APPENDIX 2.3? 1995

R.M.G.
Rhino Management Group

Richard H. Emslie, Box 707, Rustenburg, 0300. ☎ 01465 55351 ext273 FAX 01465 55525 Coordinator Status Reporting - Chairman Data Management and Statistical Analysis Sub-Group

FINE TUNING THE RHINO MANAGEMENT GROUP AGE CLASS SYSTEM

Richard H Emslie [1], *Keryn Adcock* [2], & *Hans Bjarne Hansen* [2,3]

1: Ecoscot Consultancy Services; 2: Bophuthatswana National Parks & Wildlife Management Board; 3: Independent Consultant

SUMMARY

The major problem with the existing RMG ageing categories as set out in the Conservation Plan (Brooks P.M. 1989) was that it proved difficult to correctly age E class animals in the field. The lumping of the Hitchins' (1970) old D and E classes to make a new D class (2-4yrs) solves this problem.

Given that one of the main aims of regional monitoring is to provide comparative data to guide biological decision making it also makes sense to sub-divide the old F class and use the new E (sub-adult) and F (adult) classes. By adopting a new sub-adult class (new E) the performance indices we calculate from our data will be greatly improved. Our knowledge of age and sex specific mortality rates will also improve, leading to better metapopulation population modelling and biological scenario planning in future.

Whatever system is chosen there still will be some errors made in ageing animals at the borderline between classes. Based on the study of photographs of known age animals the borderline between sub-adult and adult animals based on horn sizes and shapes has been set at 7 years old for females and 8 for males. The sex difference was because males proved harder to age on account of the generally greater rates of wear of their horns, and especially their back horns.

The revised RMG age classes are as follows:

- A: ≤5months (unchanged)
- B: 5months-1 year (unchanged)
- C: Yearling 1-2 years (unchanged)
- D: 2 - 3½ years (new)
- E: Sub-adult ♀ 3½-7 years; ♂ 3½-8 years (new)
- F: Adult ♀ ≥ 7 years; ♂ ≥ 8 years (new)

Attempts were made to contact and discuss the proposed fine tuning of the age classes with at least one key person from each of the different conservation authorities in the RMG region. Unfortunately this proved impossible in the time available as a number of people could not be contacted as they were away from base camps, at meetings or sick. However, based on those canvassed, it was clear that a consensus had been reached. The proposed modifications to the age class system outlined in this paper have been discussed with Peter Hitchins, Peter Goodman, Trevor Sandwith, Michael Knight, Trevor Morley and Raoul du Toit. No-one contacted had any major problems with the proposed changes. Indeed the modifications to the RMG age classes were supported by all those canvassed.

Given this strong consensus, we therefore propose that the new system should be implemented with immediate effect (from April 1 1993) rather than postponing its implementation for another year in order to let everyone in the field vote on the matter. In any event, everyone in the field has had ample time to comment on the issue of field ageing criteria following two requests for comment from the RMG (Emslie 1991, 1992) so it cannot be argued that a new system is being unilaterally and autocratically imposed.

The adoption of these new classes both inside the RMG region, and in the major black rhino countries outside the RMG region will increase continental data compatibility. Kenya has already expressed a willingness to adopt the new RMG age categories when finalised (Jim Else & Rob Brett pers. comm.). Raoul du Toit (Zimbabwe) also supports the new classes.

The role of Peter Hitchins in particular needs to be acknowledged as our new D class just represents fine tuning of his system for ageing immature black rhinoceroses in the field (Hitchins 1970). Separating sub-adult animals from adults is not new either, it is just that our suggested system refines previous attempts to do this.

☞ ☞ ☞ ☞ Please advise all those monitoring black rhino that the new RMG age classes replaces the existing RMG age class system on April 1st 1993

INTRODUCTION

In the past it was often difficult to compare results between different reserves as very different ageing systems were being used. The RMG and the Regional Conservation Plan therefore has adopted and promoted the use of only one field ageing system in order to ensure compatibility of data between different reserves. Kenya and Zimbabwe are also interested in standardising on age classes to ensure maximum data compatibility.

To date, the RMG region has been using the field ageing system of immature black rhinos devised by Hitchins (1970) with the addition of a sixth adult or F class for those animals greater than 3½ years old.

However, many problems have been experienced in the field in correctly ageing D and E animals using multiple observers. RMG status reports have repeatedly discussed the problems being experienced. Sometimes even "experts" have had problems. Due to problems in correctly ageing E animals, some parks in the RMG region amalgamated their E and F class data and some their D and E class data. Clearly there was a major problem with the E class.

Suggestions and comment on how to improve the age classification system (or whether the status quo should be maintained) were called for from the field (Emslie 1991,1992). The RMG would like to thank those of you in the field, that responded to the call for suggestions.
While the existing system was not perfect, it was felt that unless alternative systems represented a marked improvement on the current system it would probably be better to stick with the status quo and retain the current system. However, after much deliberation and consultation with colleagues both inside and outside the RMG region; and after further research; the RMG has decided to change its age classes. This was not done lightly simply to satisfy some bureaucratic whim - It was done because it was possible to modify the old system to:

1) reduce the chances of incorrectly ageing old D and E class animals;

2) provide more appropriate age structure data which would allow population modelling and population performance assessments to be improved (i.e. introduce a new sub-adult class);

3) to allow maximum comparison with both previous RMG data, existing Kenyan, and past National Parks Board (of S.A.) data; and

4) to provide an ageing scale that could be simplified (by amalgamating classes) if data quality was low in any particular area.

