PAN AFRICAN PROGRAMME FOR THE CONTROL OF EPIZOOTICS
EPIDEMIOLOGY UNIT WILDLIFE COMPONENT IN EASTERN AFRICA
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CONTENT

SUMMARY

The Pan African Programme for the Control of Epizootics (PACE) was launched by the AU-IBAR in July 2000. The wildlife component was organized within the Epidemiology Unit, with the TA for Eastern African based in Nairobi, focusing on the epidemio-surveillance of rinderpest in wild animals. The wildlife contract was held by CIRAD with technical assistance provided through a sub-contract with the Zoological Society of London to implement the activities in East Africa until 2004 and all regions Oct 2004 to Oct 2005. A specific and targeted surveillance of wildlife disease was considered necessary for the PACE programme and for progress towards eradication of rinderpest virus based on expert opinion.

The wildlife component contributed to the following PACE objectives:

1. **Enhancement of national capacities in respect of epidemiological services.**
2. **Facilitation of the eradication of rinderpest from Africa.**
3. **Assistance to member countries in the control of other major epizootic diseases:**

Achievements:

The component achieved most of its objectives and produced concrete results and novel findings:

1. In most countries the National teams made up from the wildlife and veterinary authorities, were established and steering committees set up to facilitate cooperation between often different Ministries responsible for wildlife and livestock.
2. In most countries wildlife surveillance has been integrated into the National disease monitoring strategy, specifically for rinderpest eradication and verification of absence according to the OIE pathway.
3. A regional training and awareness workshop for wildlife disease was held for the region in Arusha in 2002 with a CD ROM produced and disseminated to all PACE countries and relevant professional bodies.
4. Evaluation of training needs and capacity confirmed that wildlife veterinary teams were unlikely to be established in all countries and that a regional (team) approach to wildlife disease surveillance was the appropriate strategy.
5. A regional training workshop was held for the regional team in Mole Ghana in August 2005 and this established the African Wildlife Health Expert Group.
6. Strategies for wildlife disease surveillance in the region for Ethiopia, Uganda, Tanzania, Kenya, Somalia, Sudan were achieved.
7. Surveillance activities were organized in Ethiopia, RDC, Mauritania, Chad, Uganda, Tanzania and Kenya.
8. In the remaining enzootic region of Africa for rinderpest virus (Eastern Africa), the component identified virus circulation in buffalo, in 2001 in Meru National Park, Kenya, which was confirmed by the Government authorities and reported to the OIE. Other surveillance in the region was able to confirm the recent and historical absence of virus in wildlife populations since 1988 in Uganda (Northern sectors), since 1997 in Tanzania, since 1995 in Ethiopia (Gambela region), since 1975 in the Democratic Republic of Congo - Garamba, since 1998 in Sudan – Boma and since

1998 in Chad - Zakouma.

9. The data accumulated provides the current epidemiological status for rinderpest virus in the Central and East African region, with a suggested enzootic focus in the Somali ecosystem of Kenya and Somalia with identified zones of recent or past epizootics of rinderpest in wildlife. The current status at the end of 2004 was of no apparent circulation of rinderpest virus in of the sentinel populations or regions studied. This could be due to the current period being inter-epidemic with virus still circulating amongst buffalo or the virus is extinct.
10. The results confirm the value of routine serological surveillance as the outbreak in 2001 was detected in this manner and subsequently confirmed through clinical disease investigation and virology.
11. The sentinel role of wildlife for rinderpest was reinforced by the data.
12. Further evidence was provided to show that the virus does not persist in wildlife species.
13. The data show the virus can be cryptic when infecting a partially immune buffalo population, without the population showing obvious mortality or ill health. The inference is that epidemics could occur without being easily detected in the absence of routine serosurveillance.
14. The results provide some basic numbers for the epidemiology of the virus in buffalo, including transmission and extinction rates for the virus at a population level as well as the likely impact and progress of an epidemic in a partly immune population.
15. The results suggest that care should be taken in interpretation of serology with low positive titer results from virus neutralization and/or positive c ELISA N test without supporting c ELISA H positive results and other pertinent epidemiological data.
16. The results support the expert opinion that continued wildlife surveillance will be essential in the process of eradication of rinderpest virus from Africa and that continued Technical Assistance will be necessary to ensure this is carried out.
17. Possibilities for supporting the surveillance of other diseases were explored during this period notably for foot and mouth disease in Uganda and the region. Data showed the high prevalence of FMD antibody amongst herds of buffalo in the region but also showed small herd sizes and forest populations appear not to be affected. A study on RVF in collaboration with CDC and KEMRI were also launched and considerable progress made in evaluating seroprevalence in wildlife sampled under PACE and in setting up sentinels for RVF in presumed endemic zones of Kenya.
18. A number of scientific publications were produced from ongoing work and contributions made to communication of the findings in workshops, and other communications media.
19. A thesis was prepared and this provides a detailed historical record of the epidemiology of rinderpest in wildlife in the region based on work undertaken between 1994-2004.
20. A significant project on the wildlife livestock interface under UNEP GEF funding has been established which will also look at disease issues at the interface in both Kenya and Burkina Faso.

Main constraints and failures:

1. In relation to the practical execution of wildlife disease surveillance, the organizational structure of PACE and method of funding (through PACE National programmes), was found to be inappropriate and the most important constraint on the outputs. Although strategies and mechanisms for wildlife disease surveillance were established, at least in theory, at a National level the speed of execution of activities under the work plans was very poor and of a lesser scope than originally planned. The reasons were mainly financial due to delays in release of funds from EC to countries and from country programmes to executing agencies. This was a particular problem in Ethiopia and Kenya but common to all country programmes.
2. Establishment of the current epidemiological situation amongst wildlife within Somalia was not achieved due to organizational, logistic and political constraints, some of which were outside of the control of the PACE epidemiology unit and PACE coordination components. Considerable time was spent convincing the Somalia programme of the importance of the wildlife surveillance and only towards the end of the programme had this been adequately embraced and incorporated into their planning, although even then no actual execution of activities has taken place. This must be seen as a singular failure of PACE Somalia, which is responsible for a remaining focal area of rinderpest globally.

CONCLUSIONS AND RECOMMENDATIONS

Organisation and management

Conclusions:

- The principle of regional wildlife coordination within the epidemiology unit of PACE has been agreed and a post will available within the SERECU component but also with a longer term vision for this to continue in IBAR beyond PACE.
- A network for epidemiosurveillance of wildlife was further consolidated (from AWVP) and maintained, with staff trained in both veterinary and wildlife governmental agencies in the region. Proper functioning of the network relied heavily on input from the regional co-ordination units.
- Due to the weak capacity for wildlife interventions in many countries, the TA's had to organise and manage at all levels; administration, wildlife capture, sample collection, processing and dispatch, training and laboratory follow-up. As countries have been weaned off this support system problems have arisen (incomplete outputs on work plans) and this suggests the need still for regional coordination and expert groupings to ensure protocols are followed and accurate reliable results obtained.
- In all countries the relevance of the activities was well accepted.
- Mandates for wildlife intervention involve different Government departments, which complicated the organisation and management of work and caused some constraints mainly in overall output.
- Numerous activities were carried out to cover the project communication purposes: a considerable number of meetings, several conferences, the training workshop in Tanzania, contribution to the AU-IBAR communication activities, etc.

Recommendations:

- AU-IBAR should continue to support wildlife disease surveillance activities, particularly under PACE through; the regional co-ordination unit in Nairobi, continued short term technical assistance, the African Wildlife Health Expert Group (proposed) and national PACE technical steering committees.
- The wildlife activities should be coordinated and funded on a regional (ecosystem) basis to ensure the necessary flexibility for disease monitoring. Epidemic disease is inherently unpredictable and sporadic, which makes detailed planning difficult so the focus should be on preparedness with appropriate financial and practical instruments to be able to act anywhere in a reasonable period of time.
- AU-IBAR should continue to improve awareness of wildlife disease issues in all countries but emphasis should be given to countries with significant wildlife populations and livestock - wildlife interface.
- In particular trained staff should continue to be supported under PACE extensions. In addition the capacity of the network should be improved and increased but focusing on a regional rather than a series of national teams.
- Communication activities should be continued in close collaboration with the

communication department of AU-IBAR. Data management needs to be enhanced at country level to ensure wildlife data is properly incorporated into the National surveillance database and submissions to IBAR and OIE.

Training

Conclusions:

- Capacity for wildlife epidemiosurveillance in the region remains insufficient.
- The emphasis put by the component on training aspects appeared fully appropriate, as the input by mandated authorities into improving veterinary capacity in this field of expertise remains weak. Extensive periods of in service training and 2 two-week workshops were very useful in this respect. The establishment of African section of the wildlife disease association has helped to consolidate wildlife expertise across the continent and encourage a network approach.
- The need for more sustained capacity in this area is widely recognized but this cannot be achieved through training alone.

Recommendations:

- Jobs and associated activities relating to wildlife disease need to become part of the routine National inputs into human and animal health.
- The final training objective is to set up regional teams for both Eastern and West/Central Africa.
- Training priority should be given to in service activities in the regions with the support of workshops and theoretical courses. Sessions of practical exercises in wildlife capture (also other wildlife matters such as epidemiology, pathology, management, observation etc.) are strongly recommended in order for these officers to become competent and autonomous.
- As training activities cannot take place in every country under PACE, priority countries should receive support and whereever possible, regional workshops should be organised.

Epidemio-surveillance and results

Conclusions:

- Wildlife serosurveillance was achieved in a number of countries but the scope and extent of activities was constrained by delays in finance and bureaucratic complications. Meaningfull results were obtained from Ethiopia, Sudan, RDC, Chad, Kenya, Tanzania and Uganda.
- The data provide further evidence of the role of wildlife as an occasional host for rinderpest virus. The data did not provide any evidence for a reservoir status of wildlife at present population levels and in fact provided evidence for the disappearance of virus from wild animal herds soon after an epidemic.
- The results provided by the project demonstrate that rinderpest virus continues to

emerge from a focal area, the Somali ecosystem of northeast Kenya and probably Somalia. Other countries in the region and parts of Kenya appear to now be free of virus.

- The results from Kenya support the view that the blanket vaccination of cattle under the emergency intervention (EPERK) was not effective in the short term preventing further lineage II rinderpest virus circulation in the country. Whether this was because of recurrence within the populations of cattle in Kenya or from transboundary movements of infected livestock from Somalia is not known.
- At the end of 2004 the circulation of virus amongst wildlife was apparently nil in Kenya and this might reflect an inter-epidemic period with virus still circulating albeit at low levels amongst livestock or evidence for absence of virus from the ecosystems.
- There is some evidence based on wildlife serology of epizootics of PPR in apparently rinderpest free countries in Eastern Africa; notably Uganda in 2004.
- No livestock data is emerging consistent with the findings in wildlife populations suggesting the present strategy for epidemio-surveillance of rinderpest in livestock based on recommended tests and strategies is inadequate.
- The wildlife sero-surveillance continues to be a very powerful tool to help understand the epidemiology of rinderpest and the current status in Eastern Africa.
- Wildlife epidemio-surveillance results from the project have contributed significantly to the planning of strategies for the control of the disease in East Africa by the veterinary departments.
- Wildlife epidemio-surveillance appears to have been the only reliable method for monitoring lineage II virus activity in Eastern Africa in recent years.
- The results still raise questions on the epidemiology of the virus in different ecosystems and its behavior in various species, which will require further research.
- Sero-surveillance is expensive for wildlife and for this reason, it cannot be carried out by inexperienced teams or without a carefully planned strategy.
- There is a fundamental difference in surveillance of wildlife compared to livestock where high sero-prevalence after an epidemic and absence of vaccine antibody reduces the statistically valid sample sizes. Therefore the apparent high cost of individual wildlife samples is not relevant and cost-effectiveness is competitive with livestock samples. This aspect still needs to be better understood by veterinary departments.
- FMD serology shows high prevalence of the virus amongst buffalo herds irrespective of the presence or absence of livestock in the PACE region although small herds and forest populations appear free. Antibodies are rare but present amongst a range of sampled antelope species.
- A wildlife livestock interface project has been established under IBAR with UNEP GEF funding which will look at disease issues amongst others in Kenya and Burkina Faso rangelands.

Recommendations:

- In the countries where the rinderpest status appears negative, routine surveillance sampling under PACE will require relatively small targeted sampling for rinderpest

virus.

- In Kenya, Somalia and Ethiopia more extensive activities will be required in 2005-6. Wildlife sero-surveillance should be undertaken regularly to map virus activity and enable appropriate risk assessment and control strategies, without the recourse to expensive blanket vaccination.
- Present epidemiosurveillance strategies for rinderpest and peste de petit ruminant in livestock need to be reviewed in light of the results and should always include wildlife.
- National regional and international research programmes should be reinforced to answer a number of key questions raised.
- There should be a focus on training regional teams to undertake competent observation of wildlife health, wildlife capture and sampling.
- It is recommended that work be continued on developing cost effective and appropriate methods of wildlife epidemiosurveillance.
- It is recommended that where buffalo are present they be used as the main reference species. In other areas of East Africa other suitable species include warthog, giraffe, eland, roan and sable antelope and possibly oryx, impala and others.
- Immobilisation or netting of specific individuals is the preferred method over random samples from hunted animals.
- Further research should be undertaken on the role of wildlife in the epidemiology of rinderpest in the Somali ecosystem.
- Further studies are needed on the possibility of non-pathogenic strains of rinderpest virus in wildlife and livestock.
- Further confirmation of the inability of present wildlife populations to maintain the virus beyond epidemics.
- Further work should be undertaken to elucidate the likely sero-prevalence patterns in wildlife species in endemic and epidemic areas.
- Establish through experimental studies what proportion of kudu and warthog will sero-convert and what mortality levels are likely to be after infection with rinderpest virus and whether warthog will transmit lineage II virus between con-specifics or will only produce antibody when in contact with virus from cattle.
- Further studies on the persistence of virus in an area with wildlife and vaccinated cattle populations.
- Ethiopia: further sampling should be planned for Region V over the next year to confirm the continued absence of virus.
- Uganda: further sampling should be planned at low intensity for Murchison, Kidepo and Semuliki over the next 2 years to fulfill obligations of the OIE pathway and confirm the continued absence of virus.
- Tanzania: further sampling should be planned for Northern Tanzania in the near future to confirm no recent incursion of virus from the adjacent ecosystems and support applications on the OIE pathway.
- Kenya: further sampling should be undertaken in Kenya; in the North Eastern Province and Tsavo.
- Sudan: clinical surveillance of wildlife should continue but as vaccination of cattle has ceased and this would provide an early warning of persistence of virus in any locality wildlife serosurveillance may not be required and should be a back up of the

OIE pathway should livestock data suggest it is necessary.

- FMD, RVF and ASF virus should be obtained if possible from sampled wildlife/tick populations and typed to support the development of future disease control measures in the region.
- PACE should continue to support the DWLEIP UNEP GEF project under IBAR.

