8. Activity patterns

8.1. Introduction

The domestic cat is popularly considered to be a nocturnal animal. Although this is true of most species of small cats (Walker 1975, Tate 1947), there is evidence that this is not the case for the domestic cat. Kavanau (1971), studying the activity of animals by their locomotion in running wheels, found that a pet cat was active, on average, only 54 minutes a day. This cat spent most of the rest of her time resting in the wheel. The activity was scattered in a few bouts of five to 40 minutes, and occurred arhymically through the 24 hours, but with slight peaks at twilight. Crepuscular activity is also shown by the Scottish wild cat, *Felis silvestris*, although this species is mainly nocturnal (Corbet & Southern 1977). The low level of activity shown by this pet cat is not unique in the cat family. Schaller (1972) found that Serengeti lions were largely inactive for an average of 20 to 21 hours a day.

In the dockyard habitat, with its artificial lighting and high density of people, it is interesting to consider how much the activity patterns of the cats may be influenced by natural conditions, and how much by human activity.

The natural conditions which may influence cat activity patterns are the weather (temperature, sunshine, rain and wind, and possibly barometric pressure) and the day length. People may influence cats' activity by feeding them at certain times. Cats may be more active when human activity is low, such as evenings, Saturday afternoons and Sundays, and less active when human activity is greatest, when arriving or leaving the dockyard. Peaks in human-activity may occur unpredictably during the day, and resting cats may also be disturbed by games played nearby, by being chased, or by parked cars moving away.

During the patrolled watches, it appeared that cats tended to be more active in the evenings (and at dawn), and when the dockyard was quiet. Information on activity was recorded (see Section 3.2.1), but this was difficult to interpret quantitatively, due to the different numbers of observations for different hours. About a third of the cats known to be present in an area were seen on each patrol, irrespective of the month of the year. However, the number of cats seen is not only dependent on their level of

activity. The correlation between cat activity and weather conditions was not clear, although it was noted that cats often basked in the sun (when it was not excessively hot), and that very few cats remained in the open while it was raining. The latter is also true of the Scottish wild cat (Corbet and Southern 1977).

Details of activity were recorded during the long watches to provide more quantitative data on activity patterns. The activities recorded were: lie down, sit down, sit, stand, walk, trot, run, feed, forage in skip, drink, wash, defaecate, urinate, play and fight. (Details of social behaviour were recorded separately.) The methods of data collection and sorting for these watches have been described in detail in Section 3.3.

When considering overall activity levels, it must be decided which types of behaviour are to be classed as 'active'. Kavanau (1971) measured only locomotor activity. However, cats may spend considerable time in non-locomotory activity, such as feeding, washing, or simply sitting up and looking alert. It was observed that if a cat, travelling betweeen two points, paused for any reason, it would immediately sit down, although the pause may have been very brief. It was therefore decided any activity recorded other than lying down or sitting down should be classed as active. Lying down was defined as the position in which the cat did not rest its weight on its front paws. In sitting down, the weight was on the front paws, but the back held horizontal. In the normal sitting position, the front legs are held more or less straight, and the back inclined at an angle to the horizontal. Washing in a resting position (which was not very common) was included as active.

The composition and ages of the members of the two groups studied have been given in Section 6.1. The two groups (C and W) were at opposite ends of the dockyard (see Fig. 5.14), and there was a difference in their food supplies. Group C were fed regularly on cat food, which formed an important part of their diet, although they also foraged in the skips of the sullage ground which was within their range. Group W, on the other hand, usually received only a few scraps (except when there were no ships present), and their main source of food was that in the skips on the jetty, and also fish from people who fished in the dockyard on fine weekends. There was also a difference in the amount and timing of human activity between the two group areas. Group C was next to one of the dockyard gates, and was therefore very busy at the beginning and end of the working day. Group W was on a jetty, with no through-route, but tended to be busier late at night if there was a ship berthed there.

The long watches were conducted at times of year that gave the most extreme day-length conditions (that is, around the longest and shortest days), in order to give some indication of the range of possible variation. It should be stressed, however, that the data are insufficient to warrant precise conclusions being drawn, although some idea of the type of activity pattern, and the most important influences, can be obtained.

8.2. Pattern of total activity

8.2.1. The females in December

The December long watches covered two 24-hour cycles, in six-hour shifts, on each of the two groups (except for two hours of the second Group W cycle). The results of these for the females are summarised in Table 8.1. Activity is expressed as the number of times each cat was observed active per hour (out of 12 readings). All the females were adult except for an eight-month-old juvenile (527) in Group W. Female 9 of Group C is excluded, since she had apparently become peripheral to the group (see Section 6.2.2), and was only in view for a limited period of time.

The results were analysed using two-way analyses of variance, with replication, and these are summarised in Table 8.2. Differences between hours were significant at less than 0.1% in all cases.
Differences in the overall level of activity between cats may be expected, depending on the age and temperament of the cat. More important are differences in the pattern of activity, which are shown in the significance of the 'interaction' (between hours, and cats, cycles or groups).

It can be seen that there are no significant differences between cats. Although there is variation between cats, this is no greater than the variation between cycles for the same cat, which constitutes the error variation. However, when the four 24-hour cycles are compared, using the records from the different cats as replicates, it can be seen that the differences are significant. Most of this variation is due to the second cycle on Group W (for which records from two hours are missing). Excluding this cycle greatly reduces the significance of the differences. (Most of the difference between the groups is probably also due to this cycle.)

