INTRODUCTION

When an animal is losing condition, the fat reserves are mobilised and then muscle wasting sets into supply the required energy demand. Body condition scoring assesses the amount of subcutaneous fat and the degree of muscling. This will reflect changes in body weight and provide an estimate of nutritional status and fitness. The average condition among animals indicates the response of a population to prevailing environmental conditions. However, behaviour and sex-based differences between individuals also effect condition. For example, nutritional demands on females increase greatly during late pregnancy and lactation, and such females are often the first to lose condition when food limitations arise.

In animal management, many important decisions, e.g. the provision of supplementary feed, are based on the assessment of body condition. In game species, the assessment of body condition during boma confinement and in the initial post-release period provides an indication of the response of an animal to the translocation and its new environment. In black rhino, loss of body condition is often the only indication of chronic disease. Resistance to disease, drought and frost are also related to an animal’s condition. Moreover, there is evidence that mammals may require a minimum level of body fat for adequate reproductive performance. The provision of a standardised, reliable body condition scoring system for black rhino will enable management to be optimised and increase the speed at which several problems can be detected.

During 1996 a study has been conducted in Namibia by H.-O. Reuter and L.J.I. Horspool, during which a simple descriptive 5-point scale for assessing condition of several body regions of black rhino has been statistically tested for the repeatability and agreement between observers. The results of this study have been published in a paper presented at the Joint 50th Anniversary Congress of the Namibian Veterinary Association and 2nd Africa Scientific Congress of the World Veterinary Association, 10-12th September 1997, Swakopmund, Namibia. (Assessing body condition using observable criteria in free-ranging black rhinoceros, Diceros bicornis bicornis. Reuter, H.O. and Horspool, L.J.I.)

The most repeatable use of the scale was by calculation combined scores given to the various body regions by an observer. During the study it was apparent, that the subjectivity of a descriptive scale scoring system led to assessor bias, i.e. a tendency for some assessors to score consistently high or low.
More detailed description of the body regions to be assessed and better pictures to illustrate the specific characteristics of each body condition score will help to minimise such assessor bias, thus providing a standardised, reliable and repeatable body condition scoring system for black rhino.

**DESCRIPTION OF BODY REGIONS TO BE OBSERVED WHEN ASSESSING BODY CONDITION IN BLACK RHINO**

The neck
The rhino neck has a complex set of muscles between the back of the head to the rhino’s whithers, shoulders and chest, allowing the wide range of movements necessary for moving the head during feeding, and lifting and balancing the forequarters while walking or running. The nuchal ligament runs along the top of the neck from head to whithers, above the neck vertebrae which are more deeply embedded in the neck. This muscle and ligament structure means the neck can change greatly in appearance, providing a useful measure of condition.

- When black rhino are in good body condition the neck region appears thick across the top, and is well muscled, with a smooth gradation between it and the shoulder blade. It must be noted that adult rhino bulls have a thicker (more muscled) neck than female rhino.
- As body condition deteriorates and muscle wasting sets in the neck region becomes narrower and flattened in appearance. The muscles hollow out in front of the shoulder blade, so that a prescapular groove develops.
- Eventually the -nuchal ligament, back of the skull (occipital bone) and in very emaciated rhino the cervical (neck) vertebra become visible.
- (Neck muscles include the cervical part of the trapezius, splenius, cervical serratus, rhomboideus, complexus and the brachoecephalic muscles.)

The shoulder (scapular) region
- The scapular (shoulder-blade) with its spine is a prominent bony feature in the shoulder region.
- When a rhino is in good condition, this area is well covered by the infra- and supraspinatus, the deltoid and the trapezius muscles, and the subcutaneous fat layer under the thick skin.
- The rounded appearance of the shoulder changes by a flattening of the region, as body condition deteriorates.
- The scapular spine appears with the scapula becoming more sharply defined, and the muscled areas appear concave in front of and behind the scapular spine as body condition worsens.

The ribs (costal region)
- When rhino are in excellent condition the ribs are covered with thick skin folds, especially just behind the shoulder and elbow region.
- As the subcutaneous fat reduces in thickness, the ribs become visible and with further loss in condition increasingly more noticeable.

The spine (vertebral region)
The spinous processes of the vertebral column are visible along the top (dorsally) by the supraspinal ligament and on either side by the longissimus dorsi muscles.

- The vertebral region appears rounded and the long back muscle and fat deposits fill the gap between the ribs and the spine, if black rhino are in excellent condition.
- As the subcutaneous fat layer is lost the supraspinal ligament, which covers the spinous processes become visible as a defined line.
- Due to wasting of the longissimus dorsi muscles, the back hollows out either side of the spine, which become progressively more obvious. Eventually the costal processes of the vertebrae become visible.

The rump (gluteal region)
The bony protuberances of the pelvis, namely the tuber coxae, the tuber sacrum and tuber ischiadicum, and the major trochanter of the femur along with the surrounding gluteal and biceps femoris muscles are good indicators of a rhino’s condition.

- If a rhino is in excellent condition this region appears rounded and the bony points are covered.
- The rump starts to hollow out quite early on during loss of condition, and the bony points become visible as a rhino is losing condition.
- As condition worsens, the bony protuberances become increasingly prominent and the muscled region eventually appears markedly concave, with ropyligaments and muscle strands showing under the skin.

The abdominal region
- The abdomen appears filled and taught when a rhino is in good condition.
- As a rhino is losing condition, the abdomen becomes
**Table 1. Descriptions of the appearance of each of the assessment sites at different body conditions in black rhino (modified from Reuter and Horspool, 1996).**

<table>
<thead>
<tr>
<th>CONDITION Assessment site</th>
<th>Numerical scale</th>
<th>Descriptive scale</th>
<th>5 excellent (heavy)</th>
<th>4 good (ideal)</th>
<th>3 fair (average)</th>
<th>2 poor (thin)</th>
<th>1 very poor (emaciated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Neck</td>
<td>General appearance</td>
<td>thick, well muscled, rounded</td>
<td>well muscled, rounded</td>
<td>rounded flat, narrow neck; nuchal ligament visible</td>
<td>narrow, angular (bony) neck; nuchal ligament prominent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescapular groove</td>
<td>-</td>
<td>slightly visible</td>
<td>obvious</td>
<td>deep groove very obvious</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Shoulder</td>
<td>General appearance</td>
<td>well-muscled, rounded</td>
<td>rounded flat</td>
<td>flat, slightly angular (bony)</td>
<td>angular, bony</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C Ribs</td>
<td>Scapula</td>
<td>covered</td>
<td>covered</td>
<td>spine visible</td>
<td>obvious</td>
<td>obvious</td>
<td>very obvious</td>
</tr>
<tr>
<td></td>
<td></td>
<td>well covered (skin folds)</td>
<td>covered (skin folds)</td>
<td>visible</td>
<td>obvious</td>
<td>very obvious</td>
<td></td>
</tr>
<tr>
<td>D Spine</td>
<td>General appearance</td>
<td>rounded</td>
<td>slightly angular</td>
<td>back groove back visible</td>
<td>groove deep obvious</td>
<td>back groove very obvious</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spinoous processes</td>
<td>covered</td>
<td>slightly visible</td>
<td>visible</td>
<td>prominent</td>
<td>very prominent</td>
<td></td>
</tr>
<tr>
<td>E Rump</td>
<td>General appearance</td>
<td>well rounded</td>
<td>flattened</td>
<td>slightly concave</td>
<td>concave obvious depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bony protuberances</td>
<td>covered</td>
<td>slightly visible</td>
<td>visible</td>
<td>prominent</td>
<td>very prominent</td>
<td></td>
</tr>
<tr>
<td>F Abdomen</td>
<td>General appearance</td>
<td>distended, taught</td>
<td>filled</td>
<td>slightly tucked in</td>
<td>tucked in</td>
<td>tucked in</td>
<td></td>
</tr>
<tr>
<td>Flank-fold</td>
<td>none</td>
<td>sometimes</td>
<td>slightly visible</td>
<td>visible</td>
<td>obvious</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G Tail base</td>
<td>rounded (bulging)</td>
<td>rounded</td>
<td>narrow</td>
<td>slightly bony</td>
<td>very thin and bony</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1. The body regions and specific anatomical features to be observed when assessing a rhino’s condition.

Figures 2. The appearance of black rhino for all body condition scores.
tucked in and a skin fold in the flank becomes visible. During a period of anorexia this flank-fold also becomes prominent, even though the rhino has not otherwise lost condition noticeably. This suggests that the fullness of the intestinal tract and the state of hydration influence the prominence of the flank-fold.

The tail-base (caudal region)

The amount of subcutaneous fat around the tail-base can help to indicate how good a rhino’s condition is. From forming a broad swelling up to the spine, this area narrows and appears more and more bony and raised above the rump, as condition deteriorates.

ASSESSMENT PROCEDURE

• Satisfactory condition scoring can only be achieved if an undisturbed rhino is viewed from it’s side at close range (not more than 100 metres away) in the open using binoculars. The quality of light is important for reliable assessment and preferably the rhino must be viewed slightly back-lit (early morning or late afternoon), so that any bony prominence become noticeable through the contrast revealed by their shadows.

• The most reliable and repeatable body condition scoring will be achieved by assessing all the regions separately, giving a score (1-5) using unit increments to each region and then combining these scores or calculating their average.

• It may be useful to observe other body regions as well. For standardised, repeatable assessment, however, the side view of the above mentioned regions was found to be most reliable.

• Frequently rhino may, however, present facing the observer or run away before assessment of all sites is completed. Sometimes not all assessment regions are visible, e.g. when rhino are found in thick bush. Also, rhino in a boma are frequently viewed from an elevated position and rhino seen from an aircraft are viewed at an angle from above. Even if only some of the above body regions and their characteristics can be assessed during a rhino observation, some indication of the rhino’s body condition will be gained.

• Observers trained to assess condition by applying the described method, will usually find it easier than untrained people to get some indication of a rhino’s body condition, even if conditions for observation are not optimal. The reliability and repeatability of such observations can be assumed to be less consistent, however, than assessment of all the regions under optimal condition. Therefore, whenever possible efforts should be made to view rhino under optimal conditions when assessing their body condition.

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