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## Field Behavior Comparison of 8 Species of California Desert Ants

Jack S. Neal

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ABSTRACT

FIELD BEHAVIORAL COMPARISON OF 8 SPECIES OF CALIFORNIA DESERT ANTS

by

Jack S. Neal

Replicate colonies were observed at three study sites in southern California. Hourly activity was monitored during winter and spring.

The time outside the nest ranged from strictly diurnal in Pogonomyrmex californicus to bimodal to nocturnal in Pheidole barbata. Four aspects of surface activity, foraging, nest work, patrolling, and convening, also differed among species in hour and/or in relative proportion of such activity. Finally, interesting species differences were seen in climbing ability, running time between stops, and response to air blasts (Messor pergandei and Pheidole barbata were the least aggressive). Solenopsis maniosa was one of the three worst glass climbers, along with Pogonomyrmex californicus and Pogonomyrmex magnacanthus; Conomyrma bicolor and Myrmecocystus species were the best.

In summary, this study suggests many variables for further analysis of diversity, such as activity each hour, climbing ability, and response to disturbance.

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LOMA LINDA UNIVERSITY

Graduate School

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FIELD BEHAVIOR COMPARISON OF 8 SPECIES  
OF CALIFORNIA DESERT ANTS

by

Jack S. Neal

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A Thesis in Partial Fulfillment  
of the Requirements for the Degree Master of Arts  
in Biology

---

September 1985

Each person whose signature appears below certifies that this thesis, in his opinion, is adequate in scope and quality as a thesis for the degree Master of Arts.

Elwood S. McCluskey, Chairman  
Elwood S. McCluskey, Associate Professor of Biology

Leonard Brand  
Leonard Brand, Professor of Biology

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## ACKNOWLEDGMENTS

This study would have been impossible or much delayed without the constantly available help of Dr. Elwood McCluskey and the use of his computer. Dr. Roy Snelling's species determination and updating of several old names of ants is much appreciated. Also, thanks go to Drs. Leonard Brand, Marvin Peters, and Conrad Clausen for their suggestions and encouragement. The project was funded in part by a Geoscience Research Grant to ESM.

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## INTRODUCTION

Much of present taxonomy is based on morphological characters. In a museum specimen, obviously these are of primary importance. But in some cases behavioral characters might be easier to use for field identification. Further, such characters are important in a study of taxonomic diversity, and they could contribute to an understanding of how different species can share a single habitat.

Several examples may be cited of comparative behavioral studies in ants. Whitford and Ettershank (1975) found diversity in the temporal foraging patterns of four New Mexico harvesting ants. Some of this variability was related to physical environmental factors. Holldobler (1974) observed variation in the spacing and foraging strategies of 3 Arizona harvesters. Bernstein (1975) found that three species varied in altitudinal distribution and foraging strategies (single vs. group foragers).

McCluskey (1973, 1974) described generic diversity in hour of foraging and of mating flights. McCluskey (1980) also made a direct field test of rhythm characters for taxonomic value and found different species to differ consistently in hour of nest exit or return. McCluskey and Soong (1979) found rhythm characters alone could distinguish 5 ant species in the lab under constant temperature.

My purpose was to search for behavioral variability that is consistent taxonomically and possibly useful for field identification. Also records of various types of activity in several species would contribute to previous research on rhythm diversity.

## MATERIALS AND METHODS

Most of the data for this project were collected at Willis Palms Oasis at 1000 Palms State Game Preserve (elevation 120 m) near the town of 1000 Palms, San Bernardino County, California. Some data were also taken from outside the preserve about 1.5 km east, and another area about 8 km south at the edge of the town of Palm Desert (elevation 37 m).

These areas are in lower Sonoran desert. The primary plants are Encelia farinosa and Larrea divaricata. The first area was on gravelly alluvium gently sloping to the southeast next to Willis Palms oasis. The second area was on the banks of the dry Whitewater River and nearby sand dunes.

Wheeler and Wheeler (1973) studied the ants from sea level to 2,700 m near Palm Springs, California. Their book is excellent for descriptions of behavior as well as ecological distributions and keys.

Temperature was recorded at the beginning and end of every round of ant observations. It was measured by a glass mercury thermometer placed on the surface of the ground in full sun, and another placed with the bulb 7.5 cm below the ground. Cloudiness, wind, and other weather conditions were recorded at the beginning of each day and at any time they changed.

At Willis Palms most colonies were located by December 9, 1983, and observations made in late February, early to mid-March, late April and early May, 1984. The other localities were visited December 22-30, 1983.

At the study sites I found eight common species of ants and at least five replicate nests for each except only two for Solenopsis maniosa. There were three species of large harvesters, Messor pergandei (Mayr),

Pogonomyrmex californicus (Buckley), and Pogonomyrmex magnacanthus Cole; Pheidole barbata Wheeler; a fire ant, Solenopsis maniosa Wheeler; two honey ants, Myrmecocystus kennedyi Cole and Myrmecocystus flaviceps Wheeler; and Conomyrma bicolor (Wheeler).

Messor pergandei, the black desert harvester, was one of the most common ants. They foraged in long columns in the early morning and late afternoon. Their nests had medium to large craters and colonies were large.

Pogonomyrmex californicus is a large red to red and brown ant capable of stinging. The nest entrances encountered were inconspicuous small holes, but in other areas they are flat, crater shaped disks. The ants foraged singly through the warmest part of the day and closed the entrance at night. P. magnacanthus is smaller and red with larger eyes. It forages like P. californicus but was much more timid and slow. The nests, small semicircular craters, were usually in sandier places which were closed at night.

Pheidole barbata is small and the nests are often multiple small craters. The foraging behavior was somewhat crepuscular and nocturnal.

Solenopsis maniosa is a small red and black ant with very obscure nests. They foraged bimodally morning and afternoon in short columns.

Myrmecocystus kennedyi is orange and black, with slightly flattened crater shaped nests about 30 cm across. They left the nest in bursts, but foraged singly. They continued foraging when most other ants had taken refuge from the heat. M. flaviceps is brown and gray and often had a large entrance, usually with its nest among rocks, but sometimes there was a crater mound. They foraged like P. kennedyi.

Conomyrma bicolor is similar in appearance to M. kennedyi but

somewhat laterally flattened and slower moving. They foraged in thin columns nearly around the clock and would often harass other ants.

The ants were collected with an aspirator or flat forceps and transferred to vials containing water and 10% alcohol. The ants were first identified with the aid of keys in Wheeler and Wheeler (1973), then determined by Roy Snelling.

Each colony was given a number, such as Pm 5, and placed on a map of the study plot. The nest was marked in the field by placing a small mound of stones nearby and numbering a rock with black magic marker. When all the colonies needed were found I planned the most efficient route for visiting them all and noted the order of observations for later calculations. A 12 volt lantern was used, with an 18 volt lamp installed to provide a dim light source for making observations at night.

Since counting the total number of ants out of the nest was often impossible, a fixed area just around the nest entrance was used. First, the total ants within a .2 m circle (i.e., a circle with .1 m radius) were counted, then those within a 1 meter circle (i.e., with .5 m radius). Then the ants in each of the four categories listed below were counted in the larger circle. If they were too numerous, a representative section such as 1/6 of the circle was counted and multiplied by 6. The idea of using two sizes of circle was to compensate for different ant or colony size or whether the ants aggregate near or far from the entrance.

The four categories as defined by Gordon (1983) were recognized as follows:

Foraging: ants leave the nest carrying nothing and search for food. Ants return to the nest from some distance and may be carrying food.

Nest work: ants carry out sand, gravel, or debris and deposit it on

the nest or middens pile and return.

Patrolling: ants leave the nest on other than a main trail and move in a somewhat erratic motion.

Convening: ants stand motionless or move very slowly about the nest.

Three other behaviors were measured:

Running duration: Five ants from a colony were timed from one stop or pause in running to the next with a stop watch having a sweep second hand. These foragers of each species were observed for 20 seconds and the number of stops per ant recorded.

Response to artificial nest disturbance: A rubber bulb was used to make 3 blasts of air into the nest. The response was recorded on a scale from 1 to 12, with 1 being a rapid retreat and 12 a massive emergence and frenzied activity.

Climbing ability: Five or ten ants were placed in a clean 150 ml glass beaker and the number of successful or partially successful climbs was recorded for one minute. A climb to the top was given a score of 2, halfway 1, and just off the bottom 1/2.

No precipitation occurred at Willis Palms during the study. The weather was clear or partly cloudy with occasional breezes in December but not cloudy enough to reduce the ants' surface activities. The weather in March was mostly clear and windy to very gusty with blowing sand at night. April and May were sunny, breezy and warm. The changes that occurred in cloudiness and wind did not seem great enough to make a significant difference in the ants' behavior.

## RESULTS

Figure 1 illustrates well the general pattern of activity for the 8 species. It is for the most complete span of observation (March 13, 14, 16), and represents the total number of ants out in a 1 meter circle. The number out in a .2 meter circle were also plotted (not shown), and exhibit nearly the same patterns.

Figure 1 is arranged from the most nocturnal (Pheidole barbata) at the top to the most diurnal (Pogonomyrmex californicus) at the bottom. P. magnacanthus and Myrmecocystus kennedyi were actually quite diurnal; they showed 24 hour activity because an occasional colony had nest workers active at night (see Figs. 2, 7, 4B). Solenopsis maniosa, Messor pergandei, and Conomyrma bicolor were usually bimodally active, S. maniosa and M. pergandei were the most crepuscular.

Figure 2 shows a breakdown of the same data into the various aboveground types of activity. The peaks of foraging were in the evening in the first species; early morning and late afternoon in the second, third, and fourth; and mid-day in the last four.

Nest work contrasted with foraging by continuing into the night in M. pergandei, and by being nocturnal instead of diurnal in P. magnacanthus and M. kennedyi (Fig. 2, 4B). Little nest work was seen in P. californicus, M. flaviceps, or S. maniosa.

Patrolling and convening are more difficult behaviors to define, and my observations must be qualified in that way. Figures 2 and 4 suggest that in the three species where patrolling was prominent, the time pattern was like that of foraging in P. barbata and C. bicolor, and like that of

nest work in M. pergandei. Convening was late night in P. barbata; it was not prominent in the other species, but was seen in the late night and in the day in M. pergandei; in the morning and late afternoon in D. bicolor, P. magnacanthus, and M. mimicus; in the late morning and early night in M. kennedyi (Fig. 2).

