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Reproductive performance of cat breeds in Bangladesh

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Abstract

This study was carried out in the Rangpur Division, Bangladesh, to identify domestic cat breeds and assess their reproductive performance. Data were obtained through direct questionnaire administered to cat owners, complemented by regular observation of breed characteristics, behaviour, and reproductive traits. Ten breeds were identified: Indigenous, Persian, Persian (Calico), Maine Coon, Bengal Cat, Mixed, British Shorthair, Turkish Angora, Scottish Fold and American Shorthair. Common oestrus signs included vocalization, rolling, rubbing of the body and genital area, affectionate behaviour, and receptivity to male. The age at sexual maturity among females ranged from 6 to 23 months, with Persian cats exhibiting the highest mean age at maturity (16.2 ± 3.8 months, $P<0.05$). Oestrus cycle length varied from 7 to 45 days, with Bengal cats having the longest cycle (25.5 ± 6.4 days, $P<0.05$). Indigenous cats generally matured in spring and summer, although some showed year-round oestrus when housed with tomcats. Gestation lasted 57 – 67 days, with no significant difference between breeds; the longest was recorded in Scottish Folds (64.2 ± 2.4 days). Litter sizes ranged from 2 to 10 kittens, with Bengal cats producing the largest average litters (6.0 ± 3.5 kitten). Postpartum oestrus began 30–90 days after parturition. Pregnancy rates were highest in Indigenous cats (86.1%) and lowest in Scottish Folds (77.8%). Abortion rates were highest in Scottish Folds (28.6%) and lowest in Indigenous cats (16.1%). The sex ratio of kittens was approximately 49 males to 50 females. Kitten mortality was highest in Persian cats (21.8%) and lowest in American Shorthairs (11.8%).

These findings provide valuable insights into breed-specific reproductive physiology, which can support breeding management strategies and inform veterinary reproductive care. (*Bang. vet.* 2025. Vol. 42, No. 1 – 2, 17 – 27)

Introduction

The domestic cat (*Felis catus*) is a widespread and cosmopolitan species, inhabiting most regions suitable for human settlement. It was first domesticated in the Near East

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approximately 9,000 – 10,000 years ago (Vigne *et al*., 2004). Domestication likely began when cats assisted humans in controlling rodents (Dobney, 2006). Modern domestic cats retain many natural hunting instincts while adapting as affectionate companions (Bradshaw *et al*., 1999). International Cat Association recognized 73 breeds in 2023. Most breeding cats are maintained in small catteries, and inbreeding remains a concern for both domestic breeds and wild felids (Axnér, 2006).

In tropical regions cats can reproduce year-round; however, breeding seasons tend to shorten with increasing latitude (Hurni, 1981). In the Northern Hemisphere, breeding typically begins in February and continues through September, with peak oestrus occurring between February and April (Silva *et al*., 2006). Long-haired breeds tend to have shorter breeding seasons (Jemmett and Evans, 1977).

Domestic cats are induced ovulators, although spontaneous ovulation occurs in 35 – 87% of cases (Lawler *et al*., 1993). Queens generally reach puberty between 4 and 12 months of age and may cycle every 3 – 4 weeks in the absence of mating. Some queens can even conceive while nursing kittens (Silva *et al*., 2006).

Oestrus signs in queens include tail deflection, vocalization, rolling, and rubbing. Observers sometimes manually stimulate the hindquarters to confirm receptivity (Silva *et al.,* 2006). The average pregnancy rate for purebred cats in France is 85.2% (Fournier *et al*., 2017). Litter sizes average 3 – 4 kittens, with some breed-specific variation (Prescott, 1973). The mean gestation period is around 65.1 days, with a range of 63 to 67 days (Sparkes *et al*., 2006).

