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Inbreeding of the Bonsmara cattle breed

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Introduction

The Bonsmara was bred at the Mara and Messina Research Stations under the guidance of the late Prof JC Bonsma. From crossbreeding results the development of the Bonsmara was based on a 5/8 Afrikaner and 3/8 Exotic (Shorthorn/Hereford) breeding admixture. The first calves of this type were born in 1943. The Bonsmara Breed Society was formed in 1964, but only promulgated in 1972. During 1975 the Wesselsvlei and Roodebos lines were identified and developed as separate lines. In 1985 the Vaalhartz line was developed following a project in which the Australian Belmont Red breed was involved (Scholtz *et al*., 1999). An inbreeding coefficient is defined as the probability that two genes at a locus are identical by descent. Wright's coefficient of inbreeding, named after its originator Sewall Wright, is known as the most commonly used measure of inbreeding (Van Vleck *et al*., 1987). The aim of this study was to compute inbreeding coefficients and report on the inbreeding of the Bonsmara breed.

Materials and Methods

Pedigree information of the Bonsmara breed since 1955 was obtained from the INTERGIS. A total pedigree of 969 889 animals, including base parent/s, were included. Problems encountered in editing the pedigrees, were as follows: "progeny" born before their parents; "sires" being dams as well and *vice versa,* sires and "dams" being too young when their first calves were born. Animal Breeder's Toolkit (Golden *et al*., 1992) was used to calculate Wright's inverse numerator relationship matrix and inbreeding coefficients. This algorithm requires that the pedigree consists of three columns: individual ID, sire ID and dam ID, with a record for every individual in the population. The pedigree file must be constructed so that every parent preceeds its offspring. Every parent must also have an individual record, and unknown parents must be indicated with a period (.).

Results and Discussion

Since 1955 a total of 222 701 (23%) animals were inbred. The highest inbreeding coefficient was 37.55%. The average inbreeding coefficient of all the animals in the pedigree was 0.64% and that of the inbred animals was 2.78%.
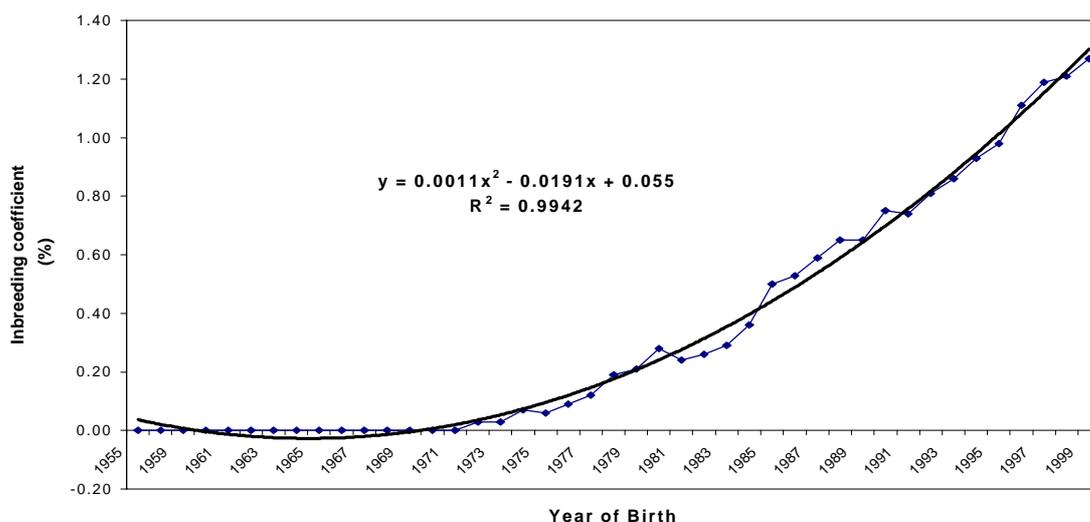

The equation shown on the figure:
$$y = 0.0011x^2 - 0.0191x + 0.055$$
$$R^2 = 0.9942$$

Figure 1 Increase in inbreeding in the Bonsmara breed from 1959 to 1999.

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From Figure 1 it can be seen that inbreeding in the Bonsmara breed is gradually increasing, but at a level that is acceptable. Inbreeding should not exceed 0.3% per year (Van der Westhuizen & Mostert, 1998). Of more concern, however, is the increase in the number of animals being inbred (Figure 2): 65% of the animals born in 1998 were inbred with a mean inbreeding coefficient for these animals of 1.85%.
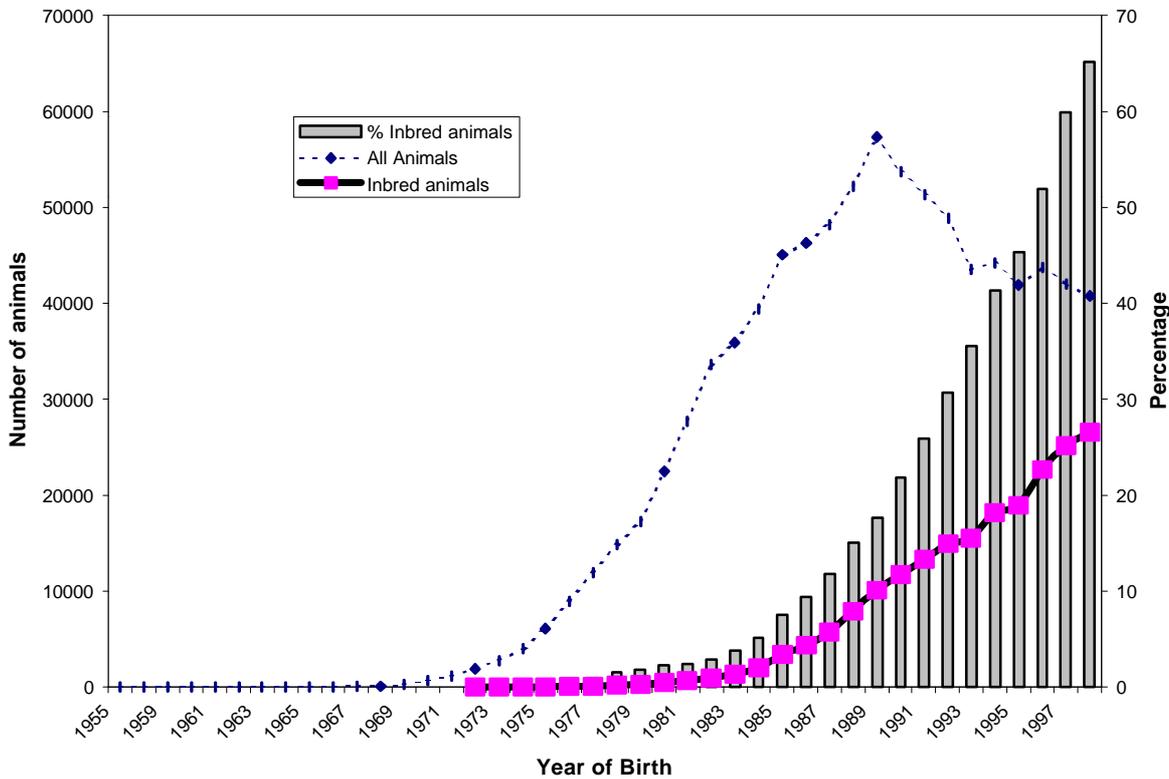

Figure 2. Number and percentage of inbred animals in the Bonsmara breed.

Conclusions

Although the rate of inbreeding is low in the Bonsmara breed, the percentage of animals being inbred increased drastically since 1984. Breeders should take note of this and sensibly mate the animals to keep the rate of inbreeding below 1.5% per generation. By doing this, the regression in performance of the breed can be counteracted by natural and artificial selection.

References

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