Laboratory analysis

Conclusions:

- The PACE wildlife component has made use of all available tests (and laboratories) to analyze the samples but results are dependent on regional and international laboratories as National labs are not using VNT. The conclusions from serosurveillance were based on reliable and valid laboratory data but delays in obtaining results after submission of samples were a problem.
- The current protocols for detecting antibody in wildlife sera using virus neutralization tests for rinderpest and PPR in addition to c ELISA H (OIE standard) remains valid. C ELISA N tests are useful in the absence of VNT as the results obtained are consistent with previously reported insensitivity of c ELISA H test to antibody produced by the current lineage II strain of rinderpest that is circulating.
- Cross reaction between PPR and RP in all available tests continues to be a problem especially for SN positive, c ELISA H negative results. Cross neutralization is not always reliable in differentiating the result.
- Data were obtained that clarified the situation of low positive VN titers in sera from certain populations in Tanzania and Chad sampled in 2000-3. These data, showed spatially and temporally inconsistent results with the stated disease occurrence for this part of the country (provisionally free). The later results in 2003-4 were consistently negative for rinderpest virus. This emphasizes the need to complete follow up sampling from populations with low positive titer sera as these may represent false positive results and show the low predictive value of the tests when expected prevalence (e.g. absence of virus) is low.
- Clearview antigen penside tests were useful in detection of rinderpest at an early stage in Meru.
- PCR proved to be a very valuable tool in diagnosing rinderpest in buffalo in the Meru outbreak. Virus isolation was not achieved.
- FMD serology of available sera has been beneficial in understanding the current status of the virus amongst wildlife populations sampled in PACE countries

Recommendations:

- Agreed test protocols must continue to be used for all wildlife samples.
- Where PPR and RP seropositive results are obtained from a population and they are not clearly differentiated through the protocol, follow up sampling should be made to establish, which infection is the cause of antibody.
- Improvements in VNT sensitivity and specificity might be achieved through the use of lineage II virus instead of the current RBOK strain.

- Antigen tests using clearview penside and PCR should be used as a standard in suspected outbreaks and PCR (and virus isolation) should not be based on eye swab material alone but include whole blood, oral and rectal mucosa in live animals and a full set of organ material and lymph nodes from necropsy.
- Support should continue to the regional and international reference laboratories to undertake the necessary work.
- RVF serology of wildlife sera should be continued and future sampling incorporate sera for this purpose in addition to rinderpest and PPR.

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ABBREVIATIONS

ADRI	Agricultural Research Institute Tanzania
ASF	African Swine Fever
CBPP	Contagious Bovine Peri Pneumonia
CIRAD-EMVT	Centre de Coopération International en Recherche Agronomique pour le Développement-Département d'Elevage et de Médecine Vétérinaire (France)
DVO	Divisional Veterinary Officer
DVS	Directorate of Veterinary Services
EDF	European Development Fund
EMPRES	Emergency Prevention System (of the FAO)
EU	European Union
EWCO	Ethiopian Wildlife Conservation Organisation
FAO	Food and Agriculture Organisation of the United Nations
FMD	Foot and Mouth Disease
GREP	Global Rinderpest Eradication Programme
GTZ	German Aid
IBAR	Inter African Bureau for Animal Resources
ILRI (ILCA)	International Livestock Research Institute
KARI	Kenyan Agricultural Research Institute
KWS	Kenya Wildlife Service
MAAFI	Ministry of Agiculture Animal Resources and Fisheries (Uganda)
MAF	Ministry of Agiculture and Forestry (Tanzania)
MLD&M	Ministry of Livestock Development and Marketing
NAO	National Authorising Officer
NCAA	Ngorongoro Conservation Authority (Tanzania) NGO
AU/IBAR	African Union/Interafrican Bureau for Animal Resources
OIE	Office International des Epizooties
PACE	Panafrican Program for Control of Epizootics
PA's	Protected Areas
PARC	Pan African Rinderpest Campaign
PPR	Peste des Petits Ruminants
RVF	Rift Valley Fever
SN	Séroneutralisation
SRI	Serengeti Research Institute
TA	Technical Assistant
TANAPA	Tanzanian National Parks
TB	Tuberculosis
TWCM	Tanzanian Wildlife Conservation Monitoring Centre
TAWIRI	Tanzanian Wildlife Research Institute
VNT	Virus Neutralization Test
WD	Wildlife Department (Tanzania)
ZSL-CP	Zoological Society of London Conservation Programmes

1. PACE WILDLIFE COMPONENT INTRODUCTION

1.1. Background

PACE wildlife was a component of the activities of the PACE epidemiology unit.

1.1.1. Wildlife and rinderpest

a. Relevance of the issue

The so-called mild rinderpest and the role of wildlife were identified as one of the most serious issues affecting rinderpest eradication in Africa (Rossiter, 1997, Advisory committee & PACE Mid Term Review, GREP consultations). This remains the situation currently with the only apparent persistence currently believed to be in the Somali ecosystem (EMPRES, 2004).

From the available history, it is vital during the last phase of eradication, to use every tool and means possible to ensure vaccination is adequate and properly targeted. This will depend largely on proper disease searching and serosurveillance in both cattle and wild ungulate populations but the data from wildlife especially is vital.

b. History of rinderpest in Africa

After the invasion of this exotic virus, attempts at eradication began in most countries where it persisted, until the present with considerable success. The virus is now apparently isolated to the Somali ecosystem of East Africa. Two major campaigns have contributed to the eradication, the JP15 project in the 1970-80's and the PARC and PACE projects of the 1980's and 90's. Recent studies (from wildlife material) have shown there were 2 lineages of virus surviving (I & II). Lineage I virus is now probably extinct in Sudan and Ethiopia, a strain, which was last reported in cattle in 1998 near Torit in Eastern Equatoria, with typical symptoms of diarrhoea, discharge and death. The second strain, Lineage II, again believed to reside in cattle populations, caused the recent outbreaks in Kenya (1993-7, 2001) and probably in Tanzania (1997) and was presumed to have originated from Somalia. The latter can cause severe mortality in wild ungulates (at least 60% in buffalo [Kock, 1999]) but "burns out" rapidly without persistence. In vaccinated or partially vaccinated herds of cattle it is believed (although this is not proven in the field but based on experimental results) to cause a mild disease, which is often missed by herders and is of little economic consequence to them. There is, however, no reason that the virus could not change in virulence and kill cattle. It may be that the recent strategy of indiscriminate blanket vaccination of cattle encouraged the evolution and persistence of this cryptic virus. This is true particularly where inadequate vaccine coverage occured (which was common in the remote pastoral areas of East Africa). There is evidence from recent studies, anecdotal information (Kenya Wildlife Service records, Kock 1999) and previous studies on wildlife (e.g. Thomas, 1944; Robson et.al., 1959; Scott, 1963) in Tanzania and Kenya that epidemics with this or a

similar strain of virus have occurred before and possibly emerged recurrently on a 10-15 year cycle. However, as with the RGK1 strain from giraffe in the 1960's, it was not always mild in cattle.

1.1.2. Veterinary needs

a. Capacity

The value of the wild animal resource to people as food, through subsistence hunting/gathering (bush meat) and wildlife ranching is significant. Tourism is a vital sector of the region's economies. The health of this resource is therefore as important as that of livestock.

However, the veterinary capacity (i.e. trained personnel and diagnostic services for wildlife health), in the region as a whole remains small and the PACE was directed at addressing some of these issues.

In Kenya there is one functional unit at the KWS (5 vets and 2 technicians) with extensive fixed facilities including animal holding areas and labs. This is the only group able to investigate free ranging wildlife health problems in Kenya. There are in addition 5-6 veterinarians/scientists in other institutions with some experience in wildlife health.

The University of Nairobi started a Wildlife Health programme in 2002 with the first MSc to be completed in 2003. Moi University has an ongoing research interest in the Rift Valley and there is some collaboration particularly in toxicology with other Universities in the USA. Government veterinary laboratories although able to provide some basic diagnostic support have no specialist personnel or facilities for wild animal disease investigation. KARI has occasional research activity involving non-domestic animals. ICIPE used to provide diagnostic support to wildlife disease investigation but since re-organisation this is now minimal. ILRI has little or no activity in the wildlife health field.

In Ethiopia there are 2 veterinarians attached to the wildlife authority, EWCO with some support staff but no equipment.

In Tanzania the capacity is better with 3 full time veterinarians in TANAPA and an expatriate and Tanzanian vet now in post with NCAA (Ngorongoro) with a signal counterpart and TAWIRI has 1 expatriate and a counterpart veterinarian. The TANAPA unit has 2 technicians and access to support staff. A small but well equipped lab exists in the Serengeti under the control of TAWIRI and another managed by TANAPA. At present the TANAPA vets are reliant on external NGO financial support and for vehicles and have inadequate field equipment. Within the academic community in Tanzania there is considerable interest and undergraduate programmes at Sokoini University and at Mweka College have included wildlife veterinary medicine.

2 veterinarians are employed within the UWA headquarters and Warden-Vets (2) have been established in the main National Parks (QUENP, Bwindi and MFNP). Other

Institutions such as Makarere University have some capacity with links to GTZ and collaboration with Tufts University and others in the USA.

There is still a regional need to convince policy makers of the role and contribution trained veterinarians and technicians can make and to support them. It is probable that the best approach to managing serious disease outbreaks involving wild species on a regional level is through a relatively small well trained and active team of veterinarians that can act across borders. This has been a focus of the PACE activities in recent years.

There is still some debate as to how disease (notifiable) investigation is handled when it comes to wildlife. Currently in East Africa this is managed from within the wildlife authority under a mandate from the Veterinary Departments usually through a MOU. This differs to the situation in Southern Africa where wildlife units exist within Government veterinary departments.

b. The role of wildlife veterinarians

The main role of the wildlife veterinarian is in recognising wildlife disease in an ecological context, judging its significance (to wildlife and others) and obtaining diagnostic material. With suitable knowledge gained from this activity, sound advice can be given to governments and private individuals on disease significance and what control or eradication measures are required. This can be applied on a single disease on a regional basis or focused even in a relatively small area or zone. This focus on disease control will be extremely important, not only regionally, but also for smaller private land developments with mixed wildlife-livestock systems in particular. This has been recognised in statements made regards future livestock and wildlife, conservation, production and trade (ODA, 1994; USDA, 1997) and has led to considerable investment in wildlife health networks in some parts of the world (e.g. Australian Wildlife Health Network.).

Much of the work in the project depends on trained professionals able to safely and humanely manipulate wild animals in the free ranging state. There has been considerable progress on this aspect in Africa but the capacity is still limited especially in West and Central Africa. The universities in the region provide some academic training in this area at under and even post graduate level, but little professional training is available. A greater input into this area will also help in the recognition early on of emerging diseases which, when unchecked, can and have cost the global economies billions of dollars. In addition there are other diseases, which are a threat either to wildlife, domestic animals or humans, which are poorly understood and require competent veterinarians, technologists and other scientists to investigate. A spin off of an improved capacity is better physical management of wildlife for conservation purposes, at a time when the future of the region's biodiversity is under threat.

Veterinarians experienced in wildlife and environment play a growing role in land use planning and evaluation of major diseases control methodology. They provide disease control programmes with appropriate advice to optimally balance (i) on one side the requirements for the control of pathogen agents and their vectors, as well as the human

needs, (ii) on the other side the priority measures to conserve and sustainably manage the remaining biodiversity.

So far the main multi-host diseases of concern in Africa are:

- Rinderpest/PPR
-Trypanosomiasis and tsetse
- FMD
- Rift Valley Fever
- Avian Influenza
- Anthrax
- Rabies
- Tuberculosis
- Ebola

1.2. Project contribution

- Contribution to the final eradication of rinderpest
- Improved specialised veterinary capacity for wildlife disease in the region, available to both public and private sectors
- Assistance to Governments in decisions relating to rinderpest control and the OIE pathway for the declaration of freedom from disease using wild animal sentinel populations
- Improved networks by which knowledge of rinderpest, PPR and other epizootics in wild animal populations, ecological processes and environmental health can be disseminated; through meetings, electronic networks, the PACE epidemio-surveillance systems, associations (Wildlife Disease Association for Africa and the Middle East and the World Conservation Union Veterinary Specialist Group – African and Middle East region) and the recently formed African Wildlife Health Expert Group proposed under IBAR.

1.2.2. Beneficiaries

The main beneficiaries are:

- the communities where disease issues are of concern,
- the livestock,
- wild animals, biodiversity and the environment,
- the veterinarians and technologists directly involved,
- the wildlife and veterinary sectors, public and private.

1.2.3. Project acceptance

The Wildlife component was fully integrated into the PACE common services and in particular the Epidemiology unit at IBAR.

During the course of the missions within Africa, there was support from the relevant

national authorities of the countries visited. The national veterinary authorities requested the continued input on the wildlife side as a way to clarify unclear livestock surveillance results and build capacity for wildlife veterinary technology, health monitoring and medicine. The national wildlife authorities subscribed to the project for the opportunity provided to bring proper wildlife veterinary techniques into their wildlife management activities and to improve professionalism in their departments.

2. IMPLEMENTATION

2.1. Organisation

2.1.1. Status

Funded by the EU, the CIRAD contract component was regional in scope falling under the direct and sole authority of AU/IBAR.

The project was fully incorporated within the AU/IBAR/PACE organisation. The immediate purpose was to provide support to PACE to help reach the aim of rinderpest eradication, improved Epidemio-surveillance networks and contribute to the better understanding of other major epizootic diseases in Africa.

2.1.2. Management

The activities in Eastern Africa were carried out under a Zoological Society of London sub-contract to CIRAD (EMVT) for the period up to 2004 under the authority of AU/IBAR-PACE, which provided full political and administrative support. The TA for West Cetnral Africa was moved to Nairobi in 2004 to focus activities on the remaining areas of concern for rinderpest eradication (Central and Eastern Africa) but during the last year of the contract only one TA (ZSL) was in post pending the arrival of a counterpart which unfortunately never materialized. Scientific decisions were taken in consultation with AU/IBAR HQ, Regional Coordinators and respective National Authorities. CIRAD/ZSL werer responsible for logistics, financing and management of the TA's under respective contracts.

2.1.3. Start and duration

The project was launched in July 2000 and field activities continued up to October 2004 when the first phase of PACE concluded and continued if sporadically during the inception phase of the PACE extension project until November 2005.

2.1.4. East African regional co-ordinating unit

The East Africa unit

Was based in Nairobi within the PACE Epidemiology unit and remained under the direct authority of the Director OAU IBAR, the PACE Coordinator and Main

epidemiologist, based also in Nairobi. The wildlife components of all regions were combined in the last year of the PACE programme and during the inception phase of the extension period to November 2005 and based in IBAR Nairobi.

2.1.5. Country involvement

a. General

In each country, the project activities were carried out under the authority of the PACE National Representative, Department of Veterinary Services and National Wildlife Authority.

East African component

- **Ethiopia**

The project was established under the umbrella of the Ministry of Agriculture, Vet Services, and EWCO and with support of the local TA under PACE - Ethiopia. All authorities visited were in support of the project, mainly as a result of the PACE Ethiopia program having had considerable success in the area of rinderpest control. Ethiopia declared provisional freedom from RPV on a zonal basis in 2004 and is applying for freedom from disease on a zonal basis in 2005. The presence of wildlife in pastoral areas makes this zone a priority. RP eradication has been apparently successful and sero-surveillance is critical for ensuring this status is maintained. The National Wildlife Authority had a vet already employed and the Director was very supportive of the project and in areas under their influence, full co-operation was provided. Regional government and some uncertainty as to the function of various national organisations did create some difficulties to implementation, but due to the dedicated efforts of the PACE coordinator, these were not a constraint.

All activities were funded and coordinated through the PACE Ethiopia programme with TA support from Nairobi

- **Kenya**

The recent outbreaks of rinderpest in Kenya in 1994-7 provided a focus for the project in East Africa. The re-emergence of rinderpest identified by this unit in Meru in 2001 fully justified the approach and investment into wildlife disease surveillance.

Kenya has an established and competent unit of wildlife veterinarians and technologists within KWS. Its integration into the activities was straightforward. The Director, KWS and CVO were fully in support of PACE and facilitated involvement of the Veterinary unit (and training facilities) in the project. Increased liaison and co-operation between the KWS unit and the MLD&M (DVS) was established through the use of a steering committee for all activities under the project in Kenya.

All activities were funded and coordinated through the PACE Kenya programme with

TA support from Nairobi. Initial problems with MOU between MLD&M and KWS were finally sorted during the period with improved financial mechanisms for achieving the planned fieldwork. Many of the problems had been foreseen at the inception of PACE but it took a considerable period to resolve many of the issues. Currently most work is undertaken without TA support although there is need for the PACE Kenya programme to facilitate the logistics for the wildlife teams to ensure the work is done. 2005 is proving to be unproductive to date but hopefully this will be addressed soon.