These types of activity are shown in a different way by Figs. 3 and 4 A-C. The level of the line for each species is the 24-hour average for that species and activity. The hour span of the line shows the time the level of activity was above the average. This type of portrayal simplifies comparisons by its reduction of details of pattern. Two observations are worth noting. First, there appears to be a correlation between the average level of activity and the time of activity. That is, the most diurnal ants show the lowest average level and the most nocturnal show the highest average level. This may be because desert mid-day is hot enough to prevent a large number out, or because the diurnal species happen to have the smaller colonies or more widely dispersed foragers. Second, the time placement of above-average activity provides a different variable for comparing species.

Figures 5 and 6 are similar to Fig. 1 but for late February and late April to early May, instead of mid-March. Figure 7 shows a stacked-bar graph of the April to May data to compare with Fig. 2 for mid-March. Figure 8 gives surface and subsurface temperatures for the three dates. The activity of the upper six species became progressively more depressed at mid-day as the days became longer and warmer (Figs. 5, 1, 6). S. maniosa and M. pergandei changed from bimodal or diurnal activity in February (Fig. 5), to early morning activity in April and May (Fig. 6); P. barbata changed from mostly afternoon and evening activity to greater morning activity.

The response to blasts of air into the nest is shown in Fig. 9. All the observations of one replicate nest were averaged together, and the average for each nest was given equal weight in calculation of mean and standard error. The least "aggressive" species are P. barbata and M. pergandei.

The climbing ability test (Fig. 10) indicated Myrmecocystus ewarti Snelling (not used in above studies), M. flaviceps, and C. bicolor to be the best climbers, and P. magnacanthus, S. maniosa, and P. californicus the worst. Note that this is not merely in relation to weight of ant, because S. maniosa is small.

Although M. flaviceps and M. kennedyi were undoubtedly the fastest running ants I observed, M. kennedyi made about twice as many stops as M. flaviceps (Fig. 11). The running time between stops ranged from lowest for M. kennedyi to highest for P. barbata and Myrmecocystus tenuinodis Snelling. The last species is not mentioned elsewhere; the few ants observed were slow moving file foragers and made the least frequent stops.

#### Incidental observations

The most fighting seemed to occur between C. bicolor and either M. flaviceps or P. californicus. One colony of P. californicus was seen closing by 1400, as if to avoid a heavy C. bicolor column. C. bicolor was observed sieging a M. flaviceps nest on 2 consecutive days. February 22 at 1640 M. flaviceps ants were defending the nest from an attack by about 150 C. bicolor ants evidently from a nest opening 1 m away. C. bicolor were walking about the M. flaviceps nest and dropping gravel into the entrance. M. flaviceps ants encircled the nest entrance walls just inside, waving their antennae. Returning foragers were chased by C. bicolor. At 1740 a few C.



bicolor ants were lingering about the M. flaviceps nest. On Feb. 23 the same observation was made at 1455 as at 1640 the day before.

A brief mating flight of a colony of the nocturnal Myrmecocystus ewarti was seen in mid-afternoon in late December (McCluskey & Neal ms submitted).

## DISCUSSION

Can the above results be used to distinguish these eight species taxonomically? The two species in the genus Pogonomyrmex and the two in Myrmecocystus are the only strictly diurnal foragers, P. barbata was the only exclusively nocturnal ant. The Myrmecocystus species began foraging about 2 hours later than the Pogonomyrmex species (Figs. 2 and 4A). Climbing ability distinguishes M. flaviceps from M. kennedyi (Fig. 10). P. magnacanthus shows nestwork day and night, but P. californicus only in the day.

C. bicolor, M. pergandei and S. maniosa can be distinguished from the rest by their bimodality (Fig. 1). M. pergandei is much less aggressive than the other two (Fig. 10), and C. bicolor shows greater climbing ability than the other two (Fig. 10).

Several species of an assemblage of ants in semi-arid Australia were strictly diurnal, a few were nocturnal, and several were bimodal or indifferent to light and opportunistic to temperature (Briese and Macauley, 1980).

McCluskey (1980) and McCluskey and Soong (1979) found that species could be sorted using rhythm characters alone.

Whitford and Ettershank (1975) found differing responses to temperature extremes to be important in helping competitive species share similar resources. The peaks of foraging for the bottom four species in Fig. 2 coincide markedly with the mid-day lows of the next three bimodal species above, which may illustrate a daily temporal distribution similar to Whitford's observations.

Smith (1968) found a good correlation between temperature and the hour of nest opening of P. californicus. My work may support Smith's in showing a change in nest opening hour among the various species with seasonal temperature changes (Figs. 5, 1, 6).

Hodgson (1955) observed that nest work in leaf-cutter ants was both nocturnal and diurnal while foraging was diurnal. This would compare with M. kennedyi and P. magnacanthus (Figs. 2 and 7).

Gordon (1983) studied the temporal distribution of several aboveground activities in Pogonomyrmex barbatus (F. Smith) in Arizona. The rhythms of all of my species except Solenopsis maniosa (Figs. 4, 7) support Gordon's observation that the peak or onset of peak of patrolling and of nest work precede the peak of foraging.

In summary, my research illustrates several aboveground behaviors useful for comparing the eight sympatric ant species. The initial goal to find behavioral differences that would distinguish ants in the field has been at least partially met and hopefully will lead to further study in this area.

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Figure 1. Species comparison of aboveground rhythms. Mean of log number of ants in a circle of .5 m radius around the nest March 13, 14, 16. Lines above and below mean line show + and -1, SE. The hourly mean for each replicate nest was taken for the 3 days and counted as one entry toward the species hourly mean and standard error. Species arranged from most nocturnal at the top to most diurnal at bottom. Solid vertical line is sunrise, broken line sunset.

Log # ants in a 1 meter circle

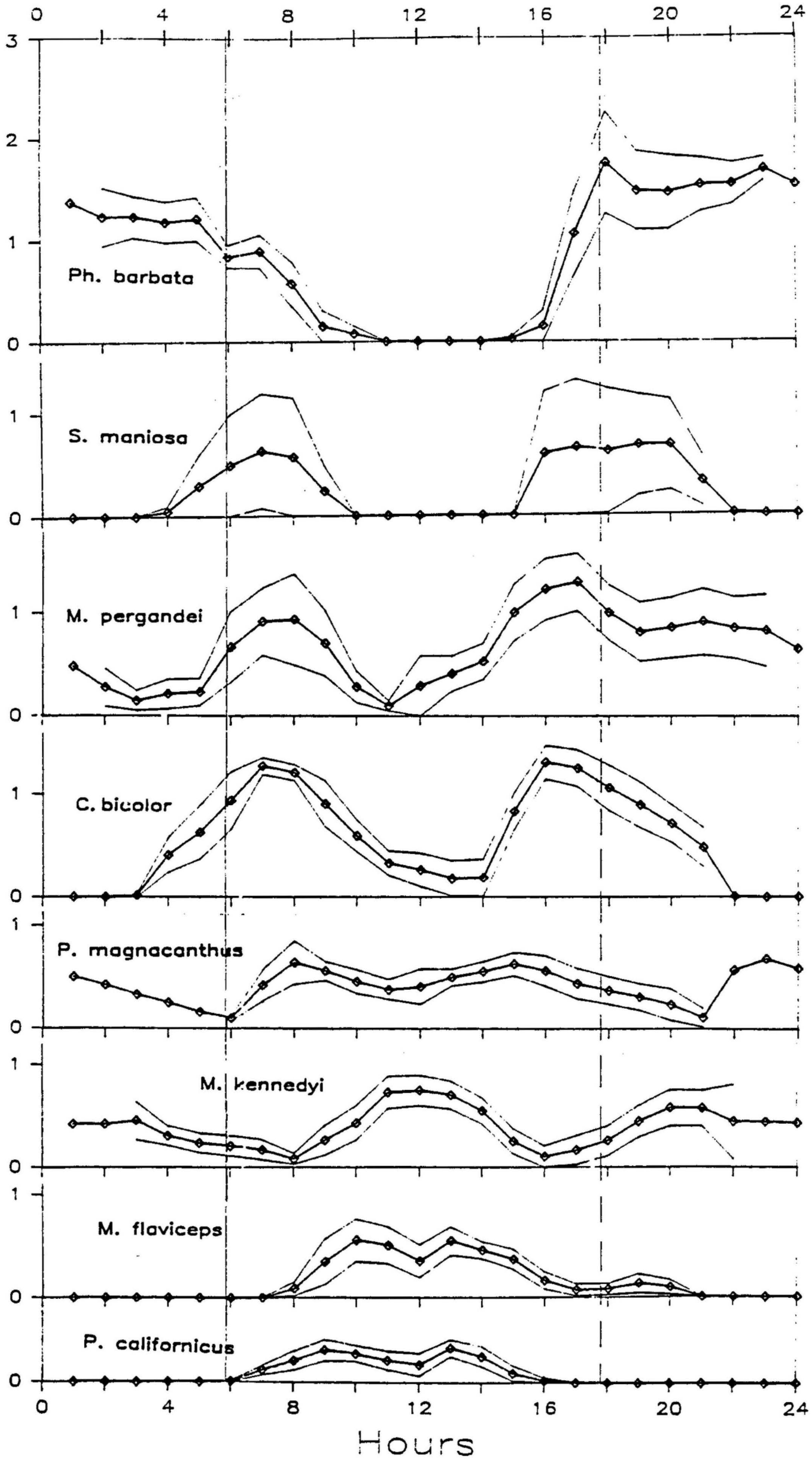


Figure 2. From same data as Fig. 1, but the total is broken down into four surface activities. Note that the sum of the logs of the activities does not equal the log of the sum of activities (i.e., number in circle), but these two types of graphs (Fig. 1, 2) show the same general pattern.





Figure 3. Hours of above-mean activity from same data as Fig. 1, but 24 hour mean plotted so as to show when number of ants was above the mean. Note how the means are higher for the most nocturnal species than for the most diurnal.

