the Italian donors have delayed the implementation of this project. AfRSG's Richard Emslie presented the results of horn fingerprinting to date, listing outstanding problems and mentioning the steps being taken to solve these problems. Samantha Watts and Simon Pillinger of KwaZulu-Natal Wildlife demonstrated the Intelligence database that has been developed by KwaZulu-Natal Wildlife and how it is used. Their presentation elicited great interest from members. It is hoped that the system will find wider application among range state participants.

Workshop on biological management of black rhino

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All current national strategies on black rhino conservation aim to increase numbers as rapidly as possible, setting minimum metapopulation growth targets to an average of at least 5% per annum. However, in recent years several 'Key' and 'Important' black rhino populations in South Africa and other major range states have been performing below this minimum target level. In some cases recommended biological management strategies have not been fully implemented.

Suboptimal growth is a problem for a number of reasons. Because of the effects of compounded growth, small differences in growth rate matter a lot. The slow growth rate brought about by poaching has resulted in markedly fewer rhinos. For example, in South Africa, lower growth rates over the last five years have resulted in approximately 250 fewer black rhinos than anticipated if previous metapopulation growth rates had been maintained. The time it takes to reach conservation goals also markedly increases as growth rates decline. It will take South Africa's *Diceros bicornis minor* metapopulation 70 years to reach the goal of 2000 animals at 1% growth per annum compared with only 11 years at 7%. Rapid growth also enhances the ability to withstand poaching outbreaks, and the loss of genetic heterozygosity is minimized when metapopulations increase through breeding at a rapid rate. Long-lived, large, K-selected species like rhinos can also overshoot the carrying capacity of an area for a period, thus potentially damaging its 'vegetation capital', which is another reason for keeping densities below carrying capacity.

Given this background, the SADC Rhino Management Group (RMG) found this an opportune time to re-evaluate and examine existing guidelines on biological management and theoretical performance models in the light of experience and RMG monitoring over the last 12 years. The RMG therefore organized a technical workshop on biological management of the black rhino to debate the successes, failures and alternative strategies of biological management and to review how best to maintain rapid metapopulation performance. The workshop took place 24–26 July 2001 at Giants Castle Game Reserve in the Ukhahlamba-Drakensberg Park, KwaZulu-Natal, South Africa. Delegates who attended from all the 'Big 4' black rhino range states of South Africa, Namibia, Zimbabwe and Kenya, were experts in a broad range of areas—from field managers of rhino areas to theoretical ecologists.

The workshop reviewed factors affecting the population growth of black rhinos. They examined case histories, population dynamics, harvesting theory, and existing and alternative approaches to achieving and maintaining rapid population growth. Participants also discussed monitoring of rhino population performance and resources available (carrying capacity issues) for rhino populations. Key indicators that would aid decision-making were identified. The workshop recognized that biological management has to be proactive, rather than responding only when monitoring detects a problem (which, sadly, is often too late).

Participants developed guidelines for enhancing metapopulation growth of black rhino populations. In reviewing harvesting, the workshop considered the size, nature (age and sex), frequency and location of the rhinos to be removed, as well as reconciling the needs of both donor and recipient areas. The principle of keeping densities at a productive and safe level (not letting populations approach or exceed ecological carrying capacity [ECC]) was upheld. However, a particularly

important workshop recommendation was that a proportional removal strategy be implemented in larger populations to maintain rapid growth rates. This strategy differs in application from the existing one of managing at or below 75% of ECC strategy.

Two versions of the new proportional removal strategy were developed depending upon 1) whether the population concerned is rapidly growing and lightly stocked or 2) is overstocked and has exceeded 75% of the estimated ECC.

Based on this strategy, current stocking levels first need to be assessed in relation to an ECC estimate. If the population is in a lower-density growth phase, the recommendation is to do nothing until densities exceed 50% of ECC. Then management would start removing 5% per annum. Population performance is assessed after a few years, and if the population has continued to grow, removals should be increased. For example, if after 5% removals, the population continues to grow by 2% per annum, the annual removals can be increased to 7%. However, removal levels must never exceed r_{max} (around 9%). On the other hand, if the population is close to or above the estimated ECC, densities should be reduced to 75% of ECC as soon as possible (preferably in one year and by at least 10% per year). To help achieve this, and to avoid skewing donor populations towards older animals, it was recommended, based on Zimbabwean experience, that cow-and-older-calf pairs also be removed. Once the population has been reduced to 75% of ECC, 5%+ per year may be removed (again, never exceeding 9%).

The principle underlying this new strategy is that the population itself will adjust its density to the level that can sustain the given percentage offtake. Should carrying capacity increase or decrease over time, the population will automatically adjust its density, up or down. For larger populations, the proposed revised removal strategy has a number of practical and biological advantages over the existing strategy of 'manage at or below 75% of ECC'. One is that continual reassessment of carrying capacity and sustainable yield densities will no longer be necessary. If implemented, this new harvesting strategy will ensure that donor populations contribute at least 5% per annum to the metapopulation and that populations cannot be 'under-' or 'over-harvested'.

The proposed revised strategy is an attractive and understandable option. Field managers appear to be more comfortable with this strategy and hence more likely to support it. It also provides a better idea of approximately how many animals may be available for translocation at a national level, thus facilitating better decision-making on metapopulation management.

Because the dispersal of black rhinos is ostensibly poor, concern was expressed about the potential negative effects of concentrating removals in particular areas within a park. Such removals may create low-density zones and in the short term do little to reduce rhino density in the rest of the park. Existing data should be analysed to show if this has happened in any park. As part of a post-doctoral research program funded by the San Diego Zoo, Dr Wayne Linklater will investigate the social aspects of translocations for both donor and recipient populations. It is hoped this research will result in guidelines to increase the success of future translocations.

The results of the workshop are currently being written up. The challenge for the months ahead will be to disseminate workshop findings and recommendations to individual management agencies and management teams on the ground. If the recommendations, especially the recommended proportional removal strategy, are implemented, the result should show increased metapopulation growth, more rhinos and a shorter period needed to reach metapopulation targets.

The workshop was made possible by the Italian-funded SADC Regional Programme for Rhino Conservation, which funded the workshop and organized the air tickets for the delegates. WWF's partial support of the AfRSG Scientific Officer enabled him to locate funding and organize the workshop. The able facilitation by Trevor Sandwith, the good background presentations, and delegates'active and good-spirited participation in the workshop contributed greatly to the workshop's success, ensuring that key issues were raised, and debate was stimulated both ahead of and during the working group sessions. The RMG thanks all delegates for their hard work.