Many previous studies have focused on litter size and kitten survival rather than infertility or pregnancy loss (Ström Holst and Frössling, 2009). Comprehensive data on breed-specific reproductive performance in domestic cats are limited. The present study aimed to identify domestic cat breeds in the Rangpur Division of Bangladesh and to evaluate their reproductive characteristics to support improved breeding management.

Materials and Methods

***Study area*:** The study was conducted in the Rangpur Division, Bangladesh, from August 2022 to August 2023.

***Selection, Identification and Recorded of Reproductive performances*:** Data were collected by interviewing 45 cat owners and six cat breeders using a pretested questionnaire. The questionnaire was structured in two parts: (1) owner's details and (2) cat details. Recorded information included breed, age, parity, and reproductive performance.

Cat breeds were identified based on coat length, coat colour, coat patterns, marking and distinctive physical traits. Key reproductive parameters recorded were age of sexual maturity, oestrous cycle length, duration of oestrus, behavioural signs of oestrus, breeding and non-breeding seasons, gestation length, number of mated

queens, number of successful and non-successful conceptions, postpartum oestrus interval, litter size, and kitten survival and mortality rates.
Data were categorized by breeds (indigenous, Persian, mixed, American Shorthair, British Shorthair, Scottish Fold, and Bengal) and season (spring, summer, autumn, winter).

Pregnancy rate, abortion rate, kitten mortality rate, and sex ratio were calculated as percentages using the following formula:

$$\text{Pregnancy rate (\%)} = \frac{\text{Number of pregnant females}}{\text{Number of mated females}} \times 100$$

$$\text{Abortion rate (\%)} = \frac{\text{Number of abortions}}{\text{Number of pregnancies}} \times 100$$

$$\text{Kitten mortality rate (\%)} = \frac{\text{Number of kitten deaths}}{\text{Total kitten born}} \times 100$$

$$\text{Sex ratio (\%)} = \frac{\text{Number of male/females}}{\text{Total number of kittens}} \times 100$$

***Statistical analysis*:** All collected data were compiled in Microsoft Excel and analyzed using SPSS version 25.0. A one-way ANOVA test was applied to determine possible association among different cat breeds. For all statistical tests, a p-value of less than 0.05 was considered statistically significant.

Results and Discussion

A total of ten breeds were identified among cats kept by owners in the Rangpur Division: Indigenous, Persian, Persian (Calico), Manie Coon, Bengal, Mixed, British Shorthair, Scottish Fold, American Shorthair, and Turkish Angora.

Sexual maturity and oestrous cycle: Sexual maturity and oestrous cycle and duration of oestrus are shown in Table 1. The age at sexual maturity among females ranged from 6 to 23 months. Persian cats had the highest mean age at maturity (16.2 ± 3.8 months, $P<0.05$). Oestrous cycle length varied from 7 to 45 days, with Bengal cats exhibiting the longest cycles (25.5 ± 6.4 days, $P<0.05$). In contrast, American Shorthair and Scottish Fold cats showed significantly shorter cycle length (17.8 ± 7.9 days, $P<0.05$). The duration of oestrus ranged from 2 to 7 days in queens, with no significant differences between breeds ($P>0.05$).

Gestation, litter size, and postpartum oestrus: Gestation, litter size, postpartum onset of oestrus of cats are presented in Table 2. Gestation length ranged from 57 – 67 days, with the longest observed in Scottish Folds (64.2 ± 2.4 days), although differences were not statistically significant. Litter size varied from 2 to 10 kittens. Bengal cats produced the largest average litters (6.0 ± 3.5 kittens), while other breeds averaged between 3.2 and 3.7 kittens per litter. The postpartum onset oestrus ranged from 30 – 90 days after parturition. Bengal cats tended to return to oestrus later than other breeds (75.0 ± 21.2 days), though these differences were not significant.

