

# Using eye and profile wrinkles to identify individual white rhinos

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## Introduction

Following the successful identification of the individuals making up the black rhino population of Solio Game Reserve, central Kenya (Patton et al., 2007), management requested a census of the white rhino population in 2007. There were no accurate population data but an aerial census in 2006 suggested some 100 individuals populated the reserve. The white rhino population was the product of an initial 16 individuals imported from South Africa in 1980 and had hardly been disturbed by humans in all that time apart from some occasional translocations to other reserves.

In the case of the Solio black rhino population, many could be distinguished by ear markings such as natural tears and holes caused by the bush habitat and unique patterns of the fringe hair (Patton et al., 2007). This was not the case for the Solio white rhinos where their habitat is largely open plain or open bush, which had only caused natural changes to the ear structure of three individuals. None of the Solio white rhinos had been artificially notched. Individual identification would have to be principally by age class, sex and horn size and shape.

Research into the use of eye wrinkles for individual identification in black rhinos (Patton & Jones, 2010) suggested that such a method could prove useful in identifying white rhinos.

## Method

Each of the white rhinos was photographed from a small vehicle. A digital camera, Minolta Dynax 7D, was set to automatic ISO400, using image stabilizer and a 70 to 300 mm, 1.4–5.6 Sigma DG zoom lens. Left and right head profiles of each rhino were taken from as close as possible and the age class (Adcock & Emslie, 2003) and sex recorded.

Photographs of all the white rhinos observed, taken over the available three-week period in February 2007, were transferred to a Toshiba Tecra computer

and head profiles cropped using PaintShopPro 9 software. The resulting photographs were compared visually and a database of individuals created.

This protocol was repeated for the annual censuses carried out over a three-week period in the month of June in 2008, 2009 and 2010. In addition, identification photographs of new calves (up to the age of around one-year) and their mothers were taken at various times throughout the years and added to the database.

## Results

The initial census identified 131 individuals; 142 in June 2008 after seven deaths; 156 in June 2009 after four deaths; 155 in June 2010 after five deaths. There were no adult rhinos identified that were not found during the initial census. After the 2008 census there were two cases where adults were considered to have been duplicated in the initial census.

Eye and profile wrinkles were found to be useful in separating individuals—especially those sub-adult and immature adults whose horn size and shape was largely similar.

The eye wrinkle pattern can be defined as wrinkles that surround the eye and the most useful for distinguishing individuals were found to be those lying in front of the eye. The profile wrinkle pattern is comprised of the wrinkles between the base of the horn down to the lower jaw and across the side of the face. The most useful for distinguishing individuals were found to be those running across from the base of the horn and often supported by those running down the side of the mouth.

The key distinguishing wrinkles for identification could be either a set of eye wrinkles or a set of profile wrinkles with neither being more or less useful in general. While more identification information was available from photographs of both left and right profiles, identifications could usually be made from one or the other but at a reduced level of certainty.

## Discussion

The initial period used for the census was chosen by default, as this was the time available for the project executants. However, in subsequent years it was found that this period was necessary to find and photograph over 95% of the 140+ individuals.

A green Suzuki Maruti Gypsy vehicle was found to cause minimal disturbance to the white rhinos. The species appeared to be very inquisitive and, on parking in an area where there were rhinos, individuals would come within five metres of the vehicle enabling clear photographs to be taken. It was possible to obtain photographs with appropriate detail of eye and profile wrinkles from a distance of up to 30 metres using the zoom lens. By selecting automatic contrast enhancement, the computer software enabled, where necessary, some improvements in the contrast between the wrinkles making up the pattern.

Profile photographs were taken as best as possible at right angles to the head. It was found that, for comparing photographs, the key wrinkles used for identification were discernible from photographs taken within the range of 65 to 115 degrees, (25 degrees either side of a right angle).

Collecting data on as many identification features as possible is essential for the most accurate identification of individual rhinos; wrinkle patterns were only considered an additional feature (Patton & Jones, 2010). In comparing photographs from different years, all available features were used for identification. In addition, it is not recommended to obtain a close-up photograph of the profile wrinkles alone as too much detail can obscure the distinguishing pattern.

Sex and age differences were easily observed and used as the basis for initial classification. Distinguishing the sex reduces the potential population by half. For comparing photographs, age was not rigidly defined but classed into small calf, large calf, sub-mature/immature adult and adult. A calf was considered to be one that was clearly smaller than and with its mother; a small calf somewhat less than half the size of its mother and with no discernible or minimal rear horn; a large calf somewhat larger than half the size of its mother and with a discernible rear horn; sub-mature/immature adult was defined as independent of its mother and associating closely with other individuals; adult was a female with calf or a single male with large body size and well developed horns. Using this loose system meant it was easier to handle a large number

of photographs even though some individuals were found to be border-line in definition and had to be checked against its two possible classes.

Horn size and shape changed with age and on a few occasions with breakage. It was particularly difficult to identify individuals using horn features among sub-adults where the horns of two or more individuals were visually similar. Eye wrinkle and profile wrinkle patterns were consistent over the years once they had been established but it was not possible to determine whether these change over a longer time period given the potential 40+ year lifespan of a rhino. Key wrinkles were visible in calves from around one year of age in some individuals and by two to three years of age in all individuals. Both eye and profile wrinkles were found to be unique to each rhino. On the rare occasion when two wrinkle patterns looked similar, there was at least one obvious difference separating the two.

One of the rhinos lost its front horn early in 2010. The rear horn was small and of no special value for identification purposes. Only by comparing eye and profile wrinkles was it possible to show it was the sub-adult female 082. In addition, six white rhinos that had died during 2009 and 2010 – three from poaching and three from natural causes – were positively identified using wrinkle information. In taking photographs from carcasses, it was found that, while it would seem appropriate to take wrinkle pictures from as close as possible, there was often too much detail which obscured the main elements for identification. Photographs taken from a distance similar to that of live animals were preferable for this purpose. Carcasses were normally found lying on one side and were moved on to their belly to enable left and right profile photographs.

## Conclusion

Eye and profile wrinkles were found to be important and robust features to aid in the identification of individual white rhinos (Fig. 1), alive or recently deceased and with or without horns present.

## References

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Figure 1. Examples of the key eye and profile wrinkles of four white rhinos at different ages.

