

## **PARIAH DOG AT THE CHITTAGONG UNIVERSITY CAMPUS: HOME RANGE, ACTIVITY PATTERN AND BREEDING**

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### **ABSTRACT**

Home range, activity pattern and breeding aspects of the pariah dog (*Canis lupus familiaris* Linnaeus, 1786) were studied at the Chittagong University Campus in Chittagong of Bangladesh during September 2012 to January 2013. The average home range encircled during daytime by a pack was 10,120 m<sup>2</sup>. The activity pattern of two dog packs was monitored through scan sampling methods at 15 minutes intervals. The dogs spent their diurnal time in resting (24.5%), sitting and basking (17.1%), standing (2.4%), moving and walking (16.2%), running (17.5%), sleeping (5.3%), feeding, foraging and drinking (6.3%), social behavior (2.9%) and territorial behavior (7.8%). Parturition occurred from September to January and the peak period was in November. The average litter size was 4.7 (range 1-12, n=10) and the overall survival rate of puppies was 2.6 per litter (i.e., 55.32%) up to January.

**Key words:** Pariah dog, home range, territory, activity pattern, parturition, litter size.

### **INTRODUCTION**

Pariah dog or stray dog (*Canis lupus familiaris* Linnaeus, 1786) refers to the dogs, which are not directly depended on human for their existence, but they feed on human wastes and/or human kindheartedness (Ahsan and Chowdhury 2007). The pariah dog is probably derived from the Asiatic wolf (*Canis lupus pallipes*) and hybrid with other races of wolf (Hemmer 1990), and it is likely that the process of domestication began at least 14,000 years ago (Clutton-Brock and Parker 1995). It is a member of the Family Canidae of the mammalian Order Carnivora where the word "dog" indicates the male species of Canine group as opposed to bitch (Dog at dictionary.com). There are about 400 breeds of domestic dogs and estimated to be 400 million dogs in the world (Coppinger and Coppinger 2001).

Animals move through and partition space to gain access to food, mates, refugia and den sites to maximize fitness (Burt 1943, Brown and Orians 1970, Both and Visser 2003). All activities of an animal are performed in a specific area of the habitat. Home range is an area used by an individual or a group of individuals during their usual for resources (Bergallo and Magnusson 2004, Burt 1943, Jewell 1966). More recently, home range has been defined in terms of the area in which an animal has some probability of being located during a specific period of time (Kernohan *et al.* 2001). Dixon and Chapman

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(1980) defined core area as the center of activity of animal movements as the area within an animal's home range with the greatest amount of activity. The area of heaviest use within the home range is the core area. This location contains sleeping site, feeding site and den site (Arora 2003). "Territory is any defended area" (Nobel 1939). An area occupied more or less exclusively by an animal or group and defended by overt aggression and advertisement is a territory ([www.wikipedia.com](http://www.wikipedia.com)).

Behavior is the range of actions and mannerisms made by organisms, systems or artificial entities in conjugation with their environment, which includes the other systems or organisms around, as well as the physical environment ([www.wikipedia.com](http://www.wikipedia.com)). It is the responses the system or organisms to various stimuli or inputs, whether internal or external conscious or subconscious overt or covert and voluntary or involuntary ([www.wikipedia.com](http://www.wikipedia.com)). Data on behavioral patterns is important for knowing a species in its environment and for their sustainability and conservation purposes. Activity budgets of canids differ due to the environmental factors (temperature, rainfall, etc.), diet, distribution and abundance of food source throughout the year and even within a day; it also reveals the responses to particular habitats (van Schaik *et al.* 1983).