The pattern of activity for each of the four cycles,, averaged over the four females, is given in Fig. 8.1, together with a summary of the times of rainfall, feeding, and activity of the dockyard workers, and whether the data were recorded on a weekday or during the weekend.

Table 8.1: The number of times cats were seen active per hour (out of 12 readings), for two 24-hour cycles (shown separated by commas) for four females in each of two groups, during December 1977.

Hour	Group C females				Group W females			
	10	18	23	449	280	305	396	527
00-01	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
01-02	0,1	0,0	0,1	0,0	0,0	4,0	0,0	0,0
02-03	2,0	1,0	0,7	0,0	0,0	0,0	0,0	0,3
03-04	0,0	0,0	0,0	0,0	0,0	0,0	2,0	0,3
04-05	0,0	0,0	2,4	0,0	0,1	5,0	0,5	9,0
05-06	0,0	0,0	0,6	0,0	0,0	2,0	0,0	0,0
06-07	0,5	1,11	5,6	4,0	0,1	3,2	0,0	2,0
07-08	6,7	9,9	11,11	7,0	8,3	7,2	10,2	7,3
08-09	5,9	9,6	4,5	12,4	7,-	3,-	2,-	0,-
09-10	7,12	7,0	4,0	8,9	2,-	1,-	5,-	0,-
10-11	9,6	0,0	0,0	0,0	2,1	0,1	0,5	0,0
11-12	7,4	0,2	0,0	8,2	0,6	0,3	0,12	2,0
12-13	4,10	0,12	0,2	10,10	0,2	5,0	0,0	2,0
13-14	9,1	9,9	2,8	3,9	4,0	1,0	0,0	7,4
14-15	6,4	7,8	9,4	10,4	4,2	4,5	4,0	9,0
15-16	4,10	9,8	6,9	2,11	6,0	9,4	8,3	10,0
16-17	0,0	0,10	8,1	4,12	0,5	5,4	5,6	6,0
17-18	4,1	1,6	1,0	2,6	0,0	1,0	6,6	3,0
18-19	0,5	0,4	3,4	3,8	0,0	2,0	3,0	0,0
19-20	0,2	3,3	2,4	5,4	4,1	0,0	3,0	0,0
20-21	7,0	0,3	0,0	1,1	0,0	0,0	0,0	0,0
21-22	2,0	0,0	0,0	1,0	0,1	0,1	0,0	0,0
22-23	0,1	0,0	0,0	2,0	2,1	9,1	1,0	0,7
23-00	0,2	0,0	2,0	0,0	3,1	4,0	0,0	0,4
Total	72,80	56,91	59,72	82,80	42,22	65,21	49,37	57,21

Table 8.2: A summary of the analyses of variance on the activity of females of Groups C and W, in December 1977.

Test		Activity			Interaction		
		F	*d.f.*	*P*	*F*	*d.f.*	*P*
Between cats:	Group C	0.46	3,96	N.S.	1.05	69,96	N.S.
	Group W	0.80	3,88	N.S.	0.62	69,88	N.S.
Between cycles:	4 cycles	9.50	3,252	<0.1%	1.91	67,282	<0.1%
	Excluding W2	3.96	2,216	2%	1.44	46,216	5%
Between groups		19.87	1,328	<0.1%	2.04	23,328	<1%