Data from the Pilanesberg National Park monitoring programme was especially useful in helping test out alternative ageing systems. This was because the approximate ages of all the younger animals are known; and the majority of animals have been photographed every year for the last four years (Hansen & Lindemann 1989, 1990, 1991; Lindemann & Hansen 1992). It was therefore possible to compare black rhino sighting forms from the field with photographs of each animal to see where most of the problems lay with the current ageing system. Alternative ageing systems were evaluated by estimating the ages of different rhino by looking at the photographs, and then comparing the results to the actual ages of the animals. Sequences of photographs of individual animals were also studied to detect cut-off points in the ages of animals that could be easily identified.

Given different rates of horn wear and/or growth rates of horns in different areas, photographs of known age animals in other areas can be used to draw up reserve specific criteria for correctly ageing black rhinoceroses. This paper therefore provides the basic descriptions of how to age animals which can then be fine-tuned for each population if need be.

The upshot of all this research and discussion was that it was decided to modify the existing RMG age categories in two ways. This paper outlines the changes to the system and explains the reason for these changes.

Unfortunately in the time available it was not possible to contact all of you in the field. Attempts were made to contact at least one key person in each of the conservation bodies in the RMG region. After discussion of the issue with a number of people, a general consensus was reached that the proposed modifications to Hitchins' ageing series represented an improvement. If consensus had not been reached the status quo would have been maintained; however no one that was approached had any major problems with the new system.

FIRST THREE AGE CLASSES (A,B & C) STAY THE SAME

The first three of Hitchins' age classes A ($\leq$ 5mths), B (6mths-1yr) and C (1-2 yrs) have generally been successfully applied in the field. These have been left unchanged.

OLD D AND E CLASSES TO BE LUMPED TO CREATE NEW D CLASS

THE E CLASS PROBLEM

As mentioned above a number of status reports in previous years have indicated that there were problems in correctly ageing D (2-3 years) and E (3-3½ + years) class animals. Experience has shown that E class animals have been particularly prone to be classified either as a D or F class.

Some black rhino have been observed to leave their mothers soon after they were three years old. If such animals are still seen with their mothers they may be aged D as it is obvious that they are much smaller. However if they are seen on their own without any other rhinos to compare against, they may be mistakenly aged as an F animal (>3½ + years). Alternatively if a young E class bull is seen standing next to a small adult female he may be classed as an F animal.

In Pilanesberg most animals have left their mothers by the time they are 3¼-3½ years. The animals Peter Hitchins originally based his E class on, ranged from 3-3½ years old (Hitchins 1970). Therefore, it appears that a major part of the problem of correctly ageing E animals is that this age class usually spans a small time period.

However, some animals remain with their mothers for longer periods. For example Peter Goodman noted (pers.comm.) that one known calf in Mkuzi has been seen with its mother for over four years. It has also been found that younger males often come back from time to time to spend time with their mothers after they have become independent (Lindemann & Hansen 1992, Sandwith pers.comm.).

THE SOLUTION - AMALGAMATE OLD D AND E CLASSES

Given the problems listed above, we felt it was reasonable to amalgamate the old D and E classes to form a new D class. This new D class therefore covers most of the animals still with their mothers. However, as discussed above some animals seen with their mothers may be greater than 3½ years old. Therefore, one must be careful not just to determine an animal's age simply on the grounds that it was seen with its mother. The use of horn criteria and size of animals should therefore be the main variables used to age animals greater than about 3½ years old.