Table 1: Sexual maturity, oestrous cycle length, duration of oestrus in cats

Breed of cats	Age at sexual maturity (months) Mean% ± SD (Range)	Oestrous cycle length (days) Mean% ± SD (Range)	Duration of oestrus (days) Mean % ± SD (Range)
Persian (n = 20)	16.2 ± 3.8[a] (6 - 23)	24.8 ± 4.6[a] (18 - 30)	5.1 ± 1.6[a] (3 - 7)
British Shorthair hair (n = 10)	10.8 ± 2.9[b] (6 - 13)	22.2 ± 7.5[a] (15 - 30)	5.0 ± 1.6[a] (3 - 7)
American Shorthair (n = 10)	11.8 ± 3.8[b] (6 - 15)	17.8 ± 7.9[b] (10 - 30)	4.6 ± 1.7[a] (3 - 7)
Mixed (n =14)	12.1 ± 3.7[a] (6 - 15)	24.1 ± 10.2[a] (7 - 45)	4.3 ± 2.5[a] (2 - 7)
Indigenous (n = 30)	11.6 ± 3.3[b] (7 - 17)	23.9 ± 8.7[a] (7 - 40)	4.1 ± 1.3[a] (2 - 7)
Scottish Fold (n = 10)	11.0 ± 4.4[b] (6 - 18)	17.8 ± 8.8[b] (7 - 30)	4.8 ± 2.1[a] (3 - 7)
Bengal (n = 10)	12.5 ± 3.5[a] (10 - 15)	25.5 ± 6.4[a] (21 - 30)	3.0 ± 0.0[a] (3 - 4)
Overall range	6 – 23	7 - 45	2 - 7
Significance Level	*	*	NS

*[a-b]Values with different superscript in the same column are significant (P<0.05)
n = Number of observations, NS = Non-significant (P>0.05), SD = standard deviation

Table 2. Gestation, litter size, postpartum onset of oestrus of cats

Breeds of cats	Gestation period (day) Mean% ± SD (Range)	Total litter size (number) Mean % ± SD (Range)	Postpartum onset of oestrus (day) Mean% ± SD (Range)
Persian (n = 20)	63.6 ± 2.2[a] (60 - 67)	3.7 ± 1.3[a] (2 - 6)	42.8 ± 21.4[a] (30 - 90)
British Shorthair (n = 10)	62.6 ± 2.8[a] (60 - 66)	3.4 ± 0.8[a] (3 - 5)	51.0 ± 25.1[a] (30 - 90)
American Shorthair (n = 10)	62.4 ± 1.8[a] (56 - 63)	3.4 ± 1.0[a] (3 - 6)	51.0 ± 8.2[a] (45 - 60)
Mixed (n = 14)	63.4 ± 2.3[a] (60 - 67)	3.4 ± 1.4[a] (2 - 6)	50.4 ± 20.9[a] (30 - 90)
Indigenous (n=30)	61.5 ± 3.4[a] (57 - 66)	3.2 ± 0.9[a] (2 - 6)	45.7 ± 17.4[a] (30 - 90)
Scottish Fold (n = 10)	64.2 ± 2.4[a] (62 - 67)	3.43 ± 0.5[a] (3 - 4)	51.0 ± 13.4[a] (30 - 60)
Bengal (n = 10)	62.5 ± 3.5[a] (60 - 65)	6.0 ± 3.5[a] (4 - 10)	75.0 ± 21.2[a] (60 – 90)
Overall range	57 - 67	2-10	30 - 90
Significance level	NS	NS	NS

[a]Values with different superscript letter in the same column are not significant.
n = Number of observations, NS = Non-significant, SD = Standard deviation.

Seasonality of breeding: Seasonality of breeding is depicted in Table 3. Indigenous and Persian cats were the most consistent breeders throughout the year. Among Indigenous cats, the highest kitten production occurred in spring (March - June) and summer (June - September). A smaller number of queens showed year-round oestrus, when housed with tomcats.

Scottish Fold and Bengal cats exhibited reduced kitten production during autumn (September - December), and most of these breeds reached sexually maturity later in Summer. However, all breeds showed some level of sexual activity and kitten production across all seasons.

