so generalist. In other words, I hypothesize that ticks of the key species in the park are generalist enough that a single abundant vector can transmit pathogens effectively (here and below, I am thinking of pathogen transmission to both humans and their livestock). The competing hypothesis is that community composition matters, and that there should be a link between the diversity of the pathogen community and the rate of pathogen transmission.
2. H: Mammalian host community composition will be important for the transmission of disease, because host species will show different resistance to and varying abilities to transmit different pathogens. The relative roles of big vs. small mammals (rodents vs. ungulates) are likely to be important. There are numerous, potentially fascinating study topics here. For example: do predators, both of rodents and ungulates, reduce the incidence of the most important tick-borne diseases? Does higher ungulate diversity promote or reduce pathogen transmission? Does higher mammalian diversity support higher tick diversity and a higher diversity of pathogens, or not?
3. H: Disease transmission is more likely in 'disturbed' landscapes (human-, cattle- or elephant-modified, simplified systems) because simplified systems will permit ticks of opportunist species to multiply rapidly and reach high abundances in the absence of potential tick predators such as lizards, ants, birds, rodents, and even fungi (including fungal infection of eggs). Engorged female ticks should be a rich prize for any of these species. This hypothesis is partially a corollary of H1.

4. H: There are thresholds for transmission of tick-borne pathogens that can be identified and managed, because pathogens are usually scarcer than their hosts. For instance, keeping pathogens in the system may require a minimum abundance of ticks or a minimum diversity of ungulates. Note that the pathogens depend on the ticks, which depend on the hosts, which depend on the habitat. After a major disturbance we can expect a recolonization of an area in the reverse order – i.e. plants, hosts, ticks, pathogens. Being at the end of the chain, pathogens may be vulnerable in unexpected ways to source-sink dynamics, population fluctuations and trophic cascades lower in the food web. The relative role of humans and domestic animals (goats, cattle and sheep) vs. other species in the system is not known. In Africa, cattle are known to be hosts to at least 100 different tick species (out of c. 240 known African species) – having not gone through the evolutionary mill in the same way, they may be better food than most other ungulates. Of course, sampling has been biased, so we don't really know how they compare.

Discussion

1. The analysis was based on all mammalian species, not just cattle, and covered >30,000 tick-host records. Answering the question of co-speciation was partly hampered by the absence of good phylogenies for ticks but comparisons at the order and generic level showed that ticks were generalists.
2. Historical data were used and there is a considerable amount of new data for southern Africa and separation of life history stages in multi-host species may reveal some measure of host specificity. There have been recent changes in taxonomy of ticks.
3. The analysis presented was based on broad scale data. There is a need to examine tick host relations and tick behaviour and physiology and very much finer scales in order to develop more holistic predictive models that can be scaled up and based on, for example, tick physiology.
4. Small game farms in South Africa would provide suitable sites for fine scale studies. Many of them find they have no tick problems until they introduce key species, such as white rhino and giraffe, which are preferred hosts for adult ticks. In small parks, the animals also can't move out of the range of ticks.
5. The work of Jaqui Minshull in Zimbabwe established that small game parks have higher tick populations and she looked at the effects of fire on tick population explosions in Kyle Game Reserve – not much ecological work has been done on ticks in South Africa.
6. Q: Have you looked at pathogens? A: Done a course study on correlations between climate and ticks, and between ticks and pathogens, but not between climate and pathogens.
7. If there is little evidence of co-speciation between ticks and their hosts, is there host specificity in other vectors? Mites are the classical example (as are fleas and lice).
8. Predicting the effects of climate change on ticks, vectors and pathogens is likely to be problematic and a good example of dealing with a complex system.

5.7 Databases and GIS for the GLTFCA – Veterinary Information Management System

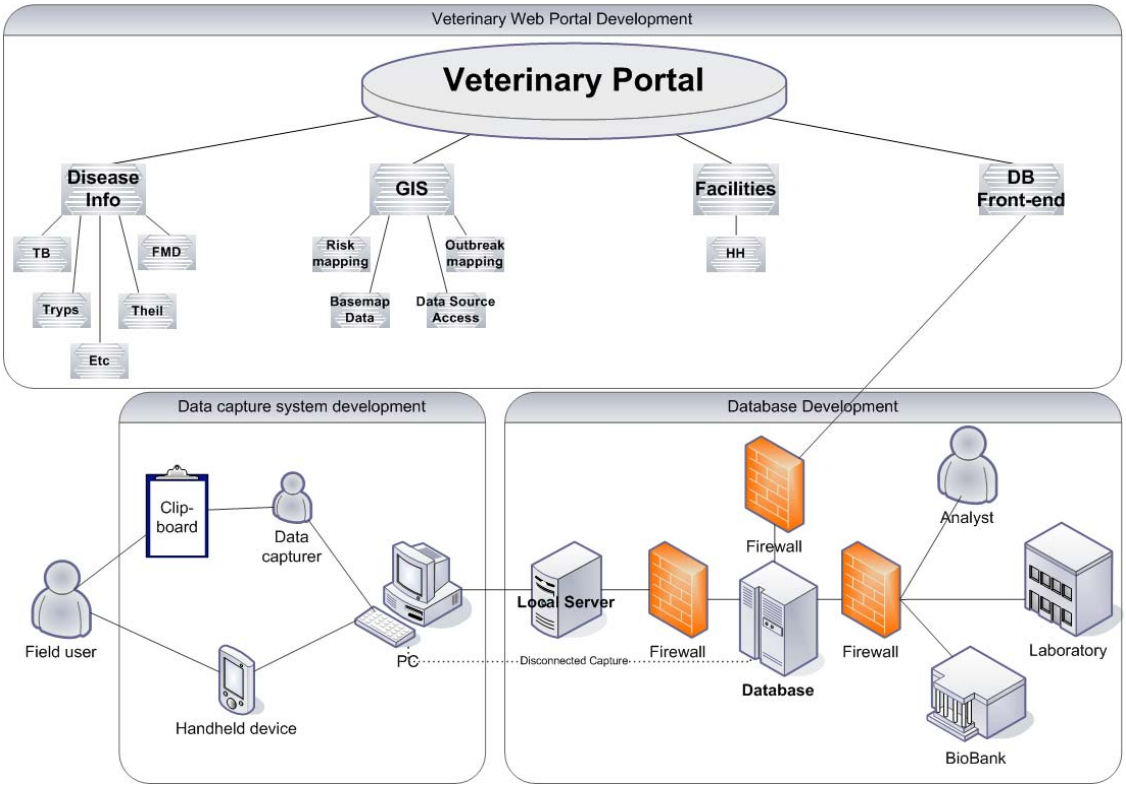
Louis van Schalkwyk, *TFCA Veterinary Programme, Peace Parks Foundation*