Hours when above 24-hour mean

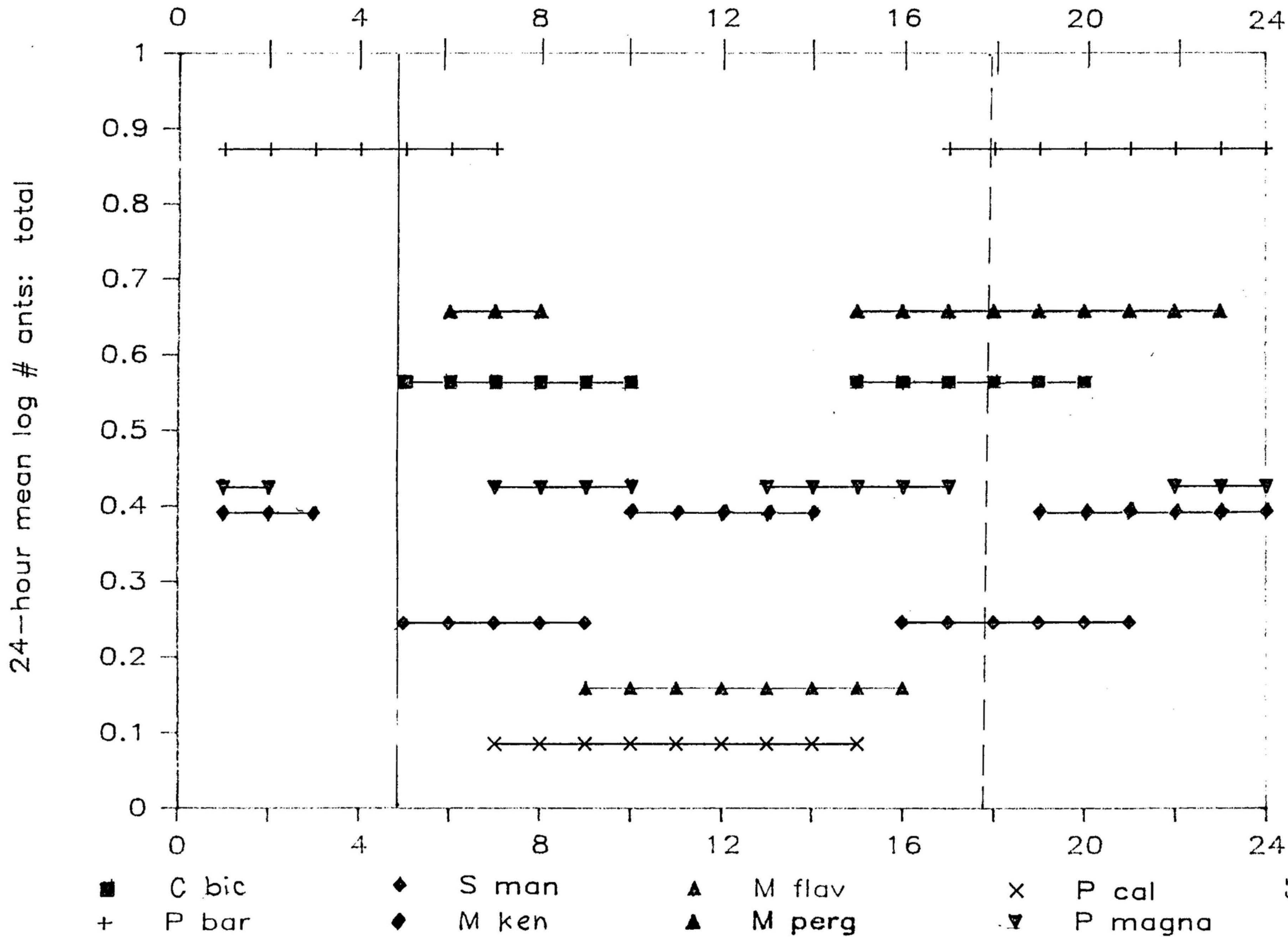


Figure 4A. Same as Fig. 2, but for foraging. Note complete coincidence of M. kennedyi and M. flaviceps.

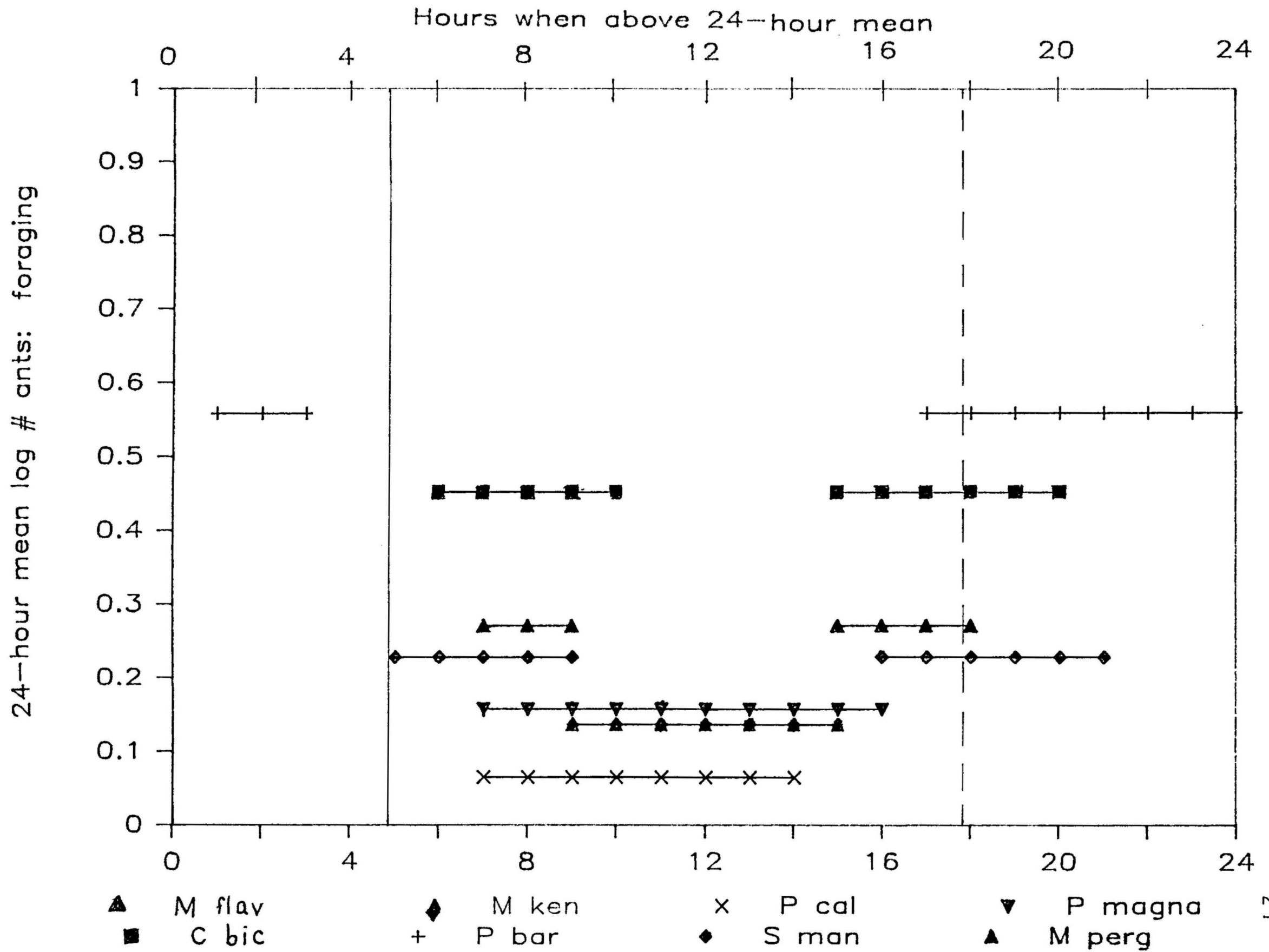


Figure 4B. Same as Fig. 2, but for nest work.

Hours when above 24-hr mean

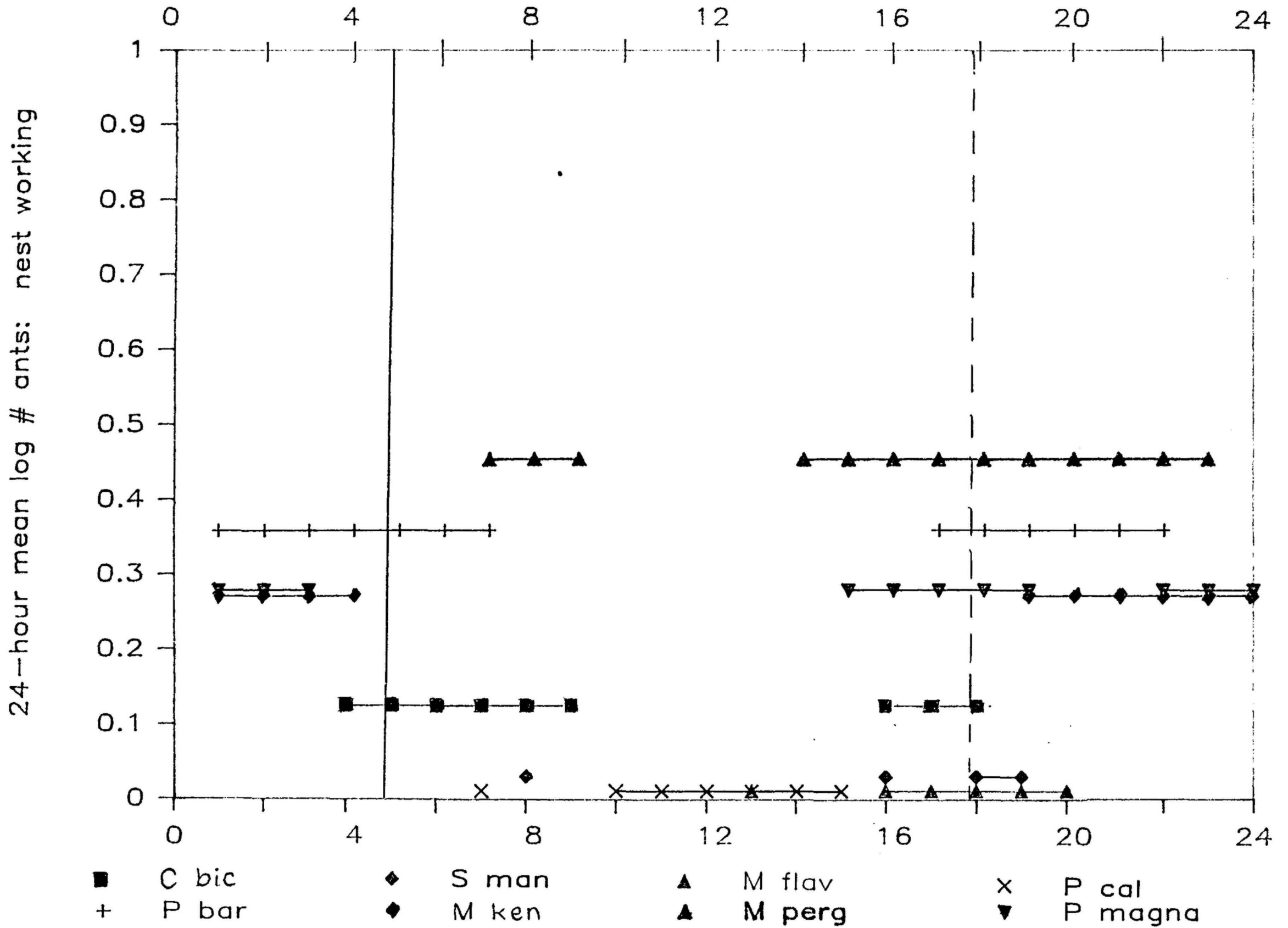


Figure 4C. Same as Fig. 2, but for patrolling.