- **Tanzania**

The largest population of large wild mammals remaining in Africa resides in this country. This fact and the recent rinderpest circulation in cattle in northern Tanzania put a high priority on the work in this country. It was critical that confidence in the effect of the immuno-sterilisation of the epidemic area in 1997 was provided.

The project was established under the umbrella of the Ministry of Agriculture, Vet Services, and the Wildlife Department through the TANAPA/TAWIRI veterinary units. All authorities visited were in support of the project. There were only minor, mainly administrative difficulties in implementation and some problems in the last phase when direct field TA support was withdrawn, with collection of sera completed more or less as planned but with subsequent poor execution of laboratory protocols, inadequate analysis and therefore incomplete surveillance results. This was highlighted to PACE Tanzania authorities on a number of occasions. Finally in recent months there was a response and material collected between 2003-5 has now been submitted according to the agreed protocols but results are still pending at the time of submission of this report.

All activities were funded and coordinated through the PACE Tanzania programme with TA support from Nairobi.

- **Uganda**

There were old reports of rinderpest in wildlife from both Murchison National Park and Kidepo from the 1980's. The question of rinderpest in wildlife in the country needed examination in light of the promising situation with cattle in recent years.

The project was established under the umbrella of the Ministry of Agriculture, Vet Services, and UWA. All authorities visited were in support of the project, mainly as a result of considerable input by the TA in the development of wildlife veterinary activities over recent years.

UWA had a vet already employed and the Director was very supportive of the project. Since wildlife populations exist almost exclusively within protected areas in Uganda this support was essential to the success of the project. Currently the units in Uganda are performing wildlife surveillance effectively and samples are being processed according to agreed protocols.

All activities were funded and coordinated through the PACE Uganda programme with

TA support from Nairobi.

West and Central Africa component

During the project the TA based in Nairobi assisted the West and Central Africa coordination and wildlife team in surveillance activities notably in Mauritania, Chad and RDC and in regional training in Ghana. These activities were undertaken through the Mali Bamako coordination and throught he relevant PACE programmes, Departments of Veterinary Services and Wildlife authorities in each country.

2.1.6. Status and role of the TA within AU/IBAR

The TA was an experienced wildlife veterinarian with a work history in the regions. The role was primarily, as co-ordinator for the activities in the region, under the supervision of the Director AU/IBAR and PACE Coordinator. The TA provided a point of contact with othe PACE activities and institutions involved with disease control, research and surveillance. The TA provided in-service training to personnel who required it and ensured proper implementation of operations and processing of samples. TA was also responsible for the collation of data and reports. All countries requested the TA to be involved in field operations and in service training but the policy was to withdraw as local capacity was improved and training completed to enable the programme to run independently in each country for the remaining periods of PACE and beyond.

2.1.7. Relationship with international organisations

Support was given during the project from:

- the Institute for Animal Health, Pirbright UK
- ZOOLOGICAL SOCIETY OF LONDON
- CIRAD EMVT, France
- the IUCN Veterinary Specialist Group.
- Staff of FAO and IAEA

2.2. Project activities

2.2.1. Field operations

The TA was requested on occasions to support the field activities of PACE in the various countries according to the situation of available expertise and complexity of the operation.

For logistical and political reasons it was necessary to organise the activities on a country by country basis. Field operations were supported by the East African TA in Tanzania, Uganda, Ethiopia, Kenya, Chad, Mauritania, Sudan and the Democratic Republic of Congo.

Other missions

These included meetings of the PACE Epidemiology Unit and regional coordination and training workshops.

- A List of the missions of the TA during PACE are attached in Annex 1 and all mission reports are lodged with the EC Nairobi delegation, IBAR PACE and at CIRAD/ZSL.

2.2.3. Training

a. General considerations

One of the purposes of the PACE wildlife component was to develop the national capacities, either to create national expertise in the field of wildlife veterinary medicine or to improve the already existing national expertise.

b. In-service training

The most valuable professional training for the National collaborators was in field training. The activities of the veterinarian require knowledge and experience of the target animals, their ecology and ethology and competent "bush craft" is essential for successful and safe working practices in the field. Successful immobilisation depends on this and competence in the application of appropriate veterinary techniques. All these aspects and more were covered.

c. Regional technical workshops and meetings

To provide a theoretical background in wildlife disease, wildlife veterinary techniques and utilisation (veterinary considerations) and maintain momentum in the wildlife surveillance under PACE, workshops were held in Arusha, Tanzania (2002) and Mole, Ghana (2005. In addition meetings of the Wildlife Disease Association African and Middle East section were supported in Pretoria, South Africa (2003). A target group of veterinarians were selected from each country. Since PACE has a major thrust for

network development the creation of associations ensures some sustainability outside of donor funded projects. The proceedings of the training workshops and meetings are available in CDROMs (attached).

2.2.4. Communications

The results of PACE activities and inputs were also translated into communications for the wider veterinary and professional community through contributions to conferences and publications:

- Conferences: see mission list
- Publications arising from the project: see attached reference list

Constraints

The main problems with the outputs of PACE in wildlife surveillance were related to capacity issues and administration of the various projects. There were considerable delays due to the slow internal bureaucratic mechanisms between the institutions involved, especially in terms of finance and preparation and implementation of work plans (EC, PACE projects, wildlife and veterinary departments) and difficulties in planning and executing operations. One reason for this was the excessive amount of time spent on preparation of complex and detailed log frames and time schedules, which were rarely adhered to or became obsolete almost as soon as they were confirmed. The different management and financial systems in the different collaborating Institutions was a second major problem, which through their incompatibility reduced efficiency and logistic support. The lack of flexibility this gave the programme ultimately killed much of the potential within country programmes. This programme format was totally unsuitable for the disease surveillance and control outputs envisaged and must be criticized for this fact. Fortunately in terms of technical outputs and rinderpest, in most instances the support of the PACE common services ensured actual field events took place and this ensured an adequate surveillnace result using resources available from the Service contracts, but when this backing was unavailable many problems were encountered and the standard of execution of the operations fell. In short the outputs of one major thrust of the project could have been more efficiently achieved through a similar approach taken in the African Widlife Veterinary Project under PARC. Whether the considerable investment in the networks under PACE will be sustained, only time will tell.

3. RESULTS AND OUTPUTS

3.1 Eastern Africa

a) Overview of the wildlife sample in the region taken during the period of the report

616 wild animals were sampled: mainly buffalo, and including roan, warthog, tiang, white eared kob, giraffe, eland, bushbuck, waterbuck and hartebeest.

Ethiopia

The Objectives of the missions were:

1. To undertake sero-surveillance in wildlife populations on the Sudan and Kenya border, in the Ethiopian surveillance zone for rinderpest.
2. To obtain any evidence of disease in wild animal populations in recent years.

The operation in Gambela was undertaken in June 2001, in the Gambela region with a helicopter and ground support provided by the department.
The operation in Dolo Odo along the Kenya border was undertaken in August 2005.

Summary of activities, observations are as follows:

Gambela 2001

- **Livestock**

The livestock numbers were relatively low but according to local information the numbers were increasing. No disease episodes were reported in recent years.

- **Wildlife Sampling**

Sampling was focused on the migrating White eared kob, tiang and roan antelope. There was heavy and extensive burning of the pasture. The results showed an absence of rinderpest from all sampled areas since at least 1995.

- **Training**

Ethiopian Veterinary Departmental and EWCO staff members were trained during this exercise.

Dolo Odo 2005

- Livestock

There was considerable livestock in the zone including cattle, camels and shoats. There had been a rinderpest scare in 2004-5 and a PPR epidemic was diagnosed in the area over the period.

- **Wildlife Sampling**

Sampling was to be focused on the warthogs but due to flooding of the main warthog habitat along the Dawa and Ganele rivers this had to be abandoned. There was no evidence of recent wildlife disease in the area.

- **Training**

Ethiopian Veterinary Departmental staff members and local Community health workers were exposed to the wildlife issues during this exercise.

Kenya

Objective of missions

1. To carry out purposive serosurveillance for rinderpest antibodies in wild ruminants in previously infected areas of Kenya and confirm absence of virus in these sentinel populations.
2. To select other species as appropriate, with a priority on giraffe, eland, kudu, bushbuck which were confirmed to be affected by Lineage II virus in 1993-1997.

Nairobi Park 2000

Resident buffalo herds were reported to be increasing since the epidemic reported in 1996-7.
There was a decline in the wildebeest and gazelle populations over the period and the cause is not confirmed but probably due to meat poaching.

5/5 buffalo aged < 3 years sampled in August 2000 were negative confirming absence of virus since 1997.

Meru

July 2000
July 2001 – February 2002
September 2003
October 2004

- **Wildlife**

Buffalo herds were reported to be increasing since the epidemic reported from Meru in 1995-6.
Other species such as kudu were also being reported again. Rinderpest disease was detected by routine surveillance in 2001-2 after a prolonged drought and this was confirmed by PCR to be due to a lineage II strain of the same phylogeny as the earlier outbreak.

- **Livestock and seasonal data**

Cattle frequently invade the adjacent wildlife reserves of Kora and Bisinadi but rarely into Meru Park itself but buffalo move out of the park in the wet season and wildlife cattle contact is common at this time. The cattle are from various ethnic groups; Somali, Orma and Boran. A drought occurred between 1999 and November 2001 with large incursions of cattle into the greater Meru ecosystem mainly from the Somali ecosystem.

- **Sampling**

The Meru National Park buffalo are considered an important sentinel population for the presumed Somali focus of rinderpest virus. The missions were to confirm a healthy population of buffalo and other wildlife through observation and sero-sampling. The work confirmed an outbreak of rinderpest in buffalo only in 2001 but this burnt out and no further evidence of circulation of virus was obtained to date in the Protected area wildlife.

- **Disease reports**

Disease investigation was initiated in 2001 on the basis of routine serosurveillance results. 2 sick buffalo were investigated from warden reports in 2004 but were found to be affected by drought and not infectious disease and were negative for rinderpest.

Northern Kenya – Laikipia, Samburu, Wajir, Mandera and Marsabit

- **Wildlife**

Laikipia is a ranching area with abundant wildlife populations. Buffalo numbers are significant and there is close contact with livestock populations. There was a drought in 2000 which had reduced population numbers significantly. Samburu and the other areas have lower density wildlife but the interface with livestock is extensive.

- **Livestock**

Laikipia is one of the main ranching areas of Kenya and substantial livestock populations occur although there has been a shift over recent years to wildlife tourism as a revenue earner for the ranch owners due to poor livestock returns. The other areas are pastoral systems with large populations of livestock including cattle, shoats and camels.

- **Disease reports**

There was an outbreak of disease in cattle in 2002, which led to a rinderpest rumour on the Ol Maisor ranch in Western Laikipia. This was proven to be negative for rinderpest with FMD confirmed as the cause of ill health. Wildlife was unaffected.

There were PDS reports of mild rinderpest in the Wajir Mandera Districts in 2004 but none of these were confirmed and no wildlife mortality was confirmed as rinderpest.

- **Sampling**

Surveys were based on sampling in contact buffalo populations associated with the affected ranch and also a representative sample from all the laikipia regions. All sera were negative for rinderpest antibodies. The samples from the Samburu and Marsabit wildlife protected areas and in wildlife concentrations of Wajir and Mandera were also negative for rinderpest.

Tsavo ecosystem

Tsavo East in October and December 2000
Tsavo West in November 2000
Tsavo in September 2003

- **Wildlife**

Buffalo in Tsavo were showing some recovery in the North and West of the Park but the Southeast was not showing increases based on aerial census data.

- **Livestock**

Increasing numbers of Somali cattle in the Taita and South East Tsavo sectors were reported over this period.

- **Sampling**

Adequate buffalo samples were obtained in the various sectors and age stratification was optimal for establishing recency of infection in all zones or absence of virus from buffalo herds since the epidemic of 1994.

- **Disease reports**

Mortality of buffalo was reported in 1999 in the area of the Athi – Galana River near the Northern border of Tsavo East. 2 blind and sick animals were seen in a waterhole. No material was obtained due to scavengers destroying the carcasses.

b) Tanzania

September 2001 Mkomazi, Tarangire
December 2001 – November 2002 Serengeti, Ngorongoro, Manyara, Mkomazi
March 2003 Ruaha, Katavi, Mkomazi
2003-2004 Northern Tanzania

Objective of missions

1. To carry out serosurveillance for rinderpest antibodies in wild ruminants in Northern Tanzania, as part of routine surveillance and confirm absence of virus since the 1997 outbreak. These missions were to be carried out without technical support from Nairobi to test the capacity and competence of the Tanzania teams selected for the work.
2. To clarify the antibody status in the Southern Parks where some tests for rinderpest antibody were found positive from sera in eland, giraffe and buffalo in Mkumi, Ruaha and Katavi in 1999. The result was not clear and consistent with the epidemiological situation so a fresh survey was requested. This clarification was important to justify the provisionally free status for rinderpest in this zone and allow further progress along the pathway. This mission had TA support from Nairobi due to the sensitivity of the situation and need for transparency and to ensure a clear outcome.

- **Wildlife**

Populations in most sectors were stable except in Ngorongoro. Mkomazi reported increasing numbers of buffalo since the last rinderpest outbreak in 1996.

- **Sampling**

Sampling was undertaken without common services support (except in Mkomazi) in Norther Tanzania and the sample was less than optimal for surveillance purposes. Samples were not adequately processed without following agreed protocols and data collection was poorly executed. One reason for this was the originally trained teams in TANAPA were not used for the surveillance by PACE Tanzania. The only reliable surveillance results during this period were from Mkomazi and Southern regions in 2003 where common services support was provided. This was discussed extensively in Dakar 2004 to try to get countries like Tanzania to follow strictly agreed protocols. Sera have now (September 2005) finally been sent to a reference laboratory and results are pending.

- **Disease reports**

There was a die off of buffalo in the Ngorongoro crater in 2002 associated with a storm of biting flies and a dramatic increase in tick numbers on the pasture. Mortality was seen in other species, lion and rhinoceros in particular. The likely cause of death was piroplasmosis.

d. Uganda

September 2002
February to May 2004
May 2005

Objectives of missions

1. To confirm absence of rinderpest antibody in wildlife populations in Uganda.
2. To provide data to support progress along the OIE pathway.

- **Wildlife**

Wildlife in Kidepo, Queen Elizabeth National Park and Murchison Falls continues to increase in numbers as a result of increased protection and management in the last 10 years

- **Sampling**

Sampling in 2002 was adequate in both locations for rinderpest surveillance purposes but attempts at collection of FMD virus from probangs taken from buffalo failed probably due to poor processing and storage of samples en route to the diagnostic laboratory in South Africa. Sampling in 2004-5 was undertaken in Kidepo, MFNP, Semuliki and QUENP without support from common services and results were comprehensive if slow in coming showing a negative result for rinderpest but positive for PPR.

3.2 Eastern Africa rinderpest and PPR serosurveillance data[2]

Sero –surveillance results were interpreted as follows:

Each individual test; c ELISA or serum neutralisation received a positive or negative as per the laboratory standard for cattle where available or as per the laboratory recommendation.

Summaries of these are given in tables and charts.

To provide **a strict interpretation** of positive animals based on validated tests for livestock, each set of data was examined and given a status, which is shown in tables. The overall status of the animal regarding antibody was derived from the cumulative set

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2 **A thesis was prepared for the period 1994-2004 and this contains considerable detail of the various epidemics and surveys undertaken and interested readers are referred to this, a copy of which is held at IBAR and EC.**

of these interpreted results. **A positive sera RPV antibody status** was defined as:

- A sera showing neutralising antibody = titre of 1/10 or above, with or without c ELISA H & N – RPV positive, with c ELISA PPR (N and H) negative and or VNT PPR negative or less than/equal to RPV – Pi or titre.
- an animal with a c ELISA H Pi value at 50% and above, with or without VNT, c ELISA N positive, with c ELISA – PPR (N and H) negative and/or VNT - PPR negative or less than/equal to RPV – Pi or titre.
- in some cases where PPR tests were not completed, the result was deemed positive if the historical status of the area suggests the absence of PPR.
- If there was conflict between Muguga and CIRAD on serum neutralisation results, the data was excluded.