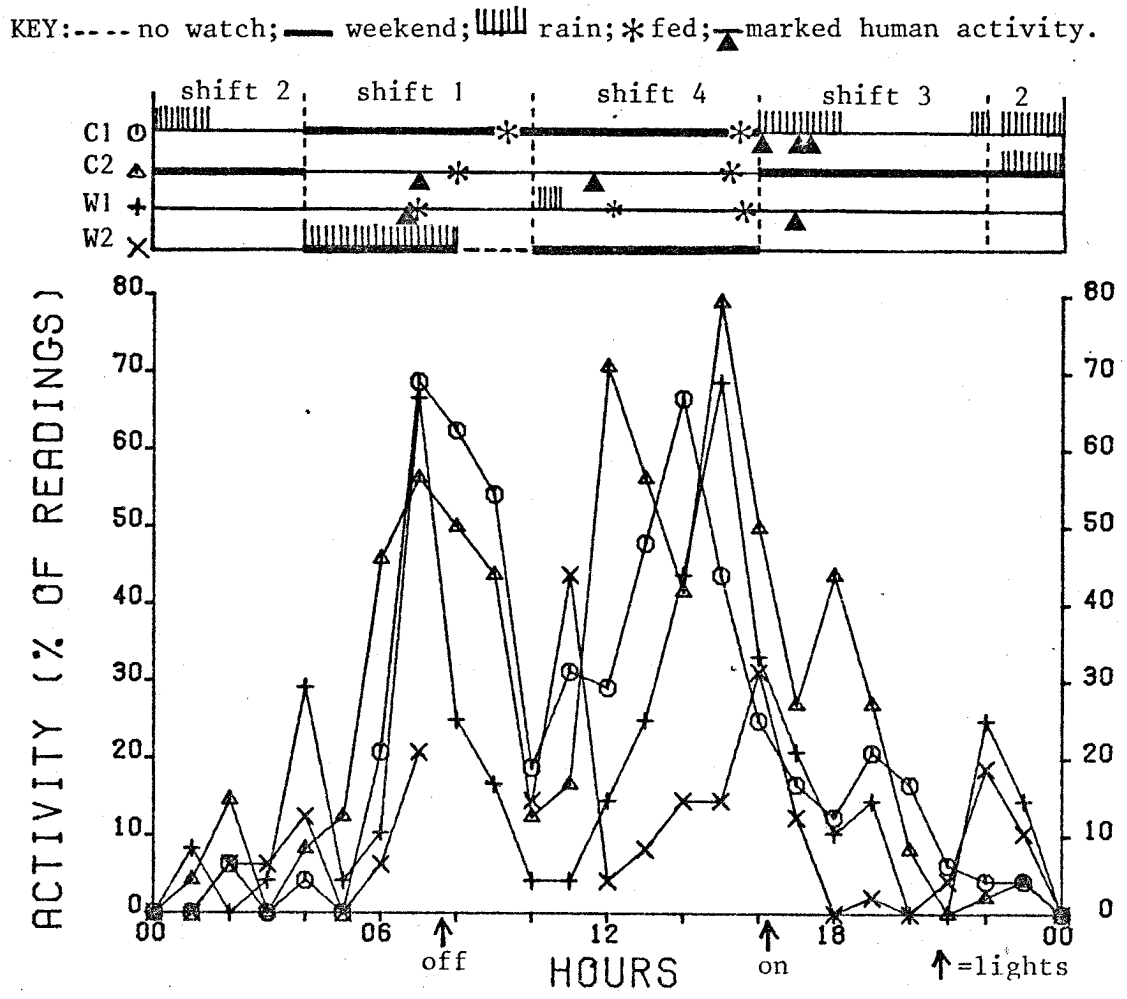


Figure 8.1 The activity patterns for the four 24-hour cycles in December 1977 (two on Group C and two on Group W), averaged over the four females

8.2.2. Comparison with kittens and young males in December

The activity of the kittens and the young males, in the two groups observed during December 1977, is summarised in Table 8.3. The mature males were only in view for a limited period of time, and are therefore excluded. One kitten (637) was only in view for half the periods of observation, since she was inside a building during weekdays.

The Group C kittens were five months old; those of Group W were four months old. The ages of the males were: 157, 27 months; 348, 19 months; 525, eight months. 348 was just reaching sexual maturity, and 157 was immature (see Chapter 6).

The results of the analyses of variance on these data are summarised in Table 8.4. Differences between hours were significant at less than 0.1%, except for the young males (P = 1% between cats, and 5-10% between cycles).

It can be seen that the only significant differences in the pattern of activity are for the kittens, when cycles or groups are compared. Differences in overall activity are mainly due to the very low level of activity of 348 (Group W), and this also accounted for the low significance of the difference between hours for the young males.

The patterns of activity for the kittens and young males are shown in Fig. 8.2, and compared with the pattern for the females.

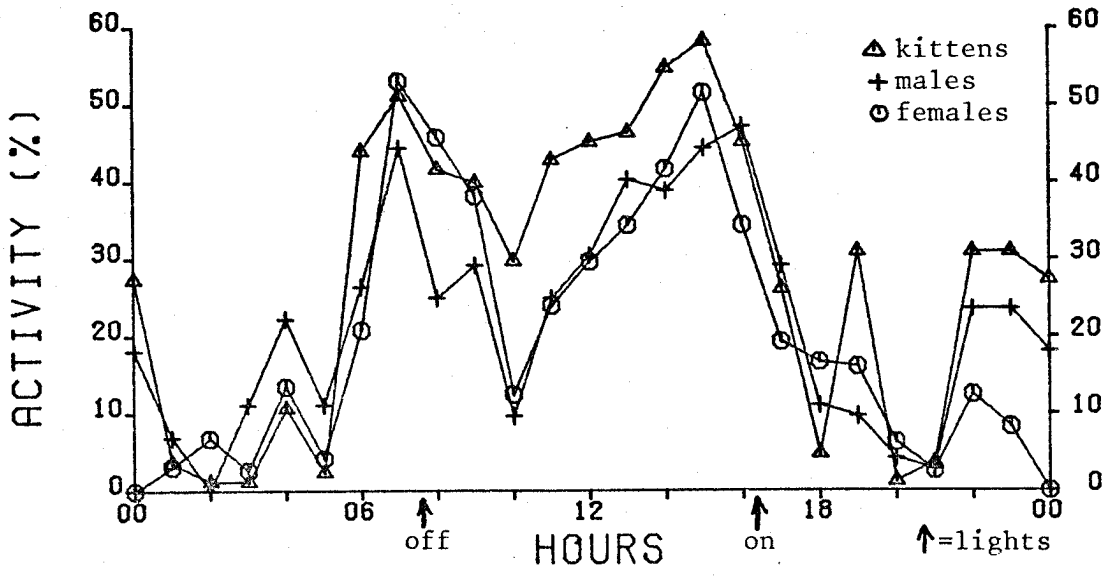


Figure 8.2 The activity patterns for the kittens, young males and females in December 1977, averaged over the individuals, groups and cycles.

