## Method / Technique

# Identification of the Nile crocodile *Crocodylus niloticus* by the use of natural tail marks

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The tail marks of 190 Nile crocodiles *Crocodylus niloticus* were documented and processed into codes. The size of the crocodiles varied from 45 cm to 4.6 m in total length. Wherever possible, both sides of the tails were observed and the marks documented. In all remaining instances only one side could be identified. A total of 267 sides were identified. The natural marks on nine segments of a specific portion of the tail was recorded and compared as codes. For this comparison two methods were employed. Differences of 95.1% and 100% was found with the respective methods. This is an indication that every crocodile has a unique pattern of natural marks on its tail. The marks can therefore be used to allocate a code to an individual crocodile that partially eliminates the necessity of artificial marking methods.

Key words: tail markings, segments, codes, crocodile, Kruger National Park.

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## Introduction

The number of crocodiles in the Kruger National Park was estimated to be 4 500 in 1993 (Viljoen 1993). These animals are free roaming and it is difficult to distinguish individuals without artificial tags. During 1994, a preliminary study was launched to collect data on breeding patterns and nesting sites. No individual was, or could be, marked artificially. It is virtually impossible to catch the same crocodile again to remove the tag after completion of the project. An alternative, that was both accurate and convenient to use, had to be found to identify individual animals. This paper describes the method that was used and the results obtained.

## Study area

The facilities at Mvuleni Crocodile Farm, Trichardtsdal, were used for the experiment, while another part of the experiment was done in a section of the Olifants River in the Kruger National Park (KNP).

## Method

An identification method was developed in which the natural marks, as they occur on a portion of both sides of the tail, can be used. These natural marks were processed into a numerical code with the aid of a computer. Both the left and right-hand sides of individual crocodiles were coded whenever possible. Initially the crocodiles in a part of the Olifants River in the Kruger National Park were caught in traps for the collection of dimensional data. Due to the difficulty of gathering sufficient field data the project was continued on a crocodile farm. One hundred and ninety crocodiles of various sizes, ranging from 45 cm to 4.6 m, were used. The sex of the individual animals was not considered. From these 190 animals, 267 codes were compiled. The tail of a crocodile is vertically segmented. These segments have horizontal marks that are naturally coloured. The colour varies from a very light grey to black. For the purposes of this paper only two colours are defined, namely grey and black. These colours are arranged in patterns which are presumably unique for each crocodile. Furthermore, it seems that the pattern is also unique for each side of an individual's tail. For practical reasons the shortest possible portion of tail that produces a satisfactory degree of uniqueness was used. The portion that was used is relatively easy to identify and therefor practical to use in nature (Fig. 1.)