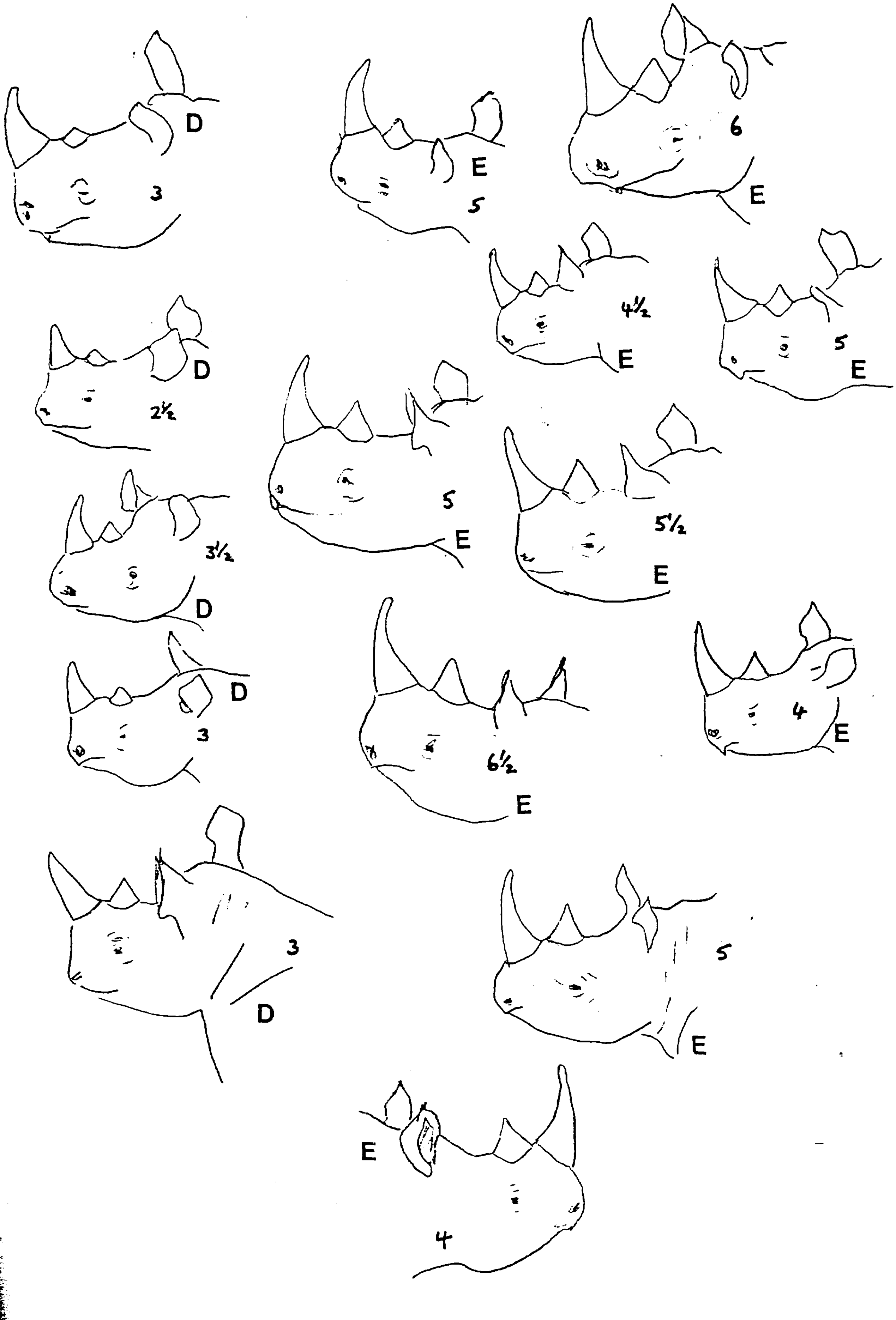
DISTINGUISHING BETWEEN (new) D AND (new) E ANIMALS

Figure 1 shows a range of D and E class animals. The younger D animals are easy to tell apart as they are smaller. Note the longer and more curved front horns on the new E class animals. The back horn on E animals is noticeably bigger and has taken on the classic almost equilateral triangular shape.

SPLITTING OF OLD ADULT F CLASS INTO A SUB-ADULT (new E) AND ADULT (New F) CLASS

One of the main reasons for wanting to sub-divide the old F class is that the adoption of the new adult F class will improve a number of performance indicators that we can calculate from age and sex structure tables. For example the ratio of the number of calves (≈ ≤3½ years old) to adults (F) will be estimated better in future using the new F class (≈ >7 years old) than the old F class (≈ >3½-4 years old). This is because

FIGURE 1: D AND E AGE ANIMALS



the new F class better reflects the number of breeding females (as the age at first calving is generally about 7-8 years in a healthy population). The proportion of the population that is adult is another good indicator of performance which will be improved by the adoption of the new ageing series.

Another reason for wanting to subdivide the old F class is that young males that have just left their mother are likely to be particularly susceptible to being killed by other males. **Splitting the old F class therefore allows us to separately estimate the mortality risk for sub-adults (new E) and adults (new F). This will provide better data for population modelling.**

However, should data quality be low (or all the animals be dehorned) in a particular area it still will be possible to amalgamate classes E and F.

The Pilanesberg photographs showed one could generally tell young sub-adults apart from fully grown adults without much difficulty on the basis of both size and horn sizes and configurations. Figures 2 and 3 illustrate the horns of some of the adult females and males in Pilanesberg. The key question was to determine what was the most appropriate cut off point to distinguish sub-adult from adult animals.

DISTINGUISHING E and F FEMALES

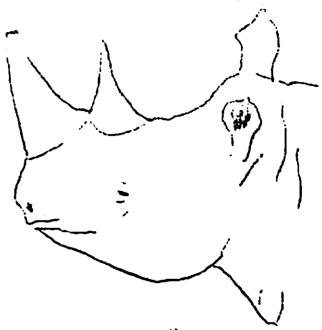
In Pilanesberg, younger females ($\leq$ 7 years old) had smaller horns, with the back horn being much smaller than the front horn and tending to have an almost equilateral triangular shape. The front horn of sub-adult independent females also still had its "young" shape and had not really started to lengthen, or curve to any great extent. Horn wear was also more pronounced on the older females; and the back horn was noticeably longer and often had generally lost its "equilateral" triangular shape to take on a more pointed and peaked appearance. Adult back horns may also become curved.