Parturition is the act or process of giving birth to offspring. This time depends on the environmental factors such as ambient temperature and it is a very critical time for an animal and remarkable in the pariah dog due to the combination of some features: polygamous and polyandry, a seasonal and monstrous reproductive cycle and alloparental care of pups is seen in sibling not yet pregnant, pseudo pregnancy, copulatory lock, reproductive skew for behavioral and by observing others and territoriality (*cf.* Asa and Valdespino 1998). A number of physical, physiological and hormonal changes take place to prepare den and fetus for parturition. Litter size reveals the number of offspring given by a bitch in a breeding season and it depends on the size of dogs ([www.encyclopedia.com/html/section/dog-ent](http://www.encyclopedia.com/html/section/dog-ent)). Published literature on the objectives of this paper on pariah dog in Bangladesh is not available. Therefore, the present study was undertaken to determine (1) pack size, (2) sex composition, (3) estimate home range, territory and core area, (4) activity pattern, (5) parturition time, litter size and survival rate of the puppies in the Chittagong University Campus (CUC).

## MATERIALS AND METHODS

### *Study area*

The study was carried out in the CUC (22°27'25.69" to 22°27'26.34" N and 91°48'10.12" to 91°48'10.96" E). It is about 23 km north of the Chittagong city and 3 km southwest of Hathazari Upazilla Headquater. The CUC area covers over a 709.79 ha (1,753.88 acres) landscape of green hills, undulating valleys, mounds, plain grassland, bushes and planted forests. About 72% of the campus area is hilly and comprises small hills and the rest are plains or valleys (Islam *et al.* 1979). The study area reveals tropical monsoon climate, characterized by hot humid summer and dry cold winter. From November 2012 to January 2013, the temperature varied from 7° to 12° C. The vegetation is mixed-evergreen type (Champion 1936). There have been reported 42 different types of soil from the CUC (Islam *et al.* 1979).



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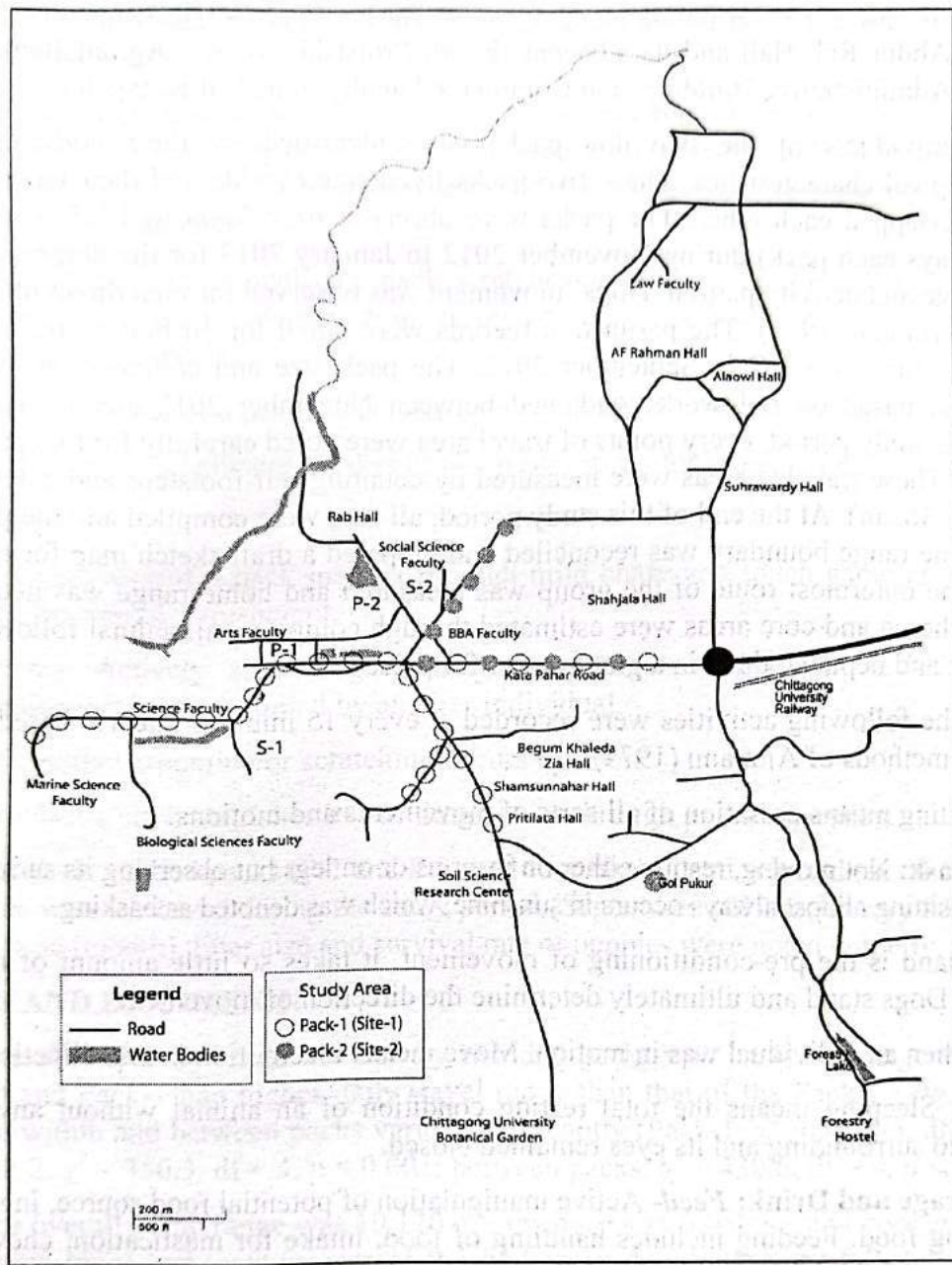