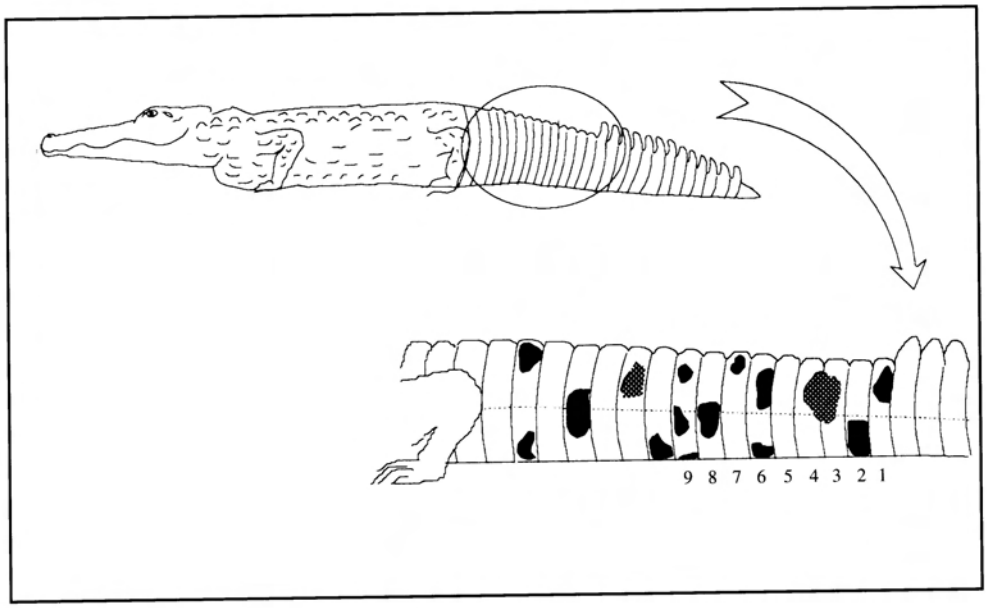


Fig. 1. Tail section used for identification.

The tail is viewed from the distal end and the first nine segments with two horizontal scutes, proximal to the last segment with one vertical scute, are used for identification purposes. Initially the whole portion of tail from the most distal horizontal scute to the hind legs was used but this practise proved to be both impractical and too time consuming. The process was refined on a computer and reduced to the aforementioned nine segments. This refined method was tested in practise and has, to date, proven to be very successful in field tests.

The segments are numbered (1-9) from back to front, with segment number nine closest to the hind legs. The marks are noted according to the number of the segment on which it occurs. If more than one dark mark occurs on a single segment, the number of that segment is repeated (see Fig. 1). The greatest number of marks on a single segment was four, although this was rare. A distinction was made between black and grey marks by placing the latter in square brackets, i.e. [ ]. If a mark covered two segments, the numbers were placed in standard brackets, i.e. ( ). The latter phenomenon was rarely seen, as in most instances two individual marks on two adjacent segments only appeared as if they were one.

### *Method 1*

If no distinction is made between grey and black marks, the numerical code for the tail in Figure 1 would be the following:

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L12346678999
```

### *Method 2*

In this case a distinction is made between the grey and black marks. If Figure 1 is used again, the code will be as follows:

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L12([34])667899[9]
```

### *The code:*

| | |
|---|---|
| L | Left side of the tail |
| (34) | There is a mark that extends across two segments, i.e. segments 3 and 4 |
| [34] | Indicates that the mark that extends across segments 3 and 4 is grey or lighter coloured |
| 66 | Two marks on segment 6 |
| 99[9] | One of the three marks on segment 9 is grey. |

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Wherever possible, a sketch of the tail section was made that accurately reflected the exact location and pattern of the marks. This served as a further aid to eliminate any doubt during the formulation of the different methods. These sketches were placed on record to serve as reference when compiling a more comprehensive database on individual animals.

## Results

*Method 1*

Of the 267 codes recorded, 254 differed and only 13 were matching. This indicates a difference of 95.1 %. This method is easy to use and with practice, can be employed relatively fast. This fact is useful as crocodiles tend to disappear into water without delay at the slightest indication of danger. The disadvantage, however, is that it is limited in terms of accuracy - a vital fact when accurate identification is required in large databases.

*Method 2*

Out of 267 recordings, all 267 (or 100 %) differed. Although this method is more involved than Method 1, it is more comprehensive and accurate, for which reason it was used during these trials.

The biggest disadvantage of both methods is the fact that, in nature, only one side of the crocodile's tail is visible at any one time. This creates confusion whenever the alternative, unrecorded side is observed. Method 2 was, however, used with great success in the study of breeding females. The localities of nests were known and the attending females could be accepted as being the same as before, thus both sides could be recorded over time.

Individuals with distinctive physical characteristics such as truncated tails, skin colour and lesions did not present any problems either, and both sides of the tail could be recorded as belonging to one animal. This was also the case with the crocodiles caught in traps.

## Conclusion

This method of identifying crocodiles was initially time consuming but was mastered quite fast. The biggest advantages are that the identifying marks do not disappear or get lost as artificial ones do, and that the physical appearance of the crocodile is not spoiled. The disadvantage is that the crocodile is not 100 % identifiable until both sides are recorded and allocated to the same animal. Under certain circumstances this is not critical.

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