

of the pods of the indehiscent species examined is not due to any exceptional nutritive value of the pods themselves which would distinguish them from the dehiscent types.

It is most likely, therefore, that the large size and bulk of the indehiscent pods, their conspicuousness, and the ease with which they are obtained in quantity from the ground with the minimum effort by the animal cause them to be eaten in such large numbers. Pods of the dehiscent species are usually smaller and frequently have to be plucked from the tree so that the large feeding animal expends more time and energy for a smaller return.

In addition all of the indehiscent *Acacia* pods have, to a varying degree, a strong, rich and not unattractive aroma which can be smelt from some distance and which quickly pervades a room in which the pods are stored. It is probable that this aroma, which is lacking in most dehiscent pod species, provides an initial attraction stimulus which aids the feeding ungulate in locating the pod deposits. The source and nature of this aroma are not known at present.

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M. D. Gwynne, E.A.A.F.R.O., P.O. Box 30148, Nairobi, Kenya.

A note on the absence of pinnae in the black rhinoceros

The absence of pinnae in the black rhinoceros (*Diceros bicornis* L.) has been recorded from at least seven discrete populations (Table 1). In this condition there is no pinna whatever and the only indication of any auditory organ is a small stellate fossa which connects with the external auditory meatus (Plate 1). Some of the animals shown in Table 1 were known to have been born earless. Spinage (1962) records that "Pixie", the famous rhinoceros of Amboseli, was born earless, being observed without ears within one day of its birth, with no signs of external wounds which could have been inflicted by a predator. Anderson (1966) reports the birth of an earless black rhinoceros in the Hluhluwe Game Reserve, Zululand.

There is no doubt that some rhinoceros do lose parts of their pinnae from the activity of predators. Some of the animals recorded in Table 1 possess one normal pinna but the other is absent. Some pinnae present are mutilated suggesting that the animal may have lost its other ear to a predator. However, some animals are known to have been born earless.

It seems very probable that a genetic character is responsible for this condition. Table 1 suggests that this is a character which somehow is associated with sex, which indicates that it could be due to a sex-influenced gene or a sex-linked gene. It could not be due to a sex-limited gene as it can occur in both sexes. However, it is far more frequent in males, suggesting that a sex-linked recessive, or a sex-influenced gene, may be responsible for this condition. Sex ratios of near unity have been observed in several of these populations.

There is some field evidence that the earless Pixie could have been the sire of the female calf which was born earless in Amboseli in August 1968 (Table 1), as he occupies part of the same home range as the

dam of this calf (Sindiyo, pers. comm.). If the earless character is due to a sex-linked recessive gene, the sire of an earless female must be earless. In addition, her dam must be a "carrier" or be earless herself. Since the dam of this calf had normal ears she must have been a "carrier".

At Olduvai an earless male calf was born to a normal-eared female in October 1967 (Table 1). The total population at Olduvai is known and catalogued (Goddard, 1967), and there was no earless male within this population during 1966 (i.e. when the dam conceived). The sire of this calf must, then, have had a normal phenotype. Since the calf showed the character, its dam could have

been a "carrier". If a sex-linked recessive gene is responsible, a cross between these rhinoceros could never produce an earless female, but could produce an earless male. This is the sex of the calf at Olduvai. It is perhaps significant that the previous calf of this dam was a normal-eared female.

The dam of Pixie, i.e. Gertie, was normal-eared (Spinage, 1962). It is not known if Pixie's sire was earless or normal-eared, but I was unable to find documented evidence of the presence of an earless male in Amboseli in 1951–1952, i.e. when Pixie was conceived. Pixie's sire could have been either earless or normal-eared. If a sex-linked recessive gene is responsible for the earless character,