The data to follow is summarised. The interpretation on the recency of infection in the population is given based on age stratification of the positive results. Interesting c ELISA N results are also highlighted although as this data is only partially validated it is not used in strict interpretation of the results.

For ease of comparison buffalo are given separately as they most closely follow cattle interpretation and all tests results are likely to be valid. Other species are given as separate groups.

Ethiopia

Sample survey June 2001

Gambela – Sudanian grasslands

4 Roan, 5 hartebeest and 14 white-eared kob were sampled. 2 kob aged 4 and 6 years were positive by VNT with low titers the rest negative in all tests.

Conclusion

- There is no evidence of recent circulation of RP virus in the Gambela region of Ethiopia but older animals where positive (if weak) titers and this could mean false positive results or possible circulation in mid 1990s. The last rinderpest rumour was in 2000 and confirmed cattle infection in 1998.

Kenya

Positive test results by strict interpretation confirmed antibody in young animals born since the end of the last outbreak in the Tsavo and Meru ecosystems. In the latter virus was confirmed by PCR. This is evidence that a virus had circulated in the North Eastern and southern sector of the country amongst wild animal populations over the period

1998-9 (Tsavo East) and in 2001-2 (Meru). No further circulation has been detected since to the date of this report and populations of eligible wildlife remain negative in all sampled areas.

a) ***Tsavo ecosystem***

Tsavo Sample survey 2000

Buffalo were sampled to confirm absence of antibody in eligible animals since the last probable circulation in 1998-9 in the South Eastern sector of the ecosystem

The results from buffalo are as follows:

VNT RPV Buffalo	C ELISA H RPV	C ELISA N RPV RGK	C ELISA N PPR	POSITIVE RPV antibody
2/23	1/23	2/23	0/23	2/23

The sample showed antibody in a 1 year 6 month and a 2 year old from the South East of the ecosystem but the majority of the animals in this age group were negative. This result indicates that the virus circulating in 1998-9 had burnt out.

Amboseli Survey 2000

VNT RPV Buffalo	C ELISA H RPV	C ELISA N RPV RGK	C ELISA N PPR	POSITIVE RPV antibody
1/14	1/14	1/14	0/14	1/14

The only positive result was from an animal of 9 years of age. The rest of the sample was aged < 5 years. The history of the epidemic indicates virus passed through Amboseli in 1994-5, which is consistent with the above results.

Tsavo Sample survey in 2003

All eligible buffalo sampled in the Tsavo ecosystem were negative for rinderpest antibody.

VNT RPV Buffalo	C ELISA H RPV	C ELISA N RPV RGK	C ELISA N PPR	POSITIVE RPV antibody
0/23	0/23	8/20	0/20	0/23

b) Meru and Somali ecosystem

Sample survey 2000

Two aged buffalo were sampled in 2000 and both were positive for rinderpest antibody.

Sample survey 2001-2

Between August 2001 and March 2002 a series of samples were taken. The initial survey suggested the possibility of infection as young eligible animals born since the last reported outbreak were positive. Seroconversion of a proportion of the population was then confirmed over the coming months and sick animals provided diagnostic material which confirmed the nature of the infection and strain of rinderpest virus. Buffalo herds in the southern sector of Meru National Park were not affected and the survey confirmed 100% seroconversion in affected herds in the North with no other species apparently affected.

VNT RPV Buffalo	C ELISA H RPV	C ELISA N RPV RGK	C ELISA N PPR	POSITIVE RPV antibody
21/37	6/37	18/37	1/37 (cross reaction VN PPR negative)	21/37

Sample survey 2003

One buffalo over 2.5 years of age was positive and the remainder of animals < 3 years were negative as were all Kongoni, waterbuck and eland sampled.

VNT RPV All species	C ELISA H RPV	C ELISA N RPV RGK	C ELISA H PPR	POSITIVE RPV antibody
1/22	0/22	0/19	0/16	1/22

Sample survey 2004

After reports of 2 sick buffalo in the Meru Park in September a sample survey was undertaken. There had been significant incursion of cattle into the park during drought. Results showed only one animal most probably alive at the time of the 2001 epidemic to be positive for rinderpest antibody. A survey was also undertaken on a limited amount of wildife in the Wajir, Mandera and Marsabit districts of North Eastern Kenya with all results negative for rinderpest antibody.

The Tana, Lamu, Ijara and Garissa districts of Kenya were sampled in September October 2004 including buffalo, warthog and giraffe selecting only animals born since 1998 (the last confirmed period of circulation of virus by antibody detection in this part of the ecosystem).

VNT RPV All species	C ELISA H RPV	C ELISA N RPV RGK	C ELISA N PPR	POSITIVE RPV antibody
0/123	0/123	0/123	0/123	0/123

2 positive results, from a warthog and a buffalo were initially obtained and these were not consistent with the expected prevalence in the herds from which they were sampled. The titers were low at 1/16. These sera tested at the regional reference laboratory were double checked at the International Reference lab and these tests proved negative which is now the agreed interpretation recorded for these sera antibody.

This data suggest there has been no circulation of rinderpest virus in these districts in wildlife since 1998.

c) *Nairobi*

Samples from Nairobi taken in August 2000 show the following results:

VNT RPV Buffalo	C ELISA H RPV	C ELISA N RPV RGK	C ELISA N PPR	POSITIVE RPV antibody
0/1	0/5	0/3	0/3	0/5

The 4/5 animals were aged <3 years. The data suggests absence of virus from Nairobi Park since 1997.

Conclusion Kenya

- There is evidence of recent circulation of RP virus in Kenya up to 2002 in the Somali ecosystem: in Meru National Park but in the south eastern part of the Somali ecosystem the results indicate no circulation since 1998/9. Other areas sampled in the ecosystem are pending results.
- There is evidence of the absence of RPV circulation from all other areas of Kenya sampled in the epidemic area since 1998/9.

Tanzania

Sample survey in 2000

In the Serengeti Ngorongoro ecosystem 0/7 buffalo of varying age were negative.

Sample survey 2001

In the Northern ecosystem 0/7 buffalo of varying age were negative.

Sample survey 2002

In the Northern ecosystem 32 buffalo were sampled but diagnostic results are only available for 16, which were all negative.

There is no evidence of circulating RP or PPR in Tanzania from these wildlife and recent livestock studies.

Sample survey 2003

Mkomazi and the Southern ecosystem were sampled in March. 1/6 buffalo in Mkomazi were positive for rinderpest antibody in an animal aged >6 years the rest of the animals < 6 years were negative.

All animals from the south (15) involving buffalo, giraffe and eland from locations, which showed positive sera from 1999 were found to be negative. The majority of animals were aged <6 years.

a) Conclusion

- There is no evidence of circulation of RP virus circulation in Tanzania in wildlife since 1996 and the previous results from Southern sector in 2001 most probably represent false positives.
- PPR appears to be absent from wildlife in Tanzania.

Uganda

Sample survey September 2002

25 buffalo were sampled in the Kidepo Valley and Murchison Falls ecosystems of Northern Uganda and all animals were negative for rinderpest and PPR antibody.

Sample survey 2004

The results from sampling undertaken by the Uganda team proved to be negative for rinderpest in all zones but there were many positive sera by cross neutralization for PPR antibody.

Conclusion

- There is no evidence of circulation of RP virus circulation in Uganda in wildlife in recent years.
- PPR appears to have been absent in wildlife in Uganda up to 2004 when the antibody appears to be becoming more prevalent amongst buffalo. This is consistent with a single report of PPR in Karamoja in shoats in 2003 (AU-IBAR Disease report) and it is probable there has been an epizootic of PPR in Uganda although this is not well recognized amongst the veterinary community and needs to be investigated.

Chad : Zakouma

Sample survey in April 2004

To follow up on some positive antibody results detected in previous surveys up to 2003 a mission was completed in April 2004 looking specifically at all the buffalo herds and sampling animals which could be aged accurately below 6 years.

All sera were negative by the c ELISA H test for rinderpest antibody. 14/25 were positive by c ELISA N RP and 2/25 positive for c ELISA H PPR but 0/25 c ELISA N PPR. 6/25 were low titer (1/10) positive for RP by VNT but cross neutralization showed 3/6 to be positive for PPR and the remaining 3/6 had positive cross neutralisaton which could not enable differentiation between RP or PPR.

Conclusion

The conclusion from this data is that there has been no rinderpest virus circulation for at least 6 years in Zakouma but there is recent evidence for PPR in the buffalo.

Democratic Republic of Congo : Garamba

Sample survey in May 2002

A survey of all buffalo herds (15) in Garamba National Park in DRC was completed with all sera (35) found negative by all tests.

Conclusion

The conclusion from this data is that there has been no rinderpest virus circulation recently and as this included animals aged >20 years probably for this period at least.

Sudan : Boma

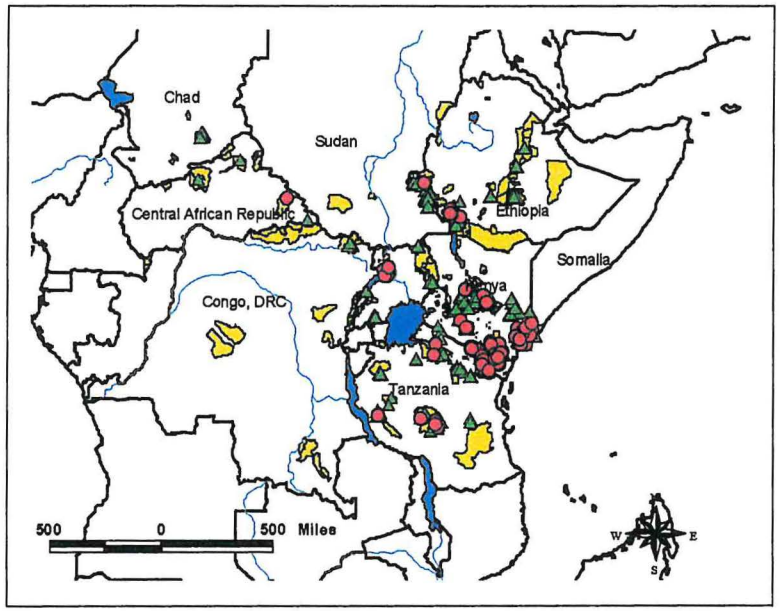
Sample serosurvey March 2004

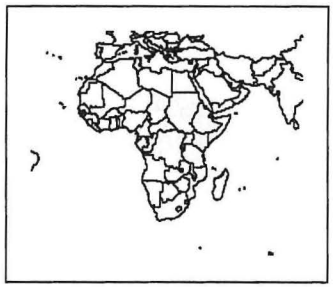
The Boma National Park adjacent to the Ethiopian border and the zone of migration of the White Eared Kob was surveyed including a number of species. All sera (48) were negative for rinderpest antibody (with only buffalo 3/3 positive for c ELISA N RP and cross neutralization positive for PPR in 2/3 of these cases, with the c ELISA PPR tests negative).

Conclusion

The conclusion from this data is that there has been no rinderpest virus circulation for at least 6 years in Boma region but there is recent evidence for PPR in the buffalo.

Wildlife Rinderpest Serology 1994-2004
Eastern and Central Africa





Serology

- Positive antibody detected in one or more herds
- Negative antibody results in one or more herds

3.2.1 The case of Peste des Petits Ruminants (PPR)

Eastern Africa

The results prove the existence of PPR specific antibodies in wildlife in Ethiopia, Chad Uganda and Sudan. The situation in Kenya indicates cross-reaction of the test in a number of cases and there is no firm evidence of PPR circulation in wildlife in Kenya. There is strong evidence for the absence of PPR in wildlife in Tanzania.

3.3. Issues of laboratory analysis

3.3.1. Problem of false negatives

The occurrence of false negative test results is likely related to a low sensitivity of the test used. Specifically if c ELISA – H test is performed alone on sera this is a possibility. There is a lower level of false negativity by c ELISA N and VNT from analyses of the data. False negative results will be avoided if these tests are performed in parallel.

3.3.2. Problem of false positives

The occurrence of false positive test results with c ELISA N is likely due to a lower specificity of this test when compared to VNT and c ELISA H. It appears false positives are also possible with VNT with low titers reported in some locations inconsistent with the expected seroprevalence in herds. The predictive value of VNT in a population with a low seroprevalence is lower and this explains these findings. False positive results can be avoided if sample sizes are large enough from the herds examined and is critical where no disease or antibody is suspected in the sample. False positive results with c ELISA H are very rare.

3.4. Emergency disease investigation

During the life of the project, 4 field operations were initiated as a result of apparent epidemic disease from regional reports or sample results.

3.4.1 Kenya: Meru National Park

A disease epidemic affecting buffalo was detected after routine serosurveillance in 2001. This was followed up and young animals (eligible cohort born since the last known epidemic) were found to be infected and showing clinical signs. The epidemic burnt out over 6 months and affected < 70% of the eligible herds in the ecosystem.

The epidemic was associated with cattle incursion after prolonged drought.

A further report of sick buffalo was followed up in October 2004 but no evidence for infection of eligible buffalo in herds was found. Data obtained from serology confirmed a negative antibody status for rinderpest.

3.4.2 Kenya: Ruga Garissa.

As a result of reports of mild rinderpest like disese in cattle and wildlife disease (blind and dead kudu, warthog and giraffe) along the Somali border with Kenya a clinical and aerial survey were undertaken but no cases of rinderpest in wildlife could be confirmed or any evidence detected. A follow up sero survey showed no evidence for recent infection (6 years) in the species examined.

3.4.3 Mauritania: Senegal river

As a result of positive c ELISA H and VNT results from 2/40 warthog along the Senegal River in the south of the country a clinical survey was undertaken and no evidence for recent disease was determined amongst livestock or wildlife and these results suggest they were false positive results.

3.5. Epidemiological status for rinderpest

3.5.1. Ecosystem based analyses including population trends and climatic factors

East Africa

Somalia - Kenya - Tanzania

Somali ecosystem - Kenya

Defined as the area of Eastern and Northern Kenya bounded by the Tana River in the South and West, the Isiolo – Marsabit – Moyale road to the Ethiopian border.

The data collected during the project and before indicates that the Somali ecosystem may still be enzootic for rinderpest (lineage II strain isolated from Tsavo and confirmed in Meru). The zone of virus circulation during the period was confined to Meru National Park and associated with trade livestock and not pastoral cattle, which suggests that if there is any circulation of virus remaining it may not be in Kenyan cattle currently. Vaccination ceased in cattle in Kenya 2001 with an emergency vaccination in Ruga Garissa after the rumours there in 2003 involving some 250,000 head of cattle.

Tsavo ecosystem

This area has been free from rinderpest virus apparently since 1999.

Masai and Miombo Ecosystems of Kenya and Tanzania

There is no evidence for incursion of virus into wildlife populations in these systems since 1997.

Ethiopia –Chad – RDC – Sudan - Uganda

This zone surrounding the Sudan focus of rinderpest last reported in 1998 is showing a negative population of wildlife for at least 6 years and in RDC for over 20 years. This is good evidence for the absence of rinderpest virus from this previous foci and suggests probable extinction of virus from the region since vaccination of cattle stopped in 2000.

3.5.2. Proposed enzootic and epizootic zones as at year 2004

East Africa

Enzootic zone

As stated above there is evidence for an enzootic zone in the Somali ecosystem from which the Meru outbreak of 2001 originated but the exact location is not determined but wildlife evidence suggests probably this is within Southern Somalia.