FIGURE 1: SHOWING THE LOCATION OF HOME RANGE AREA OF TWO STUDIED DOG PACKS AT CUC.

*Study subject*

Two packs of dog were selected for this study P-1 (Pack-1) and P-2 (Pack-2) and their sites were denoted as S-1 (Site 1) and S-2 (Site 2) (Fig. 1). Site -1 comprised Jhupri, Arts Faculty, Science Faculty, Central Library, Shahid Minar, Shamsunnahar Hall, Pritilata Hall to Ahsar-mor and Commerce Faculty to Zero point via Katapahar. Site -2 covered



Shaheed Abdur Rab Hall and its adjacent Jhupri, Probashi Colony, Agrani Bank, Shahid Minar to Administrative Building, and Commerce Faculty to part of Katapahar.

Individuals of the two dog packs were identified by their body color and morphological characteristics. These two packs lived side by side and their territory were partly overlapped each other. The packs were observed from 0600 to 1715 hours for 10 days (5 days each pack) during November 2012 to January 2013 for the determination of home range and activity pattern. Dogs' movement was observed through direct observation method (Altmann 1974). The parturition records were noted for 10 bitches from the first bitch gave birth at CUC in September 2012. The pack size and composition have been determined based on fieldwork conducted between November 2012 and January 2013. During the study period, every points of travel area were noted carefully for two packs (P-1 and P-2). These traveled areas were measured by counting self-footsteps and calculated (1 footstep = 36 cm). At the end of this study period, all data were compiled and the periphery of the home range boundary was reconciled and prepared a draft sketch map for each day. Finally, the outermost route of the group was measured and home range was determined. The total home and core areas were estimated through compiling all animal follow days of each pack and depicted them in a graph paper for presentation.

The following activities were recorded at every 15 minutes interval based on scan sampling methods of Altmann (1974).

**Rest:** Resting means cessation of all sorts of movements and motions.

**Sit and Bask:** Not moving, resting either on its arms or on legs but observing its surroundings. In winter, sitting almost always occurs in sunshine, which was denoted as basking.

**Stand:** Stand is the pre-conditioning of movement. It takes so little amount of time (1-2 minutes). Dogs stand and ultimately determine the direction of movement.

**Move:** When an individual was in motion. Move means locomotion in any direction.

**Sleeping:** Sleeping means the total resting condition of an animal without any type of response to surrounding and its eyes remained closed.