Hours when above 24-hour mean

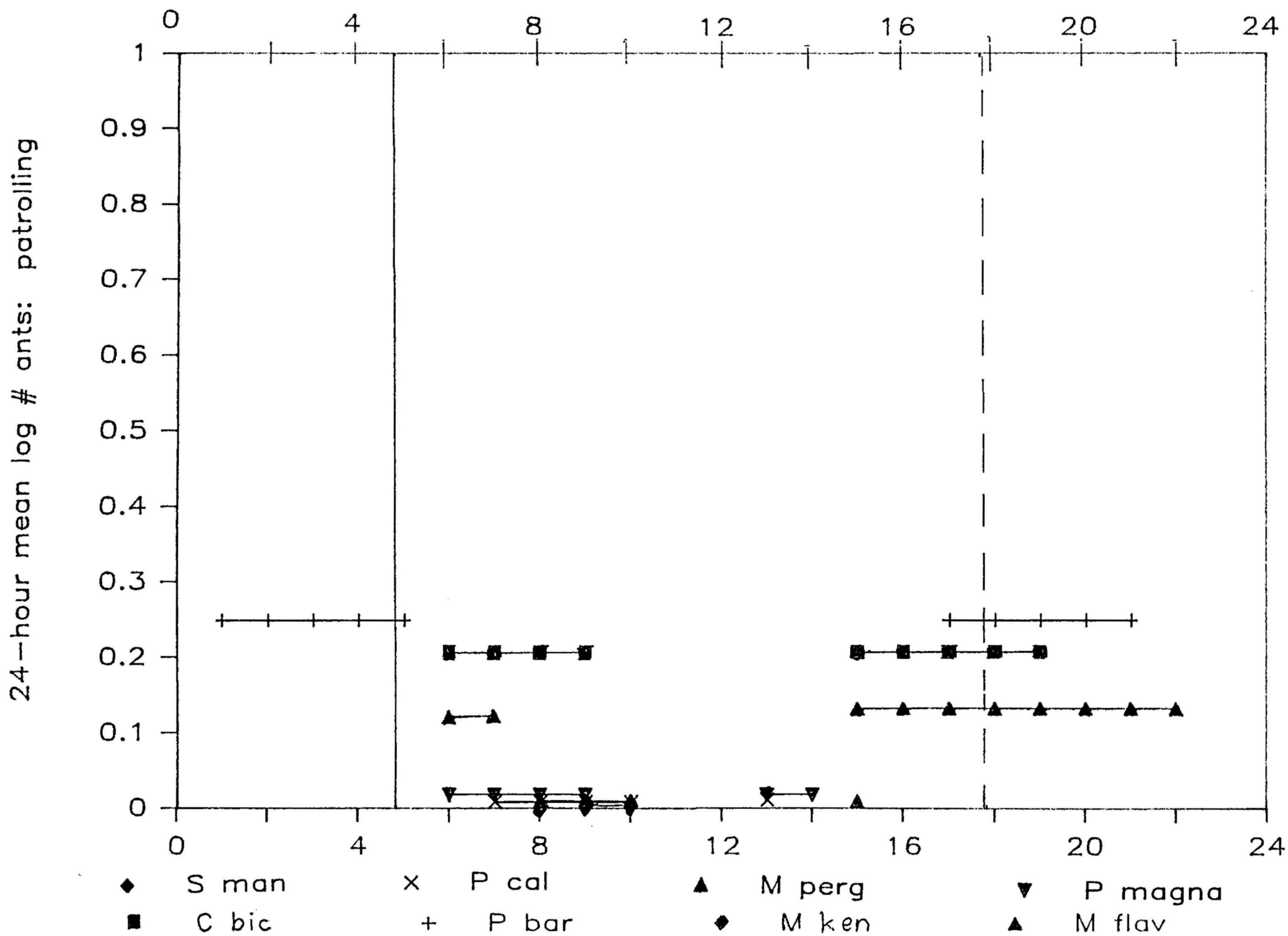


Figure 5. Species comparison as Fig. 1, but for February 21, 22, 23. Note the hours of activity for C. bicolor, S. maniosa, and M. pergandei, to compare with Fig. 6.

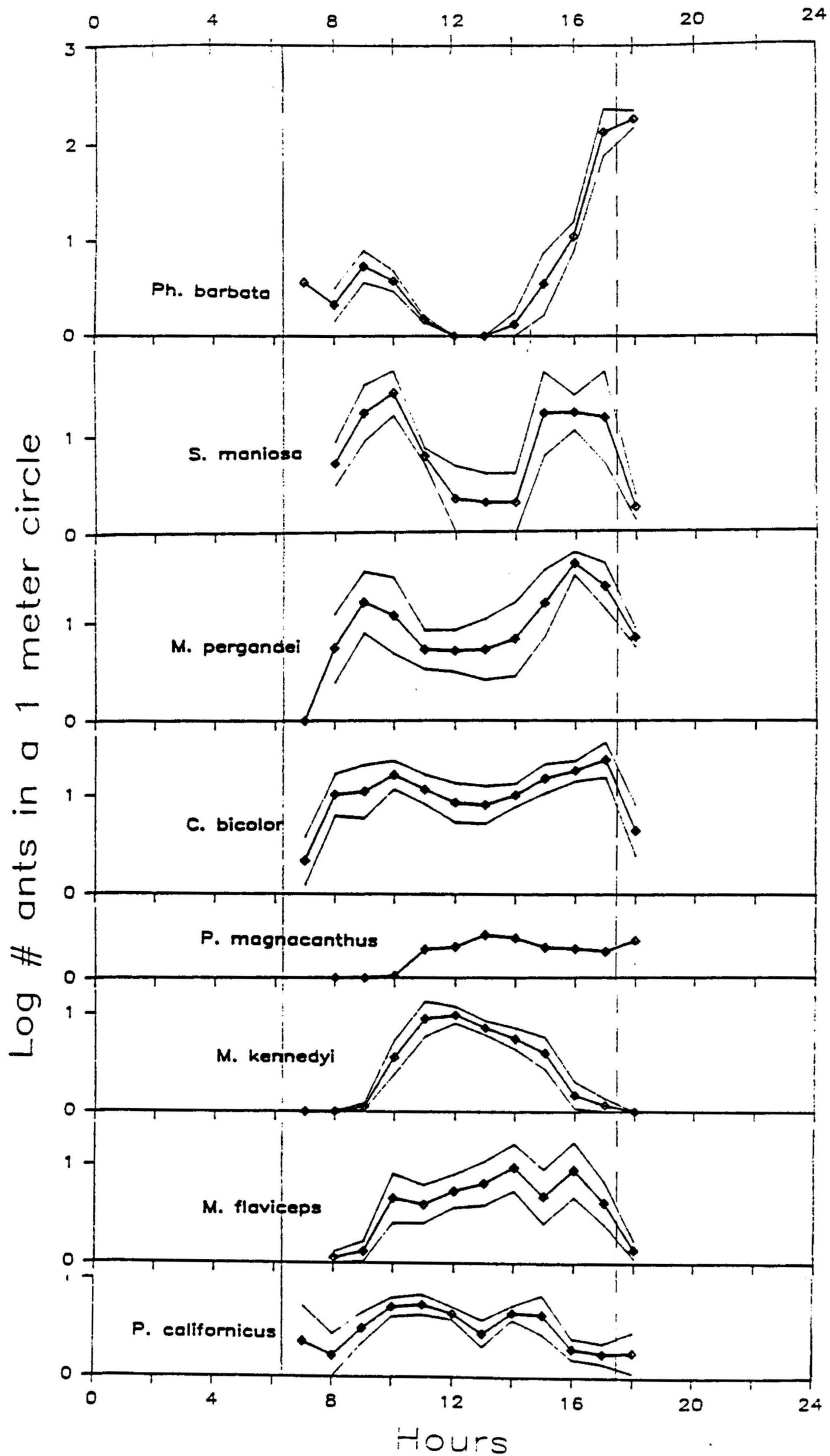


Figure 6. Same type of graph as Fig. 1, but for April 22, May 7, 8. Note how the level of activity has changed or shifted for C. bicolor and S. maniosa, compared with Fig. 5.