Epizootic zone

The epizootic zone around the Somali focus for Lineage II virus extends, based on recent history, to Garissa and Meru in the North, throughout the Tsavo ecosystem, to Nairobi in the West and to the Tanzania border area by Amboseli and in Mkomazi in Tanzania.

It is notable that this epizootic zone has not extended into into the adjacent ecosystem of the Northern Masai grasslands of the Kenya Rift Valley, Tarangire, Serengeti and Ngorongoro including the Masai steppe. The antibody pattern is now consistently negative by all tests. Whether this relates to the emergency vaccination campaign of 1997 or some other ecological factor is of interest.

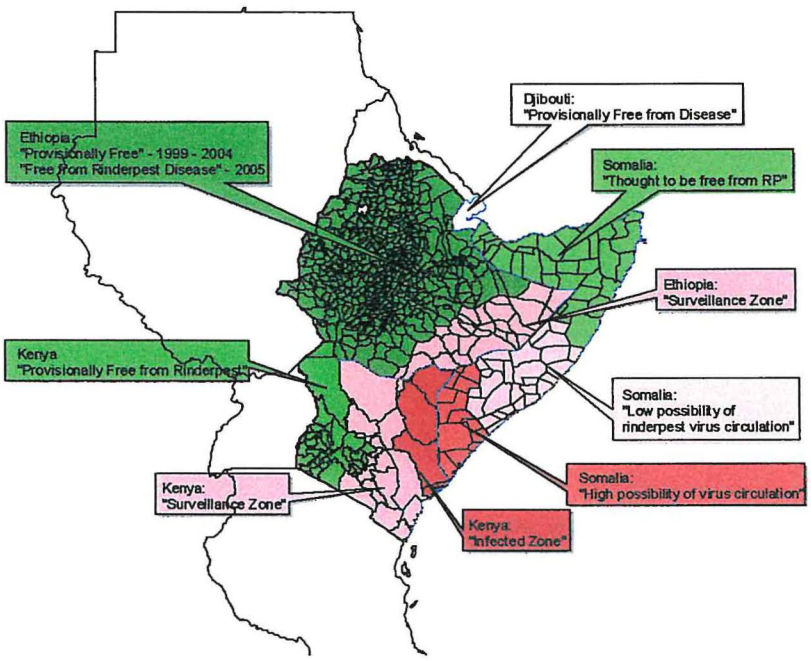
There is no evidence for an enzootic and related epizootic zone around the previously known Sudan focus in the region from the work done in Chad, Sudan, RDC, Uganda, Ethiopia.

3.5.3. Suggested PACE epidemiology unit rinderpest zonation 2004

a. Eastern Africa

The project recommended the surveillance zone for the Somali focus should include:

- In Kenya, the Tsavo and Meru ecosystems and North Eastern Kenya from the Moyale – Isiolo road to the Somali border.
- In Tanzania, along the border with Kenya to the Serengeti Mara ecosystem.
- In Ethiopia, the Ogaden and Kenya border areas East of Moyale.



CURRENTLY A NEW PROJECT IN PACE IS UNDER DEVELOPMENT SERECU TO WHICH CONSIDERABLE INPUTS WERE MADE BUT DUE TO DELAYS IN THE PACE EXTENSION AND AGREEMENT ON WORKPLANS LITTLE PROGRESS HAS BEEN MADE TO DATE AND THIS SERIOUSLY PUTS AT RISK THE CONSIDERABLE IMPROVMENTS EVIDENT IN THE EPIDEMIOLOGICAL SITUATION OF RINDERPEST IN EAST AFRICA.

3.6. Wildlife surveillance system

3.6.1. Interface wildlife/cattle

The project has worked at determining the areas of major interface between livestock and wildlife. The justification for it lies in helping to establish a restricted and accurate network of sentinel wildlife populations for rinderpest but also other disease of interest for domestic and wild animals.

It appears that these interface areas are not very extensive in size compared to the total surface of a given country. However their size does not reflect properly their importance as they play a major role in epidemiological processes: maintenance (reservoir), transmission (vector), circulation of an infectious agent (sympatric situation), extinction of an infectious agent (dead end), etc. In the present case of rinderpest these interface areas are obviously critical for the epidemiology of the disease as shown in the below tentative explanation of the 1993-97 RP
outbreak in Kenya (Kock et al., 1999).

The defined interface areas are seen as:

- areas of intensive epidemiosurveillance for rinderpest
- tools for selecting sentinel herds of major importance.

The nature itself of the interface may differ from one area to another and be a result of:

- The nomadism or transhumance of pastoralists with their herds throughout protected areas.
- The illegal penetration of permanent cattle breeders into protected areas and adjacent land.
- The movement of cattle traders along legal or illegal cattle trade routes passing through protected areas or remote areas still hosting wildlife.

3.6.2. Identification of sentinel wildlife populations

The project has identified a restricted network of sentinel sites for a rinderpest vigilance system. The process of selecting the sentinel sites goes through a combination of choices:

- sites: sentinel sites preferably within interface areas
- taxon: key sentinel taxon chosen as key species
- herd: sentinel herd selected according to the size

Buffalo

Buffalo most resemble cattle in their susceptibility and sensitivity to rinderpest virus. They also produce antibody readily identifiable by the use of standard cattle serological tests. The distribution of buffalo is also adequate as a general sentinel and surveillance population for RPV in Africa. This should be the priority species used for surveillance purposes.

Given the evidence of absence of rinderpest virus from all zones of Africa except the Somali ecosystem the sentinels suggested are as follows.

- **Kenya**

For rinderpest lineage II only, the following key populations are selected:

- **Somali ecosystem**

1. Enzootic (?) zone: Garissa Tana Lamu Districts: buffalo, warthog and giraffe for sero-surveillance; lesser kudu for disease surveillance.
2. Somali ecosystem - Epizootic zone : Meru
3. Somali ecosystem - North Eastern : giraffe, oryx and warthog for sero-surveillance.

- **Tsavo ecosystem** – epizootic zone: Galana, Tiva, Voi and Tsavo Rivers, Kamboyo, Jipe: buffalo and giraffe for sero - surveillance, lesser kudu for disease surveillance.

- **Masai ecosystem** – Nairobi National Park, Amboseli National Park, Masai Mara National Reserve

- **Tanzania**

For rinderpest lineage II only, the following key populations are selected:

- **Tsavo ecosystem** – Mkomazi National Reserve: giraffe, warthog, oryx and buffalo for sero - surveillance, lesser kudu for disease surveillance.

- **Masai ecosystem** – Arusha, Serengeti, Tarangire, Manyara National Parks and Ngorongoro Conservation area : buffalo

- **Miombo ecosystem** – Mkumi, Ruaha, Katavi National Parks and associated Reserves: buffalo, giraffe, roan, sable and eland.

- **Ethiopia**

The Moyale and Ogaden regions of Southern Ethiopia contain low densities of wildlife mainly warthog, giraffe, Mountain nyala, bushbuck and lesser kudu, which are susceptible to rinderpest and within or adjacent to the Somali ecosystem

- **Somalia**

The wildlife in the whole of southern Somalia are a useful sentinel for the remaining rinderpest virus should it exist here. This includes mainly warthog and few buffalo.

3.7. Training

3.7.1. Workshop

2 training workshop were organised by the project in Arusha Tanzania and Mole, Ghana and cd roms are available with this report. The second workshop was designed to establish an African Wildlife Health Expert Group to continue to support IBAR initiatives beyond PACE.

Eastern Africa

Kenya

In many ways Kenya provides the benchmark for the development of trained wildlife personnel in AU countries.

It is the most advanced country for the management of wildlife health in the region, with a team of 6 vets and 3 technicians that had been trained under the Wildlife Authority over the last 15 years. However, a period of major change in management and poor

financing had led to a reduction in effectiveness of this unit, over the period. The main issue is motivation and maintenance of veterinary standards during the intervention with wildlife species and processing of samples to the labs. Kenya will continue to benefit from IBAR monitoring of wildlife surveillance to ensure adequate standards are kept up.

Training Ethiopia

More Ethiopian personnel were exposed to the wildlife issues and techniques during PACE but as the wildlife health infrastructure in the country remains weak and the available personnel rarely undertake intervention; this country will continue to benefit from regional support to execute wildlife surveillance in the future.

Training Tanzania

More Tanzania staff received field training during this period including staff from the DVS and southern sectors. There is still a need to improve the execution of wildlife surveillance especially in ensuring complete analysis of samples as per the agreed protocols. Surveillance will benefit from some regional monitoring of activities to ensure adequate results on the OIE pathway.

Training Uganda

Further training of Wildlife and DVS staff were undertaken during PACE and this enabled independent implementation of missions but there is still the need for input as the results or lack of demonstrate in the last year of activities. Uganda has a weak veterinary team within the wildlife authority but there seems to be a tendency to expect the veterinary staff to perform several functions as wardens researchers etc which inevitably dilutes the competence for disease surveillance. Uganda will continue to benefit from external regional support for wildlife surveillance.

Training Sudan and RDC

A good number of Sudanese and RDC vets and ancilliary health workers were exposed to wildlife techniques but as there is no infrastructure for this in Sudan or RDC and they will both continue to benefit from a regional team implementing any wildlife surveillance work.

Regional Training

A start has been made to develop regional expertise and to have this available for future needs but there is a long way to go to establish this as a sustained entity.

3.8. Wildlife epidemio-surveillance network

3.8.1. Structure and organisation

a. Global organisation

PACE Wildlife personnel in PEU continued to bring the wildlife surveillance to the attention of epidemiologists in the AU IBAR, GREP, DVS and National PACE co-ordinators. In Kenya, Tanzania, Ethiopia and Uganda steering committees were set up and this has integrated the wildlife surveillance activities into the National epidemio-surveillance system.

Planning should be done on an ecosystem level and may at times involve cross border harmonisation of operations and strategies. Livestock surveillance should be done in harmony with wildlife surveillance and in this way the data will have some temporal and spatial integrity to enable optimal control measures to be put in place.

It is recommended that this be done in all regions with assistance from the co-ordination unit of AU IBAR where a global view is possible.

b. Eastern Africa component

The Eastern African region hosts the largest remaining wildlife resource on the continent and certainly, the most diverse population and largest concentration of herbivores on earth. In this region, the network will focus its efforts on the "wildlife hotspots" which contain the major populations of wildlife, which are vulnerable to infection with RPV and PPR viruses from adjacent livestock. Selecting accessible populations within these concentrations, the network will make its performances cost effective, rapid and efficient.

PROPOSED "WILDLIFE HOTSPOTS" IN EASTERN AFRICA IN RELATION TO RP LINEAGE II:

ECOSYSTEMS	*SITES*	*COUNTRIES*	*MAIN TAXONS*
Somali ecosystem	North Eastern Province Garissa, Tana and Lamu districts Meru -Kora N.P. Bisinadi G.R.	Kenya	Buffalo, warthog, giraffe, eland, lesser kudu
	Somalia North and South of Juba River	Somalia	Warthog
	Somaliland		
Tsavo ecosystem	West Tana.	Kenya	Buffalo, eland, giraffe, warthog, oryx.
	Galana ranches		
	Tsavo East N.P.		
	Tsavo West N. P.		
	Taita ranches		
	Mkomazi G.R.	Tanzania	
Masai ecosystem	Amboseli N.P. and Kimana swamp	Kenya	Giraffe, buffalo, warthog, various antelopes
	Nairobi N. P.		
	Naivasha Hell's Gate N. P. and ranches		
	Masai Mara G.R.		
	Serengeti N.P. – N.C.A	Tanzania	
	Manyara N.P. – TarangireN.P. – Masai Steppe		
	Arusha N.P. – Kilimanjaro N.P		
Miombo ecosystem	Mkumi N.P. – Selous G.R.	Tanzania	Giraffe, buffalo, warthog, various antelopes including eland, greater kudu, roan antelope, sable, etc.
	Ruaha N.P. – Rungwa G.R.		
	Katavi N.P – Ugalla G.R		
	Moyowosi G.R.		

Note:

- *N.P. = national park*
- *G.R. = game reserve*
- *H.B. = hunting block*
- *N.C.A. = ngorongoro conservation area*
- *for other diseases, like e.g.FMD , other "hotspots" would have to be included.*

3.8.2. Laboratory Diagnostics

The present National, Regional and World reference labs have contributed to the results and success of PACE. It has been possible with the available tests to confirm the epidemiological status regarding RPV and PPR in the countries involved. This has been possible to an adequate degree of sensitivity and specificity. One continuing problem is the time delay on tests being performed in the region and the lack of commitment to ensuring the sera are tested according to agreed protocols for whatever reason. This issue was thoroughly debated in both Dakar and Accra workshops and the response will be monitored from results subsequently received at IBAR and PID/ARIS.

The suggested protocol for future wildlife sera analyses is as follows:

1. All sera are tested by c ELISA H in the National lab and VNT with cross neutralization in the regional reference laboratories (or if sent to CIRAD screened by c ELISA N and only positives tested by VNT).
2. Any queries should be sent to the World Reference Lab.

3.9 Wildlife epidemio-surveillance system

The project has been instrumental in consolidating a system through:

- the establishment and support of a trained network of collaborators
- surveillance strategies
- identification of sentinel populations
- establishment of appropriate wildlife techniques and methodologies
- establishment of a sample analyses protocol for wildlife that works
- information flow from disease outbreaks and active field surveillance (e.g. this report)
- liaison with the PARC components, veterinary services and wildlife authorities
- establishment of steering committees for wildlife disease surveillance and AWHEG.
- recommendations to PACE, GREP and DVS.

An exhaustive inventory of resource persons is now available for the region.

3.9.1 Capacity

By focusing on the development of national veterinarians and technicians in the region as opposed to the use of short term TA's in each country, a long-term capacity for wildlife health monitoring can be achieved. One project aim was to train small, specialised teams for wildlife health surveillance, as this was practical and could be realised within the time frame and scope of the project. This has been achieved to some degree but it is not a simple process and it is recommended that it remains a major goal of IBAR with a focus on regional teams as opposed to National teams as these appear unsustainable in the majority of countries in PACE.

3.9.2 Species

It is proposed that for the present until further research resolves certain questions on the suitability of other species that the following continue to be deemed appropriate for sero-surveillance:

Buffalo, giraffe, eland, warthog.

And the following can be considered useful for disease surveillance based on clinical observations during known epizootics:

The buffalo, giraffe, bushbuck, eland, warthog (lineage 1) and kudu.

3.9.3 Epidemiology and appropriate surveillance methodology

The PACE project elucidated considerable data on the epidemiology of rinderpest virus in buffalo. It is a highly susceptible species and post infection in herds and naïve populations the expected seroprevalence is <100% which means the available tests c ELISA H and VNT have a high predictive value. In partially immune herds or populations the expected seroprevalence post infection is high <100% at the herd level but lower at the population level. This means it is necessary to sample all available herds in an ecosystem to confirm absence but sample fractions can remain low at the herd level. The data suggest persistence of virus at a herd level of 2-3 months and at the East African buffalo population levels 2-3 years in an ecosystem with a fully eligible population or >6 months for a partially immune population. Virus burns out in all observed epidemics. The epidemiology suggests virus originates from in contact cattle but this is not proven.

Epidemiological data from other species remains limited.

It is proposed that for baseline studies that buffalo are used wherever possible and other species in areas where conditions are too dry for buffalo or they are absent for other reasons.

An initial survey of 5 aged buffalo or eland from a herd within a system is adequate to establish historical infection within a naïve population. In a previously exposed population or one of unknown provenance it is advisable to increase the herd sample size to as many herds as possible but with the same within herd sample fraction of eligible animals. If buffalo are unavailable the sample from a system should be a minimum of 10 giraffe or 25 warthog. In this case ground darting and netting procedures should be adequate.