**Feed, Forage and Drink:** *Feed-* Active manipulation of potential food source, ingesting or masticating food. Feeding includes handling of food, intake for mastication, chewing and swallowing of food items. *Forage-* when feeding takes much time and occurs through searching food in a wide range of area. *Drink-* drinking is a normal daily behavioral pattern in dogs using long flat tongue and lick water and liquid food.

**Territorial behavior:** when a pack of animals or individual defend its territory, mate, resources and other members from neighboring conspecies.

**Scent marking:** when an individual of a pack discharges small amount of urine in different peripheral parts of its territory and/or home range.

**Bark:** when an individual make irregular vocal sound and/or noise towards member of conspecies or others.



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**Howl:** when an individual makes continuous vocal sound and/or noise towards member of conspecies or others.

**Chase and Fighting:** *Chase*- when a member(s) of a pack run after intruder(s) to leave its territory. *Fighting*- when a member(s) of a pack involve(s) threatening through display and occasionally bite(s) the intruder to defend territory, food source and/or mate especially the receptive female of the pack.

**Scratching:** when an individual of a pack scratches an area of the ground with its fore-paws and/or hind-paws for demarcating its own territory or home range boundary and looks towards its conspecies.

**Smell:** when a member of a pack takes odor by its nostrils of anything within its territory.

**Tail wagging:** when an individual shakes its tail to conspecies for happiness and/or interaction.

### Social behavior

**Play:** when members of a pack interact through mild chase and touch game as spending leisure time for mental refreshment.

**Social groom:** Actively scratching, picking up parasites, debris or fur of another individuals or itself being groomed by another individual.

**Self groom:** Active grooming or scratching occurs by itself.

**Lactation:** when a bitch nourishes its suckling babies through providing milks.

The main studied packs (P-1 and P-2) had four bitches and selected six other bitches in study area were observed during the study period (September 2012 to January 2013). The parturition time (month), litter size and survival rate of puppies were noted properly.

## RESULTS AND DISCUSSION

Overall, the daily range traveled by two dog packs was 1,641 m (range 947-2591 m, n = 10) and Pack-1 had higher daily travel range than that of the Pack-2 (Fig. 2). The daily range within and between packs varied significantly (Pack-1:  $\chi^2 = 510.95$ , df = 4, p < 0.001; Pack-2:  $\chi^2 = 350.3$ , df = 4, p < 0.001; between packs:  $\chi^2 = 430.6$ , df = 9, p < 0.001).

The overall home range was 10,120 m<sup>2</sup>, territory size 5,050 m<sup>2</sup> and core area 510.5 m<sup>2</sup>. The home range and territory size of P-1 had about double than the P-2, but the core area was nearly similar (P-1 had 520 m<sup>2</sup> and P-2 had 501 m<sup>2</sup>). The overlapped area of two packs was 3,840 m<sup>2</sup> (Fig. 2).