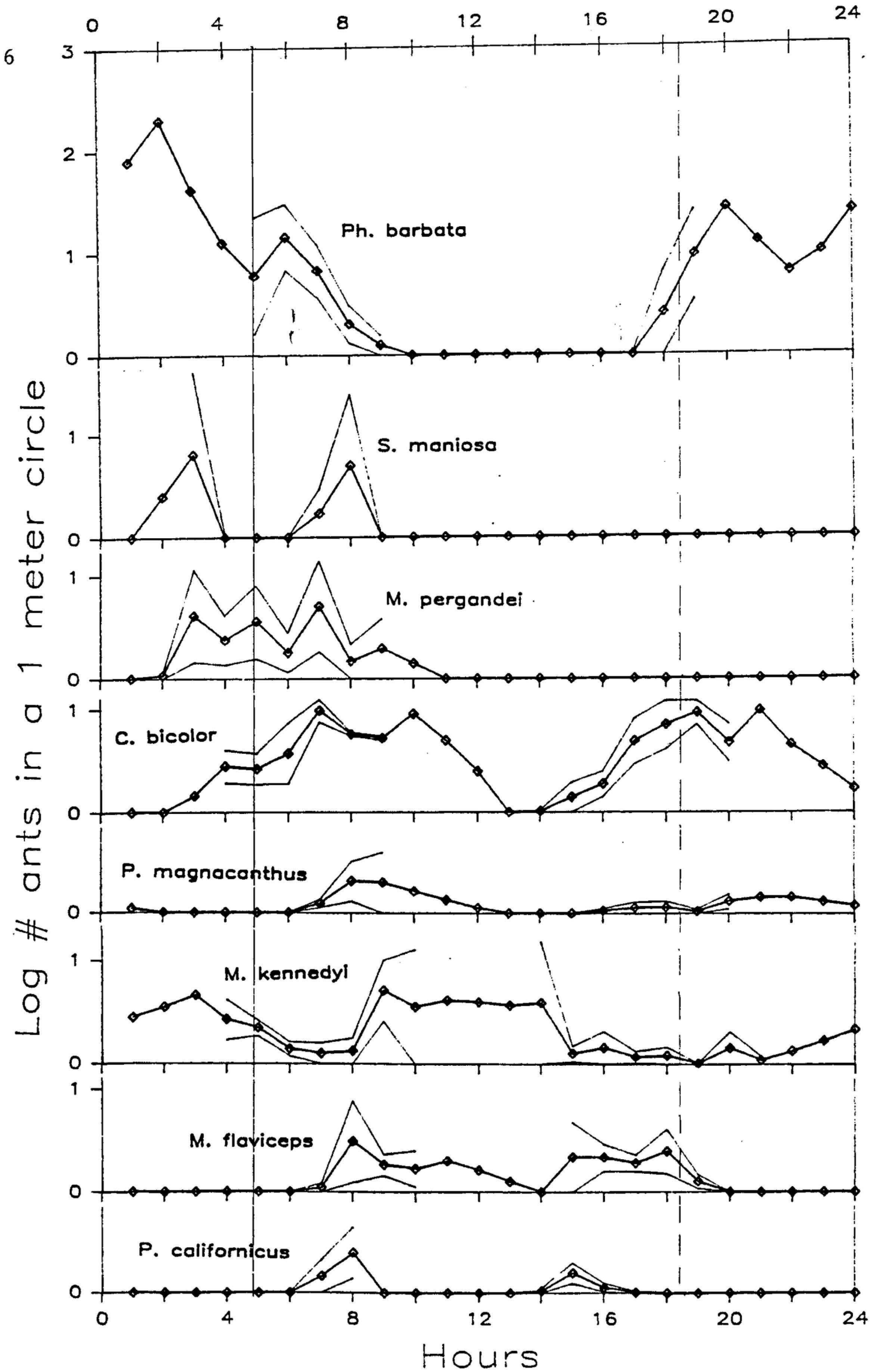


Figure 7. From same data as Fig. 6 for April 22, May 7, 8, but the total is broken down into four surface activities (as in Fig. 2 for earlier date).



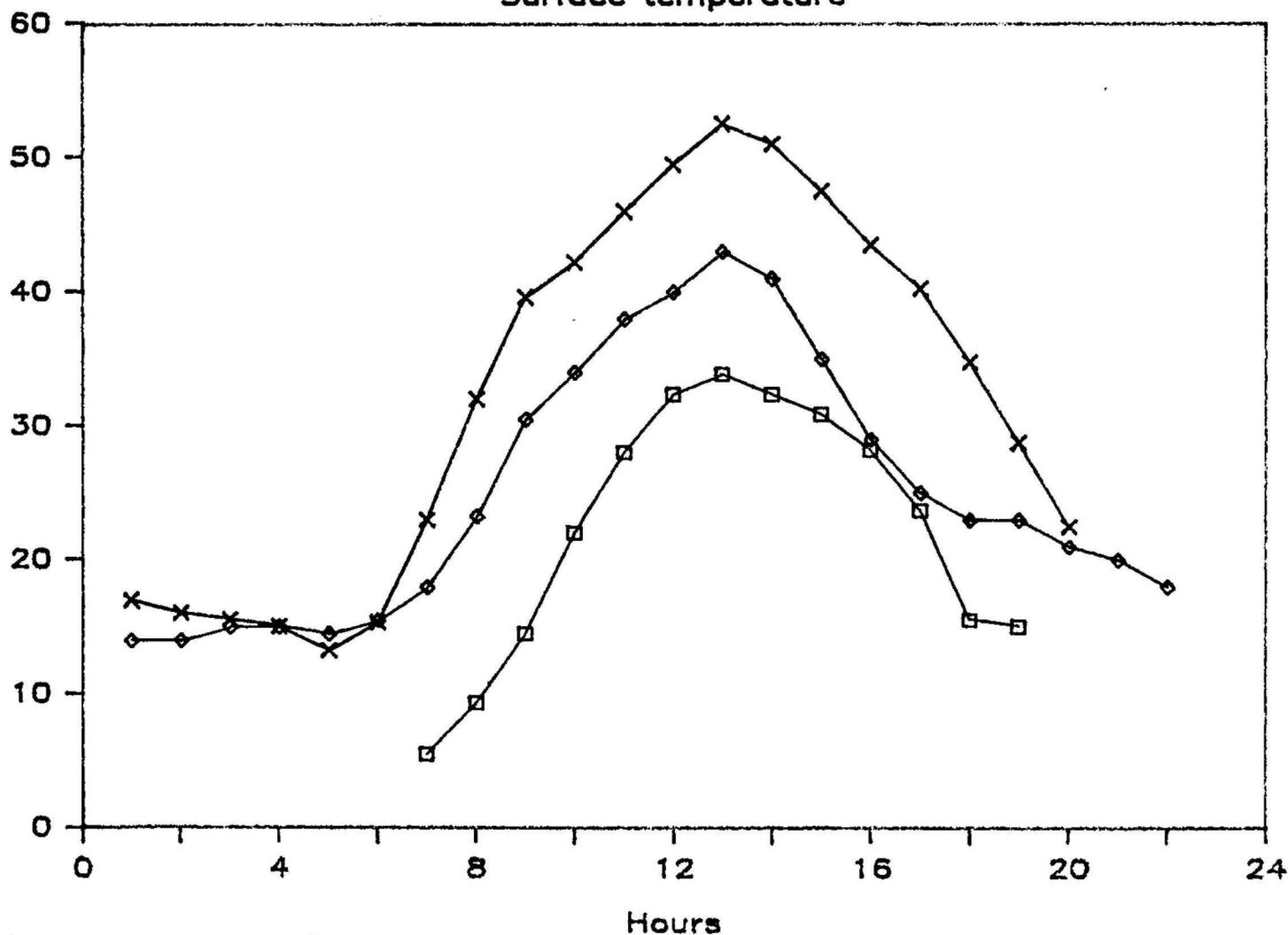
Figure 7. From same data as Fig. 6 for April 22, May 7, 8, but the total is broken down into four surface activities (as in Fig. 2 for earlier date).





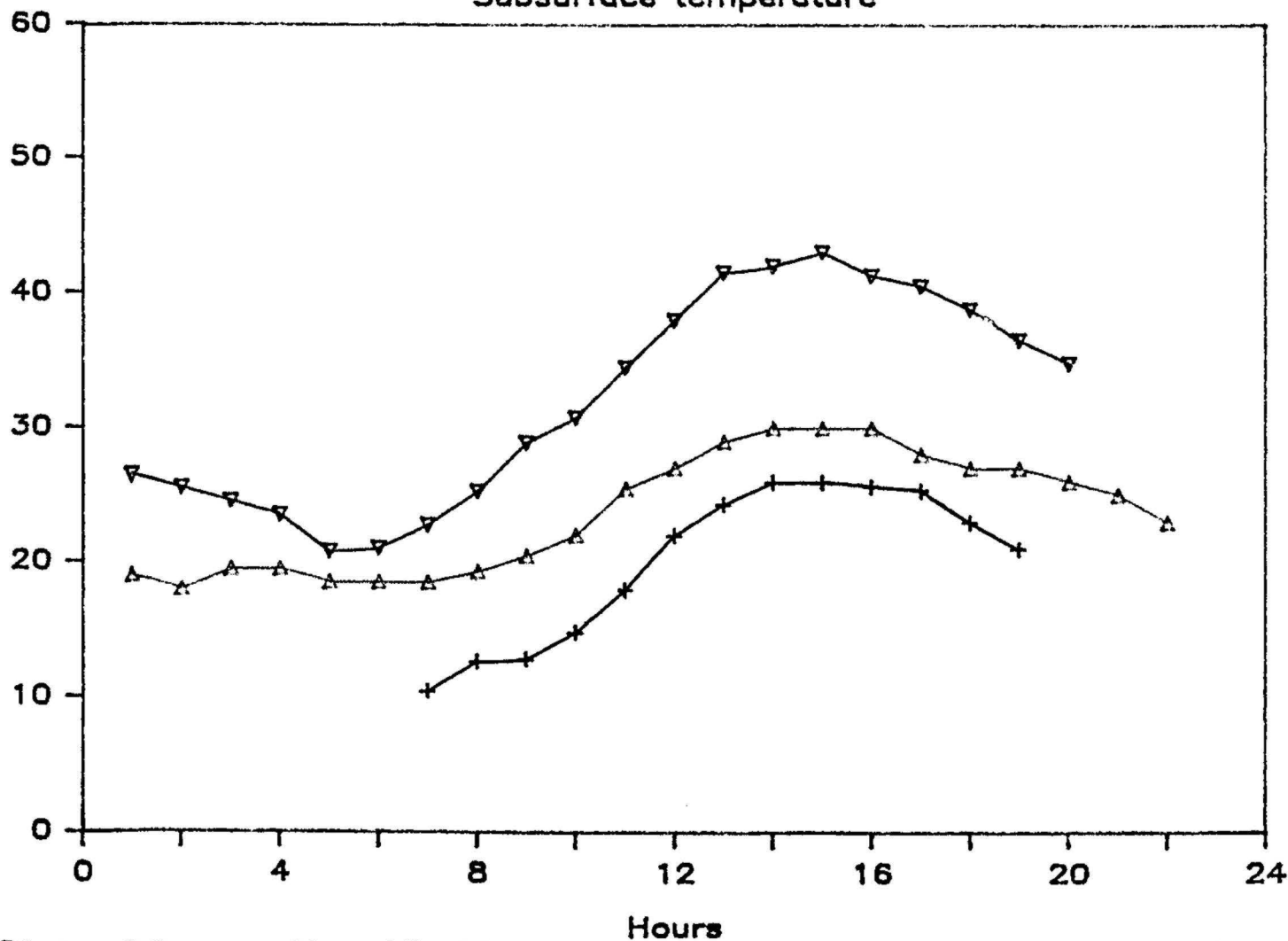
Figure 8 A. Mean hourly surface temperatures for the dates given. Readings obtained from a mercury thermometer in an unshaded area on the ground surface. B. Hourly temperatures taken 7.5 cm below the surface.

