

## An epidemiological survey demonstrating decline in reproductive efficiency with age and non-seasonality of reproductive parameters in German shepherd bitches in Kenya

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### ABSTRACT

An epidemiological survey undertaken in Kenya indicated that 2 previously well-established factors, namely decline in reproductive efficiency with age, and non-seasonality of canine reproductive parameters, hold true for German shepherd (GSD) bitches in Kenya. Data collection forms were distributed to randomly selected GSD breeders and information so obtained was verified using East African Kennel Club records. Whelping was recorded throughout the year. The litter size varied from 1 to 14 pups per litter with a mean of  $6.3 \pm 0.4$  SD puppies. Records of 567 whelpings and 3592 puppies were studied. The mean monthly whelping rate was  $47.3 \pm 7.2$ . There was no significant difference in the mean litter size by month ( $P < 0.05$ ).

**Key words:** epidemiological survey, GSD bitches, Kenya, litter size, month, parity.

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German shepherd dog breeding is a popular enterprise in urban and peri-urban areas of Kenya. It constitutes a major source of income for the breeders. Litter size is one of the most important reproductive parameters in a dog-breeding enterprise, because it can be used to assess the reproductive status of the kennel<sup>4,7</sup>. It can be used to predict the breed population over a given period of time assuming a known survival rate<sup>9</sup>. Understanding the pattern of this parameter is important in maintaining the integrity of a breed<sup>3</sup>.

A closed-format questionnaire was distributed to 280 randomly-selected GSD breeders in Kenya to gather information on their bitches over a period of 15 years. A simple random number method was used to select breeders from those known to keep proper records and own registered bitches. The purpose of the survey and requirements for completing the forms were explained verbally to each breeder. In all cases, information was recorded at the time of visit. In order to verify information taken from the breeders, records of all registered bitches from 1982 to 1997 were obtained from the East African Kennel Club (EAKC). Records of

the dates of whelping, the number of puppies born and parity details were verified.

All information obtained from the questionnaire was entered into a database (D-BASE IV, Ashton-Tate, Torrance, California). The Statistics Analysis System (SAS) was used for descriptive statistics. Significance was tested for by 1-tailed Student's *t*-tests ( $P < 0.05$  or  $P < 0.01$ ) with regard to month-to-month whelping.

The records of 594 bitches were studied, comprising 567 litters and 3592 puppies. Parities ranged from 1 to 7. The distribution of whelpings per month is shown in Fig. 1. Whelping was observed throughout the year, with the highest mean incidence in December and the lowest in October and January. The mean monthly whelping frequency varied from 38 in January and October to 65 in December, but these differences were not statistically

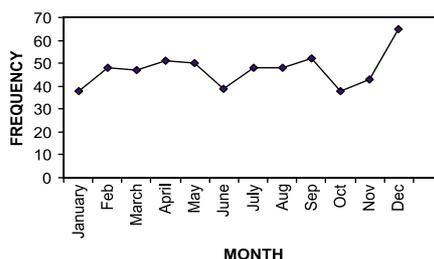


Fig. 1: Monthly whelping.

significant ( $P > 0.05$ ).

Figure 2 shows that litter size varied from 1 to 14, but most litters numbered 4–8 puppies. The mean litter size did not differ significantly between the months, although it varied from 5.7 in August to 7.1 in October, with a mean of  $6.3 \pm 0.4$  SD puppies. The litter size increased steadily from 1 (12 cases), peaked at 6 pups per litter (116 cases), and thereafter declined, with only 2 litters of 14 pups recorded. The relationship between whelping, parity and litter size are presented in Fig. 3 and Table 1. The parity of the bitches whelping ranged from 1 to 7. Most of the bitches whelped once (265 cases), and few bitches whelped 6 or 7 times (19 and 18 cases respectively). The percentage occurrence of parities observed declined steadily from 1 to 7. Litter size also reduced significantly after parity 5.

Epidemiological surveys are commonly used to collect data. However, the method is open to criticism on the grounds that the results may be statistically biased owing to specific environmental influences. In the present study, an attempt

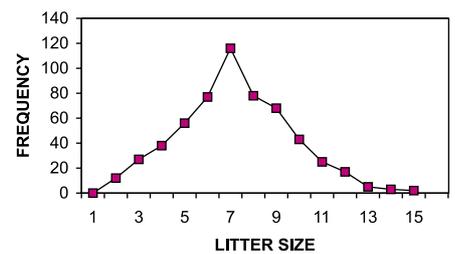


Fig. 2: Frequency of litter size.

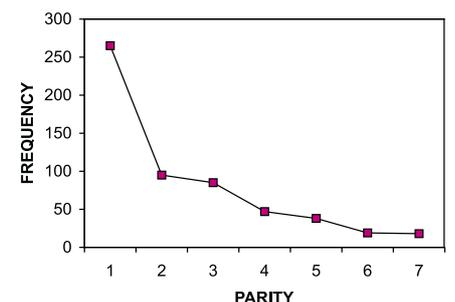


Fig. 3: Frequency of parity.

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Table 1: Relationship between parity and litter size in German shepherd bitches in Kenya.

Parity	1	2	3	4	5	6	7
Percentage	46.8	16.7	15	8.3	6.7	3.3	3.2
Mean litter size	6.5 ± 0.9	6.7 ± 0.7	6.7 ± 0.8	7.2 ± 0.4	6.3 ± 0.3	4.5 ± 0.1*	5.0 ± 0.1*

\*Statistically significant ( $P < 0.05$ ).

was made to use only information provided by reliable breeders, and the information was validated by using the EAKC records. Only records of registered bitches were used. The fact that the bitches studied came from all parts of the country diminished the influence of environment on the parameters investigated.

Whelping occurred throughout the year. The average litter size of 6 puppies per whelping reported in this study agrees with previously published results<sup>6,8</sup>. That this factor did not vary significantly between months indicates that GSD bitches in Kenya are non-seasonal breeders, as already established for other breeds of dogs<sup>2</sup>. Litter sizes are highly correlated with optimum timing for breeding<sup>5</sup>. In this study, it appears that the bitches were bred at the right time, as natural mating was invariably used and the brood bitch remained with the stud dog for the entire heat period. Most breeders had a resident

dog in the kennel, and those who did not sought breeding advice and services from the owners of stud dogs.

Parity did not appear to affect litter size up to the 5th whelping, but litter size declined with increasing parity thereafter, suggesting that fertility declines after the 5th whelping. This agrees with previous studies that demonstrated that reproductive efficiency declines after 6 years in the dog<sup>2,5,6</sup>, the probable age of the bitch after the fifth parity<sup>1</sup>. It is thus best to breed GSD bitches in Kenya before 7 years of age. This is supported by the fact that the mean litter size was similar for the first 5 parities but declined thereafter. The number of whelpings also decreased with increasing parity.

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