Summary

Background

- Project started in 2004
- Investigation of wildlife / rural livestock role players' information management (IM) capacity
- Found severe lack of IM capacity & information sharing
- Workshops to determine needs (software (incl. functionality) / hardware)
- Investigated available veterinary IM Systems (TADInfo, ZIMS, etc)
- Conceptual version of data capture system designed
- Expanded in 2005 to include Veterinary Portal and Veterinary GIS capacity

Structure



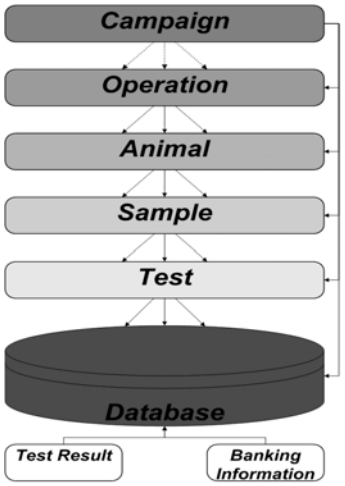
Data Capture

- Electronic field capture system
  - Custom software development (OpenSource)
  - Via handheld electronic devices (ideally)
  - Hard copy capture still possible
  - High level of functionality to decrease data capture time
  - Hierarchical structure to reduce data input duplication
  - Single click entries to reduce input errors
  - Customizable
- Synchronization capability (up- and downward)

Central Database

- Central data repository for data capture system
- Access control for protection of IP and sensitive data
- Direct linkage to sample bank to enable sample tracking and inventory

- Possible direct linkage (or through web) to laboratories and/or lab equipment



Challenges

- Various role players in different countries
- Non-standard methodologies
- Remote & harsh data collection environments
- Time constraints in field with immobilized animals
- Unreliable connectivity
- Lab personnel used for data capture – decreased productivity
- Currently: Limited information generated from data due to cumbersome and/or inadequate data management

Web Portal

- Various role players in different countries
- Non-standard methodologies
- Remote & harsh data collection environments
- Time constraints in field with immobilized animals
- Unreliable connectivity
- Lab personnel used for data capture – decreased productivity
- Currently: Limited information generated from data due to cumbersome and/or inadequate data management

Status

- Funding
  - Secured by Peace Parks Foundation
  - Project of TFCA Veterinary Programme
- Data capture system & Database
  - Software developing company contracted to develop data capture system & central database
- Web Portal
  - Web development company contracted to develop veterinary portal

Time frame

- Data capture system & Database
  - First version (post-testing) - 2007/2008
- Web Portal
  - First phase – info sites & infrastructure - 2006
  - Second phase – GIS & database web interface - 2006/2007

Management

- Establishment & initial management of database - PPF
- Database Administrator - To be appointed as soon as database implemented

- Hardware - Initial setup by PPF
- Future management - National/International scientific organization

***Discussion**:*

1. The existing PPF GIS databases were not suitable for wildlife data which is why a new database is being developed. It is difficult to capture research data because each research worker uses different methods, however, databases are becoming more flexible and links between databases are becoming more flexible.
2. NCEAS have developed major data bases and working on one for South Africa and would it not be sensible to link into their system rather than re-inventing the wheel on this?
3. Medical database systems interact with different systems and are able to provide doctors with daily information on patients and medical database design is forming the template of the PPF database system

5.8 Transboundary Protected Areas Research Initiative Anna Spenceley

Summary

OUTLINE

- Overview of the Transboundary Protected Areas Research Initiative (TPARI) – linkages, modes of collaboration
- TPARI research - themes, current research projects, recent progress
- Current gaps in nature-based tourism research - including hunting and photographic wildlife tourism
- Potential linkages/collaboration between AHEAD and TPARI – and contributions to AHEAD research priorities

1. TPARI in a nutshell

- Research network running under auspices of IUCN-SA
- Initial funding from NSF via Centre for the Integrated Study of the Human Dimensions of Global Change, Carnegie Mellon University
- Human and social dimensions of TBPAs / TFCAs in Africa
- 28 researchers over last two years
- Two post-doctoral fellows: on tourism and CBNRM survey/assessment
- International linkages

2. International linkages

- **Key partnerships**: IUCN South Africa
- **Key relationships:** DEAT, SANP, PPF, EWT, SAVANNA consortium, WCPA-IUCN TBPA Task Force, AHEAD
- **Southern African university partners**: Wits, Stellenbosch, Johannesburg, Cape Town, Western Cape (PLAAS)
- **North American universities:** Bates College, Carnegie Mellon University, Johns Hopkins, Indiana, Georgia, Berkeley Calif., British Columbia, Montana, Michigan
- **European universities**: Wagenigen, Vrije Amsterdam, TU Berlin, Finland, Mainz

3. Modes of collaboration

MoU

- Formal inter-institutional MoU
- Formal researcher MoU

Informal agreements & informal participation in network
Benefits:

- Library & research platforms
- Proofing of research topic
- Research design
- Logistical support & registration procedures
- Field mentoring (academic)
- Networking & research synergies
- Funding & fundraising
- Exposure and peer review (teleseminars/website)

4. Research themes

Human-environment relations:

- Climate variability, environmental disaster, resource limitations,
- HIV-AIDS & resource use

Decision-making and governance:

- Political ecologies, planning & participation,
- PA Management and co-management

The social and economic framework:

- Land rights, resource rights and livelihoods,
- Tourism development, economic development and beneficiation,
- Cultural landscapes, cultural histories, cultural & social impacts