Surface temperature



Feb. 21, 22, 23    o    Mar. 13, 14, 16                      x    Apr. 22, May 7, 8

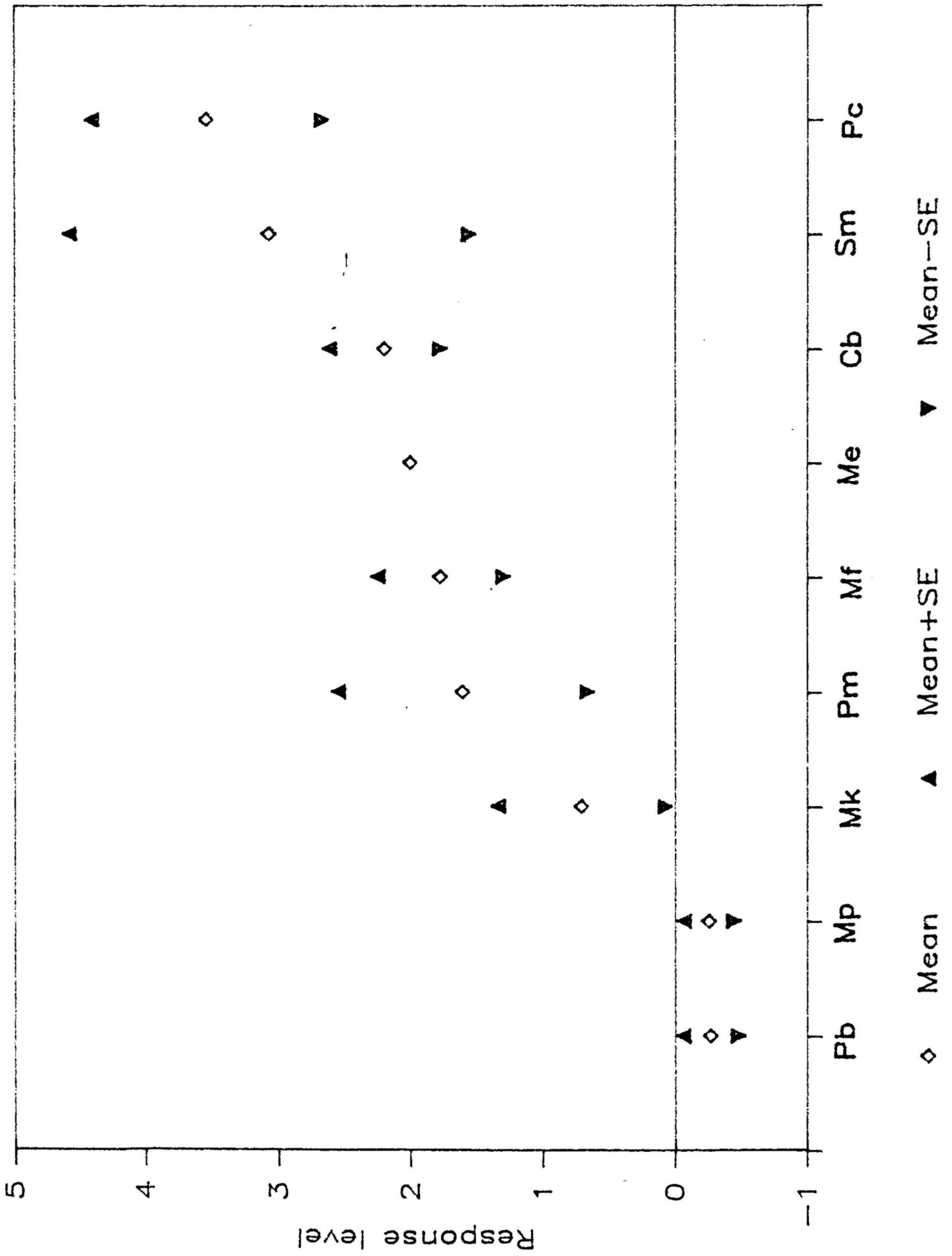
Subsurface temperature



Feb. 21, 22, 23    Δ    Mar. 13, 14, 16                      ∇    Apr. 22, May 7, 8

Figure 9. Comparative species response level of ants to 3 puffs of air from a rubber bulb into the nest. The y-axis represents the response level; the species are distributed along the x-axis. The data for each replicate colony were averaged and each replicate was then given equal weight in calculating the species mean and SE. Ants were observed at three localities mentioned in the Materials and Methods. Dates of these observations were December 9, 22, 23, 27, 28, 30, 1983; February 21, 22, 23; March 5, 6, 7; May 7, 8, 1984. The criteria and number of replicates (n) are as follows:

Response level:	Species abbreviations	n
-2 = massive retreat	Pc = <u>Pogonomyrmex californicus</u>	13
-1 = retreat	Sm = <u>Solenopsis maniosa</u>	5
-.5 = caution, less emerge, slow	Cb = <u>Conomyrma bicolor</u>	13
0 = no response	Me = <u>Myrmecocystus ewarti</u>	1
.5 = slight increase in activity	Mf = <u>Myrmecocystus flaviceps</u>	15
1 = increased activity and retreat	Pm = <u>Pogonomyrmex magnacanthus</u>	3
2 = increased activity	Mk = <u>Myrmecocystus kennedyi</u>	10
2.5 = slight emergence	Mp = <u>Messor pergandei</u>	14
3 = emergence	Pb = <u>Pheidole barbata</u>	9
3.5 = slight emerg., increased act.		
4 = emergence, increased activity		
5 = frenzied activity		
6 = massive emergence		
7 = emergence, frenzied activity		
8 = mass emergence, increased activity		
9 = mass emergence, frenzied activity		



◇ Mean    ▲ Mean+SE    ▼ Mean-SE

Figure 10. Comparative climbing ability. Species are represented on the x-axis, and climbing ability is on the y-axis. Mean and SE are calculated as in Fig. 9. The data were collected from the 3 localities December 22, 30, 1983; March 5 and May 8, 1984. The 1984 data were recorded differently and the scales were made compatible with the 1983 data by dividing each 1984 observation by 10.

December 22, 30, 1983

Climbing ability rated on a scale from 0 to 4. One to 5 ants tested in a 100 ml glass beaker.

Scale

0 = no climbing  
 1 = climbs barely (1/2 to 1")  
 1.5 = occasional climbs halfway  
 2 = climbs up, falls easily  
 3 = climbs well  
 4 = climbs very readily

March 5, May 8, 1984

Climbing score found by placing 5 to 10 ants in a 100 ml beaker 5 minutes and summing the individual scores.