Table 8.3: The number of times cats were seen active per hour (out of 12 readings), for two 24-hour cycles (shown separated by commas) for the immature males and kittens of the two groups, during December 1977.

	Immature males			Kittens			
Group:	**C**	**W**	**W**	**C**	**C**	**W**	**W**
Hour	**157**	**348**	**525**	**662**	**637**	**638**	**639**
00-01	1,0	0,0	7,5	0,0	-,0	6,5	7,5
01-02	0,0	0,2	0,3	0,0	-,0	0,0	0,3
02-03	0,0	0,0	0,0	0,0	-,l	0,0	0,0
03-04	0,0	0,0	8,0	0,0	-,1	0,0	0,0
04-05	0,8	2,0	6,0	0,0	0,-	4,0	5,0
05-06	0,8	0,0	0,0	0,2	0,-	0,0	0,0
06-07	7,4	1,0	7,0	6,8	8,-	7,1	7,0
07-08	11,8	3,0	8,2	6,9	6,-	9,7	6,0
08-09	6,6	0,-	0,-	7,5	l,-	4,-	8,-
09-10	12,0	0,-	2,-	6,4	6,-	4,-	4,-
10-11	0,3	0,0	0,4	0,5	7,-	0,8	0,5
11-12	0,11	0,0	2,5	1,12	3,-	0,10	2,8
12-13	2,6	0,0	8,6	6,10	9,-	6,1	6,0
13-14	9,5	0,0	10,5	7,6	2,-	0,7	8,9
14-15	4,6	0,0	10,8	3,1	8,-	4,12	11,7
15-16	9,6	0,4	7,6	5,11	4,-	12,2	10,5
16-17	10,9	2,4	3,6	1,10	-,2	9,4	10,2
17-18	3,11	0,0	2,5	5,8	-,1	0,1	5,2
18-19	0,7	0,0	1,0	0,1	-,1	0,0	2,0
19-20	0,0	0,2	5,0	7,0	-,1	3,6	8,1
20-21	0,0	0,0	0,3	0,0	-,0	0,1	0,0
21-22	2,0	0,0	0,0	0,0	-,0	3,0	0,0
22-23	5,0	0,0	7,5	0,0.	-,0	6,6	7,7
23-00	7,0	0,0	9,1	5,0	-,0	7,6	4,4
Total	88,98	8,12	102,64	65,92	61	84,77	110,58

Table 8.4: A summary of the analyses of variance on the activity of the kittens and young males of Groups C and W, in December 1977.

Test		Activity			Interaction		
		F	*d.f.*	*P*	*F*	*d.f.*	*P*
Kittens:	Between cats	0.86	3,68	N.S.	0.75	69,68	N.S.
	Between cycles	2.42	3,70	>5%	2.64	67,70	<0.1%
	Between groups	2.08	1,116	N.S.	1.68	23,116	<5%
Young males:	Between cats	21.31	2,68	<0.1%	1.01	46,68	N.S.
	Between cycles	3.75	3,46	<2%	0.96	67,46	N.S.
Between kittens and males		3.65	1,256	5%	0.50	23,256	N.S.
Young v females:	Group C	1.07	1,264	N.S.	0.81	23,264	N.S.
	GroupW	14.30	1,320	<0.1%	1.00	23,320	N.S.

8.2.3. Comparison of December and summer data

The data recorded for Group W in the summer of 1977 (.see Table 3.4) were less complete than those recorded in December, but they allow some comparison, and give an indication of the differences in activity pattern at extremes of daylength.

The activity of the females in the summer is summarised in Table 8.5. Female 396 was not present for the watch on 26 May 1977, and the activity of 280 was not fully recorded for the other watches. It should be noted that the summer data are given according to British Summer Time, while the December data are given according to Greenwich Mean Time.

It can be seen from Table 8.6 that the total activity in the summer differs significantly from that of Group W in December, but not from that of Group C. The pattern of activity differs significantly from that of both groups in December, and these differences are more marked than that between Groups C and W in December (see Table 8.2).

The pattern of activity for the summer watches is compared with that for the December watches in Fig. 8.3.

Table 8.5: The number of times cats were seen active per hour (out of 12 readings), for the females observed during the summer long watches (26 May 1977, and 22 June to 3 July 1977, shown separated by commas.)

	Group W females				Summary of factors[+]	
Hour[*]	293	305	347	280/396	May 1977	June/July 1977
00-01	-,0	-,0	-,0	-,0		
01-02	-,0	-,0	-,0	-,0		29.6.77
02-03	-,5	-,9	-,0	-,8		
03-04	-,3	-,7	-,0	-,4		
04-05	-,0	-,7	-,7	-,5		
05-06	0,5	5,0	3,0	0,3		22.6.77
06-07	2,8	7,4	1,2	4,2		
07-08	4,7	12,10	5,9	12,11		
08-09	0,-	11,-	3,-	1,-		
09-10	4,-	11,-	1,-	4,-		
10-11	4,-	5,-	0,-	3,-		
11-12	5,-	10,-	1,-	4,-		
12-13	3,2	6,12	8,3	5,0		3.7.77
13-14	8,1	8,8	6,1	0,3		2.7.77
14-15	0,4	3,6	0,2	0,4		
15-16	0,2	3,1	1,2	0,0		
16-17	5,0	1,0	2,0	0,0		
17-18	0,5	6,6	9,8	3,8		
18-19	1,7	2,5	3,7	0,1		23.6.77
19-20	2,4	3,0	10,8	1,9		
20-21	0,8	3,11	12,5	2,8		
21-22	0,9	1,12	4,3	0,5		
22-23	0,6	2,9	4,7	4,12		29.6.77
23-00	-,0	-,0	-,0	-,1		
Total	38,76	99,107	73,64	43,84		

* British Summer Time

\+ KEY: ¦ no watch; | weekend; ≡ rain; * fed; ▶ marked human activity.