TABLE 1
Records of "earless" black rhinoceros from seven discrete populations

Location	Date	Sex	Age	Observer	Remarks
1. Amboseli	— .10.55	♂	2 y	C. A. W. Guggisberg*	Pixie, born earless 1953. Dam normal.
1. Amboseli	17.11.68	♀	Immat.	J. Goddard	Born earless Aug. 1968. Dam normal.
2. Near Samburu	1960	♂	Adult	D. M. Sindiyo	—
3. Ngorongoro Caldera	Picture published 1964	? ♂	Immat.	B. Grzimek*	Born earless.
4. Hluhluwe Game Reserve	—	♂	Adult	J. L. Anderson*	Born earless. Spec. H30. Died at 7.25 y.
5. Nr. Lugards Falls, Tsavo E. S. bank of Galana	28.10.65	—	Adult	Anonymous*	—
5. Tsavo E., 2°45'30"S., 38°25'E.	15.2.68	♂	Immat.	J. Goddard	Born earless 1965. Dam normal.
5. Tsavo E., 3° 19' 20" S., 38° 42' 20" E.	8.3.68	♂	Adult	D. L. W. Sheldrick*	Mating.
5. Mopea Gap, Tsavo East	28.9.68	♂	Adult	J. Goddard	Rt. ear normal.
5. Tsavo East, 3°03'S., 38°47'E.	29.10.68	♀	Immat.	J. Goddard	Rt. ear normal but mutilated. Dam normal.
5. Tsavo E., 3°20'30"S., 38°42'E.	1.12.68	♂	Adult	J. Goddard	Left ear normal but mutilated.
5. Tsavo E., 3°07' S., 38°39'E.	10.2.69	♂	Immat.	J. Goddard	Rt. ear normal.
5. Tsavo E., 2°56'15"S., 38°28'30"E.	1.3.69	♂	Adult	J. Goddard	Rt. ear normal.
6. 1½ miles E. of Kitchwa Tembo, Tsavo West	26.3.67	♂	Adult	J. Goddard	Left ear normal.
6. Tsavo West 3°03'S., 38°08'E.	11.5.68	♂	Adult	J. Goddard	—
7. Olduvai Gorge	20.4.68	♂	Immat.	J. Goddard	Born earless Oct. 1967. Dam normal; previous calf of dam a normal female.

*Guggisberg (1966)
Grzimek (1964)
Anderson (1966)
Anonymous (1965)
Sheldrick (1968)

Gertie's genotype could have been as a "carrier" or homozygous normal. Regardless of the genotype of Pixie's sire, if Gertie's genotype had been homozygous normal she could never have produced an earless calf of either sex. She could, therefore, have been a "carrier". The circumstantial evidence suggests that Pixie's sire was probably normal-eared, but this unfortunately will never be known. It will be seen from the above that all three dams could have acted as "carriers". Gertie's subsequent calves were a normal-eared female, and a normal-eared male. The latter was probably sired by a normal-eared animal (Taberer, 1959).

The suggestion, based on the above cases and data from Table 1, that the earless character in black rhinoceros *may* be due to a sex-linked recessive gene, partially concurs with at least three of the effects of this gene demonstrated in man (Snyder, 1951). Earlessness in black rhinoceros could not be due to a sex-linked dominant gene, because no more females than males show the character.

The possibility of this character being due to the effect of a sex-influenced gene cannot be dismissed. However, when possible genotypes of parents and progeny are determined from the above cases it is apparent that the frequency of earless rhinoceros in the populations should be far higher than the field records indicate. A field method could check if a sex-influenced gene is responsible for the character. If the earless female calf in

Amboseli lives to maturity and produces calves (and assuming a sex-influenced gene is responsible for the character), her female calves could be either earless or normal, but all her male calves will be earless, regardless of the genotype of her mate.

It is emphasized that part of the above discussion is strictly theoretical, and recommended that parental phenotypic histories of known cases be recorded whenever possible.

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- J. Goddard**, c/o Fish and Wildlife Branch, Department of Lands and Forests, Parliament Buildings, Toronto, Ontario, Canada.



Plate 1

"Pixie", the male rhinoceros in Amboseli which has been earless since birth.