Once presence/absence is established, an age stratified sample can be further refined to determine recency of infectin and the period of the epizootic and extent of the epizootic. This will need to be designed according to local circumstances and in conjunction with livestock surveillance.

In this case and with emergency (recent infection) it is most efficient and appropriate to use air surveillance and helicopter support to obtain suitable samples rapidly.

3.10 Epidemiology and appropriate surveillance of other important infectious diseases

In the last phase of PACE foot and mouth disease and Rift Valley fever were examined from the wildlife perspective.

FMD serology has been undertaken on the sera obtained under PACE from 7 East and Central African countries and the results are still being analysed for serotype at the Pirbright Laboratories in the UK. The distribution of antibody is predominantly in buffalo, although a few other species show antibody including giraffe, gazelle, eland, roan, oryx, topi and impala. In affected buffalo herds the seroprevalence is high – close to 100% of the herd sample and positive herd prevalence appears restricted to larger herds with all small herds and forest buffalo negative even within a zone where infected herds are present. This phenomenum has also been observed amongst buffalo in Botswana. A publication will be derived from this data once the serotypes are known.

A collaborative study is in process between Centers for Disease Control Nairobi Emerging Infectious Diseases Programme, the Kenya Medical Research Institute and IBAR-PACE. The input from IBAR is from the wildlife side and sentinel populations of wildlife have been identified in North Eastern Province where there has historically been a high incidence of RVF. Available sera banks are available to the study and the wildlife sera will be analysed from the region for RVF antibody to determine the prevalence across the region in wildlife species sampled under PACE. The objective of this work is to establish an improved understanding of the epidemiology of RVF and to better organise emergency preparedness and control of the disease during epizootics.

3.11 Wildlife livestock interface

During the PACE project support was given to IBAR in developing a new project (Drylands Livestock Wildlife Environment Interface Project DLWEIP) at the wildlife livestock interface through UNEP GEF funding of > 1 million USD. This proposal was successful and will focus on areas in Kenya and Burkina Faso where different mixed species land use systems are based around wildlife and pastoral livestock. It is due to start in 2006 and much of the conceptual basis of this project has been derived from lessons learned under PACE.

4. MONITORING AND EVALUATION

A record of activities and expenditure has been maintained throughout the project by each of the regional co-ordination units. The activities of each country have been closely supervised and monitored by the TA's.

All the reports, results and data have been forwarded to the Director of AU/IBAR, EC, GREP and member countries.

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APPENDICES

1) Mission reports

2) PACE epidemiology Wildlife background and TOR

Background documents regarding TOR
Wildlife programme status and future strategy 2001 - 2004

R.Kock

29.8.01

This paper was prepared on the request of PCU/PEU to review the status of work, identify problems with the programme and future strategy and work needs as well as any general recommendations. The paper would be considered internally at OAU IBAR PACE and recommendations taken forward to the advisory committee for comment.

Status of PACE wildlife components

In relation to rinderpest eradication and verification, which is the main thrust of PEU wildlife, the following table provides a list of the current situation of rinderpest and the wildlife programme.

Table 1	Rinderpest risk	Personnel Training need	Wildlife at risk	Field survey activities outstanding	Constraints to date
Kenya	High	Low	High	90%	PACE delay
Uganda	Moderate	Moderate	Moderate	100%	PACE delay
Tanzania	High	Low	High	100%	PACE delay
Ethiopia	High	Moderate	Moderate	75%	Logistic
Somalia	High	High	Moderate	100%	PACE delay
Sudan	High	High	Moderate	100%	PACE delay
Eritrea	Low	High	Low	N/A	N/A
Djibouti	Moderate	High	Low	N/A	N/A
Rwanda	Low	High	Low	?	?
Burundi	Low	High	Low	N/A	N/A
Chad	Low	High	Low	50%	Funds available late
CAR	Low	High	Low	50%	Funds available late
RDC	Low	High	Moderate	100%	PACE delay
Cameroon	Very low	Very High	Very low	100%	PACE delay
Congo	Very low	Very High	Very low	100%	PACE delay
Gabon	Close to nil	Very High	Close to nil	100%	PACE Gabon managmt
Eq.Guinea	Close to nil	Very High	Close to nil	N/A	PACE delay
Nigeria	Unknown*	Very High	Low	100%	PACE delay

Niger	Close to nil	Very High	Close to nil	100%	PACE delay
Benin	Close to nil	High	Close to nil	100%	Sheduled Year 2
Togo	Close to nil	Very High	Close to nil	N/A	PACE delay
Burkina F.	Close to nil	High	Close to nil	100%	PACE delay
Ghana	Close to nil	High	Close to nil	100%	PACE delay
Ivory Coast	Close to nil	Very High	Close to nil	100%	PACE delay
Mali	Close to nil	Very High	Close to nil	N/A	PACE delay
Guinea	Close to nil	Very High	Close to nil	100%	Sheduled Year 2
Bissau Gui.	Close to nil	Very High	Close to nil	100%	PACE delay
Senegal	Close to nil	Very High	Close to nil	75%	
Gambia	Close to nil	Very High	Close to nil	100%	PACE delay
Mauritania	Close to nil	Very High	Close to nil	75%	

N/A - not considered countries with sufficient wildlife populations to justify activities.
*One of the last outbreaks in wildlife in West Africa was reported from Nigeria and freedom from infection has not been confirmed in this population.

PEU Wildlife

The main role of the wildlife unit in East Africa is to promote disease and sero-surveillance activities in wild ruminant populations in the region, to be able to identify the epidemic and endemic zones for the remaining foci of rinderpest and investigate the risks at the wildlife livestock interface.

In West and Central Africa the duty is mainly in assisting the countries along the OIE pathway, ensuring, fulfilment of the requirements for the country to be declared free of rinderpest disease and infection. A major aspect of the programme is the training the people in charge of disease surveillance in wildlife, which will support an early warning system in case of an outbreak in the region. The work also involves the identification of wildlife populations to work with and the sampling of wildlife to assess the current situation is some places.

The work involves activities at the PEU (Nairobi and Bamako), with National PACE programmes and National Wildlife authorities as the mandate for wildlife management does not lie in most countries with the Ministries of Agriculture.

The TA provision was envisaged for 2 years at the inception of PACE, with a smooth transition to management of wildlife activities by National projects for the remaining period of PACE.

In East Africa, few activities were possible at the National level except for emergency disease investigations (Kenya, Tanzania, Ethiopia) funded out of regional PACE funds. The reason for this was that only 2/10 of the programmes (Ethiopia and Rwanda) in the region were effective to date. The lack of involvement to date in National projects is a major constraint in completion of the TA inputs required.

A workshop was organised specifically for the Wildlife component after deliberations of an Expert panel, which examined disease surveillance data from wildlife gathered between 1994 –2000, convened under the auspices of OAU IBAR PACE. Numerous meetings and workshops have been attended in support of PEU and the development of PACE proposals from countries in the region.

Despite the delay in the launching of National programmes, some work has been possible and this has provided valuable data in relation to the remaining RP foci in Sudan and Somalia.

In response to rumours of RPV in Southern Sudan samples were obtained from the Akobe region on the Sudan Ethiopia border. Results indicate that RP activity recently was highly unlikely, as species sampled were all negative by ELISA and VNT tests. Some of these animals are migratory from the suspect zone in Pibor and would have been present at the height of the livestock mortality and presumed virus activity.
The samples from Kenya (Tsavo) collected under PACE funding, showed the presence of antibody in buffalo born since the last epidemic and the age stratification suggests virus activity in the zone in late 1998 – 9, some 4 years after the previous incursion. This was after the EPERK funded National vaccination campaign (1st round). This clearly shows that a high risk of virus incursion into Kenya from the foci in Somalia persists, despite vaccination. This is not surprising given that effective vaccination in Somalia has not been possible for many years and there is no effective control of cattle movements from the Somali ecosystem to the areas where the wildlife indicators were found. These facts led to an examination of the trade movements in this zone, which confirmed that over the last decade, there was an increasing use of fattening grounds around the Southern borders of Tsavo by Somali cattle owners almost up to the Tanzanian border.

The situation has improved recently over the start of the National PACE Projects and all countries should be funded by January 2002. This will enable more PEU input into assisting the National Projects, in training personnel, in developing the strategies necessary and in implementation of the specialised wildlife work. It must be emphasised that in the remaining time available, the TA will not be able to complete the necessary work to ensure the smooth hand over and implementation of this component of PACE. There is a danger therefore of losing the flow of epidemiological information from wildlife that has hitherto been critical to the knowledge of rinderpest in the region over the last 10 years.

In West and Central Africa, emphasis was given on:

Identification of wildlife areas still having a good density of suitable animals, and according to these populations, design National PACE wildlife components, to be presented in the National Work Plans (and yearly WP&CE), to satisfy the needs of the OIE pathway in relation to wildlife.

Identification of training needs and production of training tools (Booklets and Cd ROM in French and English). Carrying out training workshops (done for 13 countries and 46

trainees) on disease surveillance in wildlife.

Realisation of 2 capture operations, in Chad and CAR, to assess the Rinderpest status in the Cordon Sanitaire, following the data collected during the AWVP. 70 sera collected, including 22 buffaloes. The samples were submitted to Montpellier CIRAD-Emvt, Farcha (Chad) and Bangui (CAR) labs: no results are currently available. This also provided a training session in game capture for 2 vets and 2 wildlife officer of Chad and CAR.

The sampling of blood from hunted animals in areas where darting is not feasible; in Mauritania, Senegal, Chad and CAR. Emphasis was given on the "quality assurance" for the realisation of good quality sera, in order to be able to perform the lab tests effectively. Results regarding ASF and RVF are available from Senegal and Mauritania and are very interesting.

In addition to these points, the work includes participation to all scheduled meetings (PCU, PEU, 2 Advisory Committees) and permanent assistance to the countries for work plan, progress along the OIE pathway, maintaining a network of wildlife vet and manager inside PACE-Bamako (mainly by email). A special issue of the CAR-PACE newsletter was produced in June 2001 about wildlife.

Recommendations on future wildlife work under PACE

As the final eradication of rinderpest is the main focus of wildlife work, activities should be carried out in relation to the main ecosystems of concern, centred on Southern Somalia and Southern Sudan. In addition some work needs to be carried out where question marks exist for RPV e.g. Southern Tanzania.

The input on rinderpest will focus on facilitating the National teams set up for wildlife surveillance in providing current epidemiological information. This will enable tracing of the origin of virus from past and present epidemics should they occur. This along with information from livestock surveillance will ensure virus pockets are rapidly stamped out through vaccination.

In addition and as stipulated in the OIE pathway guidelines, appropriate and relevant wildlife populations should be examined (through disease search and serosurveillance) at the correct time, to ensure fulfilment of the requirements for the declaration of freedom from rinderpest in each country.
The development of strategies for the control of other epizootic diseases could benefit from activities with wildlife under PACE. For example:

PPR - where wildlife could be as a good an indicator as it is for RPV,
ASF - where the role of wild pigs in certain countries is not well understood,
FMD - where wildlife sampling could help elucidate the distribution of certain topotypes regionally, confirm the effectiveness of cordon sanitaire and support recommendations of OIE (2001), which recommend studies to improve the knowledge of wildlife in the epidemiology of the disease.

Work identified to support the objectives and outputs of PACE through activities of the PEU wildlife components

Table 2 Rinderpest3	Surveillance & the OIE pathway	Training	Laboratory and other activities	Planning
Kenya Tanzania Uganda Ethiopia Somalia Sudan DR Congo Chad CAR	North Eastern** 2002 – 4 Tsavo – Meru** 2002 – 4 North – South Tanzania ** 2002 – 4 North Uganda 2002 and 2004 ** Mburo 2002 Ogaden 2002 ** West 2003-4 ** Baseline survey all regions warthog 2002 ** Targeted surveys 2003-4 Baseline survey in infected zone** 2002 Targeted survey** 2003-4	East Africa: 2002 training workshop for the region 2004 End PACE wrap up 2002 – 4 Field training where needed For W&C Africa: - Complete the disease surveillance course (7 countries) - follow up the capture training for the countries (Chad, CAR, Burkina Faso) which have done capture operation (2002- 2004) - organize a training workshop on game capture (2002 or 2003): East Africa? Southern Africa?	Ensure samples of a high quality are collected to enable effective diagnosis of disease are submitted to appropriate labs. Facilitate the process so that the testing is carried out a timely manner and ensure results are appropriately analysed and disseminated to OAU IBAR, PEU and country authorities. Continue to examine the role of species like warthog as sentinels for RP in the somali ecosystem.	Support strategic planning for surveillance and interpretation through close collaboration of PEU with National projects and attend steering/ Technical committee meetings

3 Activities relevant to the eradication of remaining foci of rinderpest marked **
Activities relevant to the OIE pathway marked *

Nigeria Benin All countries for acquiring the status "free from RP infection"	Garamba NP ** 2002 – 2004 Zakouma NP * 2002 and 2004 Gounda NP * 2003-2004 Yankari GR* 2002 Pendjari NP* 2002 From time the country is free of RP disease			

Table 3 Other diseases	FMD	ASF	PPR	Rabies
East, West and central Africa region	Use sera to establish baseline serotypes Collect probang samples for characterisation of FMD strains. A pilot initiative will be carried out in Lake Mburo Uganda in the current workplan.	Examine role of wild pigs in ASF outbreaks in the region. Develop recommendations for reducing risks from wildlife reservoirs.	Use sera to establish distribution of PPR in wildlife in the region	Support initiatives in this area with wildlife.

Table 4 Epidemiological network	Wildlife Vets	Communication system	Laboratory support	Legal framework
	Training Development of manuals	Establishment of Wildlife Disease Association in the region. Develop email network for dissemination of information between members of the network and livestock personnel. Improve system of reporting wildlife disease incidents to OIE Wildlife group and IUCN Veterinary Specialist group	Support and promote establishment of appropriate screening tests for rinderpest in regional and local laboratories.	Support the examination of National Veterinary legislation in the area of health and veterinary intervention for investigations and disease control. Make recommendations through the appropriate unit of PACE for improvements to facilitate future disease control.

Conclusions

PEU wildlife has provided valuable data even whilst the PACE projects in the region were hardly started.

The main contribution the PEU wildlife component can make is towards rinderpest eradication and the establishment and training of suitable National staff to carry out work in the future.

There is a lot of work that can be done to support National PACE programmes and PACE PEU can continue to provide this but only if experienced technical staff are available throughout the life of the project that remains. This is particularly important for the East African region.

TERMS OF REFERENCE

September 2000 to August 2002

Background

WHY WILDLIFE?

The main focus of the wildlife activity is towards Rinderpest eradication and the examination of the role of wildlife in other epizootic in disease persistence in Africa, in particular in relation to livestock.

PACE is interested in defining:

1. focuses of infection (endemic populations)
2. routes of dissemination of infection
3. recent infections (not necessarily epizootics).
4. epizootics

All these are best studied in domestic animals with wildlife surveillance a support to epidemio-surveillance as disease indicators and a reservoir of antibody to enable the definition of the historic status of disease in an area.

With rinderpest, where wildlife involvement is concerned it is 2, 3 & 4 that are of interest because wildlife populations are not large enough to sustain infection.

Regarding rinderpest in particular:

The rinderpest virus survives in a few foci because of certain attributes of those ecosystems including the socio-political status of the areas. The latter aspect defines the livestock systems that are practiced including resident herds, pastoral herds, managed herds (absentee owners) and trade livestock.

One important attribute is the presence of unrestricted ruminant wildlife mixing freely with livestock.

Wildlife may not be the reservoir but it contributes to the persistence of the virus through an expansion of the host population (which cannot be vaccinated) especially during epidemics.

In some areas wildlife may be the only effective route for monitoring virus activity, especially where trade is intermittent and livestock are transient.

Final eradication will be confirmed through confirmation of the absence of antibody from the population of wild ruminants of mixed ages.