Table 8.6: A summary of the analyses of variance on the activity of the females of Groups C and W in December 1977, and Group W in the summer of 1977.

Test		Activity			Interaction		
		F	*d.f.*	*P*	*F*	*d.f.*	*P*
Summer:	Between cats	4.43	4,42	<1%	0.73	79,42	N.S.
	Between cycles	7.86	1,114	<1%	1.58	13,114	N.S.
Summer v December:	Group C	41.16	1,288	<0.1%	2.91	23,288	<0.1%
	GroupW	3.07	1,296	>5%	3.69	23,296	<0.1%

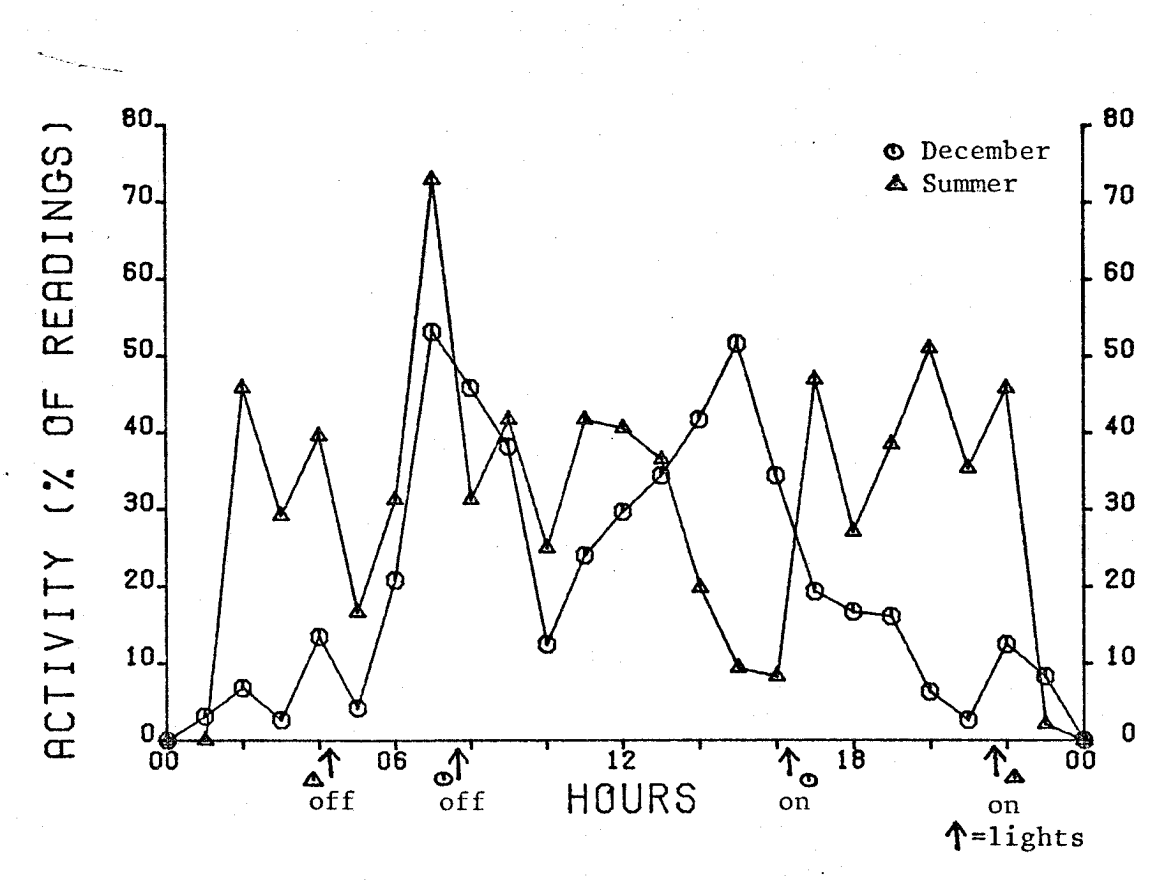


Figure 8.3 The activity of the females during the summer and December long watches (1977), averaged over individuals, groups and cycles.

8.3. Type of activity

The types of activity recorded can be divided into four main classes: locomotion (including fight and play); forage and feed (including drinking); maintenance (including autogrooming, scratching, urination and defaecation, and allogrooming, which was mainly of kittens); and alert (sit up or stand).

The pattern for each type of activity, for the December and summer watches separately, is shown In Fig. 8.4, averaged over the females and cycles. The average percentage of readings for which each type of activity was recorded, for the four December cycles and for the summer data, is given in Table 8.7. The summer data are not separated into cycles since neither of the two cycles covered an entire 24 hours.