Scale/10

.5 = off the bottom(1/2 to 1")  
 1 = halfway up  
 2 = to the top

Species	n
Pm	2
Sm	3
Pc	8
Mp	9
Pb	5
Mk	10
Cb	9
Mf	12
Me	1

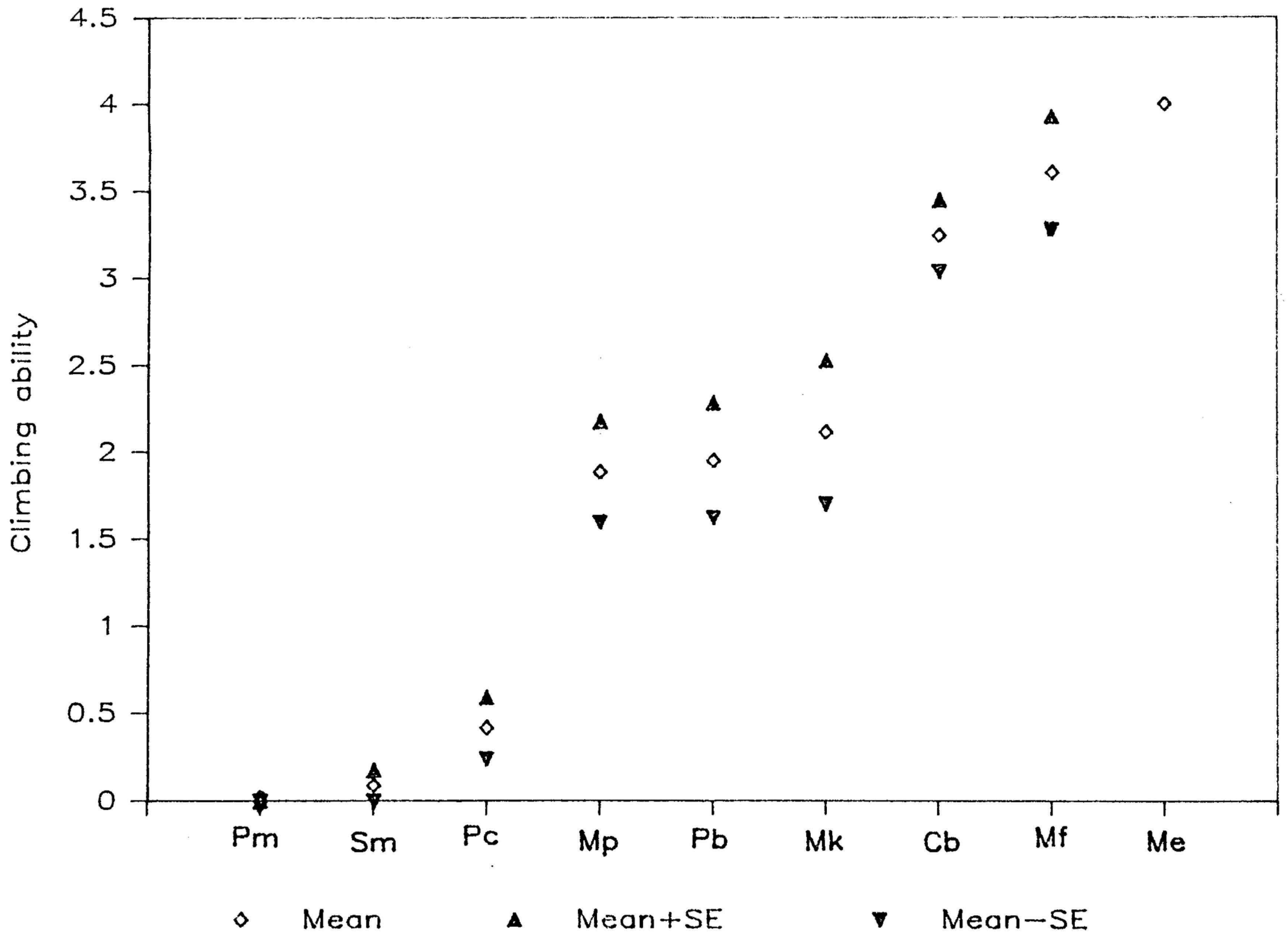


Figure 11. Average duration (seconds) of running between stops. Data were collected from the localities and treated as for Fig. 9. Time, usually 20 seconds, was divided by the number of stops to give the duration or frequency value. The dates of the observations were December 22, 23, 27, 28, 1983; and March 17, 1985. The results of this test seemed to be, slightly inversely related to temperature for many species, but the temperature of most observations was close to 25 C, so this was ignored.

Species	n	n'	Average temperature(C)
Mk	1	3	28
Cb	2	13	22
Pc	1	8	31
Mf	4	21	25
Mp	1	8	28
Pm	2	8	22
Pb	1	5	19
<u>Myrmecocystus tenuinodis</u> Mt	1	5	26

n = # of replicate nests, each given equal weight in calculating mean and SE.

n' = Total # of ants tested.



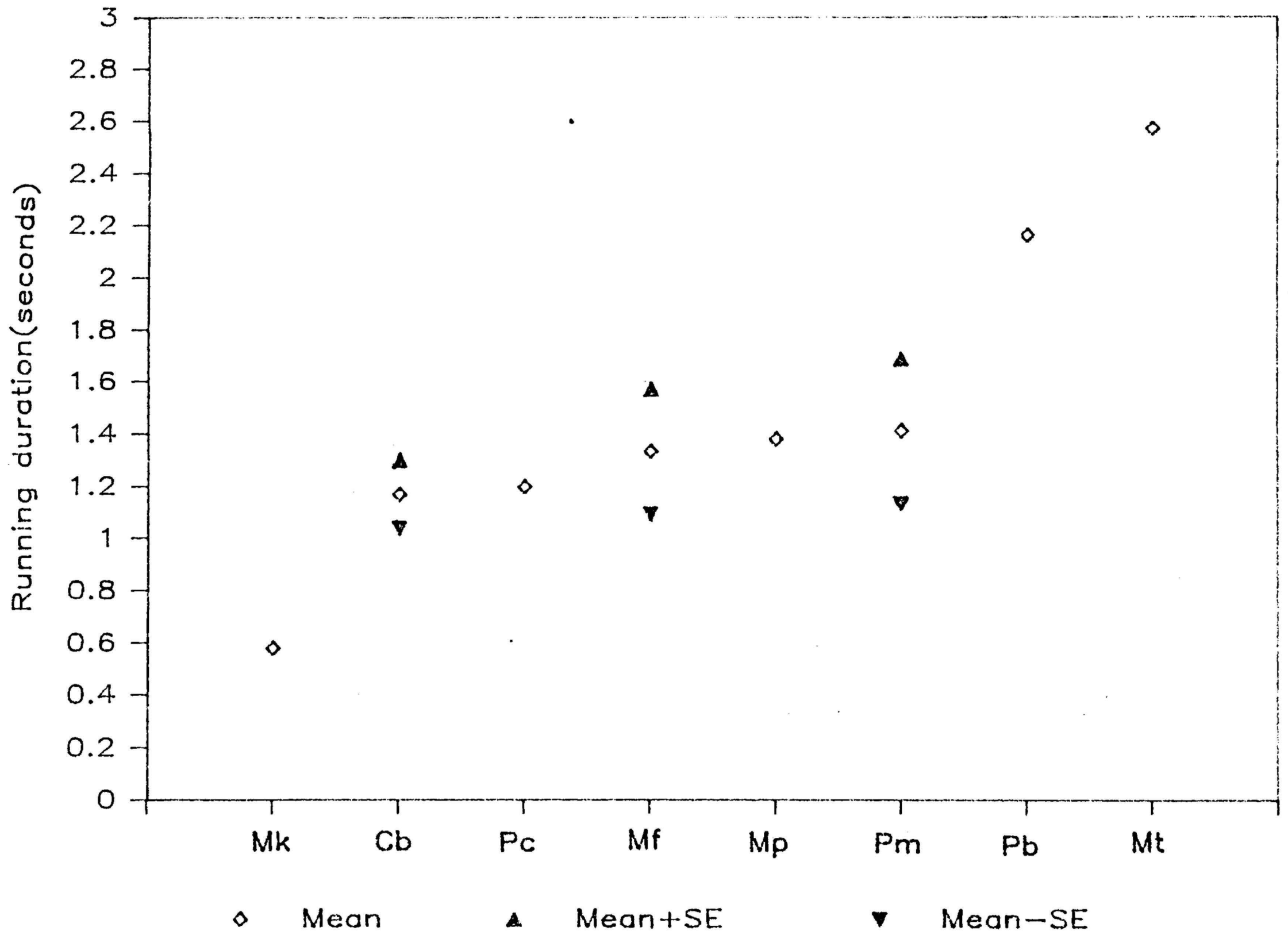


Figure 12. Species comparison by discriminate analysis. Variables are blowing, climbing, and mean log number ants around the nest at various hours. Most of the hourly count variables used were average counts between 2 consecutive hours. Data was from February 21-23, March 13, 14, 16, and April 22, May 7, 8. Symbols represent species as follows:

B = C. bicolor

F = M. flaviceps

K = M. kennedyi

P = M. pergandei

H = P. barbata

C = P. californicus

M = P. magnacanthus

S = S. maniosa

Numbers represent overlapping replicates and belong with the nearest letters. Each species is segregated from the others. This and Fig. 13 are part of further analysis based on the thesis to be included in a publication.

FACTOR(1)

80  
70  
60  
50  
40  
30  
20  
10  
0  
-10  
-20

H H  
2

P  
P PP P  
B  
2B B

S S

K  
KK  
K K

R  
CC  
C C  
C

F F  
F FFF

-10 -5 0 5 10 15

FACTOR(2)

Figure 13. As in Fig. 12 but with foraging and nest work instead of total out. Only the March data was used. Each species is segregated from the others.

FACTOR(1)

10

0

-10

-20

-30

-40

-50

12

14

16

18

20

22

24

26

28

30

FACTOR(2)



Table 1. Raw data. Before analysis, all raw counts were converted to  $\log (x+1)$  to validate statistics as well as to account for the logarithmic nature of biological activity. Abbreviations used in the headings, symbols used elsewhere, and certain data gathering procedures are explained under "notes" to the right.

Ts	Td	Tsh	Hour'	Hour	Gs #	Act	Cnt	Clm	n	Blw	Cr'd	Bkr	Stps	Scds	Notes
S.B. Co., CA., Palm Desert 12-22-83 sand dunes & banks of Whittr. R.															
32	25	28	1300	13	Pm								20	24	Ts = surf. temp.(C)
32				13	Pm								20	22	Td = temp. 7.5 cm deep
32				13	Pm								20	22	Tsh = shade temp.
30.5				13.5	Pc								20	28	Hour' = beginning time of round
30.5				13.5	Pc								20	30	Hour = actual time of observation
30.5				13.5	Pc								20	32	
29	23	20	1400	14	Cb	Fc		3		3			20	19	Gs # = Genus, species, & replicate number
29				14	Cb								20	19.5	
29				14	Cb								20	20	
28	22			14.2	Mk			3		9			20	10	"/ = partial shade
28				14.2	Mk								20	11	"/, / = complete shade
28				14.2	Mk								20	14	
28	22			14.4	Mp			2					20	22	Mp = <u>Messor pergandei</u>
28				14.4	Mp								20	25	Pc = <u>Podonomurx californicus</u>
28				14.4	Mp								20	27	Pm = <u>Podonomurx magnacanthus</u>
28				14.4	Mp								20	28	Mf = <u>Mursecocustus flaviceps</u>
															Mk = <u>Mursecocustus kennedui</u>
S.B. Co., CA., 8 km N. of Palm Desert 12-23-84 (el 120 m) Larrea, Encelia															
26	16	21	1030	10.5	Mf	F				5.5			20	25	Cb = <u>Conomorpha bicolor</u>
26				10.5	Mf								20	25	Pb = <u>Pheidole barbata</u>
26				10.5	Mf								20	30	?Tp = <u>Tapinoma?</u>
26				10.5	Mf								20	19	Sm = <u>Solenopsis maniosa</u>
26				10.5	Mf								20	16	Me = <u>Mursecocustus ewarti</u>
26				10.5	Mf								20	19	Do? = Dolichoderine ant?
28	17		1100	11	Mp	Fc							20	27	Act: F = foraging
28				11	Mp								20	28	Fc = foraging in a column
28				11	Mp								20	32	Fc( # ) = # of columns
28				11	Mp								20	31	NW = nestwork
															C = convening
															n = # ants convening inside nest entrance
30	18	24	1130	11.5	Cb					3			20	17	P = patrolling
30				11.5	Cb								20	20	FL = flight
30				11.5	Cb								20	23	
30				11.5	Cb								20	23	
30				11.5	Cb								20	25	Cnt = # ants in 1 m circle
31	22	25	1230	12.5	Pc	Fc				9			20	17	Stps = given stops of foraging ants for the time measured
31				12.5	Pc								20	24	
31				12.5	Pc								20	18	
31				12.5	Pc								20	21	Scds = seconds
31				12.5	Pc								20	22	