WHAT IS NEEDED TO IMPLEMENT SURVEILLANCE IN WILD ANIMAL POPULATIONS?

An understanding of the role of wildlife in rinderpest epidemiology and other diseases.

An understanding of the sensitivity of wildlife as a sentinel for rinderpest virus and other diseases.

An understanding of the minimum scope of wildlife surveillance activities to maintain an adequate understanding of the epidemiology of RP and other diseases in each country

An understanding of the relative cost of wildlife surveillance in each country in comparison to livestock surveillance

An understanding of the constraints – physical, technical and political

A small multidisciplinary team to deal with the various aspects and integration of the team into the epidemio-surveillance network for livestock disease (avoiding duplication where possible)

At a country level: planning, data and sample collection, processing, laboratory analyses, interpretation of results (epidemiological analysis) and use of data in formulation of disease control strategies

At a regional level: data collection, assistance to planning, emergency preparedness and intervention, training, maintenance of an epidemiological picture of the status of virus activity and dissemination of this status to all countries in the region

SUGGESTED PROCEDURE UNDER PACE

AT NATIONAL LEVEL

National co-ordinator ensures a global plan is submitted for wildlife disease surveillance as part of the country document.
National co-ordinator organises a steering committee, under the chairmanship of the Director of Veterinary Services with representation from key authorities for wildlife and disease control (and OAU IBAR?) To meet at least annually or in emergency situations
The mandate of the committee is to:

Identify participating institutions which are tasked with providing personnel and support for each aspect of surveillance.
Recommend scope of activities
Guide activities
Monitor activities

National coordinator manages the work plan through:
Financial control and accounting
Use of OAU IBAR technical and political support
Facilitation of all activities and administration of sample processing dispatch
Data compilation and distribution

AT REGIONAL LEVEL OAU IBAR

Epidemiology and wildlife TA's assist in planning
Epidemiology and wildlife TA's assist in implementation of surveillance, analyses, data processing and interpretation
Epidemiology and wildlife TA's assist in training, workshops and at steering committee level where necessary
OAU IBAR assists in communications and regional politics
OAU IBAR assists in ensuring appropriate diagnostics are in place in Africa and economic test procedures instigated for each situation
OAU IBAR assists in emergency situations

Work Plan September 2000 – February 2001

The Work Plan will involve a great deal of planning for the longer term as the TA support will end in July 2002. This period of discussion and meetings will formulate the appropriate organisation for the PACE Wildlife activities and strategies. Training needs will be identified and workshops and field training proposed.

Due to the persistence of Rinderpest in the East African region most of the TA East Africa's time will be focused on this disease. During the next 6 months field operations will be supported in 5 countries to continue to build up serological and disease incidence databases with a focus on study populations (where baseline data is available). This will ensure that the National Authorities are aware of the epidemiological situation at a time when vaccination is ceasing in many countries i.e. a period of high risk. At the same time there is a need for targeted research on:

Warthog as a sentinel to include increase field samples in ASAL areas and experimental work on infection, transmission, antibody production in this species.
Applicability of tests on wildlife species. Screening of known negative populations to compare with field results. Development of new tests.

In West Africa although a large proportion of the time will be spent on assisting countries in complying with the surveillance requirements in wildlife for the OIE pathway to declaration of freedom from RP, there will be a contribution to other disease control strategies.

Terms of Reference Extension 2002

Addendum n°1 to the Service contract OAU-IBAR/CIRAD-Emvt for the PANVAC-Wildlife component of the PACE Programme

Background

The *key issues*, which have led to the present request for an amendment to the TA contract:

Regarding Rinderpest active surveillance:

The populations of buffaloes represent the best possible sentinel for rinderpest (lineage II and hypovirulantes forms): an outbreak of rinderpest in wildlife in Kenya was for example detected through the albeit limited activities possible under the programme and this issue will now be a high priority of work under PACE for a considerable and difficult to determine period.

For Western and central Africa, the population of buffaloes of central Africa is as important as that of Eastern Africa if Tanzania is excluded :

Areas	Buffaloes (heads)
Western Africa	13 000
Central Africa (= Chad, CAR, Cameroon, RDC)	50 500
Eastern Africa (except Tanzania)	49 200
Tanzania	245 000
TOTAL	357 700

The lineage II was identified over the last 50 years 6 times in East and West Africa, in Sokoto Nigeria 83, Sokoto 64, Nigeria 58, Kenya 1963, 1994, 2001 and the absence from these areas of hypovirulant strains has not been confirmed as yet. (In addition queries exist in Benin in 1998, and in numerous sites of central Africa where wild fauna presents 10 % of weakly positive serums in Séroneutralisation, from 1999 till 2001)

□ The surveillance of the buffaloes populations in Africa (in East but also in West and Central Africa) remains a high priority in view of the existing risk.

Regarding rinderpest serosurveillance in wildlife:

The wildlife disease surveillance under National programmes requires support for the collection of sera as capacity is minimal. This means training of staff in all the techniques. Training are presently ongoing in countries through workshops, field training and establishment of networks (in Eastern, Western and Central Africa , 87 staff from 18 countries have already received some training for clinical surveillance and 15

countries with field activities on wildlife) .
In eastern Africa, the key countries Tanzania, Kenya, Somalia, Sudan and Uganda were delayed in acceptance and financing of their respective PACE programmes. This means implementation of the PACE wildlife work plan for this region, were severely constrained over the period of the initial contract.

□ If the support for the still inexperienced National staff was suspended now, countries could not maintain disease surveillance for rinderpest lineage II nor finalize their files of progress in the OIE procedure.

Regarding PANVAC:

The 6th Conference of Ministers responsible for animal resources underlined the importance of PANVAC and urged OAU/IBAR to finalise the seat agreement, the Director nomination and the implementation of the planned TA contract. However the expert for CBPP is now considered to be unnecessary, after a re-evaluation of the work plan, and considering the fact that only 10 months are remaining.

Nevertheless, due to the delay of this component implementation, only 2,5 years of TA instead of 3 as initially planned will be possible before the end of the PACE.

□ If the PANVAC TA implementation begins immediately, it will mean only 2,5 years is possible within the framework of the present contract.

Proposal

As a result, it is agreed to extend the contract of the 2 wildlife TA, in order to fulfil the task and the following is proposed:

A TA contract amendment of the wildlife component TA in eastern, western and central Africa, for the unused part of the PANVAC TA component on the extension (for a period of 10 working months).
The West & Central Africa wildlife TA will depend on the Bamako Coordination, but will be based part time in N'Djamena (the cordon sanitaire epidemiologist will move to N'Djamena, and the office there will be run by the wildlife TA). He will also support the EA wildlife TA in order to fulfil the activities related to Rinderpest eradication.

Goals

Strengthening of the capacities of the national teams in wildlife épidémiosurveillance, with a particular accent on sera collection.
Support for the OIE files finalization in every country.
To clarify the status of hypovirulant rinderpest strains in all the countries having a population of buffaloes.

Purpose

To provide the necessary support to PACE programmes in member countries through provision of Technical Assistance, focusing on wildlife aspects of disease epidemiology, ensuring strategies/activities are properly developed and executed.

Expected outputs

Technical field support provided in Africa at a critical phase in the eradication of rinderpest virus.
Technical field support to the Kenya programme to resolve the current rinderpest outbreak in wildlife in Kenya.
Continue training of National staff especially where delays in implementation of PACE have prevented activities planned to date but also to strengthen actions implemented during the two first years
Consolidated network in Africa to ensure rapid detection and diagnosis of rinderpest or other epizootic disease in wildlife.
Established epidemiosurveillance teams responsible to the veterinary authorities in each country to support routine surveillance and activities related to the OIE pathway activities.
Integrated wildlife disease surveillance as part of approach to epizootic disease control.

PACE EPIDEMIOLOGY

Wildlife Component

Extension of contract July 2002 – June 2003 (10 months)
East and West Central Africa Technical Assistance
Main Objectives

Ensure appropriate input through PEU in strategy development for major epizootic disease control in particular in relation to rinderpest eradication.

Support the continued collection, processing and analysis of data from the wildlife livestock interface from PACE member countries, in particular from the endemic or epidemic areas and high risk zones.

Support the sustained development of wildlife disease surveillance units in countries through workshops, field training and establishment of networks.
Activities

East, West and Central Africa

The proposed activities are divided into priority I and II under each objective to enable focus from the TA's and the PEU. The days dedicated are contract days not field days and will include logistics, administration, general support to PEU and PACE – OAU IBAR.

The TA West Central Africa will be expected to provide some input to Eastern Africa activities as this is main focus of interest for the wildlife component. Exact dates for activities will change according to local logistic arrangements, funding cycles etc. The period June 2003 will be dedicated to planning for the final phase of PACE, administration and report writing.

Ensure appropriate input through PEU in strategy development for major epizootic disease control in particular in relation to rinderpest eradication				
Activity	Country	Days	Priority	Date
Assist in the planning for the implementation of recommendations of meeting of June 15-17th on wildlife surveillance and control of the "mild strain" of rinderpest	Kenya and Email conference	5	I	July 2002
Visit wildlife (vet) departments to assist in planning interventions in relation to strategy implementation	All countries	10	II	July – December 2002
MOU development between wildlife and veterinary authorities if needed	All countries	10	II	July – December 2002
OIE pathway - support for submission from countries for freedom from disease (batch 1)	Burkina Faso, Ivory Coast, Gambia, Ghana, Guinea, Mali, Mauritania, Niger, Senegal	5	II	June 2002
OIE pathway - support for submission from countries for freedom from disease (batch 2)	Benin, Guinea Bissau, Nigeria, Togo	3	II	September 2002
OIE pathway - support for submission from countries for freedom from disease (batch 3)	Cameroon , CAR, Chad (zonal)	3	II	December 2002

Support the continued collection, processing and analysis of data from the wildlife livestock interface from PACE member countries, in particular from the endemic or epidemic areas and high risk zones.				
Activity	Country	Days	Priority	Date
Support surveillance of the lineage II virus strain persisting in Kenya/Somalia through disease search and studying antibody prevalence in certain species and locations.	Kenya – North Eastern Province Somalia	20 10	I I	September 2002 – May 2003
Support the assessment of the epidemic risk of rinderpest possibly spreading from NE Kenya - Somalia through sero – surveillance of sentinel populations	Kenya (Tsavo, Samburu – Shaba – Marsabit) Tanzania (North), Ethiopia (Ogaden), (Somali programme).	30	I	August 2002 – May 2003
Support surveillance for rinderpest in Eastern Equatoria, Northern Uganda lineage I	Sudan Pibor Sudan Boma Northern Uganda	10 14 10	I I I	October 2002 February 2003 July 2002
Support bthe operation to clarify antibody status in Miombo wildlife populations and rule out possibility of a mild strain of rinderpest persisting in the region.	Southern Tanzania (Mkumi - Selous, Ruaha – Rungwa, Katavi) Katanga (DRC)	30	I	January 2003
Carry out the samples collection in sentinel populations of Central Africa	Zakouma (Chad) Gounda (CAR) Benoue-Boubandjida-Faro	45	II II I	March 2003 March 2003 February 2003

	(Cameroon)			
Perform sample collection to rule out possibility of mild strain Rinderpest in Benin-west Nigeria	Pendjari – W (Benin) Borgu (Nigeria)	20	I	April 2003
Assist countries in the collection of blood samples from hunted animals	Chad, CAR, Cameroon, Benin, Burkina Faso, Senegal, Gambia, Mauritania, Guinea, Guinea Bissau	5	II	December 2002 – April 2003

Support the sustained development of wildlife disease surveillance units in countries through workshops, field training and establishment of networks.				
Activity	Country	Days	Priority	Date
Assist to wildlife disease training workshop for the east Africa region.	Tanzania	7	II	September 2002
Organise and Establish the 5th wildlife disease training workshop for the W&C Africa region.	Cameroon	7	I	December 2002
Organise and establish wildlife capture training workshop for the east, west and central region	Zimbabwe	20	I	August 2002
Undertake field training of individuals from vet units in each country to reinforce capacity for wildlife disease surveillance in the region	Kenya, Tanzania, Ethiopia, Somali programme, Uganda, Sudan. Chad, Cameroon, CAR, Benin, DRC	90	I	July 2002 – May 2003
Assist in integration of wildlife units/data into epidemiosurveillance system in each country.	Region	10	II	July 2002 - May 2003

ADDENDUM No 2 TO THE TECHNICAL ASSISTANCE CONTRACT FOR THE PAN AFRICAN VETERINARY VACCINE CENTRE (PANVAC) AND THE WILDLIFE EPIDEMIOLOGY
COMPONENTS

Programme	Pan African Programme for the Control of Epizootics
Financing Source	Seven European Development Fund
Title	Technical Assistance to the PANVAC and Wildlife Epidemiology component
Project Accounting Number	7 ACP RPR 744 - 9
Contractor	CIRAD-EMVT

I-BACKGROUND

Under the original terms of the contract the TA support for PEU (wildlife) ceased in effect April 20th 2003 for West Central and June 30th 2003 for East Africa. However, the performance of the main thrust of rinderpest eradication under the PACE programme is highly dependent on continued support in the area of wildlife surveillance. This has become clear with the improved understanding of the current rinderpest status in the region with a mild form of disease affecting cattle and making surveillance difficult in domestic animals. The last advisory committee4 and mid term review recommended clearly that continuation of the wildlife surveillance component of the PEU was necessary, as its activities are essential to identification of the remaining foci of disease, which appear truly limited in extent.

Although training for wildlife epidemiosurveillance under PACE has progressed, with considerably improved awareness, the highly technical nature of the work, and a lack of experience in many of the PACE countries remains an issue. This requires that TA input is continued in key countries to ensure satisfactory completion of planned activities on the ground. In addition, it is now recognised that it is not realistic to expect veterinary and wildlife departments in some countries to be able to support a full time wildlife veterinary field expert and therefore training needs to be more concentrated, on fewer individuals, to enable regional capacity, which can be tapped into in emergencies. The TA input would be essential to consolidate this team over the remaining period and ensure that there is sustainability in this speciality area.

Therefore an addendum is needed to the contract to enable continued activities in this area and the modified terms of reference for the technical assistance are presented below.

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4 The 7th advisory committee's advised that the priority was to continue support to the epidemiology component and the wildlife activities particularly in the remaining foci and in particular the Somali ecosystem. They recommended that the PCU examine means to extend the wildlife consultants contracts.

II-TERMS OF REFERENCE

II-1. Wildlife epidemiosurveillance requirements under PACE 2003-2004

EASTERN AFRICA

In Eastern Africa, the key countries involved are Tanzania, Kenya, Somalia, Sudan, Ethiopia and Uganda. Considerable effort is now needed in this region to capitalise on the progress of PARC and PACE to date and ensure eradication of the last foci of rinderpest virus, before PACE finishes.

There is a need to continue to help Uganda, Tanzania and Sudan to progress along the OIE pathway and ensure there are no strains of rinderpest circulating in the region with wildlife hosts.

In Uganda the main person trained in the techniques was badly injured in a plane accident so Uganda has asked for further TA support over the next year to complete a round of wildlife surveillance as required by their status on the pathway and to train fresh personnel.

Sudan ceased vaccination in 2002 so are unable to use livestock serosurveillance to establish the current situation. Considering the recent circulation of virus perhaps to 2000 the current period is one of high risk so they have requested wildlife surveillance to provide supporting data on the current situation. They have no capacity for this and the TA support will assist in completion of a serosurvey and train personnel for the future.

Tanzania – support for their next serosurvey round according to their provisional freedom from disease may be required.

Ethiopia requested support to undertake serosurveillance in the Omo region where the last rinderpest antibody in wildlife was detected. The data were complicated by presence of PPR.

Kenya and Somalia present a major challenge and intensive wildlife disease and sero-surveillance is urgently needed now that vaccination has ceased in both countries. As with Sudan this is a high risk period and current information is essential to guide the final control measures necessary to finally eradicate rinderpest.