To summarise: One of the key ways to distinguish sub-adult from adult females (apart from size which is difficult if you don't have other animals to compare against) is both the size and shape of the back horn. As the females get older their back horns start to grow taller and take on a more pointed appearance, while sub-adults tend to have classic almost equilateral triangle shaped back horns. On adult animals the front horns had also grown much more and in many cases started to curve more.

Figures 4 and 5 show the development of the horns on two young females. In the case of Filana (Figure 4) it was difficult to age her when she was 6 years and 5 months old. The back horn has started to grow up and lose its regular shape. The front horn has also grown taller and started to curve. At this age we would class her as a probable adult (F?). A year later she is obviously an adult (F) as her back horn has grown taller and more peaked and her front horn is now markedly curved.

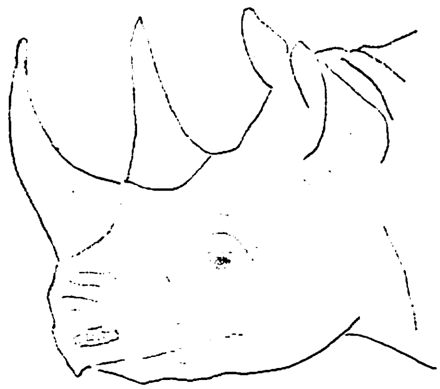
In the case of Mkuzi (Figure 5), when she was 5 years 10 months old her back horn had started to grow up and had a hint of a curve. However her front horn still a sub-adult shape. We would class her as a probable sub

FIGURE 2: F CLASS ADULT FEMALES



"PHOSO"