Table 3: Seasonality of different cat breeds

Breeds of cats	Seasons			
	Spring (March–June) (number)	Summer (June-September) (number)	Autumn (September-December) (number)	Winter (December-March) (number)
Indigenous	20	22	9	6
Scottish fold	3	6	0	1
Mixed	7	12	5	4
Persian	9	18	9	4
*ASH	4	5	3	4
**BSH	3	2	1	4
Bengal	3	2	0	5

*ASH = American Shorthair, **BSH = British Shorthair

Pregnancy and abortion rates: Pregnancy rate, abortion rate, sex ratio of cats is presented in Table 4. The highest pregnancy rate was in Indigenous cats (86.1%), followed by mixed breeds (85.0%) and Persian cats (84.4%). The lowest pregnancy rate was in Scottish Folds (77.8%).

The abortion rates were highest in Scottish Folds (28.6%) and lowest in Indigenous cats (16. 1%). The overall kitten sex ratio was nearly equal, with 49 males for every 50 females. No significant breed-specific differences in pregnancy rate, abortion rate, or sex ratio were detected.

Kitten mortality: Kitten mortality rates in different cat breeds are presented in Table 5. The highest total mortality rate was in Persian cats (21.8%), while the lowest was in American Shorthair (11.8%). When broken down by time of death: immediately after birth, the highest mortality occurred in mixed breeds (8.6%) and lowest in Indigenous and Scottish Fold cats (3.3%). One week after birth, mortality was highest in Scottish Folds (8.3%), with no death in American Shorthairs. Eight weeks after birth, mortality was highest in Persian (8.9%) and lowest in Mixed breeds (3.5%).

Table 4: Pregnancy rate, abortion rate, sex ratio of cats

Breeds of cats	Pregnancy rate (%)	Abortion rate (%)	Sex ratio (Male : Female)
Indigenous	86.1(56/65)[a]	16.1(9/56)[a]	49 : 50
Persian	84.4(27/32)[a]	18.5(5/27)[a]	
Mixed	85.0(17/20)[a]	17.7(3/17)[a]	
American Shorthair	83.3 (15/18)[a]	20.0(3/15)[a]	
Scottish fold	77.8(7/9)[a]	28.6(2/7)[a]	
British Shorthair	80.0(8/10)[a]	25.0(2/8)[a]	

[a]Values with different superscript in same column are not significant.

Causes of kitten mortality included abortion, stillbirth, accidental crushing by the queen, illness, outdoor delivery leading to exposure, and predation by dogs. No statistically significant differences in total kitten mortality rates were found between breeds.

Table 5: Kitten mortality rate in different cat breeds

Breeds	Total kitten mortality (%)	Immediately after birth (%)	After 1 weeks (%)	After 8 weeks (%)
Indigenous (n = 30)	14.4[a]	3.3	3.9	7.2
Persian (n = 20)	21.8[a]	6.9	5.9	8.9
Mixed (n = 14)	13.8[a]	8.6	1.7	3.5
ASH (n = 10)	11.8[a]	3.9	0	7.8
BSH (n = 10)	14.7[a]	6.9	5.9	5.9
Scottish fold (n = 10)	16.7[a]	3.3	8.3	5.0
Significance Level	NS			

[a]Values within the same column are not significant, NS = non-significant.
ASH =American short hair, BSH = British Shorthair.

In Bangladesh, local domestic cats-often mixed breeds-are the most common. Ten breeds were recorded: Persian breeds were the most common, followed by Persian Calico, Mixed breed, Bengal cats, American Shorthair and Scottish Fold.