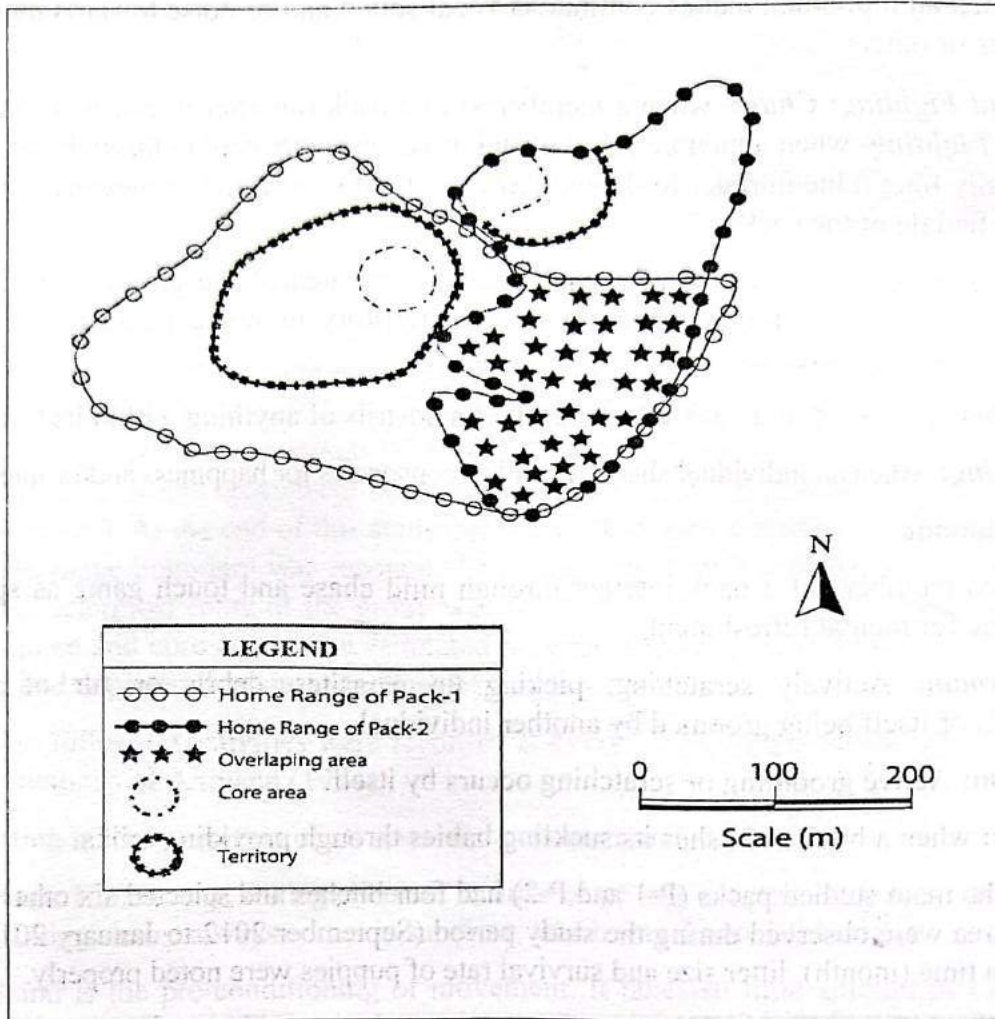


FIGURE 2: HOME RANGE, TERRITORY AND CORE AREA OF TWO DOG PACKS AT CUC.

P-1 had larger home range and territory size, because, the males were stronger than P-2, the females were pregnant, so they moved more for mostly searching food, the southeast side of P-1 had no dog pack and all members always stayed closer together, but it was not the case for P-2, where only two members (one male and one female) remained closer. P-1 collected their foods from the Arts Faculty Jhupri and Institute of Marine Sciences and Fisheries Jhupri and P-2 collected their foods from Rab Hall Jhupri and Teachers' Canteen, the dominant male of P-1 travelled large area for extra mating and held large area. This result also reveals that home range is positively correlated with the body size of the pack members. The females of P-2 had puppies and they were busy to take care of them and stayed more time in the core area.

During the study period on two dog packs, 1,225 observations were recorded within 427 scans and 112.3 man hours. The dogs were more active during 1300-1600 hours of the day and showed various activities (Table 1).



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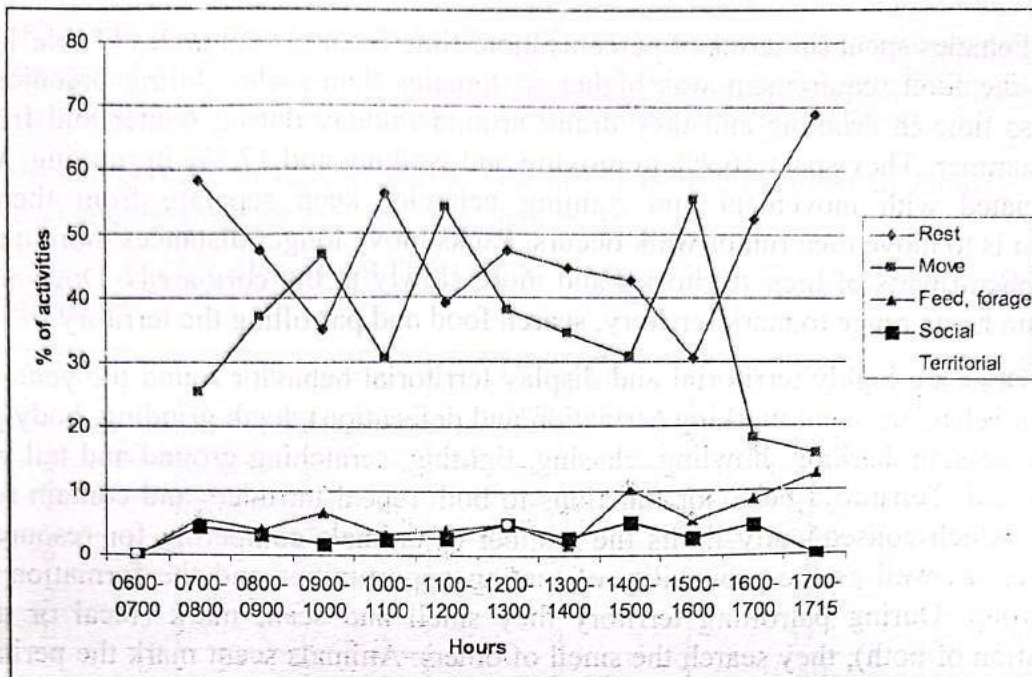


FIGURE 3: HOURLY ACTIVITY PATTERNS OF PARIAH DOG AT CUC.

TABLE 1: OVERALL ACTIVITY PATTERNS (IN DIFFERENT SEXES) OF PACK-1 AND PACK-2.

Behaviors	Male	%	Female	%	No. of observations	%
Rest	199	30.1	101	17.9	300	24.5
Sit & Bask	125	18.9	85	15.1	210	17.1
Stand	8	1.2	21	3.7	29	2.4
Move & Walk	94	14.2	105	18.6	199	16.2
Run	94	14.2	120	21.3	214	17.5
Sleeping	45	6.8	20	3.6	65	5.3
Feed, Foraging & Drink	31	4.7	46	8.2	77	6.3
Territorial	60	0.8	35	5.4	36	2.9
Social	5	9.1	31	6.2	95	7.8
Total	661		564		1225	

Overall, pariah dogs spent maximum time in resting (24.7%) and minimum standing (2.4%) (Table 1). The similar observations were also reported by Hubrecht *et al.* (1992). They (1992) also mentioned that dogs like other carnivores spent much of their time in resting. Adult males spent more time (30.1%) in resting than that of adult females (17.9%). The reason may be that P-1 had two nulliparous pregnant females and their food demands were high for the development of their pups in the wombs, so they had to spend most of their time in movement for seeking foods. This study was conducted during winter months, so sitting bouts almost always occurred in sunshine places. Males spent more time (18.9%) in sitting and basking than females (15.1%). Similarly, males also spent more time sleeping (6.8%) than females (3.6%).



Females spent (in terms of percent) more time feeding than males (Table 1); this is because the food requirement was higher in females than males during breeding. Dogs spent less time in drinking and they drank around midday during winter and frequently during summer. They spent 16.2% in moving and walking and 17.5% in running. Walking is associated with movement and running behavior keep separate from them. First condition is to move then run or walk occurs. Packs move longer distances more quickly in the peripheral parts of their territories and more slowly in the core areas. Dogs walk and run within home range to mark territory, search food and patrolling the territory.

Dogs are highly territorial and display territorial behavior round the year. Among territorial behaviors scent marking (urination and defecation), teeth grinding, body posture, facial expression, barking, howling, chasing, fighting, scratching ground and tail wagging were noticed. Territorial behavior functions to both repeal intruders and contain residents to areas, which consequently limits the number of animals competing for resources in a given area, as well as the probability of mating opportunities and the formation of new social group. During patrolling territory they smell and scent mark (fecal or urine or combination of both), they search the smell of others. Animals scent mark the perimeter of their territory, forming a "scent fence" (Hediger 1949) and motivated to protect their territory by attacking intruders (Ralls 1971). It can also act as signals in mate selection and dominance assessment by the chemical composition and relative positioning of marks (Rosell and Nolet 1997, Sun and Muller-Schwartz 1998, Kumura 2000, 2001 in [www.sagepublication.com](http://www.sagepublication.com) 2004). Before urination and defecation, they smelled and/or scratch the ground.

Dogs try to avoid fighting, but when the territory owners and intruders become face to face they bark, show teeth grinding, make facial expression, chase and finally fight may occur. Dogs bark to communicate (Fox and Bekoff 1975, Simpson 1997). Howls are long, melodious sounds that sweep through many different pitches. Dogs' howls under many circumstances and the full range of meaning of this vocalization are still not understood.

Dogs are avid chasers, and through chasing could displace intruders from their habitats. To avoid fighting, dogs show high degree of avoidance between packs. Visual display such as scratching of the ground or lifting of the hind leg may accompany urine or facial marking (Bekoff 1979).

Tail wagging is an indicator of arousal and of intention to interact. In a domestic context, the tail wag is often conditioned as a greeting behavior and it is a behavior, which is generally viewed as a sign of "happiness" and well-being in the dog.

It is noticed that during reciting "azan" through loud speakers' and "miking" dogs howl. Sometimes when one dog of a pack howls then the neighboring pack members start howling. If mother howled during "azan" then puppies did the same. When intruders enter the territory they howl to communicate to pack members and neighbors. Lund and Jongenson (1999) mentioned that howling is a natural response of dogs' separation from their social group or owners. At CUC dogs spent 2.9% of their diurnal time in social behaviors, which were play, self grooming and social grooming. Social play is a game directed at a conspecific



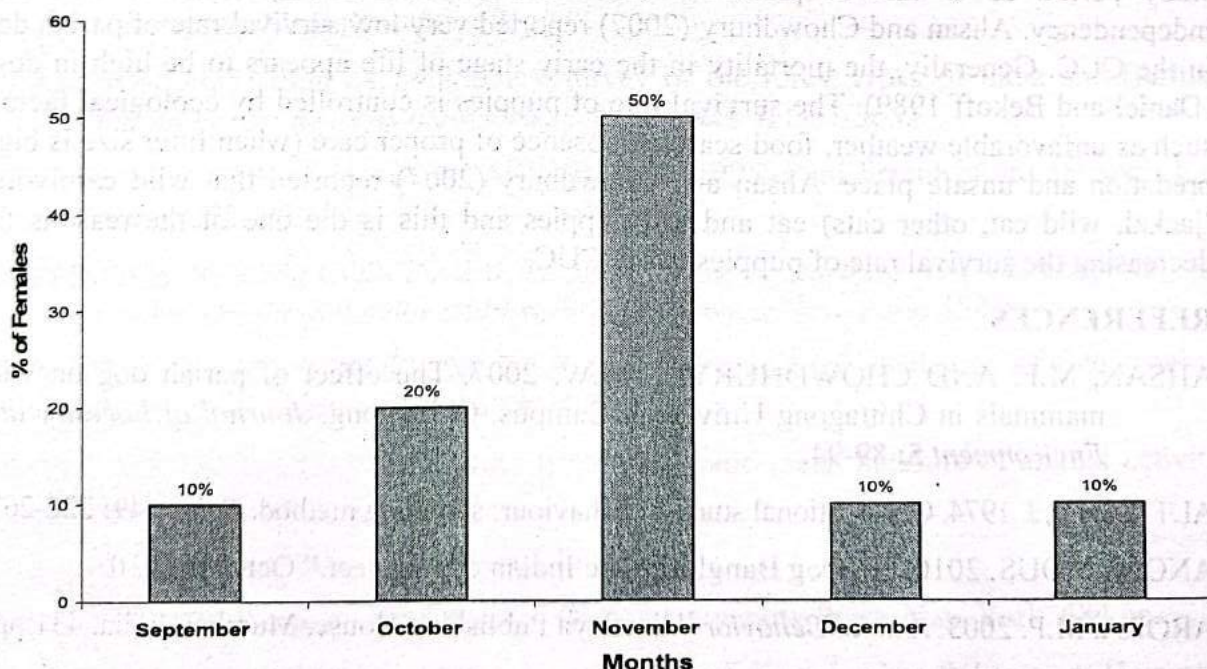
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(Bekoff and Byers 1981, Fagen 1981, Bekoff 1984) and in canids it includes behaviors such as chasing and play-fighting games, mounting behavior and inhibiting biting (Bekoff 1984, Burghardt 2005). Animals play to learn valuable social skill (Biben 1998).