"GIJIMA" ≈ 13-15 YEARS



"PIGA PICHA" 18+ YEARS

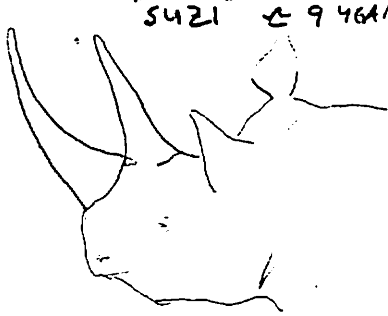
"BUGLEHORN" ≈ 15 - 17 YEARS

"DENGEZI" 19+ YEARS

"HAIRY-EAR" 17+ YEARS

"SUZI" ≈ 9 YEARS

"MKUZI" ≈ 8½ YEARS

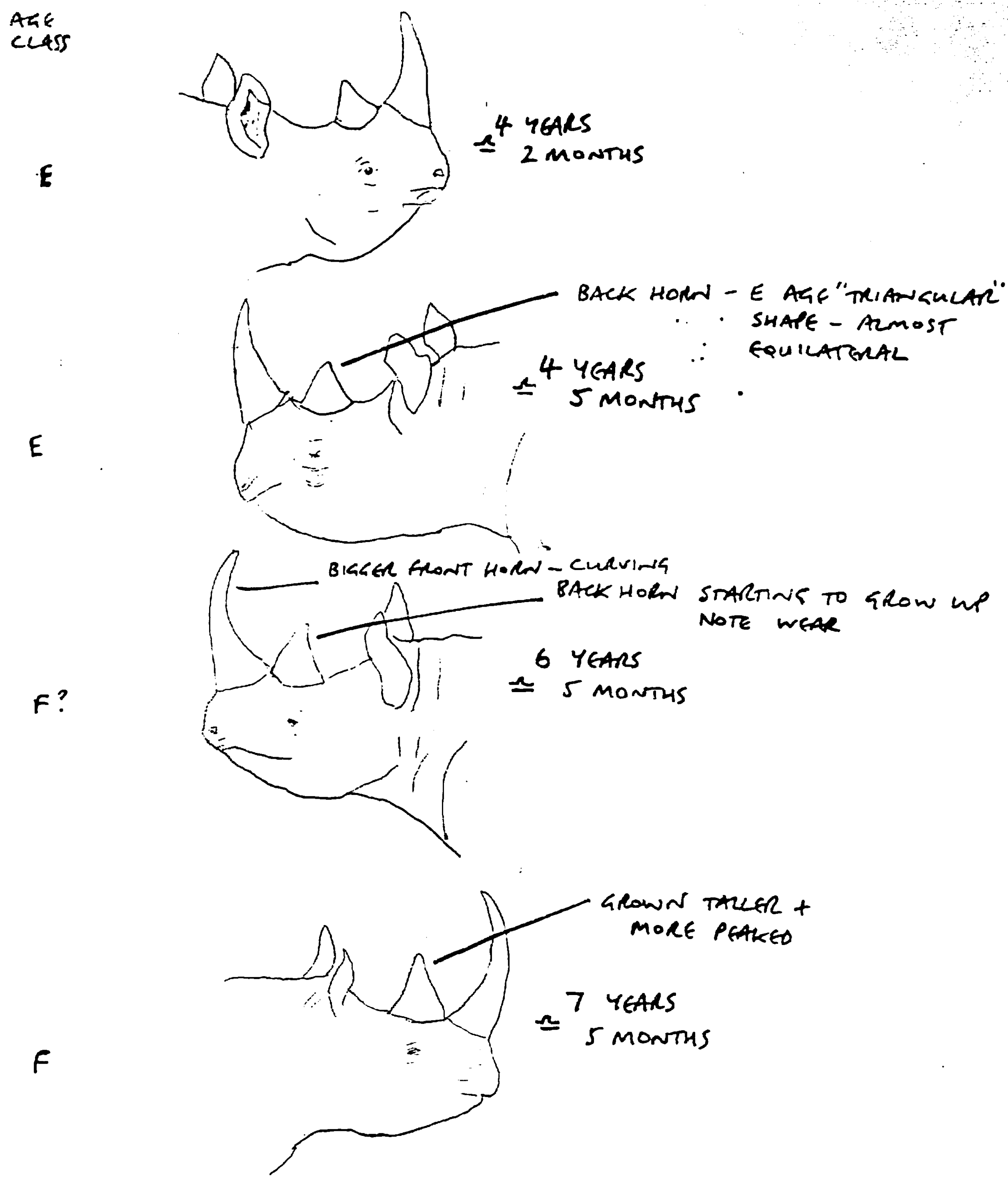


"DONGALINA" 18+ YEARS

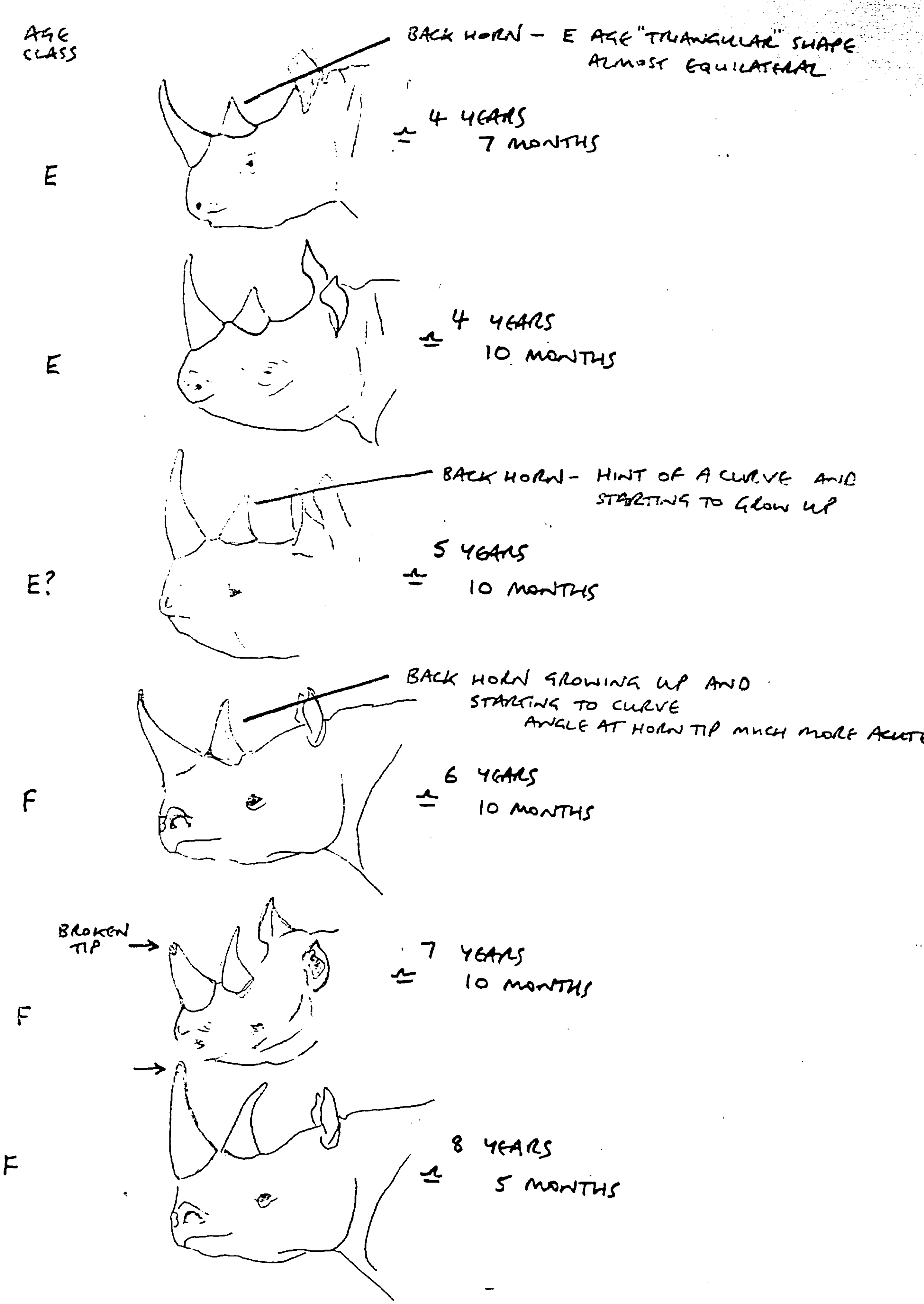
"FILANA" ≈ 7½ YEARS

FIGURE 3: F CLASS ADULT MALES

FIGURE 4: HORN DEVELOPMENT - CASE HISTORY (i)



"FILANA" ♀ BORN ≃ MARCH 1985



"MKUZI" ♀ BORN ≏ OCT 1984

adult at this age (E?). However a year later at about 6 years 10 months old she is clearly an adult. The back horn has grown up and it is obviously starting to curve. The front horn has got fatter at the base and the curved tip has become well worn.

DISTINGUISHING E AND F MALES

Sub-adult and Adult males proved harder to distinguish as they tended to wear their horns much more. In many cases the back horn is maintained in a shorter state through heavy wear. We found that the key feature of male horn development was that the horns got chunkier as the animals got older. As the males get older the basal circumference increases. Adult male back horns also tended to show more obvious signs of wear. This often resulted in horn outlines that had the odd bump (i.e. often taking on a more irregular appearance rather than a perfect straight line).

An ageing system has to be used by a range of observers, and not just very experienced observers. Thus while Peter Hitchins may be able to approximately age animals up to 10-11 years, this could not easily be done by the average observer with less experience.

E/F FUZZY ZONE

When animals are near the border between adult and sub-adult some classification errors are bound to occur. This will be the case whatever ageing system we adopt. **Fuzzy classifications can be indicated by adding a question mark. Where an observer is not 100% sure but thinks it is probably an E class animal he should age it E?. Similarly where an observer thinks it is probably an adult animal he would age it an F?.**

There was a fuzzy zone where ageing was difficult for both males and females. In males the fuzzy zone occurred approximately a year later than females and covered a slightly longer period. In both sexes it was easy to age 5 year olds. In females 6 year olds were often aged as F?. From 7 years onwards it was generally easy to correctly age females as adult (F). Biologically this is very convenient because it around this age that most females may start having their first calf. The proportion of adult (new F) females with calves will therefore provide a much improved index of a populations reproductive performance. In the case of males, 6 year olds were often aged as probable sub-adults (E?); while 7 year olds were often aged as probable adults (F?). From 8 years old onwards it was usually easy to correctly age males as adults (F).

To summarise: the study of the photographs revealed that in Pilanesberg it was about 6½-7 years old that the horns of most females appeared to cross from obviously sub-adult to adult. The same change occurred about a year later in males.

Figure 6 illustrates the horn changes between sub-adults and adults in Pilanesberg. The shoulder level of an A calf is less than or level with it's mother's inguinal region (Arrow 1 in diagram). The shoulder level of B class animals falls between the inguinal region of the cow and the base of her vulva (arrow 2 on diagram). The shoulder level of yearlings (C) will fall between the bottom of the cows vulva and the base of her tail (arrow 3 on diagram). D class calves have shoulder heights greater than the base of the tail up to slightly smaller than fully grown. The critical heights developed by Hitchins (1970) have been used here, except his D and E classes have been amalgamated. This simplifies the ageing of animals based on size class as one only needs to remember the three key cut off points (marked 1, 2 and 3 on the diagram).

Figure 6 also illustrates the "typical" pattern of horn size and shape evolution for females and males in Pilanesberg. The diagrams have been annotated to draw attention to key points.

Different reserves may have different wear patterns, but it should still be possible to tell the difference between sub-adults and fully grown adults. Peter Goodman in Mkuzi has also found that horn shape and size is a good measure of age on younger animals. The figures in this paper can provide guidelines which can be fine-tuned on a reserve to reserve basis to take account of local conditions.

Figure 7 illustrates how animal size is particularly useful for separating out A, B, C and D animals.

CONCLUSIONS

The ageing system used by Rob Brett in Kenya to date also subdivides those animals that have left their mother into younger sub-adults (4-6 years) and adults (>6 years). In the 1989/91 National Parks Board status reports Adults (F) were distinguished as animals over 8 years old, with the E class being for animals between 3 and 8 years old. In essence these two sets of sub-adult and adult categories are similar to the new RMG E and F classes. For his own records Peter Hitchins also subdivided the old F class into sub adults and adults (pers.comm.). In essence we have just fine tuned the distinguishing of sub-adults from adults using the extensive data sets and photographic files. The new E and F age class boundary approximates to those used in other areas facilitating comparison. As mentioned above, it should be possible for each reserve to fine tune the criteria for separating between sub-adult and adult animals under particular local conditions.

It just makes good biological sense to subdivide the old F class into sub-adult and adults, and the evidence to date indicates that on the whole adults and sub-adults can be successfully distinguished from each other in the field. The adoption of a fully grown adult class by Kenya and National Parks in the past supports this view.

We should not forget that whatever class boundaries we decide on, there will always be some misclassification of animals at the boundaries of age classes. The odd misclassification is a reality we have to accept. (In many cases subsequent sightings of the same animal may well indicate a past error in ageing). However by lumping the old D and E classes we will reduce the risk of incorrect calf classification. In the

FIGURE 6: REVISED NEW RMG AGE CLASSES

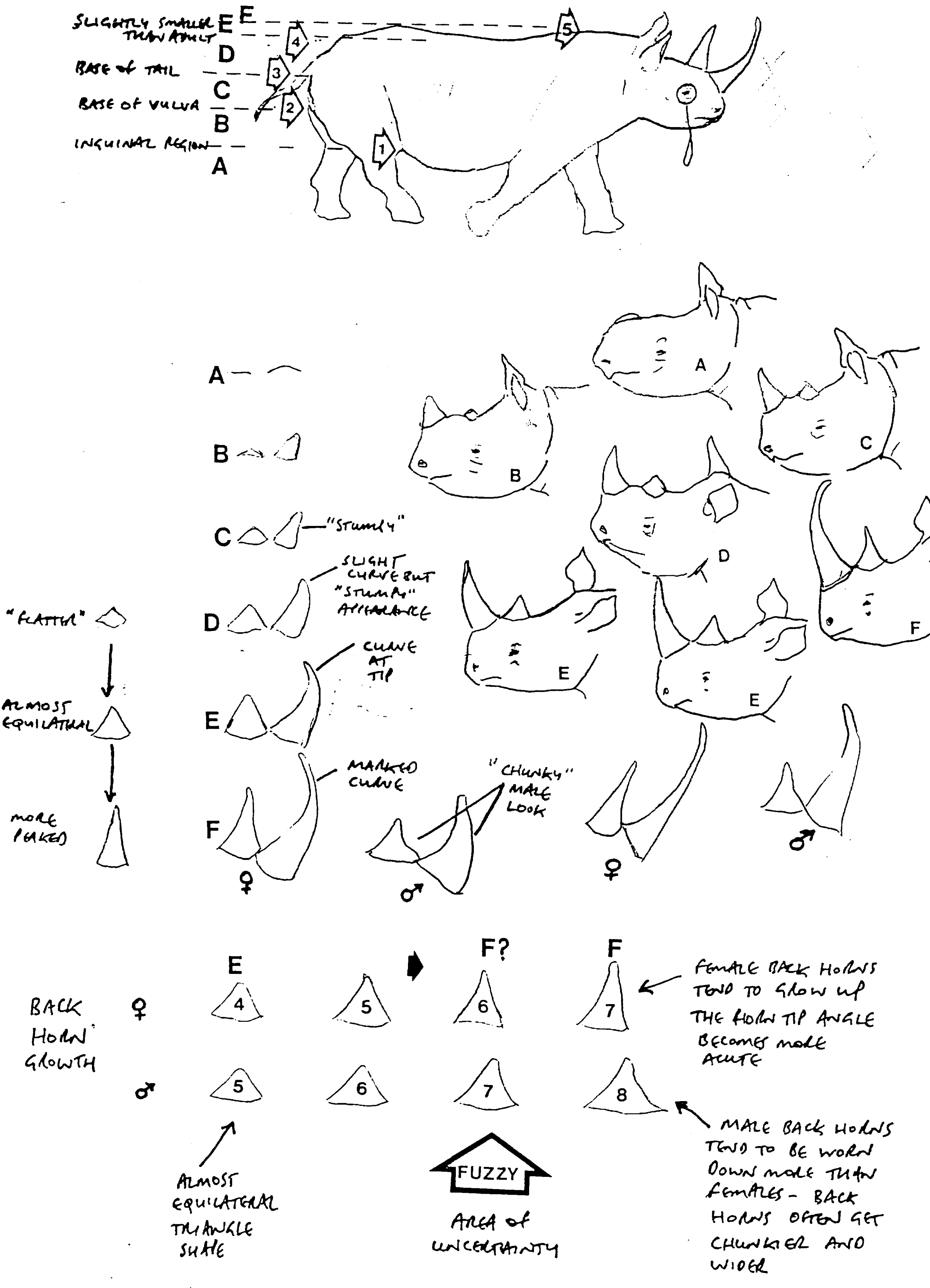
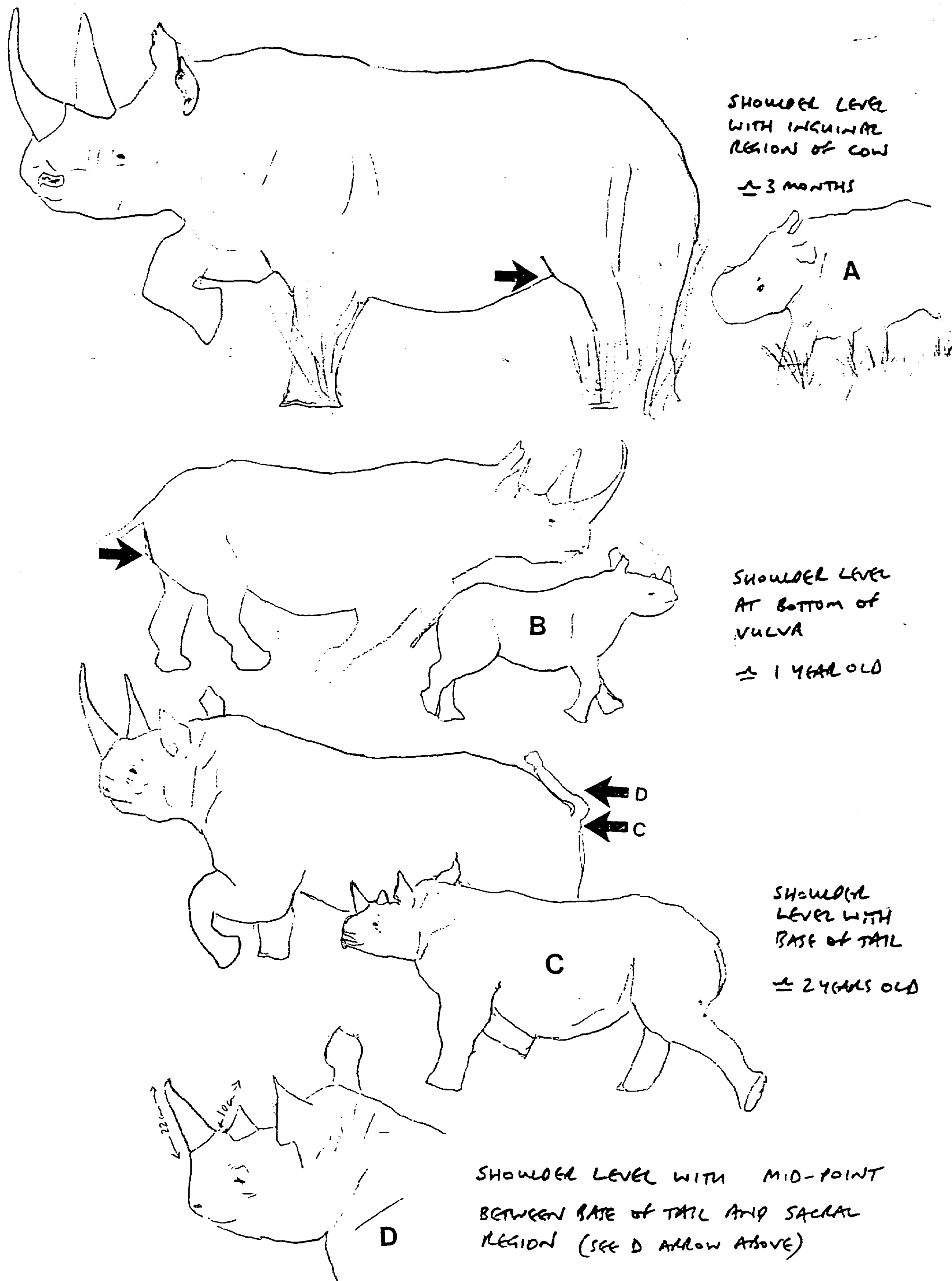