The distribution of observations of social behaviour (see Chapter 6) through the day is summarised in Fig. 8.5, for interactions between females during the December and summer watches. Amicable behaviour includes greeting and allogrooming, and agonistic behaviour includes active aggression and threatening stare, but not nervous behaviour in the absence of threat. Interactions of the Group W females are not included for the December data, since no amicable behaviour was observed, and only two cases of active aggression (in 07.00 and 22.00 hours). The observations of social behaviour during the summer are those for the watches used for the analysis of activity (see Table 3.4).

Table 8.7: The types of activity recorded, as a percentage of the total number of readings, for the four December cycles and their average, and the summer average.

Period	Type of activity				Total activity	Total readings
	Alert	Loco-motion	Forage/ feed	Maint-enance		
C1	5.0	7.8	4.2	6.4	23.4	1152
C2	4.5	10.7	3.9	8.9	28.0	1152
W1	5.0	7.8	3.5	2.2	18.5	1152
W2	2.4	5.1	1.3	1.7	10.5	1056
December	4.2	7.9	3.2	4.8	20.1	4512
Summer	8.2	16.2	2.4	5.3	32.0	1824

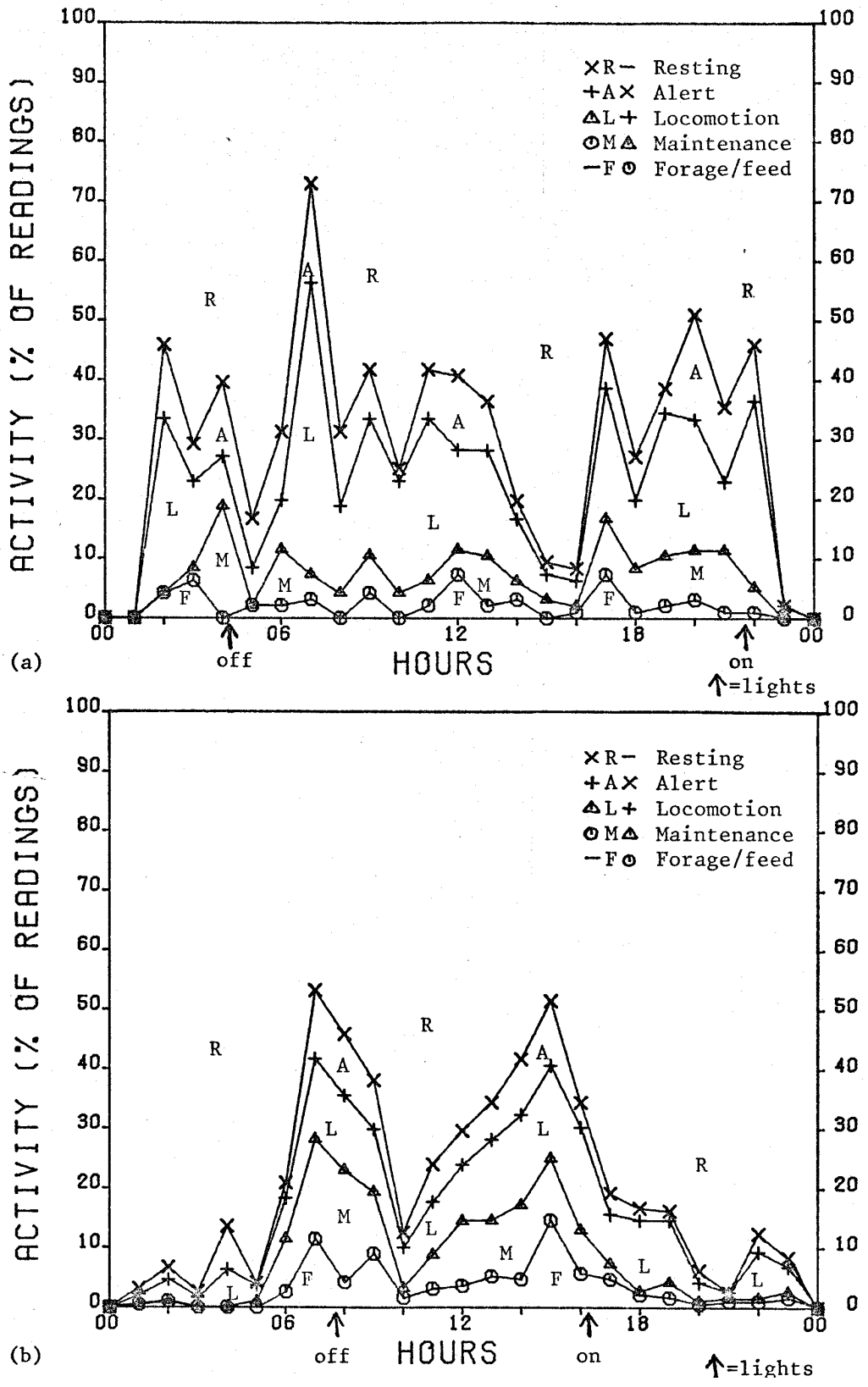
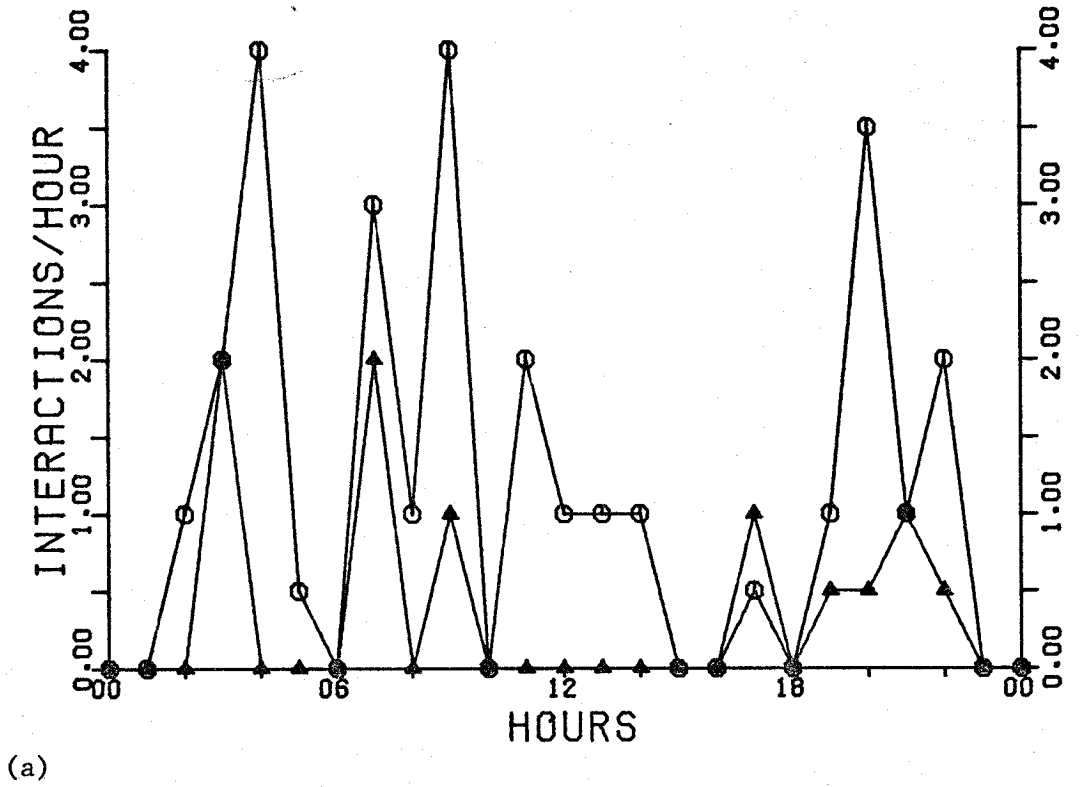


Figure 8.4 The activity patterns of the females (averaged over individuals, groups and cycles), divided into the four main classes of activity (see text), and showing the proportion of time spent resting. (a) Summer 1977. (b) December 1977.



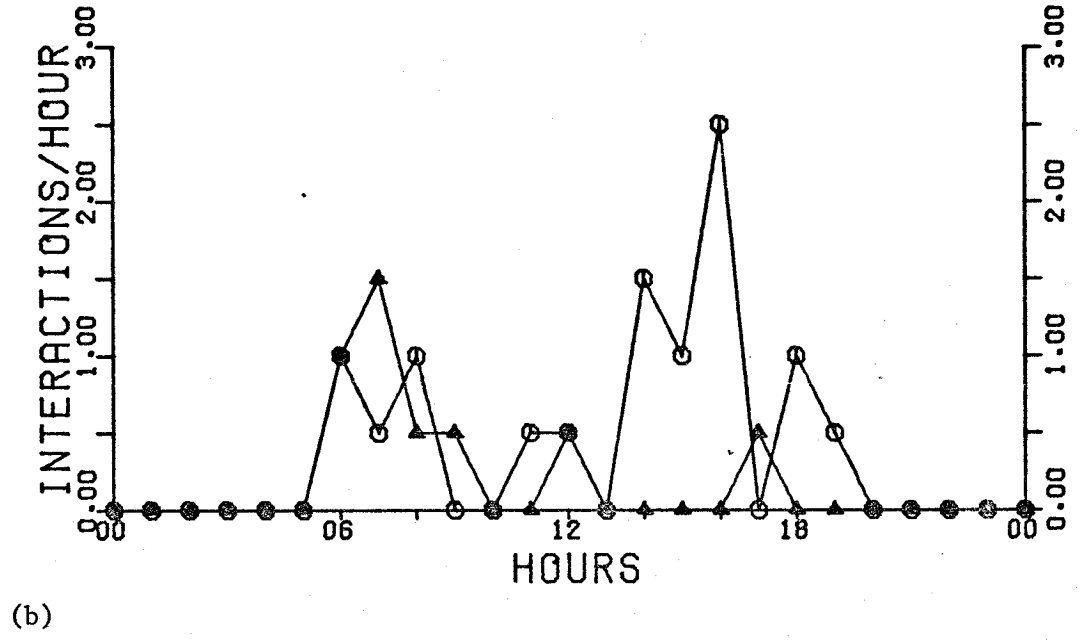


Figure 8.5 The distribution of observations of amicable (circles) and agonistic (triangles) interactions through the day, from the long watch data. (a) Group W, summer 1977. (b) Group C, December 1977.