TA support has been requested by the Kenya Wildlife Service to ensure completion of planned activities, in a logistically and practically difficult area of north eastern Kenya.

In Somalia no work has been done and no competence in this field exists. It is envisaged the TA support will focus here particularly in assisting planning effective wildlife surveillance in Somalia and undertake training of Somalia veterinary professionals, collaborating with KWS, which has competency in this field.

There is a need to improve the regional capacity for wildlife disease surveillance.

There is a need to continue to evaluate the results of disease surveillance to better understand the role of wildlife in the maintenance of rinderpest virus in the possible remaining foci (Somali ecosystem) and to ensure the eradication strategy in cattle populations is valid.

WESTERN AND CENTRAL AFRICA

In Western Africa, the key countries requiring technical assistance on the wildlife are Chad, Gabon and Central African Republic, and to a lesser extent; Nigeria, Senegal and Mauretania, Burkina Faso, Benin, Cameroon and Ghana.
There is a need to give advice as required to those countries in Western Africa, which have made progress to disease freedom recently and will be carrying out serosurveillance over the coming months according to the requirements of the pathway. Problems will no doubt arise as recently found in Mauritania, from warthog serology and clarification missions will be necessary to ensure issues are rapidly resolved.
In Chad there are some concerns over results from a number of wildlife sera collected from 2002 and the programme was recommended to clarify the findings. This will require TA support and follow up as a matter of priority. The situation in RCA will also need close monitoring due to its proximity to Sudan and Chad.
In Gabon a number of positive results from aged buffalo sampled recently need to be clarified. The reason being that the country, has never reported rinderpest nor carried out any control measures for rinderpest.
There is a need to improve the regional capacity for wildlife disease surveillance.

PURPOSE OF THE ADDENDUM

III.1 Extended period of performance of the two wildlife TAs:

The extension will:

Ensure appropriate input through PEU in relation to refinement of the rinderpest eradication strategy, through providing a current understanding of the incidence of RP infection in wildlife species (serosurveillance) and in improving the understanding of the epidemiology of the African Lineage II strain currently (presumed to be) circulating between wildlife and livestock in the Somali ecosystem.
Support the continued collection, processing and analysis of data from the wildlife-livestock interface from PACE member countries in mainly Central and Eastern Africa.
Support the development and or consolidation of regional wildlife disease surveillance units, through field training and establishment of mandates and networks.
Support countries on the OIE pathway for freedom from rinderpest in obtaining and using wildlife data to ensure comprehensive dossiers confirming the absence of rinderpest disease and ultimately virus.

In addition; both TAs will be based in Nairobi under the management of the PCU and PEU and the duties will be according to needs with a general orientation of one TA to the West Central African regional requirements (as specified by regional coordination) and vice versa.

Other terms of reference will remain unchanged according to the original contract and terms and conditions.

III.2 Expected outputs Eastern Africa

Technical field support provided in eastern Africa at what may be the final phase in the eradication of rinderpest virus from the region.
Current knowledge of the circulation of rinderpest virus in Kenya and Somalia to enable identification of affected cattle populations and targeted vaccination.
Better understanding of the epidemiology of the current strain of virus in the Somali ecosystem in wildlife and between wildlife and cattle.
Trained and mandated regional team to be able to respond to transboundary wildlife disease emergencies beyond PACE.
Consolidated network in PACE member countries to ensure a good surveillance system for wildlife disease.
Integrated wildlife - livestock disease surveillance as part of regional approach to epizootic disease control.
Support countries as requested in obtaining and analysing wildlife surveillance data in pursuit of verification of freedom from infection along the OIE pathway.

III.3 Expected outputs West & Central Africa

Clarification of positive serological results or suspicion of rinderpest in PACE countries (currently required for Chad and possibly Mauretania.
Progress on the training of regional team to be able to respond to transboundary wildlife disease emergencies beyond PACE.
Consolidated network in PACE member countries to ensure a good surveillance system for wildlife disease.
Integrated wildlife - livestock disease surveillance as part of regional approach to epizootic disease control.

IV- Activities recommended

IV.1 Technical assistance August 2003 to October 2004 – 2 x 12 man months

Support the general activities of PACE Common services, PEU and PACE programmes in Eastern, Western and Central Africa and general administration. (2 x 3 months)
Support appropriate authorities in exploring the role of different wildlife species in the disease ecology of mild strains of rinderpest virus present in Kenya and Somalia. This achieved mainly through a serological survey in northeastern Kenya and Somalia, and disease search, which will establish the importance of wildlife as a vector and evaluate if this phenomena in any way prevents successful eradication of the lineage II strain of virus present in the region. (4 months mainly field work).
Support RP disease search and sero-surveillance in wildlife in Southern Ethiopia and Sudan (4 months).
Support annual routine surveillance of sentinel populations for RP in Tanzania and Uganda as part of emergency preparedness and for OIE pathway activities. (1month).
Support MOU development between wildlife and livestock departments and other institutions in the region; for long term policy and collaboration on disease surveillance and establishment of a regional surveillance team. (1 month).
Support RP disease search and sero-surveillance in wildlife in Central Africa 2 months.

Support annual routine surveillance of sentinel populations for RP in West Africa for OIE pathway activities (4 months).
Provide input to support PEU on wildlife aspects of the epidemiology surveillance systems and networks on specific disease entities such as PPR, ASF, RVF etc. identified as priorities under PACE PEU. This will ensure strategies developed are appropriate and that where necessary wildlife disease status is elucidated as part of risk assessments (2 x 2 weeks).

WILDLIFE

Extension of TA support to the programme extension November 2004 until October 2005

TERMS OF REFERENCE

Background

Provision of TA (2) to cover West, Central and East Africa was budgeted up to the end of October, 2004.

A major thrust of the PACE programme is rinderpest eradication and this is highly dependent on continued support in the area of wildlife surveillance. This issue has been made clear in a number of reports and evaluations of the programme and is written into the current PACE extension documents. The latter states that an expatriate wildlife expert (TA) should remain in the programme for another year with a counterpart supported from the middle of 2005 until the end of the programme taking over responsibilities from the TA.

The PEU Dakar meeting in August, 2004 presented the proposed strategy for wildlife surveillance until the end of PACE (2007) and this was endorsed by the countries. It is focused on 2 main areas:

Continued wildlife surveillance for the identification of foci of rinderpest in East Africa and support to the completion of surveillance according to the OIE pathway in West and Central Africa. These activities will in all regions use an ecosystem approach.
Training and establishment of regional teams to undertake surveillance for rinderpest; one in W&C Africa and one in E Africa. These teams would be responsible to AU IBAR on wildlife issues and support the Epidemio-surveillance systems/networks in PACE countries.

Another concern at this stage in the PACE project has been the sustainability of wildlife inputs in IBAR once the TA support concludes. The PACE extension has taken this into consideration and a counterpart will be provided during this period.

The Main Objectives are to:

To support the induction and training of the counterpart in PEU Wildlife in all relevant aspects of the programme to enable continued achievement of the set objectives.
Ensure appropriate input through PEU (specifically through the Somali Ecosystem Rinderpest Eradication Coordination Unit SERECU) in relation to refinement of the rinderpest eradication strategy, through providing a current understanding of the incidence of RP infection in wildlife species (sero-surveillance) and in improving the understanding of the epidemiology of the African Lineage II strain currently (presumed to be) circulating between wildlife and livestock.
Support the continued collection, processing and analysis of data from the wildlife-livestock interface from PACE member countries in mainly Eastern Africa. The TA will provide a series of publications summarising the results of surveillance in wildlife in the region and a thesis on the subject will be available at the end of October 2005. These will provide the main reference points for ongoing activities by the PEU (wildlife).
Support the development and or consolidation of regional wildlife disease surveillance units5, through field training and establishment of mandates and networks.
Support countries on the OIE pathway for freedom from rinderpest in obtaining and using wildlife data to ensure comprehensive dossiers confirming the absence of rinderpest disease and ultimately virus.

In Eastern Africa, the key countries involved are Tanzania, Kenya, Somalia, Sudan, Ethiopia and Uganda. This includes the core countries in the Somali ecosystem and those at risk.

In Uganda there is a new team, which undertook surveillance unsupervised in 2004 but it is difficult to evaluate the output as no data is reported from these activities as yet. It would advisable to have a formal evaluation of the capacity in 2005 including introduction of the counterpart at IBAR to the situation in Uganda.
Sudan is now advancing along the OIE pathway and given any concerns there will need to be backstopping from the TA and counterpart. None are currently allocated under the PEU extension work-plan but there is a contingency for this in the country programme.
Tanzania – as for Uganda the outputs have been inconsistent for the period of unsupervised activities 2003-2004 and an evaluation of the capacity is proposed for 2005.
Ethiopia requested support to undertake sero-surveillance in the Ogaden region where the last rinderpest suspicion took place. This is scheduled for 2005.
Kenya has a competent team but also benefited in 2004 from support from the TAs for technically difficult work in the Somali ecosystem. The results of this work are indicating that virus may no longer be circulating amongst wildlife in north-eastern province, which is a very positive sign. This population now becomes the sentinel for disease incursions into Kenya and must be closely monitored. It is proposed that an

5 The personnel for the regional teams have been proposed for W & C Africa and for E Africa. Once the personnel have been accepted by the Director IBAR and the countries concerned, a workshop will be organized to consolidate the group and provide updates on the strategy for wildlife surveillance in respect to important diseases with a focus on rinderpest, the OIE pathway and the eradication process. There will be a formal approach to all countries through IBAR to ensure the necessary permissions, freedom of movement and mode of operation for these personnel in the different ecosystems. This group will be co-ordinated ultimately by the wildlife counterpart at IBAR.

evaluation of the northern Kenyan section of the SES is carried out by a joint PEU/KWS/DVS team as the surveillance undertaken in 2004 was considered inadequate due to the logistic and financial constraints at the time. This will involve PDS and opportunistic sampling of wildlife.
Somalia presents the major challenge and intensive wildlife disease and sero-surveillance is urgently needed. More current information is essential to guide the final control measures necessary to eradicate any remaining foci of rinderpest. In Somalia no work has been done in wildlife and no competence in this field exists. It is envisaged the TA support will focus here particularly in assisting planning effective wildlife surveillance in Somalia and undertake training of Somalia veterinary professionals, collaborating with KWS, which has competency in this field. These activities will be undertaken under the supervision of SERECU and the counterpart wildlife expert will be a member of the coordinating group.

In Western and Central Africa, the key countries requiring technical assistance on the wildlife are in the 3 identified ecosystems. Western (Senegal, Gambia, Mauritania, Guinea B and C), Central West (Burkina Faso, Benin, Nigeria and Niger) and Central (Cameroon, Ghana, Chad, Gabon and Central African Republic)

There is a need to give advice as required to those countries in Western Africa, which have made progress to disease freedom recently and will be carrying out sero-surveillance over the coming months according to the requirements of the pathway. Problems will arise as recently occurred in Mauritania, from warthog serology and clarification missions will be necessary to ensure issues are rapidly resolved.
Ghana had requested in 2004 training support for the wildlife team and this was agreed at the time but due to logistic constraints and problems with PACE contract extensions November 2004 was not executed. This is planned in 2005.

Expected outputs Eastern Africa

Technical field support provided in Eastern Africa at what may be the final phase in the eradication of rinderpest virus from the region.
Current knowledge of the circulation of rinderpest virus in Kenya and Somalia to enable identification of affected cattle populations and targeted vaccination.
Better understanding of the epidemiology of the current strain of virus in the Somali ecosystem in wildlife and between wildlife and cattle.
Evaluation of the Uganda and Tanzania wildlife ESS and outputs 2003-5.
Trained and mandated regional team to be able to respond to transboundary wildlife disease emergencies beyond PACE.
Consolidated network in PACE member countries to ensure a good surveillance system for wildlife disease.
Integrated wildlife - livestock disease surveillance as part of regional approach to epizootic disease control.
Support countries as requested in obtaining and analysing wildlife surveillance data in pursuit of verification of freedom from infection along the OIE pathway.
References provided based on publications and a thesis on the role of wildlife in rinderpest virus circulation in Africa as a guide for future activities under IBAR.

Expected outputs West & Central Africa

Clarification of any positive serological results or suspicion of rinderpest in PACE countries.
Support to Ghana on establishment of wildlife team.
Establishment of a regional team to be able to respond to OIE pathway surveillance needs and transboundary wildlife disease emergencies beyond PACE.
Supervision of ecosystem level surveillance planned for 2005-6 and coordination of any STE required for this work.

Duty station

The TA will be situated in the AU IBAR PACE offices in Nairobi within the epidemiology unit reporting to the Main Epidemiologist and the collaborating closely with the Regional Epidemiologists for EA and WC Africa.

The TA will be expected to provide all necessary reports and promote publication of the materials relevant to this TOR to ensure dissemination of information.

PROGRAMME PAN AFRICAIN DE CONTROLE DES

PAN AFRICAN PROGRAMME FOR THE CONTROL OF EPIZOOTICS

PACE EPIDEMIOLOGY
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25 April 2006

Administration
PACE IBAR
Nairobi

REFERENCE INVENTORY OF EQUIPMENT SUBMITTED TO PACE IBAR AT END OF CONTRACT WILDLIFE PANVAC CIRAD 7ACP RPR 744

Dear Sir madam

Please accept the following inventory of items placed in the 6th floor office of PACE IBAR on 20.9.05.

Some items purchased during the AWVP project remain in other locations and this is noted on an attached inventory, which was submitted at the end of AWVP and their current status is noted on this sheet e.g. dart rifles held in the wildlife departments of the countries supported under PACE.

These are non-consumable items purchased under the PARC/PACE programmes.

Inventory

Table 1

1) AWVP inventory carried on to PACE				
20.9.05	Number of items	Location	Serial code if present	Comments
Camping				
Medium bell tent	1	PACE office		Condition fair
Large frame tent	1	PACE office		Condition fair holding bag needs replacement
Accessories				
Binoculars	4 opticron MCF mini	PACE office	T 143429 T 143719 T 143727 T143708	1/5 of the original AWVP binoculars was lost in the field
Satellite phone	1 Mobiq	PACE office	97304122	In working order – contract with Telemedia (K) Ltd
Airband handheld radios	5	PACE office	12440 12479 12439 12480 03837	1 is not in working order 3 charging units included
Veterinary				
Dart rifle palmer	1	KWS	NN202894	Not in working order
Dart rifle pneudart	1	KWS	193 182202287107	In working order
Dart rifle palmer	1	Uganda Wildlife Authority	NM387430	Status unknown
Dart rifle palmer	1	Tanzania National Parks	NM202899	Status unknown
Capture nets short	4	PACE office		Fair condition

Capture net long	1	PACE office		Fair condition
Liquid Nitrogen transport dewars	2	PACE office		Fair condition
12 V fridge	2	PACE office		Non functional
Domestic fridge	1	PACE office		806KR00054 Good condition
Chest Freezer	1	KWS		Functional
2) PACE equipment				
Ex Caron				
Binocular	1	PACE office	TASCO FUTURA.LE	Ex caron see attached
GPS etrex	1	PACE office		Functional
GPS etrex	1	PACE office		Functional
Tent frame small	1	PACE office		Fair condition
Bedroll	1	PACE office		Fair condition
Range Finder	1	PACE office		Ex Ndjamena
Memory stick	1	PACE office		128MB
PACE purchased				
Handigaz cylinder	1	PACE office		Deposit paid and receipt attached
Handigrill and burner	1	PACE office		Functional
Compaq notebook computer and printer	1	PACE office	CNF411074D/ MY42B4P2RR	Functional and note earlier ATLAS computer already handed over – see attached
Bedroll	1	PACE office		Fair condition

N.B. Consumable items e.g. syringes etc are also stored but not noted for inventory purposes.

Yours sincerely

Checked PACE Administration

Date: