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HOME RANGE AND HABITAT USE OF A MALE ASIATIC JACKAL *(CANIS AUREUS)* AT KHAO NANG RUM WILDLIFE RESEARCH CENTER, THAILAND

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ABSTRACT

A male Asiatic Jackal *Canis aureus*, weight 10.3 kg, was caught and radio-tagged on 3 June 1993. The minimum area that it used during a 16-month monitoring period was 923 ha (N = 257 detected points). The range included 87% deciduous and 13% dry evergreen forests. In February 1994, the animal was observed to cover 427 ha (N = 17 points), which was the largest monthly range and included 286 ha of dry dipterocarp, 115 ha of mixed deciduous and 23 ha of dry evergreen forests. In July 1994, it was found to cover the smallest range of 57 ha, entirely in dry dipterocarp forest. During the dry season, the average core area, activity radius and percentage of its activities were as high as 77 ha, 1,015 m and 62% respectively. During the rainy season, the averages of the above were as low as 33 ha, 656 m and 44% respectively. The core area during both seasons was in dry dipterocarp forest. On average, the most active time was from 2200 to 0400 hours and the least active time was from 1200 to 1400 hours.

INTRODUCTION

Asiatic Jackals *Canis aureus* are found distributed from southeastern Europe and southwestern Asia, throughout India and Sri Lanka and extending into Burma (Myanmar) and Thailand (PRATER, 1971; LEKAGUL & MCNEELY, 1988). In Thailand, the Asiatic Jackal is found in the north and west (LEKAGUL & MCNEELY, 1988).

The Asiatic Jackal can be found in various types of habitat, ranging from open lowland plains up to 3,660 m in the Himalayas and from humid forest to desert. They frequent more dry zones than moist ones (YIN, 1968; PRATER, 1971).

The Asiatic Jackal is a secretive animal, living in solitary or sometimes in pairs, and is usually nocturnal. It spends the day sleeping in a hole in the ground, but can occasionally be seen out on a cloudy or cool day. It usually comes out at dusk and retires at dawn (PRATER, 1971). It hunts alone or in pairs. On a hot day, it may come out to drink water or lie in the shade (YIN, 1968; PRATER, 1971).

The breeding season is reported in February and the five cubs are born in April. Usually the pair share duties in caring for the young. Besides milk, both parents regurgitate food for the cubs from when they are about three weeks old (YIN, 1968). There is very little known about the Asiatic Jackal, particularly in Thailand. I, therefore, present my study on home ranges and habitat used at Khao Nang Rum Wildlife Research Center.

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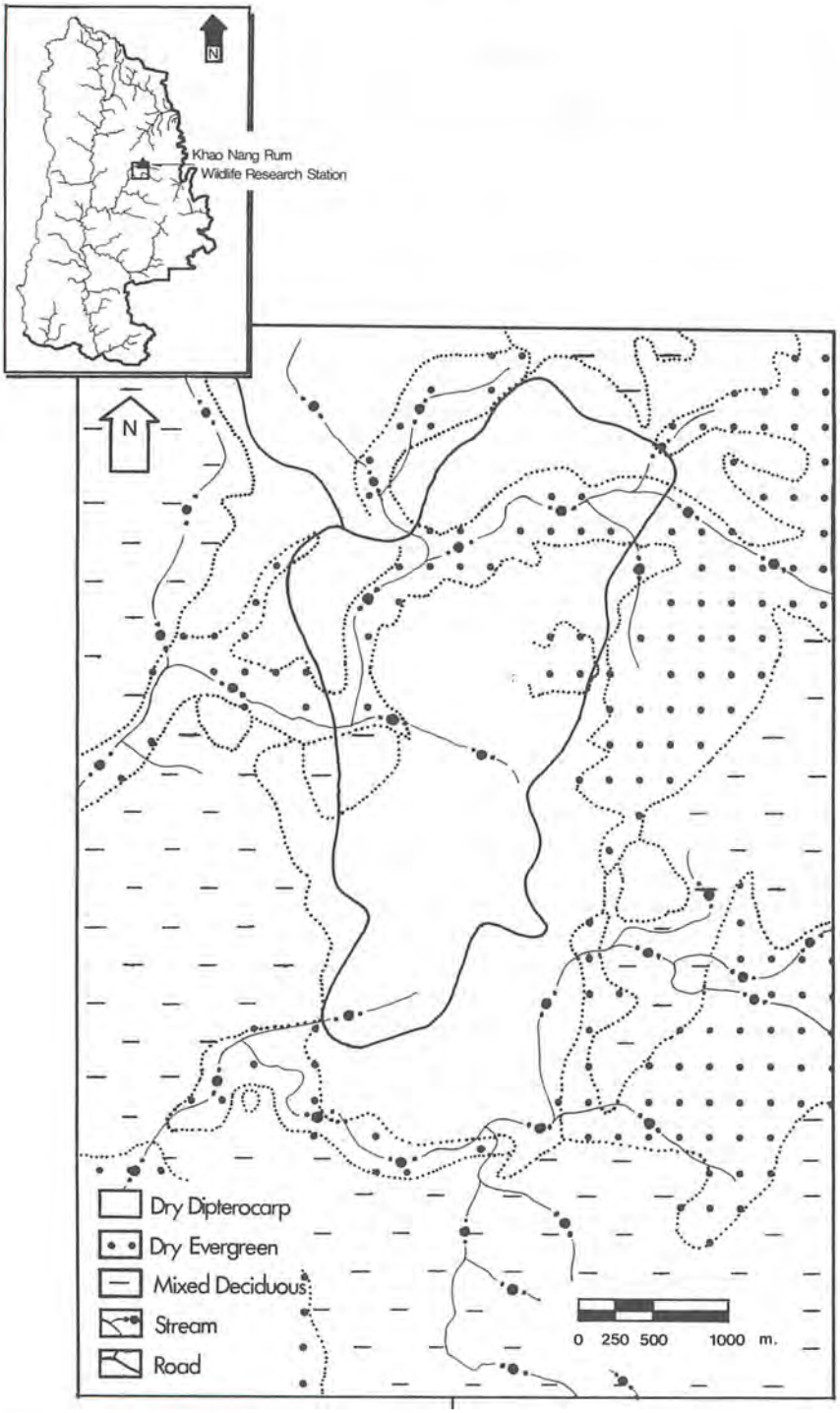

Figure 1. Map of study area and its vegetation.

STUDY AREA

The study was carried out in a 40-km^2 area located between 15°30'00"–15°25'55"N and 99°14'50"–99°19'18"E, at Khao Nang Rum Wildlife Research Center, Huai Kha Khaeng Wildlife Sanctuary, western Thailand (Fig. 1). Altitudes within the study area range from 400–600 m a.s.l. There are two main streams, the Huai Charng Tai and Huai Ai Yoh. The latter one supplies water throughout the year. There are two distinct seasons, wet and dry (Fig. 2). The dry season begins in November and lasts until April. The wet season is from May to October.

The study area comprises three different vegetation types. These are dry dipterocarp forest (10.6 km^2 or 26.6%), mixed deciduous forest (19.1 km^2 or 47.8%) and dry evergreen forest (10.2 km^2 or 25.6%) (Fig. 1). In the dry dipterocarp forest, the most common Dipterocarpaceae trees are Teng *Shorea obtusa,* Rang *S. siamensis* and Phluang *Dipterocarpus tuberculatus,* and other common trees were Daing *Xylia kerrii,* Pradu *Pterocarpus macrocarpus,* Makhaam pom *Phyllanthus emblica,* Ket daeng *Dalbergia dongnaiensis* and Salak paa *Morinda angustifolia.* The forest floor is covered with plants in the family Zingiberaceae, Yaa khaa *Imperata cylindrica* and Yaa phai yong *Pogonatherum crinitum.* In the mixed deciduous forest, dominant trees are Salao *Lagerstroemia tomentosa,* Pradu *Pterocarpus macrocarpus,* Makhaa mong *Afzelia xylocarpa,* Ma kok *Spondias pinnata,* Sawong *Vitex* spp., Phai paa *Bambusa arundinacea* and Saang *Dendrocalamus strictus.* The forest floor is covered by Yaa phai yong *Pogonatherum crinitum* and Popit *Helicteres isora.* Evergreen forest is found along the streams or valleys where common trees are Yaang daeng *Dipterocarpus turbinatus,* Yaang khaeng *D. macrocarpus* and Takhian thong *Hopea odorata.*

METHODS

Trapping and Radio Tagging

Animal and patrolled trails were checked for passing tracks of Asiatic Jackals. Leg-hold traps were set along these trails. Once jackal was trapped, its weight was estimated for proper doses of anaesthetic drug (ketamine hydrochloride, Parke-Davis & Co., at 20 mg/kg). The trapped jackal was weighed, and body and tail lengths were measured. Sex and age were classified. An age class as adult or sub-adult was identified based on characteristics, size and colour of teeth. A collared transmitter with a frequency between 150–152 Hz was attached (Telonics Inc., Mesa, AZ, USA). The transmitter was an activity transmitter which emits a different signal when the tagged animal moves its head. The jackal was re-released into the wild at the place where it was trapped.

Monitoring and Data Collection

Monitoring of the tagged jackal was begun one week after release to minimise any effects which may have been caused by trapping and tagging. Tracking was done in two different ways based on the availability of receivers.

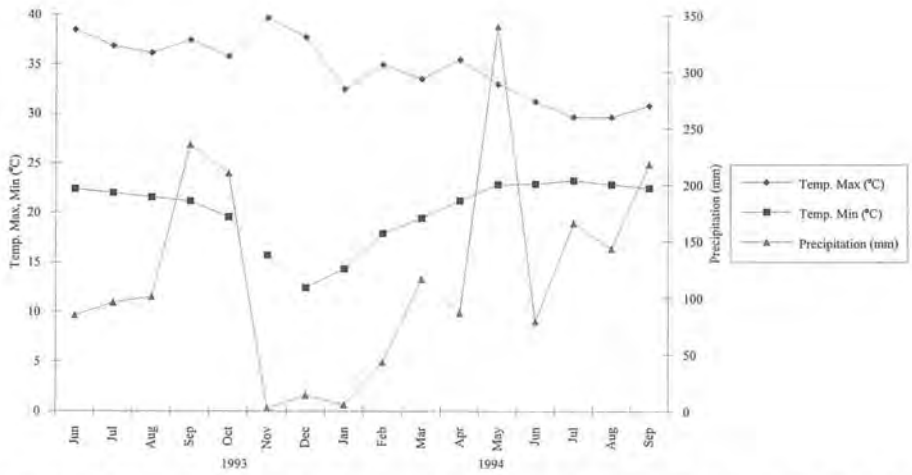

Figure 2. Average monthly maximum and minimum temperatures and precipitation. Data collected at the Khao Nang Rum Wildlife Research Center from June 1992–September 1993.

First, during June–November 1993, I moved the only receiver from one place to another within 30 min and assumed that the jackal had not moved. Second, during December 1993–September 1994, two receivers were operated at the same time from two places. During both periods, tracking was done four times per week.

Signals detected would indicate different types of activities. If detected signals were steady, this meant that the animal did not move its head. If the signals were unsteady, it would indicate movement of the head. An hourly activity study was performed once a month for 24 hours, each recording taking 1–2 min.

Daily movement was determined hourly by tracking from two stations for 24 hours once a month in May, July and August 1994.

Data Analysis

Sizes of home range and core area were determined from minimum convex polygon (Calhome Home Range Analysis Program).

Forest area which the home range covered was determined from dot counts on a grid map of vegetation types (scale 1 : 20,000).

Daily movement was determined from sums of a distance between consecutive locations detected hourly for 24 hours.

Terminology

A **centre of the home range** was defined as an average distance of positions from the x and y axes. The **shift in home range centre** was defined as the change in such an average distance from the range detected at a former period. The **activity radius** was defined as a mean distance between the home range centre and the positions at which the

animal was detected. The **core area** was defined as the area within 50% of detected positions located near the centre, where activities were most intense.

RESULTS

Home Range Sizes and Habitat Use

A male Asiatic Jackal that weighed 10.3 kg was radio-tagged in June 1993. Weather information was recorded as shown in Figure 2. Monitoring throughout 16 months, the minimum convex polygon showed that total home range of this jackal covered an area of 932 ha (N = 257 detected points) (Fig. 3). Data strongly show that among the three forest

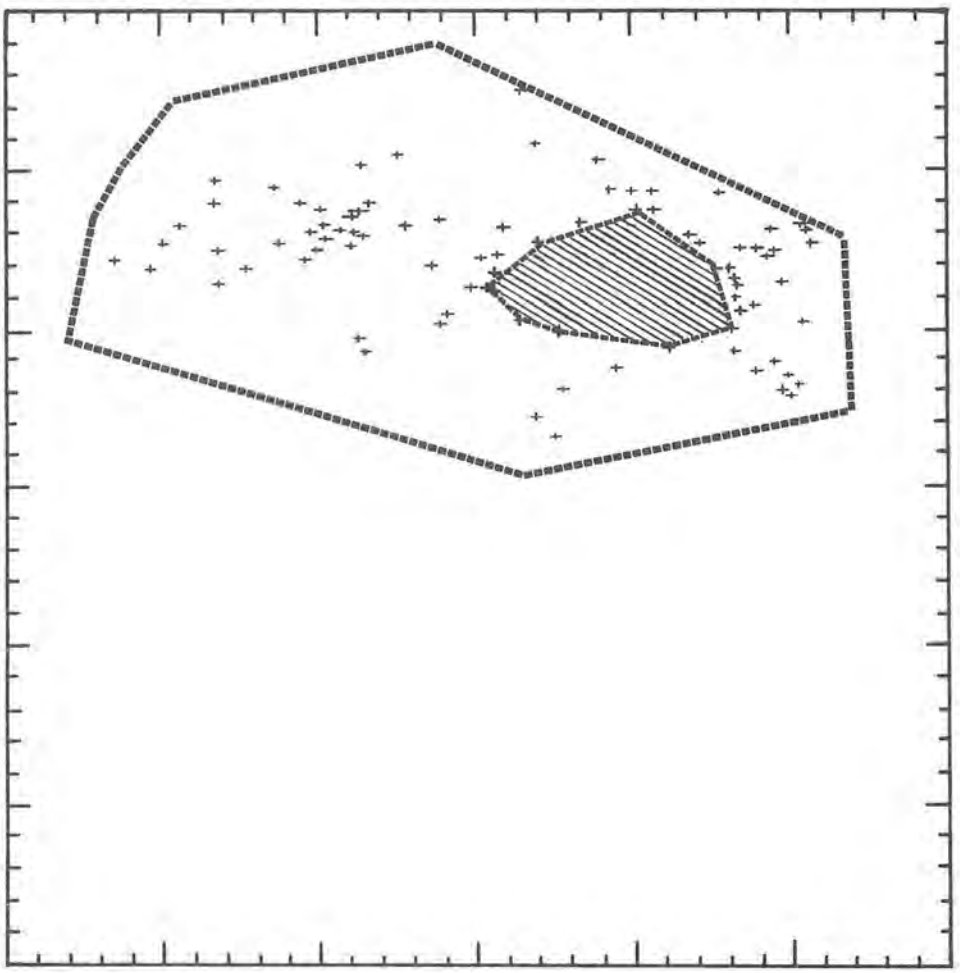

Figure 3. Total home range and its core area (50% of total detected points) of a male Asiatic Jackal monitored during June 1993–September 1994 at Khao Nang Rum Wildlife Research Center.

Table 1. Monthly total home range, range in different habitat types, core area , activity radius and home range centre shift for a male Asiatic Jackal monitored during June 1993–September 1994 at Khao Nang Rum Wildlife Research Center. DD = dry dipterocarp forest, MD = mixed deciduous forest, DE = dry evergreen forest.

	Month	Rainfall	No. points	Home range (ha)				Core area	Activity	Range
		(mm)	detected(N)	Total	DD	MD	DE	(ha)	radius (m)	center shift (m)
Wet season										
1993	June	84.3	14	68	6.8	0	0	4.6	1018	-
	July	95.8	14	136	115	0	21	6	943	821
	Aug.	101.1	12	98	90	0	8	22	746	257
	Sept.	235.2	17	168	168	0	0	12	640	409
	Oct.	210.1	19	133	118	0	15	12	441	245
Dry season										
	Nov.	2.5	19	153	149	1	3	21	836	395
	Dec.	113.8	13	82	67	5	10	9	644	419
1994	Jan.	5.8	21	203	173	24	6	76	1189	899
	Feb.	43.2	17	427	286	115	23	35	1430	133
	Mar.	116.6	11	138	129	3	6	22	791	203
	Apr.	86.6	12	171	171	0	0	17	575	883
Wet season										
	May	340.1	23	384	362	29	3	24	922	219
	June	79.0	18	185	185	0	0	26	666	389
	July	165.9	15	57	57	0	0	15	439	296
	Aug.	143.5	20	213	185	3	25	16	640	246
	Sept.	218.4	12	159	152	4	2	11	681	433
Wet season (n=10)										
	X	167.3	16.4	160.1	140.28	3.6	7.4	14.86	713.6	368.33
	SD	84.1	3.6	93.0	86.8	9.04	9.5	7.26	198.23	187.51
Dry season (n=6)										
	X	61.4	15.5	195.67	162.5	24.67	8	30	910.83	488.67
	SD	51.6	4.1	120.2	71.9	45.13	8.1	24.07	331.9	330.33

types the dry dipterocarp forest was most favoured and the mixed deciduous and dry evergreen forests were the alternatives (Table 1 and Fig. 3). The home range incorporated areas in the dry dipterocarp forest of 579 ha (54.6%), in the mixed deciduous forest of 228 ha (11.9%) and in the dry evergreen forest of 123 ha (12.1%) of existing forest types in the study area (Figs. 1 and 3). But between the two types of deciduous forest (the dry dipterocarp and mixed deciduous forests), the core areas, where most intense activities took place, were in dry dipterocarp forest (Fig. 3).

By season, monthly rainfall, home range size, core area, activity radius and the distance of home range centre shift are given in Table 1. Although mean monthly rainfall in the wet season was significantly higher than in the dry season (Mann-Whitney Rank Sum Test: $t = 2.7$, $n_1 = 10$, $n_2 = 6$, $df = 14$, $p = 0.0152$), rain seemed to have no effect on this jackal. Statistical tests showed no differences between means in the wet and dry seasons for number of points detected, total range, ranges in dry dipterocarp forest (DD), mixed

deciduous forest (MD) and dry evergreen forest (DE), core area, activity radius and range centre shift (Table 1). It should be noted, however, that in February, which is in the dry season, the range was largest (427 ha) and mainly incorporated in the dry dipterocarp of 286 ha (67%) (Table 1). It also had the greatest activity radius (1,430 m), but the distance of home range centre shift was shortest (133 m). There were also no statistical pairwise correlations between total home range, core area, activity radius and home range centre shift, except between total home range and core area. These two variables had a positive statistical correlation (r_s = 0.65096, n = 16, p = 0.00618) (Table 1). The monthly ranges in two wet seasons fluctuated greatly (Table 1). In May, when rainfall was highest (340.11 mm, Fig. 2), the range was largest (384 ha) and almost the entire range was in the dry dipterocarp forest (94.3%). Whereas in July, when rainfall decreased to about 50% of May (Fig. 2), the range was smallest (57 ha) and the entire range was in the dry dipterocarp forest. However, statistical tests showed no correlations between monthly rainfall and monthly home range, core area, and range centre shift, but rainfall showed negative correlation with activity radius (r_s = –0.5151, n = 16, p = 0.0402) (Table 1).

Seasonal Range and Core Area

In Figure 4, home ranges, as in the wet '93 (June–October 1993), dry (November 1993–April 1994) and wet '94 (May–September 1994) seasons varied, to cover 413 ha, 504 ha and 543 ha respectively. There was great overlap of all three ranges (Fig. 4). The core areas of these three seasons were entirely located in the dry dipterocarp forest. It was found that the core areas for the two respective wet seasons were similar (33 ha and 36 ha) and were smaller than that of the dry season (77 ha). The differences in size of the core areas for the two different seasons may be related to abundance of food in each season.

A percentage of the core area in relation to the total home range should indicate a comparative size for an area in which most activities actually occurred. From Figure 5, the percentages of the core areas peaked in each season. The highest percentage of the core areas of the two wet seasons were similar. In the dry season, it was distinctly higher in January. There was no correlation between the percentages of the core area and precipitation (r_s = –0.403, n = 16, p = 0.118) (Fig. 5). The abrupt change in size of the core area in January may have been influenced by low temperatures in December (12.5 °C) (Fig. 2). This is supported by the furthest shift of the home range centre (899 m) (Table 1).

Changes in Cumulative Range Size with Increase in Monitoring Period

Cumulative home range and core area sizes increased with the length of monitoring (Fig. 6). The stepwise form of the curve of cumulative ranges suggests that the jackal was roaming in the same area for 1–2 months at a time (i.e. September–November, February–April, May–July and August–September; Fig. 6). It appeared that the cumulative ranges reached the maximum range of this jackal. It is also interesting to note that home range increased abruptly in February, while before and after that the range only increased slightly.

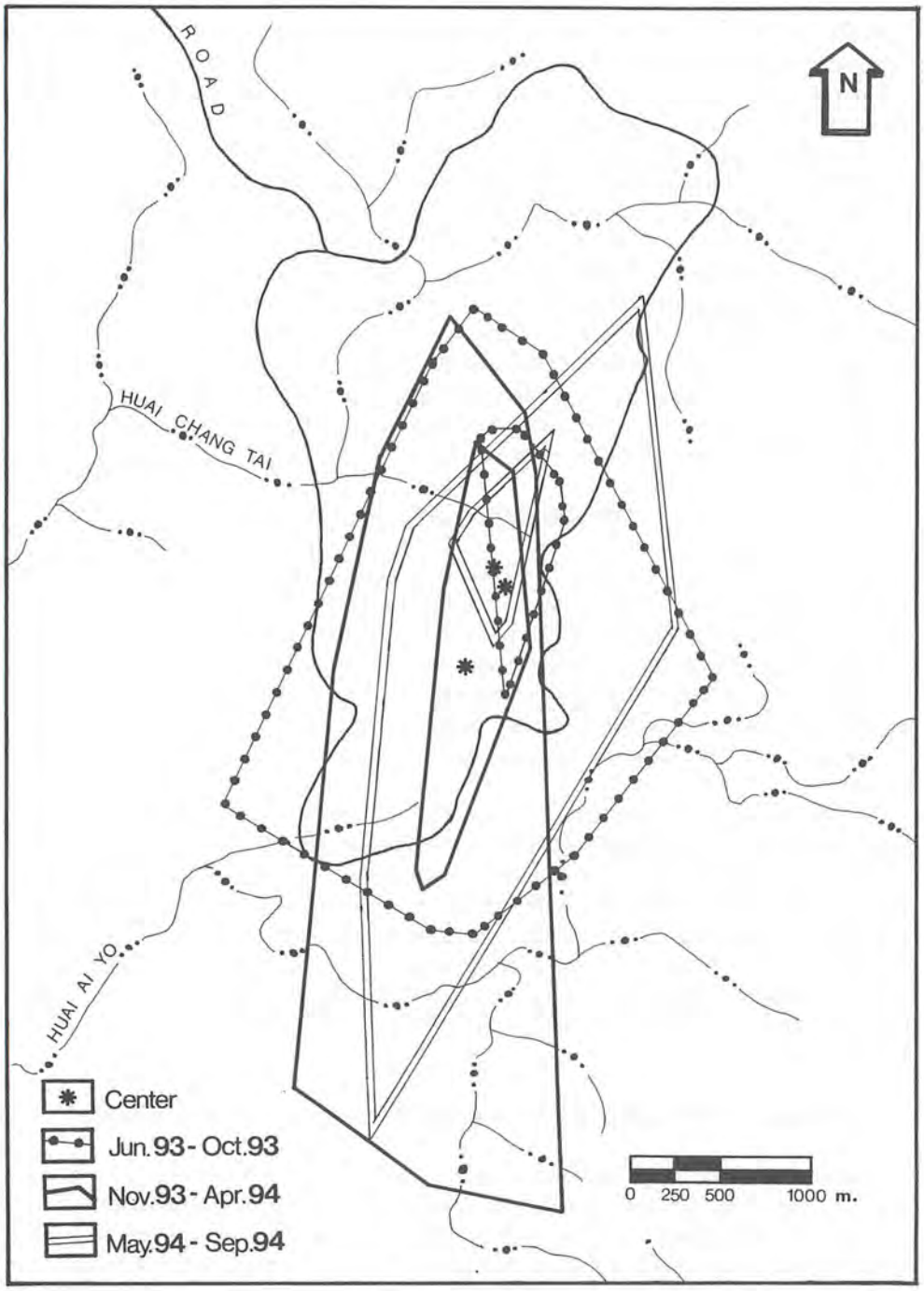

Figure 4. Home ranges and core areas of a male Asiatic Jackal in three different seasons at Khao Nang Rum Wildlife Research Center.

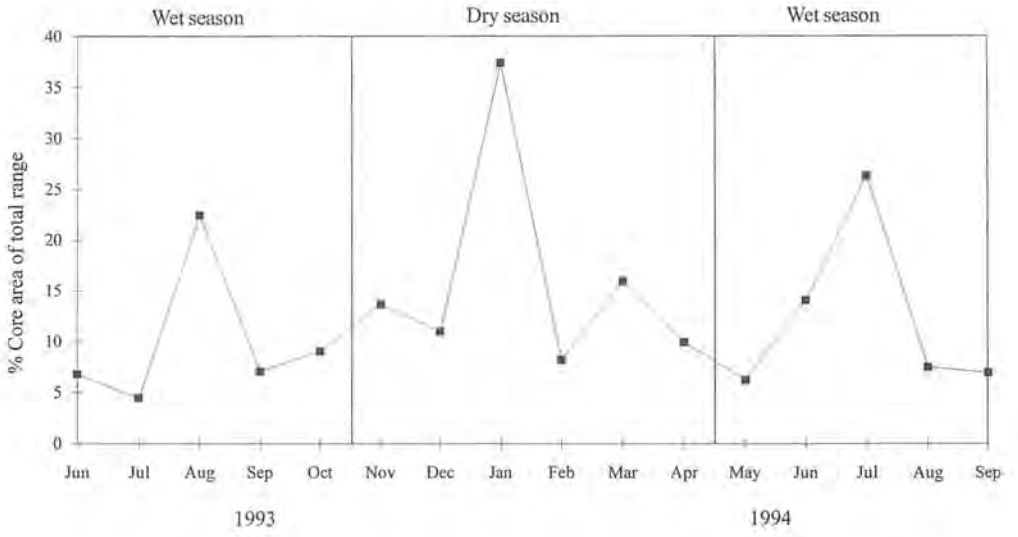

Figure 5. Monthly core area as a percentage of total home range for a male Asiatic Jackal at Khao Nang Rum Wildlife Research Center.

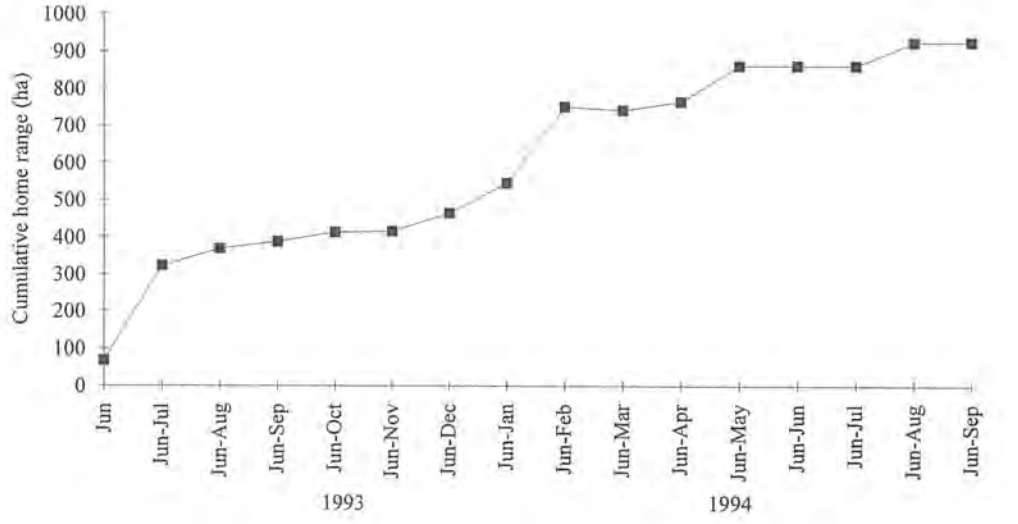

Figure 6. Accumulative size of home range of a male Asiatic Jackal at Khao Nang Rum Wildlife Research Center.

Temporal Activity

The percentage of activities at 2-hour intervals is shown in Figure 7. The activity of this male jackal peaked between 2200 and 0400 h and was lowest between 1200 and 1400 h. The activity markedly increased between 1800 and 2000 h and dropped between 0600 to 0800 h in both dry and wet seasons. These data confirm that the jackal is a nocturnal animal being active around midnight and inactive during midday. The data also suggest that this jackal may spend at least 12 hours foraging.

Daily Movement

Total distances of 24-hour movement in May, July and August of this jackal were 8,884 m, 9,557 m and 8,508 m, respectively. The hourly distance (Fig. 8) shows no specific pattern. Unfortunately, there was no comparative study on 24-hour movement in the dry season. In May and August, the jackal moved longest between 0600 and 1000 h and shortest between 1400 and 1600 h. Means of hourly distance the jackal moved within 24 hours of three days in these three months were similar (370.2 ± 306.2 m, 397.2 ± 285.1 m and 354.5 ± 332.7 m, respectively.)

Among daily ranges in these three months, the range in May was the greatest (150 ha), whereas July was the smallest (51 ha) (Fig. 9). Hourly positions and ranges in May, July and August shown in Figure 9 indicate the active areas correspond with cumulative size of home range (Fig. 6). Thus, it confirms that the period between May–July 1994 the jackal foraged in the same area and changed the feeding ground in August (Figs. 6 and 9).

DISCUSSION

Asiatic Jackals are known to live in almost any environment, ranging from humid forest to dry open plain, but they are found more in dry lowlands and avoid moist ground (PRATER, 1971; YIN, 1967). Although, data were from only one jackal, it is obvious that this jackal preferred the dry dipterocarp forest in all seasons. This is perhaps true in this case study since the animal stayed entirely in the dry dipterocarp forest in the months of heaviest rain. Conversely, it liked mixed deciduous forest least. There must be favourable factors available in dry dipterocarp forest such as food and shelter. The Asiatic Jackal is known to spend the day in a burrow in the ground, such as among ruins or in dense grass (PRATER, 1971; LEKAGUL & MCNEELY, 1988). Perhaps there are plenty of suitable shelters in the dry dipterocarp forest.

The maximum home range of this male Asiatic Jackal was about 930 ha. Home range may be affected by season, which consequently affects food abundance. Asiatic Jackals are reported to be scavengers and omnivore. Their food ranges from fruit to animals, including small mammals, birds, amphibians and reptiles. Besides being a carnivore, the Asiatic Jackal also feeds on animal carcasses; they do not hunt very often (PEACOCK, 1933; PRATER, 1971; LEKAGUL & MCNEELY, 1988). The larger home range was, perhaps, mostly influenced by cold weather or too little or too much rain and by the scarcity of food. If the latter is true, it is likely that the food of the Asiatic Jackal in this area would be some

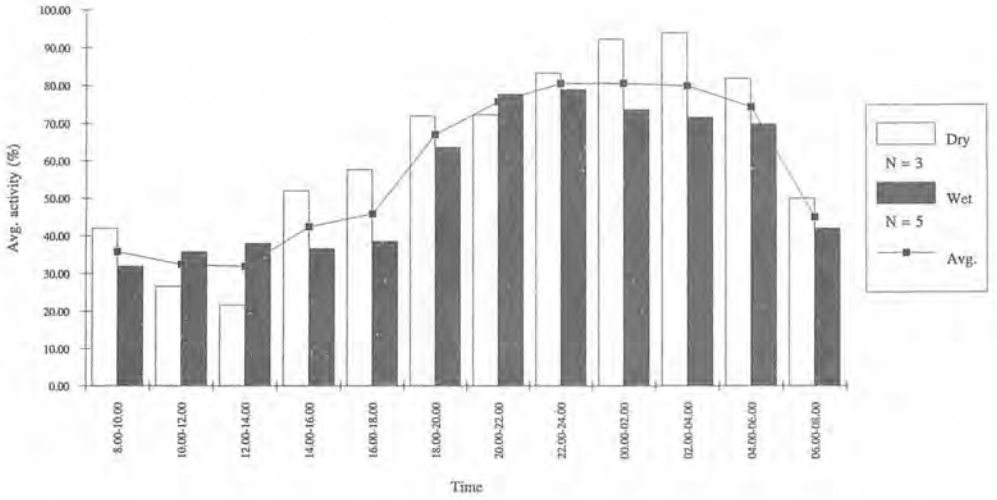

Figure 7. Percentages of 2-hour periodic activities in dry and wet seasons of a male Asiatic Jackal.

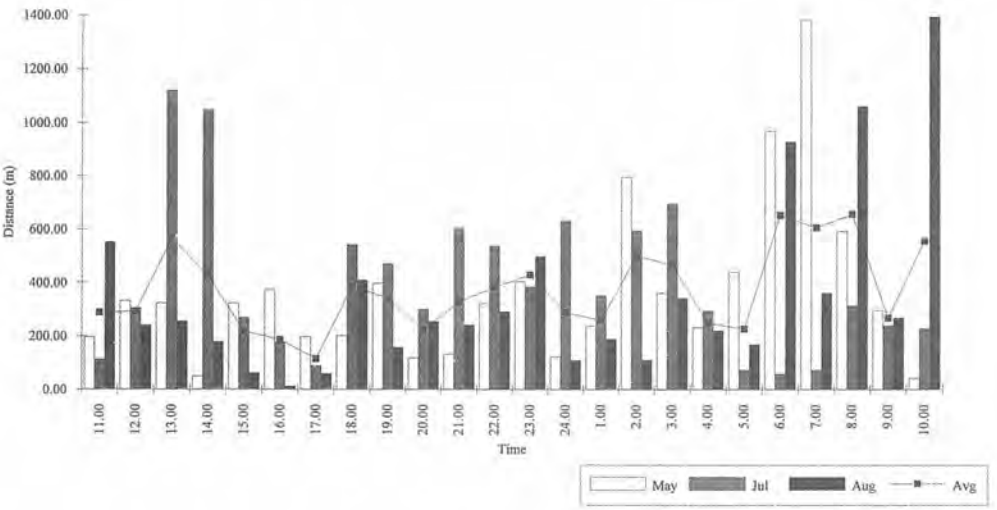

Figure 8. Three-day hourly movement of a male Asiatic Jackal in three different months during the wet season of 1994 at Khao Nang Rum Wildlife Research Center.

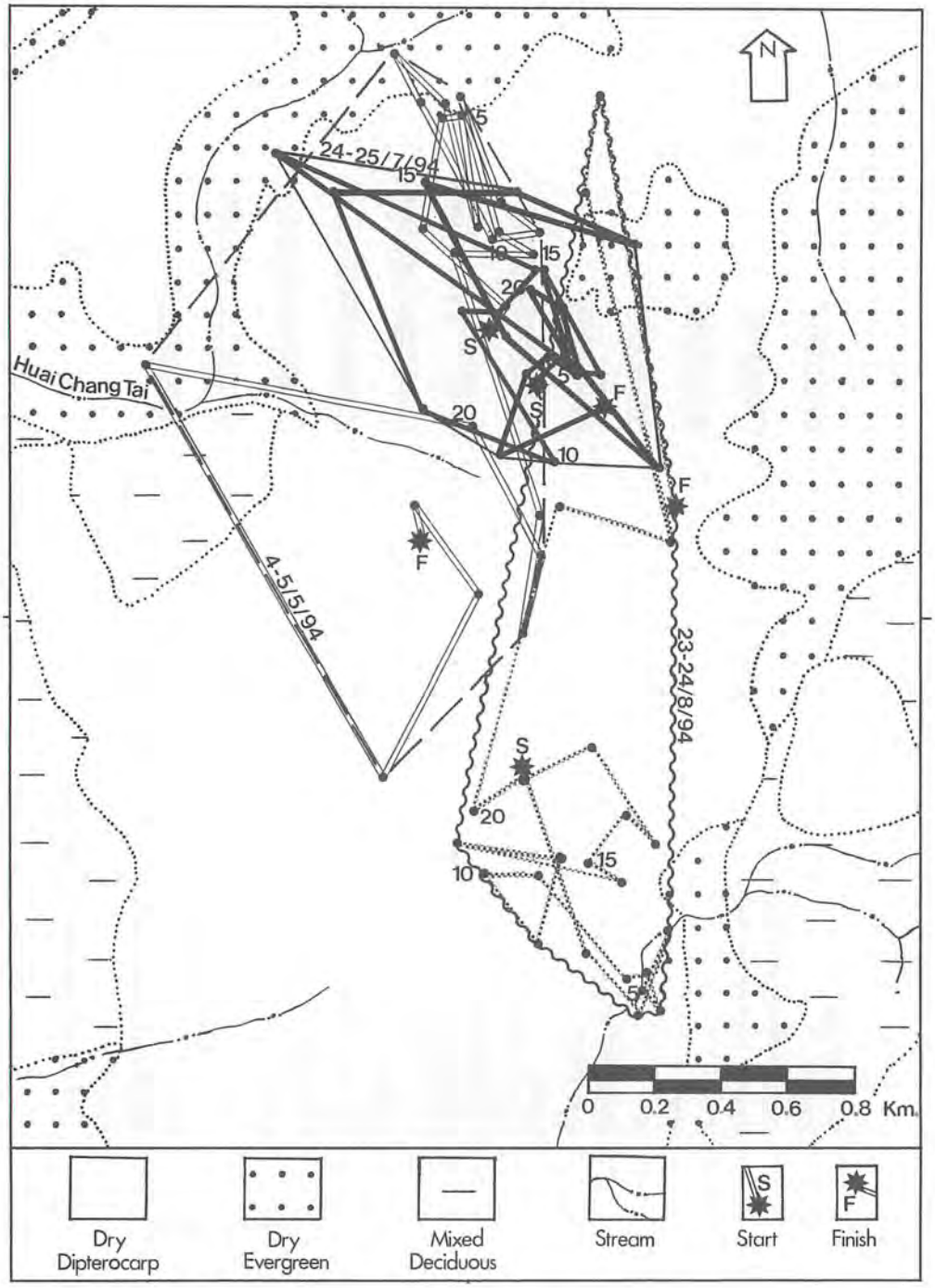

Figure 9. Daily movement and ranges of a male Asiatic Jackal in three different months during the wet season of 1994.

animal groups which hibernate (such as amphibians and insects) or aestivate (such as molluscs) in the dry and cold season.

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