The parturition time of pariah dog lasted from September to January in the CUC (Table 2) and the peak period was in November (Fig. 4).

**TABLE 2: LITTER SIZE, PARTURITION TIME AND SURVIVAL RATE OF PUPPIES IN THE CUC**

No. of female	Litter size	Offspring survived	%	Time (Month)
1	7	1	14.3	October
2	7	3	42.9	November
3	12	11	91.7	October
4	1	0	0	November
5	2	2	100	November
6	7	4	57.1	November
7	5	2	40	November
8	1	1	100	September
9	1	0	0	December
10	4	2	50	January
Total	47	26		
Mean	4.7	2.6		



**FIGURE 4: PARTURITION OF PARIAH DOGS IN DIFFERENT MONTHS AT CUC.**



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The nulliparous females, which had earlier experience of giving birth, parturitions occur earlier of the season than the females, who did not have previous experience. The parturition period of pariah dog in Bangalore of India spread over August to January (Anonymous 2010) and this slightly variation of the parturition time with the present study may be due to some environmental and physiological factors. Mostly bitch take care of puppies and when mother was not present near the pups they play with the male member (may be father) of the pack and other young members of the pack play active role to take care of pups.

The litter size was 1-12 puppies (mean 4.7, n = 10) in the CUC during this study, while Mech (1974) recorded the average litter size as 6 (extreme 1-11), which is close to this study. The litter size may vary due to physical status of female, succeed mating and environmental factors. Small bitches produce fewer puppies than strong healthy bitches. The maximum litter size was 4 for the first time pregnant female, which is less than the nulliparous females. The early breeder produced less puppies (noticed three). Parturition noticed relatively quiet, safe and warm places, which comprised drain, hole and hollow log for safe shelter of young. Pups started to disperse from their natal territories depending on ecological and social factors but in case of small pack size and less offspring stayed with pack which was noticed in P-2.

Survival rate of pups in the CUC was very low nearly half of the average litter size (mean 2.6, range 0-11, n = 10), but some puppies were small during the end of the study period so it can be predicted that the survival rate may decrease to attain independency. Ahsan and Chowdhury (2007) reported very low survival rate of pariah dog in the CUC. Generally, the mortality in the early stage of life appears to be high in dogs (Daniel and Bekoff 1989). The survival rate of puppies is controlled by ecological factors such as unfavorable weather, food scarcity, absence of proper care (when litter size is big), predation and unsafe place. Ahsan and Chowdhury (2007) reported that wild carnivores (jackal, wild cat, other cats) eat and kill puppies and this is the one of the reasons for decreasing the survival rate of puppies in the CUC.

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