FIGURE 7: AGE AND CALF SIZE



case of boundary (E? And F?) animals the fact that the animal is borderline gives us a good indicator of its age.

WHO DID WHAT AND ACKNOWLEDGEMENTS

This paper was written by Richard H.Emslie (Ecoscot Consultancy Services) and Keryn Adcock (Bophuthatswana National Parks and Wildlife Management Board [Bop Parks]). Hans Hansen (Bop Parks & Independent Consultant) took the vast majority of the photographs of Pilanesberg's black rhino over the last four years which were used in assessing alternative age categories.

Bop Parks are thanked for providing access to all their black rhino monitoring data and photographs. Hans Hansen, Hanne Lindemann and Keryn Adcock did the majority of the collating of the photographs and sighting records. Thanks to the Pilanesberg section rangers George Phiri, Freddie Mothlathedi and William Sehularo, their game scouts, Hans Hansen, Hanna Lindemann, Bob Keffen, and the staff of Pilanesberg Safaris, Bakubung Lodge and Kwa-Maritane who provided the black rhino sighting data.

Thanks also to all those who took the trouble to comment on the ageing issue in the past. We would like to thank Peter Hitchins (Kangwane Parks Corporation), Peter Goodman, Trevor Sandwith (both Natal Parks Board), Michael Knight (National Parks Board), Trevor Morley (Game Production Unit - Roodeplaat Grassland Institute and ex-Natal Parks Board), and Raoul du Toit (WWF seconded to Zimbabwe Department of National Parks and Wildlife Management Board).

This paper forms part of the final larger scale recommendations of Black Rhino 2000; which was a joint collaborative project of Ecoscot Consultancy Services, The S.A. Nature Foundation, The Endangered Wildlife Trust, Total Oil (S.A.). and the Natal Parks Board.

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