8.4. Discussion

The observations on the female cats in December 1977 support the suggestion from the patrolled watches that the dockyard cats are not nocturnal. Although there was some activity during most hours, levels during the night were much lower than during the day.

The main peaks in activity during December coincide with dawn and the period preceeding dusk. However, these are also the times when the cats were fed, and when peaks in human activity occurred, so that the effects cannot be distinguished in the December data.

Minor differences in the pattern of activity between cycles can to some extent be explained by differences in human activity and weather conditions. For example, the more prolonged peak in morning activity of the Group C females (Fig. 8.1) is probably due to their being fed later than the Group W females. The peak of activity at 12.00 to 13.00 hours for the C2 cycle was probably due to the disturbance caused by large numbers of people leaving the dockyard for lunch. Rainfall appears to have decreased the level of activity. There is no apparent reason for the anomalous activity pattern for the W2 cycle, during the 10.00 to 16.00 hours period, although it should be noted that the peak at 11.00 to 12.00 hours was mainly due to one cat (396; see Table 8.1).

The activity patterns of the kittens and immature males agree well with those of the females, although the activity levels during the period of 22.00 to 01.00 hours are noticeably greater for both classes (Fig. 8.2). This is most marked for the Group W cats, especially for the kittens (Table 8.3) and is reflected to a lesser extent in the females of this group (Fig. 8.1). It is possible that activity of the Group C cats was suppressed during this period, due to rainfall during both cycles. Alternatively, this nocturnal activity may be innate, and suppressed in the adults due to environmental conditions.

The activity pattern of the females derived from the summer data differs markedly from the winter pattern (Fig. 8.3). Activity was relatively high in all hours, except for midnight to one am, the middle of the short night, and a trough in activity from 14.00 to 16.00 hours, when the cats mainly slept through the heat of the afternoon. In general, the peaks of activity in the summer coincide with the troughs in December, except for 07.00 to 09.00 hours, when activity is high in both cases. Since human activity is similar for summer and December, the differences in activity patterns are probably due to differences in daylength. However, the 7 am peak which occurred for both seasons may have been triggered by the increase in human activity as people arrived for work. Human influence may also account for the smaller lunch-time peak observed for both seasons.

When the types of activity for the December data are examined (Fig. 8.4.(a)), it can be seen that the four main types are approximately equally represented during the day, dawn and dusk, but that during the night (especially from 18.00 to 05.00 hours) the activity is primarily of the 'locomotion' and 'alert' classes.

For the summer data (Fig. 8.4.(b)), it can be seen that feeding behaviour (including drinking and foraging in skips) and maintenance behaviour are distributed relatively evenly through the 24 hours, although there are slight peaks in maintenance at dawn and in the pre-dusk period. Most of the variation between hours is due to locomotory

and alert behaviour. When December and summer behaviour are compared (Table 8.7), it can be seen that feeding and maintenance behaviour occur at about the same average frequencies for both seasons, but that frequencies of locomotory and alert behaviour in the summer are double those in December.

The amount of time that the dockyard cats spent in locomotory behaviour (8-16%) was greater than that of a domestic cat in a running wheel (4%; Kavanau 1971). The dockyard cats spent 76-84% of their time largely inactive, which is comparable to the approximately 85% of time for the Serengeti lion (Schaller 1972). Since dockyard cats do not need to hunt their food, it is interesting to consider the function of their locomotory behaviour. Some of it is people-orientated; either following people who are likely to feed them, or avoiding people or cars. Some is concerned with moving to a site where they can feed or defaecate. Other locomotion is concerned with attention to kittens, and social behaviour. However, much of the cats` locomotion is not readily interpretable, and is probably involved in the maintenance of familiarity with the home range, checking sites for alternative food sourves, and perhaps defence against possible intruding cats. This type of locomotion appears to be the one that is reduced during the winter, when it is cold and the days are shorter.

The extremely low level of activity (0.9%) of 348, the maturing young tom, illustrate how inactive a cat can be. It is possible that he was attempting to avoid contact with the mature tom (275), who repeatedly chased him (see Section 6.4.2).

The frequency of amicable social interactions appears to be related primarily to the overall level of activity (Fig. 8.5 and Fig. 8.3). The relationship is not as clear for the agonistic behaviour. There is a slight indication that aggression is higher when cats are waiting to be fed. However, observations of agonistic behaviour were not sufficiently frequent to warrant firm conclusions being drawn.

In summary, the gross pattern of activity of the dockyard cats appears to be determined by day-length. However, the diurnal habits of the cats may well be due to the fact that much of their food supply (provided by humans) is diurnal, rather than nocturnal, as it might be in the wild. Despite this, the cats do not regulate their activity strictly in time with human activity, and show a tendency towards being crepuscular, on which peaks of activity due to human influence are superimposed. In fact, it seems that the cats may be influenced as much by mass human activity (presumably a disturbance factor) as by feeding times.

On a smaller scale, the activity patterns seem to be influenced by weather conditions, with rainfall suppressing activity to some extent, but not greatly altering the overall pattern. Other short-term differences in pattern may have more subtle causes, such as the reproductive state of a particular cat. Random differences would also be expected, given that the sample size on which this analysis is based is rather small.