In comparison, Huang *et al*. (2017) found domestic shorthair cats to be the majority, with Persian, American Shorthair, Scottish Fold, Himalayan, and Kashmiri cats ranking next. In the present study, the overall median age of the cats was lower than in studies from Sweden and England (O'Neill *et al*., 2014). Our findings indicated that

purebred cats lived longer than mixed breeds, contrasting with earlier English research - a difference possibly explained by varying purebred distributions (O'Neill *et al*., 2014). Himalayan and Kashmiri cats had the highest median longevity among the five most popular breeds (O'Neill *et al.,* 2014).

Sexual maturity, oestrous cycle length, and oestrus duration were similar to previous findings. The first oestrus among different breeds ranged from 6 to 23 months. Oestrus typically begins between 5 and 9 months, though age at onset of oestrus may vary widely (3.5 to 18 months) (Griffin, 2001). In this study, Persian cats reached sexual maturity significantly later than other breeds (16.2 ± 3.8 months; $P<0.05$). Persian and related longhaired breeds may not experience their first oestrus until 18 months or later and may not reach full sexually maturity until two to three years (Griffin, 2001).

Onset of first oestrus is influenced by breed (shorthairs mature earlier than longhairs), season (day length), and body condition.

Domestic cats generally reach puberty at around six months, with oestrous cycles occurring every 14 - 21 days. Indoor cats may cycle according to seasonal light pattern (Little, 2012).

Gestation length ranged from 57 to 67 days, closely matching the 63 - 66 days reported for Persian and Siamese cats in Australia (Prescott, 1973) and 104 pregnancies in the United Kingdom (Jemmett and Evans, 1977). Reported gestation periods: Hungerford (1967) recorded 52 - 69 days (mean 59), Wilkinson (1966) 62 - 64 days, Joshua (1965) 63 - 66 days, and Whitehead (1964) 58 - 71 days. Differences may arise from whether calculations start from the last or first day of mating. In this study, the mean gestation length was 66.9 ± 2.9 days ($n = 15$), with variation possibly due to regional factors, breed differences, and the queen's condition.

Average litter size was 3-4 kittens, aligning with the figure of four reported by Scott (1970). Bengal cats had the largest average litters (6.0). Longhaired breeds and Abyssinians generally had smaller litters, consistent with reports that Abyssinians are less prolific. The Burmese were the most prolific (average 5.4 kittens), while Chinchillas had the smallest average litters (2.8).

In this study, the oestrous cycle length ranged from 7 to 45 days, with oestrus lasting 2-7 days. The Bengal cats had the longest cycles (25.5 ± 6.4 days; $P<0.05$). These findings are similar to Root *et al*. (1995), who recorded average oestrus duration of 5.8, 3.3 days (Range: 3 - 19 days) in a research colony (Root *et al*., 1995). No differences in oestrus duration were observed between breeds.

Around 75% of matings occur within the first three days of oestrus (Fournier *et al*., 2017), considered the optimal breeding window (Fontbonne *et al*., 2022). However, early mating may be less effective. Mating on the first day (Donoghue *et al.,* 1993) often releases immature oocytes, whereas over 85% of queens ovulated after three matings on the second or third day (Swanson *et al*., 1994), and 100% ovulated after multiple copulations on the third day (Concannon *et al*., 1980).

Oestrus lasts 4 - 7 days on average (range: 1 - 21 days) (Susan Little, 2012). The present study's oestrous cycle length (7 - 75 days) and oestrus duration (2 - 7 days) are consistent with previous research.

Seasonal variation in kitten production depends on geography, body condition and nutrition. In this study, peak reproduction occurred in spring (March-June) and Summer (June- September), a pattern consistent with earlier local reports. In Brisbane, sexual activity was reduced during late summer and early autumn, linked to high temperatures and humidity (Prescott, 1973). Such declines are also influenced by day length, as reduced day length suppresses oestrus (Hurni, 1981). Production typically rises when days lengthen, especially in long-haired breeds.

Shorthair breeds often breed year-round (Jemmett and Evans, 1977), as seen in the Burmese. Breeder management affects seasonality: longhair breeders often mate queens early to ensure at least two litters per season, while shorthair breeders may time litters for market or show schedules (Jemmett and Evans., 1977).

