A general foot patrol was conducted without tracking spoor of individual rhinos. Night census using image intensifiers was conducted simultaneously from three fixed points (waterholes) for two consecutive full-moon nights in Ngulia. In this case, two additional night counts had been done as usual by the Ngulia staff in July and August. When the rest of the census team arrived, the Ngulia staff had already done one night of the September–October count. Thus the rest of the census team participated only in the remaining two nights of the count.

In Tsavo East, 25 rhinos were sighted and in Ngulia, 20 were counted. However, the two night counts done in Ngulia recorded 48 rhinos, almost two and a half times the number seen in the aerial and ground counts. The night waterhole count produced a number that was close to the expected population size. This means that a higher proportion of the population can be seen from the waterhole counts than by the ground or aerial surveys. But it should be noted that daytime ground sighting data if routinely collected over an extended period and analysed using mark-recapture statistics can be used to produce reasonably accurate population estimates (better than minimums seen) provided there are enough sightings.

Aerial counts of black rhinos are known to produce highly variable and significant undercounts of true population size. The minimum numbers seen on these aerial counts are therefore likely to be gross underestimates of true numbers, and in part reflect the search effort put in.

Although the distribution maps are still being processed at the Kenya Wildlife Service GIS section, rhinos in Tsavo East were observed to range the entire area south of the Galana River that is part of the Yatta Plateau.

One rhino carcass (the only known death in 2000), which had been reported, was picked up in the Ngulia count; five elephant carcasses were recorded in the Tsavo East counts and their GPS (global position system) locations recorded. No new rhino carcasses were sighted even after a thorough foot patrol in areas of high rhino density. Although only 25 rhinos were sighted in Tsavo East, numerous fresh signs distributed south of the Galana River indicated the presence of many more. However, while we could be confident that there were around 53 rhino in Ngulia, the exact number of rhinos in Tsavo East remains much more uncertain. More work is therefore required to produce improved population estimates for this park. However, the census did provide valuable information about the extent of the distribution of the Tsavo East population. Other animal species of interest counted in Ngulia Sanctuary included elephants (161), giraffes (32) and lesser kudus (11).

Table 2. Rhino numbers seen and estimated in counts in Tsavo East and Ngulia, 26 September–22 October 2002

Type of count	Tsavo East	Ngulia
Aerial count	21	16
Ground count (by foot and vehicle)	4	4
Night census (at waterhole)	not done	48
Rhino signs < 48 hr old	109	not recorded
Estimated	53	53

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SADC regional programme for rhino conservation—update

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The SADC Rhino Programme has continued to support rhino conservation projects for black and white rhinos (*Diceros bicornis minor, D. b. bicornis, Ceratotherium simum simum*) within the southern Af-

rican region. Although activity has been reduced because of a pause in funding from the Italian government for most of 2002, resumption of funding for a further two years is expected towards the end of this year. Since the last edition of *Pachyderm*, experts in the programme have worked towards improving management of the black rhinos in Liwonde National Park in Malawi (ecological and institutional evaluation) and have supported a study of ecological and human factors limiting the black rhino population of West Kunene Region in Namibia. Assistance has been provided in the development of new national rhino conservation strategies in Botswana and Namibia. The project to improve the security and management of rhino horn stocks in the SADC region, implemented by TRAFFIC, has developed a comprehensive rhino horn and product database/GIS on horn stockpiles in 41 countries. The latest version (1.31) of the site-level WILDb rhino monitoring database has been issued and is now in use for several rhino populations in Zimbabwe and Botswana. A national-level version of WILDb will be available shortly. This will include automated queries that can produce a number of standard SADC RMG (Rhino Management Group) indicators of rhino population performance. WILDb is also being modified to deal with clean animals, incomplete observations and observer rating and will be able to generate data input files compatible with RHINO 2.0. The inaugural meeting of the SADC Rhino Recovery Group (RRG) was held in May 2002, with membership from the six SADC countries involved in present or future projects to reintroduce rhino populations (Angola, Botswana, Malawi, Mozambique, Tanzania, Zambia). The support and coordination enabled by SADC RRG is expected to provide the basis for a sustained effort by member states in re-establishing viable rhino populations using resources and expertise drawn from the SADC region.

Horn fingerprinting technique update

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Validatory statistical research undertaken by Rajan Amin and an MSc student has provided a good test of how reliable different techniques and models are for predicting the species or source of new rhino horn samples (that is, ones not used in building the models). The result of this work, which was sponsored by the Italian-funded SADC Regional Programme for Rhino Conservation, confirmed that horn fingerprinting can reliably differentiate between species and horns from different countries or regions. However, jackknife validations of park discrimination models confirmed Richard Emslie's earlier suspicions—that sample sizes would need to be increased to more than the current four to five samples per park for reliable discrimination of source within a park or area (unless one was dealing with a park with very unusual geology such as Pilanesberg National Park). The next phase of research is to undertake an experimental analysis of additional samples to determine how many samples per park are required for reliable source discrimination at the finer spatial scale.

Dr Amin's research also found that Bayesian and probabilistic neural networks produced better discrimination models using fewer variables than the original models developed by Dr Emslie using classical canonical variates analysis (discriminant function analysis). Final horn fingerprinting models and the resultant user software will therefore be based on neural network analysis.

Other research planned includes investigating the use of novelty detectors to identify whether or not samples have come from areas not yet included in the continental horn-fingerprinting database.

Anglo-American Research Laboratories are also approaching the final stages of developing a standard multi-element analysis package that will be able to quantify the abundance of about 70 rarer elements and isotopes more cheaply and more accurately (Richard Holdsworth, pers. comm.). Using their Finnegan-Mat-element high-resolution magnetic-sector inductively-coupled-plasma mass-spectrometer, abundance measures can be calibrated against known standards and expressed in parts per billion. Using the same sample of horn, but at a different dilution, inductively-coupled-plasma optical-emission-spectroscopy can also be used to quantify a suite of the commoner elements. These