5. Projects

Senior researchers, post docs & PhDs

- PAs: does collaborative management make a difference? Comparative study (PhD)
- Agricultural development project next to park (PhD)
- SANP approaches to engaging community (PhD)
- GLTP, ENSO events & livelihoods (PhD)
- Survey & assessment of 'CBNRM' interventions (post doc)
- Tourism investments in GLTP (post doc)
- States, markets and conservation (PhD) GLTP history and NGO relations (post doc)
- Do TBPAs help? (PhD)
- Understandings of land & place among the displaced people from the GLTP (PhD)
- Digitisation of TEBA Archives
- Multi-objective decision-making model for Kruger to Canyons (looking for funding) (senior researcher)
- Agroforestry study in Limpopo National Park (PhD)
- Woodland conservation & EE: comparative SA and Nigeria (PhD)
- Indigenous knowledge systems and disaster preparedness

MA / MSc

- Concept of 'Peace Park' and implementation in SA
- Conservation & livelihoods in Makandizulu, LNP
- Madimbo Corridor land claim
- Private game farms and transboundary conserv.
- Gender and Indigenous Knowledge in LNP (Hons)
- Community participation in Kgalakgadi: park perspective
- Network Analysis of 2 villages

- 2 Cultural Tourism case studies
- Makuleke training project (BA Hons)
- Distribution of iron age habitation in Pafuri

6. Recent Progress

- USAID study – NRM case studies (Namibia, Botswana, Zimbabwe, Malawi)
- Social mapping of KNP – GIS mapping human and cultural landscape (planning phase with SANP and PPF)
- SANPAD joint projects -
  (a) legal dimensions of TFCA conservation
  (b) land claims and land reform in GLTP
- Postdocs on GLTFCA –
  Dr Wolfram Dressler - completed 1-year on CBNRM – teleseminar and papers in 2006
  Dr Anna Spenceley – 2006/7 NRF research fellowship - sustainable tourism research (2nd year)
- Post social indaba process (special edition Conservation and Society Journal)

7. Nature-based tourism research gaps – relevant to AHEAD

For Nature-based Tourism (NBT) – consider photographic wildlife tourism and hunting in particular

Policy/Planning

- What are implications of land tenure and reform for NBT, wildlife management and biodiversity conservation?
- What are the policy implications for transboundary NBT and alternative livelihood approaches?
- How does the planning approach *(e.g. level of participation)* influence sustainability?

Environmental

- What are implications of animal health for NBT? *(hunting / photographic)*
- What are the implications for climate change and NBT? *(two-way impacts)*
- What different implications are there for WHS/TFCAs/ NPs/Biospheres for NBT and conservation and stakeholders?

Economic

- $ impacts of wildlife diseases on hunting/CBT/NBT and implications for $ to business and rural livelihoods
- What are the options/best practices for alleviating poverty through NBT?
- What is the relative importance of NBT in conservation finance?
- What are the impacts of NBT on poverty?
- How resilient are different NBT sectors? *(e.g. to instability)*
- How can risks be managed? *(e.g. disease, instability, climate change)*

Social

- What are the impacts of human disease (e.g HIV/AIDS) and wildlife disease (e.g. BTB) on the NBT sector?
- What are the social / cultural impacts during the destination life-cycle, and in relation to alternative livelihood options?
- What are the social, cultural and spiritual impacts of NBT?

Holistic

- What are the dynamics between conservation, and local economic development (esp. poverty alleviation) and society in NBT? (and consider sustainable alternative livelihood options)

8. Potential contributions to "AHEAD- GLTFCA draft projects summary table"

Theme #4, Human livelihoods, animal health and ecosystem goods and services

Tradeoffs between alternative landuse enterprises – e.g. tourism, agriculture etc - CBA

Effects of alternative policies on development, adaptability and resilience

e.g. regarding land tenure, commercialisation, PPPs (Public-Private Partnerships)

#5 Policy support and capacity building

 # 6 Communications and outreach – teleseminars (presentation – prepared critiques – potentially wide geographical distribution – discussion), TPARI network & linkages etc.

Other related research options:

- Wildlife and disease issues relating to socio-ecological systems (e.g. sustainable livelihoods, poverty alleviation implications)
- Implications for viability of nature-based tourism as a livelihood option (hunting / photographic) / business option
- CBA / scenario planning on wildlife, tourism & livestock options
- Access to TPARI network of socio-economic researchers
- Joint research funding proposals

Discussion:

1. The link between disease and nature based tourism (NTB) needs to be emphasized.
2. In South Africa the demand for FMD free buffalo (at very high prices) has resulted in them being moved into farming areas from which they have long been absent. While free of FMD they may not be free of other diseases (such as theileriosis) with the result that they become a threat to neighbouring rural cattle populations with subsequent claims for compensation that are not always justified being lodged and complex social dynamics developing that vets are not equipped to deal with. Social scientists may be able to assist in these cases and this might be a good opportunity for collaboration with TPARI.
3. A consideration of the political and social risks of TFCA development is not the focus of today's AHEAD-GLTFCA deliberations. In general, local resistance to TFCAs is often put down to 'ignorance' of rural people and the question is how do we bring about change in the perceptions of both parties involved? There is a need to foster community involvement in the process of TFCA development and planning and to help both rural people and TFCA developers appreciate issues of dealing with complex systems and complexity. So far TFCA development has been mainly top-down, but we need both top-down and bottom-up approaches. Two-thirds of local people have never heard of TFCAs. However, in the development of the Sengwe Corridor there have been initiatives to involve local communities on both sides of the Limpopo and there is high level of awareness in this particular area.
4. The need to further develop links between TPARI and the programme were emphasized as was the need to further develop the involvement of social and economic scientists in the programme.

5.9 Review of the Establishment of the Sengwa Corridor as Part of the GLTFP/TFCA
Giuseppe Daconto

Summary

The Sengwe-Tchipise Wilderness Corridor is being established to provide a connection between Kruger National Park and Gonarezhou National Park in Zimbabwe. The planning process has been supported by CESVI through a project funded by the Italian Ministry of Foreign Affairs, entitled "*Sustainable Development and Natural Resource Management in Southern Zimbabwe."*

The presentation outlined the corridor planning process, selected local scale NRM issues, and the regional context of the initiative (south east lowveld and other TFCA components in Zimbabwe); it also highlighted questions arising from the corridor planning process which have research relevance.

The establishment of the wilderness corridor was proposed as a result of extensive consultation processes undertaken at the national and local level since 2000. Baseline appraisals and conceptual development supported a series of consultative events which eventually contributed to establishment of a framework for broader cross-sectoral and inter-agency consultation about the TFCA in Zimbabwe (at grassroots, district, and regional levels). Through this process, stakeholders clarified, inter alia, the preferred legal route for the establishment of the connection between the two parks, which would comprise about 400sq km of communal land. A consensus was achieved not to excise the area for inclusion in the National Parks estate. The area is to be established under the Regional Town and Planning Country Act, which recognizes the local authorities (Rural District Councils - RDCs) as planning authorities.

The statutory planning process is ongoing and aims at establishing a Wilderness Area with the following objectives: (a) to ensure compliance with international treaty obligations and the overall conservation objectives of the GLTFP; (b) to enable a physical linkage in the form of a conservation corridor between the Gonarezhou National Park and the Kruger National Park to enable: wildlife habitats and movement between the two national parks - tourist flows and associated development linked to the corridor and overall development of the GLTFP - regional economic development; (c) to provide opportunities for local communities to manage and derive benefits from the natural resources to be conserved in the proposed wilderness corridor.

The local stakeholders have indicated that they favor using the area for trophy hunting as the most feasible scenario for the near future. This landuse model could evolve in the future towards either national park standards or biosphere reserve standards, depending on changes in context and preferences.

Field level consultations unequivocally confirmed the local wish to retain local ownership and control over the corridor resources, to minimize potential negative impacts, and to enhance potential positive impacts associated with the initiative. Among the critical resource management issues are the management and development of surface and ground-water for domestic, agriculture and livestock consumption; relief grazing presently occurring within the proposed corridor area; separation of wildlife from people and cattle; and control of animal diseases (FMD, tryps, BTB).

The establishment of the corridor requires devising an appropriate management and institutional system, which at local scale is likely to entail a role for the CAMPFIRE programme, managed by the RDCs and for community trusts, as community associations with legal persona. The establishment of the corridor is also closely linked with ongoing planning developments at the regional scale, with particular regard to the tourism industry, the wildlife industry, and agriculture and rural development.

The process to date has been directly affected by the depressed and fluid state of the wildlife and tourism industry in Zimbabwe and, by and large, by the massive economic crisis of the country and fundamental changes in the policy context. Given the complex and uncertain planning context, CESVI, along with other stakeholders and government agencies, undertook in 2005 an analysis of alternative scenarios for the wildlife and tourism industry in the lowveld. This study identified a set of alternative futures which were reviewed in terms of economic, social and environmental benefits. This process contributed to the identification of factors constraining effective regional tourism planning and to the formulation of desired goals for the TFCA in Zimbabwe.

The establishment of the Wilderness Corridor raises important issues relevant to the livestock sector: the present state and potential impact on the local cattle economy and the traditional and often illegal cross-border economy of this border area; the management of local environmental constraints for

livestock; coping with diminishing technical and extension services; the implications of potential boundary realignment of Gonarezhou National Park; the establishment of a supportive and effective governance system over natural resources, acceptable to the range of stakeholders; the combined impact of the GLTFP (being established in Zimbabwe in a highly uncertain scenario) and potential animal disease control measures on the resilience of the agro-pastoral system and local livelihoods.

At a regional scale, a number of questions would deserve further analysis in relation to the establishment of the GLTFCA. What is the biological rationale for landscape connectivity pursued through the GLTFP/TFCA? What is the value added by cross border natural resource management established by virtue of the GLTFP/TFCA and what is its impact on local livelihoods? The GLTFP Treaty recognizes regional economic integration as one of the objectives of the regional initiative: this goal still awaits better articulation in terms of possible scenarios for the development of the rural economy and livelihoods vis-à-vis the tourism industry. What is the present, historic and potential cross-border nature of the local livestock-based rural economy? Which are the likely impacts on the local agro-pastoral system due to future changes in the tourism industry, infrastructure base, market access and structure, wildlife management and animal disease control systems, and governance systems brought about by the GLTFP/TFCA?

Last but not least: which is the most desirable management model for natural resources at the scales affected by the GLTFP/TFCA? The process and debate to date reflect more often tacit assumptions than articulate analysis of this crucial issue.

The Italian Ministry of Foreign Affairs is planning to fund a second phase of the programme established in Zimbabwe. This phase will be at regional scale and will be delivered through a partnership between CESVI and IUCN, along with Government agencies and other stakeholders in the three countries concerned.

Discussion:

1. *Mine Field*. The mine fields can be cleared. The estimated cost in a study carried out five years ago was US$ 5 – 10 million. Earlier this year the Zimbabwe Army indicated that they would undertake the task.
2. *Biological rationale for the corridor?* It has not been a traditional migration route for animals although it could function as a dispersal corridor for elephants. Initially the corridor was expected to be much wider (about 50 km) but at that stage little consideration had been given to the numbers of people already living in the area. Both Gonarezhou and Kruger are large enough to be independent and separate entities but with climate and other future unpredictable events it makes good sense to link them into a larger, contiguous area. Disease may be one of the costs but there are other trade offs and several potential conservation benefits, one of which is that large conservation areas offer better survival potential for larger species. The major wildlife movements are up and down the drainages which run southeast / northwest of both Gonarezhou and Kruger.
3. *Cultural aspects*. The Shangaan people live in all three countries and there have been historical, and recent, movements of people across the borders. Cultural and economic ties exist across the border and the creation of a border post will formalize an existing situation. There is, however, some fear that the creation of the corridor and full establishment of the transfrontier national park may interfere with cross border connections.
4. *Top down planning*. There is high level of distrust of central government on the part of local people, with a ‘disconnect’ between central and local planning and interests. When little happens at the local level in terms of implementation, disillusionment creeps in and this is particularly a problem when participatory planning approaches have been used.

6. PROJECT DEVELOPMENT IN THE PIPELINE - IDRC, FOUNDATION ENSEMBLE, MACARTHUR (CLIMATE CHANGE), BRITISH ECOLOGICAL SOCIETY, OTHERS?

Discussion

1. *IDRC.* The progress in funding from IDRC for the CASS scenario planning project has already been reported in these minutes (see pp. 10-11).
2. *Fondation Ensemble*. Fondation Ensemble is a French foundation based in Paris that approached WCS and the AHEAD programme because they were interested in the work it was doing. They have invited a proposal that matches their focus on projects that have benefits both to biodiversity conservation and improved livelihoods. They require quantifiable benefits to people in the project area and they would prefer the project to be in South Africa or Mozambique. They fund projects up to about $180,000 a year for three years. Work has started on trying to identify a suitable project within the TFCA in Mozambique that will focus on livestock health, wildlife health and benefits to people. Any suggestions from the Working Group would be welcome.
3. *MacArthur Foundation*. Mike Kock, David Cumming and Graeme Cumming met with Michael Wright and Elizabeth Chadri from the MacArthur Foundation in Cape Town during February to brief them on the AHEAD Programme and to explore potential joint interests. Their major interest is in climate change and adaptation in relation to the conservation of biodiversity, and they were visiting a number of countries in southern and eastern Africa and will be putting out a call for proposals later in the year.
4. *British Ecological Society*. The society has put out a call for proposals to support the establishment of ecological societies in undeveloped countries. Support to successful applicants would amount to £5,000 a year for five years. Steve Osofsky asked if anyone had looked at the call and thought of ways in which the AHEAD programme might benefit. No contact had been established with them. David Cumming was of the opinion that the funds were to foster or support the establishment of ecological societies and that the AHEAD Working Group initiative would not qualify. Harry Biggs had BES contacts he thought he could follow-up with, just in case.
5. *EU proposal*. Carlos Pereira reported that two local Mozambican NGOs, together with the Association for Scientific Development (ASD) and an Italian NGO had submitted a proposal to the EU dealing with livestock and human health. The results of what is a highly competitive bid will be announced in March. One of the Mozambican NGOs is particularly interested in malaria.
6. Colorado State University has a programme on infectious diseases (especially malaria) and may be able to support American students, with supervisor at CSU, to work within the GLTFCA.

7. PROPOSAL FOR A CORE AHEAD-GLTFCA STEERING GROUP

(Facilitator: Cumming)

The question of a core group, or steering group or committee has arisen in several previous meetings and so far the Working Group (WG) has operated on an informal, networking basis. Harry Biggs (HB) was invited to open the discussion on the need for a steering committee. He argued that it was time a steering group was established. WCS could not be expected to support the process forever and the local agencies and individuals involved in the TFCA should find the resources to support a steering committee and the ongoing coordination of the programme. However the initiative and membership need to involve all three countries and should not be a predominantly South African effort. Bearing this in mind SANParks would be prepared to host the committee if it can find the funds to do so.

Markus Hofmeyr and Mike Murphree concurred with HB's comments and considered that it was now necessary to establish a formal steering committee. However, it should not be seen as a position of

authority or privilege and careful consideration needed to be given to its structure and membership. Networking has worked very well so far and that needed to be maintained. It was generally agreed that a formal steering committee was needed but DC pointed out that such a committee needed resources if it was to function effectively. Carlos Pereira agreed but pointed out that we needed to continue as we are until such time as new structures were in place.

Nick Kriek considered that a steering committee needed to be formalized now and greater cohesion between the various groups involved in the programme was needed. He indicated that PPF has some funds available and would be able to support 2 to three meetings of the steering committee a year. PPF would however need to see a budget before making any commitment.

Mike Kock and Markus Hofmeyr said the committee needed to include a mix of disciplines and experience and needed to work at a regional level.

Fred Potgieter expressed discomfort at the direction the discussion was going. There was lot of ongoing research being carried out, for example by OVI[1] and ARC with government and independent funding- what was needed was a listing of what ongoing relevant research existed so that members of the WG and others could link-up and network with those they needed to. He did not have time to sit on a steering committee but needed to interact with Anna and Graeme and others, for example. The tsetse policy needed to be developed and the programme needed commitment and focus, the BTB programme needed input from social economists.

DC asked if, in the light of these considerations, a formal steering committee was redundant. Are we more active and effective as an open networking group?

Steve Osofsky (SO) asked if new functions on the web site (such as 'bulletin boards' or moderated listserves/discussion groups) would help networking and communication between members of the Working Group. The option was discussed and some members felt it would be a useful addition while others had reservations about its usefulness. SO and Louis van Schalkwyk would follow-up on the matter.

The question of involving the wider network of those who have been at previous meetings but were absent this week was discussed and it was pointed out that the group was even wider and included the entire e-mail list that receives the reports and updates of the programme. Given that the universities and students were in lower attendance at this meeting (several previous meetings having been held at U of P), there could well be as many as five times as many interested people.

Steve Osofsky noted the WG was almost entirely self selected and perhaps the steering group could be similarly formed. Since there was reluctance to take any form of (s)election further forward, DC asked those participants who wished to be part of a steering committee to send him an e-mail within the next two weeks. Once a self-nominated group was apparent we could take the process forward more formally if necessary. Mike Kock thought that it may be best to leave it flexible and simple, but he did feel it was desirable to have a core group that helped to steer the process. Steve Osofsky welcomed more regular input from WG members interested in that type of involvement (e.g., steering committee).

Graeme Cumming suggested that smaller working groups which were networking within the overall programme would be an effective strategy. DC noted that Greg Simpson had earlier suggested setting up a working group to deal with medical issues and DC suggested that was an excellent way to go and would encourage it. HB asked if there were any others that wished to form working groups and Graeme Cumming said he would be happy to form a group on tick research. Claire was keen to do so for tuberculosis although that could be part of the medical group.

The question of establishing a formal steering committee was left open and pending a response from members of the WG who might wish to serve on such a committee.

On the question of formal appointments to further the AHEAD-GLTFCA programme Markus Hofmeyr noted that at a pre-meeting on Wednesday the 8th March with Peace Parks Foundation (Nick

[1] A list of relevant OVI projects supplied by Fred Potgieter can be found in Appendix 2 of this report.

Kriek), and WCS (Steve Osofsky, Mike Kock) and SANParks (Hector Magome, Danie Pienaar, Harry Biggs and Markus Hofmeyr), the possibility of joint funding for 2 essential AHEAD-related positions in SANParks was discussed. The posts would be a program manager in veterinary issues (KNP scientific services, research orientation) and a veterinary policy integrator ("AHEAD Liaison"- conservation services at HQ). The meeting went off well with commitments from multiple parties to look at the availability of funding for these very important positions

8. INSTITUTIONAL COMMITMENTS TO THE PROGRAMME: FINALISING 'LETTERS OF COLLABORATION' (Facilitator: Cumming)

Formal letters of collaboration have been received from seven organisations so far and those who intend to continue to participate in the programme were urged to complete and submit the letter to David Cumming. The letter is a very simple, open letter expressing intent to participate in the programme in so far as resources of time, funds and staff allow.

A major purpose of the letters, apart from a formal statement of intent from the head of a participating agency, is that the letters can be shown to potential donors as evidence of commitment to the programme by a full range of government, university and NGO agencies in the three countries involved in the GLTFCA. Copies of the letters would be available to members to use in backing-up funding proposals should they need them.

9. NEXT STEPS AND NEXT MEETING

1. The proceedings of the meeting to be written up within the next month – David Cumming responsible.
2. One- to two-page summaries of presentations to be submitted by speakers to David Cumming as soon as possible if they have not already done so.
3. WG members interested in participating in the scenarios planning effort discussed by Michael Murphree should contact him over the next few weeks.
4. Power-point presentations will be on Mike Kock's computer and on the web site if authors agree to their presentations being on the web site. A useful means of providing some protection against plagiarism is to print 6 slides per page in PDF format. [Note- all PP presentations received for this purpose have since been posted as PDFs at http://www.wcs-ahead.org/gltfca_march2006/agenda_march2006.html -ed.]
5. Volunteers for the Steering Group to indicate their intentions to David Cumming within the next two weeks. PPF to evaluate funding possibilities.
6. WG members are kindly requested to pay particular attention to Appendices 2 and 4 of these minutes- please let David Cumming know of any additional projects / project-related details that should be listed. Thank you.
7. Next meeting to be held in Zimbabwe if at all possible and preferably in the South East Lowveld. September / October possible time-frame.

The meeting closed at 13.30 and Danie Pienaar thanked everyone for their input. He thought it had been an interesting and stimulating meeting that had covered a wide range of appropriate topics. He extended thanks on behalf of the delegates to those who presented papers, to Steve Osofsky and Olivia van Melle Kamp and WCS for convening and funding the meeting, to David Cumming for his facilitation and to Merle White and Jackie Deacon for their, as always, excellent organisation and logistical arrangements.

APPENDICES

APPENDIX #1: LIST OF PARTICIPANTS

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APPENDIX #2: PROJECTS SUMMARY TABLE – UPDATED 10 MARCH, 2006

AHEAD-GLTFCA – Programme: Outline of Themes and Modules and summary of concepts being developed or suggested.

Theme	Module	Potential research proposal/Activity	Lead Agency/ person respon.	Status	Potential Donor
#1 Overarching conceptual framework to facilitate integrated and inter-disciplinary approaches	a) Coordination and project start up	1. Support for the coordination and development of the AHEAD-GLTFCA programme	WCS/ Osofsky	Outline proposals developed	**WCS**
	b) Development of inter-disciplinary frameworks and models	1. Develop conceptual models to link the six programme themes through a series of meetings/workshops involving full range of researchers/disciplines and stakeholders in the GLTFCA	WCS/CASS Cumming / M. Murphree	**Initial funding secured for framework and scenario planning**	**USAID/WCS**
		2. Furthering TFCA scholarship (open for further discussion) ? NSF grants, Ford Foundation support to MSc. Students,, UCN/PLAAS short course . TPARI. Scholarship funding? Pick up on baseline indicators	CASS Inst. Nat. Res. Centre Environ. & Development.	Initial note from CASS	
	c) Baseline indicators	1. Participatory surveys of animal and human diseases, livelihoods and socio-economic baseline data in communal areas of the GLTFCA (Part of module 1(a)1?)	WCS Cumming/Osofsky	Initial concept and budget by WCS	
#2 Animal health and disease	**a)** Epidemiological studies	1. BTb, FMD and Brucellosis in Sengwe Communal Land Zw.	Vet Wildl. Unit, Zw/ Foggin	**2000 cattle sampled – none +ve**	PPF
		2. Status of BTb, FMD and Brucellosis in Limpopo National Park Will be done this year Ongoing work in KNP testing vaccines	DINAP / Pereira /	Initial note	PPF
		Kruger: Ongoing work on BTb in Buffalo, Kudu, lion, leopard, hyaena and giraffe and testing of vaccines	Roy Bengis / Markus Hofmeyr	Ongoing research and surveillance	
		3. Serological studies of FMD, etc. in wild and domestic ungulates in the GLTFCA (Links to Theme #4 need to be built in and be explicit + link to a development NGO?)	OVI Vosloo et al. Will be revisited	Project concept	
		4. BTb and zoonotic implications	OVI / Michel	Project Concept Needs further development	
		5. Coordinating pathological data/sample analyses in GIS database in Mz	Rosa Costa / Mary-Lou Penrith	Project Proposal developed	Part of WB TFCA Project?
		6. Monitoring of tsetse in TFCA and linked to research on tsetse resurgence in Kwazulu-Natal (also development of SA policy on tsetse control)	Potgieter	**Follow up with EU (v.d. Bosche) on monitoring in GLTFCA**	**?EU**
		7. BTb data base from MRI work	MRI / Wayne Getz / Claire Geoghagan / Elissa Cameron	**Programme continuing but requires new funding cycle**	Proposal submitted to PPF
	b) Alternative animal health management and disease control strategies	NOTE: No concepts yet Primary health care measures, Cultural practices and indigenous knowledge, links with epidemiological studies, community based strategies	Mike Kock / Carlos Pereira	Proposal being developed for submission to Fondation Ensemble	

Theme	Module	Potential research proposal/Activity	Lead Agency/ person respon.	Status	Potential Donor
	c) *Preventative/proactive measures in disease control and management*	*1. SOPs/Contingency plans/Risk assessments/Scenarios for priority diseases (e.g. Distemper) as a way of helping to define research and management priorities. (?Alien invasions!) – links to National Depts., Joint MB – Vet & Wildl. Committee)*	*Raath* *Starting with baseline GIS work and developing a template*	*No Progress or concept developed*	
		2. BTb risk assessment in GLTFCA – PhD study proposal developed and submitted via CIRAD for support	*Alex Caron*	*Proposal developed*	*CIRAD*
	d) *Theoretical/fundamental studies (Needs further development in terms of key or strategic additional studies/ideas)*	*1. Examining the relationship between social structure and the spread of diseases in ungulates and viverrids using modeling approaches and empirical data from general sampling of disease presence in a range of species in these groups. (also question of Brucella in small ungulates)*	*?*	*Initial note by Paul Cross – no further development*	*NSF*
		2. Spatial models of disease risk between KNP and Mozambique using village livestock and wildlife densities and also examining the risks of diseases spreading from dogs to wild carnivores	*?*	*Initial note- Cross cannot continue (new job)*	*NSF*
		3. Study of tick-host-pathogen ecology at several spatial and temporal scales involving wild and domestic ungulates and humans. A key area of focus would be on determining thresholds of transmission and how these may vary under differing management regimes.	*Cumming GS WEC/UFL*	*Initial note*	
#3 *Landuse, ecosystem goods and services & animal health*	*a) Spatial and temporal relationships between ecosystem processes and disease prevalence*	*NOTE: No concepts yet* *Requires remote sensing studies linked to epidemiological work in Theme #2* *Climate change and cycles in relation to disease spread and prevalence*			
	b) Landscape level resource use and impacts by wild and domestic ungulates on ecosystem goods & services	*NOTE: No concepts yet* *Requires remote sensing studies and detailed ground survey work at appropriate scales e.g. impacts of elephant damage, overgrazing, trampling on run off, nutrients, water, non timber forest products*	*INR?*		
	c) Effects of landuse scale and pattern on animal health	*NOTE: No concepts yet* *Requires links between 3a & b and 2a.* *What minimum sets of data are needed?*			
	d) Linkages between animal and human health	*1. Disease risk assessment of people living in villages in the TFCA*	*Follow up on LNP Survey by Raath and Pereira*	*?*	
		2. What happens when fences are taken down in the wake of dispersal of wildlife from NP and vice versa for livestock dispersal (also linked to water distribution)?			
		3. Public health implications of establishing the GLTFCA	*Simpson*	*Proposal*	
	e) Understanding animal husbandry practices	*1. Role of livestock in household production, community differentiation, collective management and institutional factors affecting these*	*INR*	*Being reworked*	
		2. Mike's concept + ARC projects and related projects			

Theme	**Module**	**Potential research proposal/Activity**	**Lead Agency/ person respon.**	**Status**	**Potential Donor**
#4 *Human livelihoods, animal health and ecosystem goods & services (Ecosystem health)*	*a) Scenario planning and participatory exploration of land use options*	*1. Scenario planning and modeling at local community and village levels and developing approaches and methodology for "local adaptive scenario planning" – a 5 yr programme at least.*	*CASS + INR Manjengwa / Murphree MJ / Murphree MW*	***Funded***	***IDRC + USAID / WCS & SCF***
		2. Issues of larger scale landuse planning, placement/removal of fences etc. (Biosphere Reserve concept for SEL of Zimbabwe?) (Need for spatial info. and remote sensing data/interpretation)	*WWF-SARPO R. du Toit +CIRAD/NPWMA*	*Feasibility study in May 05 –* ***Done.*** ***Extended TFCA concept now being examined***	***CIRAD***
	b) trade offs between alternative landuse enterprises	*NOTE: No concepts yet but could form part 4(a)2 above on biosphere reserve concept*			
	c) Effects of alternative policies on development, adaptability and resilience	*NOTE: No concepts yet*			
#5 *Policy support and capacity building*	*a) Support for policy development on animal health and linkages between animal and human health and ecosystems*	*Reviews of existing policy, seminars and training workshops in policy analysis*	*?*	*Initial concept and budget developed by WCS*	
	b) Exploring consequences of alternative policies using scenarios	*See 5(a)1 above* *Scenario planning workshops* *Urgent need in Zw – scenarios and use of scenes from remote sensing*	*INR Mike Murphree* *RdT and MM*		
	c) Capacity building in policy analysis	*See 5(a)1 above*			
#6 *Communi-cations and outreach*	***a)*** *Communication between research workers and agencies engaged in the programme*	*1. Series of workshops and seminars*	*WCS (See also Theme #1)*	*Concept and budget developed*	***Partial support USAID / WCS grant***
		2. Web portal for communication among researchers / members of Working Group	*Louis van Schalkwyk*	*Being implemented*	***PPF***
	b) *Information flow between scientists and Govt. and implementing agencies and policy making agencies*	*Workshops and seminars and meetings* *Development of website and database for results.*	*WCS & CASS* *PPF GIS initiative*		
	c) *Participation of landowners, communal farmers etc. in the programme & information flow*	*NOTE: No specific concepts yet* *CASS IDRC effort related?*			
	d) *Production and distribution of research results, syntheses, policy briefs, etc*	*NOTE: No specific concepts yet*			

Theme	***Module***	***Potential research proposal/Activity***	***Lead Agency/ person respon.***	***Status***	***Potential Donor***
	e) *Community and Village outreach including theatre linked to PRA*	*Transfer of information and research findings to communities and feedback on their views, perceptions and needs*	*Kock & Theatre for Africa + INR*	*Concept note*	

APPENDIX #3: AGENDA FOR THE 6TH WORKING GROUP MEETING

6th *AHEAD*-GLTFCA Working Group Meeting
9 th – 10th March, 2006

Venue: ***Pestana Kruger Lodge, Mpumalanga, South Africa (outside Nelspruit, near Kruger's Malelane Gate)***

NOTE: The focus of this meeting is "Current Science, Development and Policy Needs in the GLTFCA"- discussion papers on key research and development problems in the GLTFCA. Presentations should be approximately 20 minutes, with the remainder of the time allotted for a given topic being available for discussion. These sessions are meant to better define core problems identified, encourage interdisciplinary discourse, and perhaps lead to the development of additional proposals by consortium members to support identified critical needs. *Listed presenters are kindly asked to prepare a two page summary ahead of time and circulate these and any additional material before the meeting or at least have it ready at the start of the meeting. Thank you in advance for your time and contribution.*

Day One: Thursday 9th March

0900 **Welcome** (Carlos Lopes Pereira, Chair Danie Pienaar)

0905 Introductions- around the room

0915 Brief introduction to *AHEAD* and background (Steve Osofsky, Mike Kock)

0920 Objectives and format of the 6th Working Group Meeting (David Cumming)

0930 "An Introduction to Complex Systems thinking and research [*Complex adaptive systems 101*]" (Harry Biggs)

1030 **Tea/Coffee break**

1045 "Developing conceptual frameworks, models and linkages between themes and modules for the *AHEAD*-GLTFCA programme" (David Cumming)

1145 "Introduction to 'Scenarios' process and plans for year 1 with Sand County Foundation, USAID, and WCS support"; group reactions / discussion (Michael Murphree)

1300 **Lunch**

1400 Brief informal presentations / updates by proponents of concepts / projects submitted so far and discussion (Facilitator: Cumming)

1530 **Tea/Coffee break**

1545 "Animal disease threats and priorities in the GLTFCA- a JMB Conservation & Veterinary Sub-Committee perspective on 'real world' relationships between management / policy decisions and research" (Roy Bengis, *Chris Foggin [unconfirmed])*

1635 "BTB and the livestock/wildlife/human interface- experiences in KwaZulu-Natal" (Claire Geoghegan, Wayne Getz)

1655 "Report on the Sengwe Communal Land BTB Survey" (Lisa Marabini, Keith Dutlow, *Chris Foggin [unconfirmed]*)

1715 "BTB roundtable update on current research, major findings, unanswered questions and research plans / priorities in the GLTFCA" (Wayne Getz, Markus Hofmeyr, Nick Kriek, Anita Michel, Roy Bengis, Carlos Lopes Pereira, Lisa Marabini, Keith Dutlow, *Stuart Hargreaves [unconfirmed]*)

1800 Brief review of progress, outline of tomorrow's programme and break for evening (Facilitator: Cumming) **Adjourn for dinner (dinner at Pestana provided by WCS)**- ***Please come back for Day 2!***

Day Two: Friday 10th March

0830 "FMD epidemiology and research needs in the GLTFCA" (Wilna Vosloo, Gavin Thomson)

0900 "Tick borne diseases: some perspectives and research opportunities in the GLTFCA" (Graeme Cumming)

0945 "Databases and GIS for the GLTFCA: a resource available to the programme" (Louis van Schalkwyk)

1030 "Socio-economic research in the GLTFCA - a review of recent work, gaps and priorities" (Anna Spenceley, Daniel Marnewick and Conrad Steenkamp)

1115 Tea/Coffee break

1130 "Rural development and ecosystem health in the GLTFCA - current issues and research and management needs" (Giuseppe Daconto)

1230 Project development in the pipeline – IDRC, Fondation Ensemble?, MacArthur (climate change)?, British Ecological Society, others? (David Cumming, Steve Osofsky, Mike Kock, Harry Biggs, Markus Hofmeyr, group)

1245 Proposal for a core *AHEAD* GLTFCA steering group (presenters: Biggs / Hofmeyr / Kriek / Kock / Osofsky others as available) and discussion (Facilitator: Cumming)

1300 Institutional commitments to the programme: finalising "letters of collaboration," etc. (Facilitator: Cumming)

1315 Next steps, actions and responsibilities (Facilitator: Cumming)

1330 Next meeting- when, where, and seeking a volunteer host? (Facilitator: Cumming)

1345 Thanks and closure (lunch provided)

March 9, 2006 version

APPENDIX #4: LISTING OF RESEARCH PROJECTS IN THE GLTFCA & PROJECTS RELATED TO THE AHEAD-GLTFCA PROGRAMME

(***NOTE***: This is preliminary draft that was prompted by Fred Potgieter's interventions at the 6th Meeting – if any members can provide additional projects that should be included in the list please let me have the relevant information – David Cumming)

Project Title	Researchers	Years	Contact Person
Onderstepoort Veterinary Research Institute / Agricultural Research Council, South Africa			
1. Survey to determine whether the current boundaries of the African swine fever control zone are relevant to ensure safe pig farming for small scale farmers who cannot afford to comply with the regulatory requirements within the control zone	A. Lubisi, W. Vosloo, R. Dwarka, N. Mtshali, D. Seminya, T. Luthuli	2004-2005	
2. African swine fever virus: Development of vaccines and epidemiological investigations	W. Vosloo, A. Lubisi, R. Dwarka, L. Dixon	2005-2009	Wilna Vosloo vosloow@arc.agric.za
3. Molecular Epidemiology of African Swine Fever	RM Dwarka, N Mtshali, BA Lubisi, D Semenya, W Vosloo	Continuing	
4. Molecular Epidemiology of Foot-and-Mouth Disease	RM Dwarka, N. Mtshali, B. Botha, J. Esterhuysen, W Vosloo	Continuing	
5. Epidemiology of animal trypanosomiasis in KZN	Abdalla Latif, L Ntantiso, J Esterhuizen, F Majiwa	2005-2008	
6. Development of a policy for tsetse and trypanosomiasis monitoring, surveillance and control in KwaZulu-Natal and the Great Limpopo Trans Frontier Park.	K. Kappmeier Green, A. Latif, F.T. Potgieter, J.R. Esterhuizen, N. Sishuba, R. Bengis, L. Ntantiso, D. Mtshali, R.J. Bagnall, P. van den Bossche	2006-2009	
Mammal Research Institute, University of Pretoria			
1. BTB in Hluhluwe- Umfolosi	C. Geoghegan, W. Getz, M. Robertson	2005-2008	Claire Geoghegan cgeoghegan@zoology.up.ac.za
Kruger National Park, SANParks, South Africa			
1. Kruger – 200 + research projects in the park			
- BTb bi-annual survey			
- BTb Vaccination project			
- Comparative study of infected and non-infected lion populations			
- BTb Molecular epidemiology			
- BTb in Kudu			
- Passive surveillance			

Project Title	Researchers	Years	Contact Person
- Development of Btb diagnostic techniques for pachyderms			
- Diagnostics for theileriosis			
- Continuing surveys of a range of diseases in KNP			
- Genetic studies of buffalo			
Department of Veterinary Services, Zimbabwe			
1. Survey of bovine tuberculosis, brucellosis, FMD and trypanosomiasis in the Sengwe Communal Land, Zimbabwe	L. Marabini, K. Dutlow, C. Foggin	2004- ??	Veterinary Services, Zimbabwe/PPF
2. Tsetse surveillance and monitoring			
3. Incidence of FMD in kudu and impala			
Veterinary Services, Mozambique			
1. Monitoring BTb, brucellosis and FMD			
2. Ongoing data processing and analysis of the incidence of diseases in Mozambique using the TAD-info programme developed by FAO			
3. Tsetse surveillance and monitoring			
12 Malilangwe			
13. Gonarezhou fire			NPWLMA/ TREP
14. Save Valley Conservancy			
TPARI			
CASS/INR			
Etc., etc.			