In tropical regions, ovarian activity is present year-round, though reduced in winter (Ortega-Pacheco *et al.,* 2012). Domestic cats are seasonally polyoestrous with induced ovulation, with oestrus stimulated by prolonged daylight (>12 hours) after short days (Hurni, 1981). Melatonin plays a key role, with higher levels during short days suppressing ovarian activity (Leyva *et al*., 1984; Little, 2001).

Peak oestrus occurs from February to June in the Northern Hemisphere, shifting later in temperate climates (Feldman and Nelson, 1996).

Tropical latitudes show less variation in light hours (2.5 - 3 hours annually), which may not be enough to suppress reproduction (Hurni, 1981). Oestrus can be triggered by social and reproductive stimuli, such as the presence of entire males or other queens in heat. Long-term studies (Robinson and Cox, 1970) show births occur year-round but peak in spring and summer, reflecting environmental influences on ovarian activity.

The pregnancy rate was highest in Indigenous cats (86.1%) and lowest in Scottish Folds (77.8%). Reported global pregnancy rates are similar - around 85% (Fournier *et al*., 2017). Abortion rates were highest in Scottish Folds (28.6%) and lowest in Indigenous cats (16.1%). Litter sex rations were approximately equal, with no significant effect of breed. Seasonal or maternal age effects on sex ratios, as observed in other mammals were minimal (Clutton-Brock and Albon, 1982).

In this study, overall kitten mortality did not differ significantly ($P>0.05$) between breeds. Mortality was highest in Persian breed (21.8%), with deaths occurring immediately after birth (6.9%), after one week (5.9%), and after eight weeks (8.9%). Causes included abortion, stillbirth, maternal crushing, illness, delivery outside the home, and predation by dogs.

Reported neonatal mortality rates in other studies range from 12.8% to 48% (Scott, 1978; Jemmett, 1977; van Aarde, 1984). Van Aarde (1984) observed mortality rates up

to 90% before six months in some colonies, with trauma being the primary cause. Deaths may also result from predation (dogs, foxes, raptors) or illness, though debilitated cats often hide, making disease-related deaths less visible.

Environmental factors influence mortality causes. In farm cats in Ithaca, New York, Wolski (1981) found predation, disease, and environmental hazards to be key factors. In North America, annual mortality rates are around 8.3% (New *et al*., 2004), with higher risk in cats under seven weeks or over seven years (Murray *et al*., 2008).

Breed-specific causes of death vary. In Germany (1969-1982), infectious diseases, especially feline panleukopenia, predominated (Landes *et al*., 1984). In France, infectious disease was the leading cause, followed by accidental death (Moreau et al., 2003). Other studies have reported high rates of feline infectious peritonitis, cardiopathy, mammary tumours, urinary tract disorders, and diabetes, with breed-specific mortality ranging widely (Egenvall *et al.,* 2009).

The present study found no statistically significant breed differences in mortality causes, likely due to environmental factors having a greater overall impact than genetic predispositions.

Conclusions

This study identified ten domestic cat breeds in the Rangpur Division. Indigenous and Persian breeds were the most common. Indigenous cats matured earlier, while Persian cats reached sexual maturity later. The oestrous cycle ranges from 7 - 45 days, with Bengal cats having the longest cycles. All breeds were capable of breeding year-round, with peak activity from March to November.

Pregnancy rates were highest in Indigenous cats and lowest in Scottish Folds. Abortion rates were highest in Scottish Folds and lowest in Indigenous cats. Early neonatal mortality was highest in Persian cats. While this study provides important baseline data, the reproductive physiology of the queen cat is not yet fully understood, particularly with regard to induced ovulation mechanisms and the hormonal role of the placenta. Further research is needed to identify factors influencing reproductive outcomes and to support improved breeding management.

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