Ts	Td	Tsh	Hour	Gs	# Act	Cnt	Clm	n	Blw	Crd	Bkr	Stps	Scds	Notes
S.B. Co., CA. 8 km N. Palm Desert 12-27-84 Windy, Clear, Ground moist														
24	17	20	1200	12	Mf	F	5		6	3		20	25	Clm: 0 = no climbing
24				12	Mf							20	28	1 = climbs barely(1/2 to 1")
24				12	Mf							20	32	1.5 = rarely climbs but climbs well
24				12	Mf							20	35	2 = climbs well then cannot
24				12	Mf							20	50	2.5 = climbs but falls easily
25	19			12.5	Pc	NW	2		3					3 = climbs
25	20			12.6	Mf	2	20		6	3				4 = climbs readily
25	20		1245	12.7	Mf	3	30		6	6				ants tested in a 100ml glass beaker
25	21			12.8	Mp		15		3					
25	21	22	1300	13	Cb	1	20		10	2		20	20	
25				13	Cb	1						20	20	Blw = 3 blasts of air
25				13	Cb	1						20	30	Crd = card rattled over nest
25				13	Cb	1						20	30	Bkr = beaker tapped over nest
25				13	Cb	1						20	30	
25	22			13.0	Cb	2	5		6					Response to above disturbances:
25	22			13.1	Cb	3	3		6					1 = massive retreat
24	22			13.2	Cb	4	15		6	2				2 = retreat
24	21			13.2	Mp	2	4		2	2				2.5 = cation,less emerg,slwd act
23	20		1320	13.3	Mp	3 Fc	35							3 = no response
22	19		1330	13.5	Mf	1	5		6					3.5 = slight increase in act
21	18			13.7	Pc	NW	4		2					4 = increased act & retreat
20	17	20	1515	15.2	Mf	1	15		6	3				5 = increased activity
20	17			15.3	Mf	2 NW	20		6	7				5.5 = slight emergence
20	17			15.4	Mp	2	20		2	3				6 = emergence
19	17			15.4	Pc	NW	2		2	2				6.5 = slight emg & act
19	18			15.5	Pb	3 NW	3							7 = increased act & emg
19	18			15.6	Pb	4 FcNW	60		2	2		20	46	8 = frenzied activity
19	18			15.6	Pb	4						20	38	9 = massive emergence
19				15.6	Pb	4						20	38	10 = frenzied act & emergence
19				15.6	Pb	4						20	42	11 = increased act & mass emg
19				15.6	Pb	4						20	52	12 = frenzied act & mass emg
19				15.7	Mf	4 NW	10		2	2				
18	18		1600	16	Mp	3 FNW	45		2	2				
18	18			16.0	Mf	5 NW	15		9	9				
18	18			16.0	Cb	6 NW	20		7	2				
18	18			16.1	Pb	1 NWF	40		2	2				
18	18			16.1	Mp	5	10		2	2				
18	18			16.2	Cb	1 FNW	20		7	3				
18	18			16.2	Pb	2	75		2	2				
18	18		1620	16.3		Cloudy								
18	18			16.3	Cb	2 NW	8		4	2				
18	18			16.3	Mp	4	15		2	2				
17	18			16.3	Mp	1	1							
17	18			16.4	Cb	5 NWF	40		7	2				
17	18			16.4	Cb	4 NWF	25		7	3				



Ts	Td	Tsh	Hour	Gs	#	Act	Cnt	Clm	n	Blw	Crđ	Bkr	Stps	Scds	Notes
17	17	1630	16.5	Mf	6	NW	4			2	2				
17	17		16.5	Mf	1	NW	6			2	2				
17	17		16.5	Mf	2		2								
17	17		16.6	Mp	2		8			2	3				
17	17		16.6	Pc	1	closed									
17	17		16.7	Pb	3	NW	3								
17	17		16.7	Mf	4		3								
17	17		16.8	Pb	4		50								
17	17		16.8	Mp	3	P	25			2	3				
16	17		16.9	Mf	5	C	3								
16	17		16.9	Mp	5	C	3					3			
16	17	1700	17	Pb	1	F	30								
16	17		17.1	Do?	1		4			4					
16	16		17.1	Cb	1		10			7	2				
16	16		17.2	Cb	2	C	7			2	2				

S.B. Co., CA. 8 km N. Palm Desert 12-28-83 Clear, Sunny, slight breeze, ground dryer

13	12	13	820	8.33	Cb	1-FcPNW	12			5	3				
13	12			8.37	Pb	2	1			3					
13	12			8.41	Mp	5									
14	12			8.46	Pb	1	2			2					
14	12			8.5	Mf	2									
14	12			8.54	Mp	2									
15	12			8.58	Pc										
15	12			8.62	?	3									
15	12			8.67	Mf	4									
16	12			8.71	Pb	4-C	10			7	7				
16	12			8.75	Mf	5				3					
16	12			8.79	Cb	2 NW	17			4	2				
16	12			8.83	Pm	4	3			6	2				
17	12			8.87	Cb	3	3			4					
17	12			8.92	Mp	1"P	11			2	2				
17	12			8.96	Cb	4 NWF	20			4	2				
17	12	14	900	9	Cb	1 FNW	20			5	3				
17	12			9.06	Pb	2	2			2	3				
17	12			9.13	Mf	6	0			2					
18	13			9.19	Mf	1	0			2					
18	13			9.25	Mf	2 C	3			10	3				
18	13			9.32	Mp	2-	0			3					
18	13			9.38	Pc	-				3					
18	13			9.44	Mf	4 C	6			2	3				
18	13			9.51	Pb	4 C	6			7	2				
19	13			9.57	Mp	3 NWFc	65			2	3				
19	14			9.63	Mf	5-	0								
19	14			9.7	Pb	1-	1								
19	14			9.76	Mp	5 FcNW	45			2	3				
19	14			9.82	Pb	2	1								
19	14			9.89	Mf	3 C	3			7	3				

Ts	Td	Tsh	Hour	Gs #	Act	Cnt	Clm	n	Blw	Crđ	Bkr	Stps	Scds	Notes
20	14		9.95	Cb	1-Fc2NW	25			4	2				
20	14		10.0	Cb	2 NW	25			5	2				
20	14		10.0	Mp	4 clsg	3			7	2				
20	15		10.1	Cb	3 NW	8			4.5					
21	15		10.2	Mp	1-CP	50			2	3				
21	15		10.2	Cb	4 NW Fc	15			6	3				
21	15	16	1020	Mf	6 F	1								
21	15		10.4	Mf	1 CF	20			5	2				
22	15		10.5	Mf	2 CF	13			10	3				
22	15	1040	10.6	Mp	2	0								
22	15		10.7	Pc		0								
23	15		10.8	Mf	4 CF	18			4	3				
23	15		10.9	Pb	4 C	4			2	2				
23	15	1100	11	Mp	3 FNW	50			2	3				
23	16		11.0	Mf	5 FNW	12			4	3				
23	16		11.1	Pb	1-C	4			2	3				
24	16		11.1	Mp	5 NWF	35			2	2				
24	16		11.2	Pb	2	1			3					
24	16		11.2	Cb	1-F	20			3	3				
25	16		11.3	Mf	3 NW	20			7	5				
25	16	15	1120	11.3										

## S.B. Co., CA. Palm Desert 12-28-83

25	19	21	1200	12	Pc	1 FNW	30		10	10				
25	19			12.0	Pc	2 F	7		7	8				
26	19			12.1	Mf	1	1		3			30	20	
26	19			12.2	Pc	3 F	6		10	8				
26	20			12.3	Mf	2 C	8		2	3		10	18	
26	20			12.3	Mf	2						10	18	
26	20			12.4	Mf	2						10	19	
26	20			12.5	Mf	2						10	17	
27	20													
27	20			12.6	Mf	3 FNW	3		3	3		10	11	
27	20			12.6	Mf	3						10	12	
27	20			12.7	Mf	3						10	12	
27	21			12.8	Mf	3						10	25	
27	21			12.9	Mf	3						10	14	
27	21			13	Pc	1	13		10	10				
				13										

## S.B. Co., CA. Palm Desert 12-30-83

20	9	13	930	9.5	Pc	1 F	30	0	8	10	11			
20	9			9.64	Mk	2 F	1		3	3	6			
20	9			9.79	Mk	3 FcNW	15	4	2	2	3			
21	10			9.93	Pc	4 F	13	0	6	10	10			
21	10			10.0	Pc	5 Fc	15	1	10	8	3			
22	10			10.2	Pc	6 F NW	12	0	10	3	5			
22	11			10.3	Mk	4	0		3	3	3			

Ts	Td	Tsh	Hour	Gs #	Act	Cnt	Clm	n	Blw	Crd	Bkr	Stps	Scds	Notes
23	11		10.5	?Tp	aNW	F	3		2	6	2			
23	11		10.6	?Tp	b1		2	3	2	2	2			
23	12		10.7	Mk	5	C	F	6	2 (1)	2	2	2		
24	12		10.9	?Tp	bNW		20		2	2	2.5			
24	12		11.0	?Sm	1NW		5	3	5	3	3			
25	13		11.2	Pc	3	FcNW	20	1	9	3	3			
25	13		11.3	Pc	2	F	NW	10	1	7	3	3		
26	14	17 1130	11.5	Pc	1	F	40	0	12	3.5	3			
26	14		11.6	Mk	2	C	5	3	2	5	3			
26	14		11.6	Mf	3	F	0	3 (1)	3	3	3			
27	14		11.7	Pc	5	F	7	1	12	5	3			
27	14		11.8	Pc	4	F	15		7	5	5.5			
28	15		11.9	Pc	6		0	0	7	5	5.5			
28	15		12.0	Mf	4		0		3	3	3			
29	15		12.1	?Tp	aNW		3	4 (1)	2	3	3			
29	15		12.2	?Tp	bNW		3	3	3	4	3			
30	16		12.3	Mk	5		0		3	1)10	3			
30	16		12.4	Pc	2	F	5	1	7	6.5	3			
31	16		12.5	Sm	1		1		12	3.5	3			
31	17		12.6	Pc	3	FP	15	1	12	5.5	3			
32	17	21 1245	12.7	Pc	1	F	45	1	11	5	3			
32	17		12.8	Mf	2	C	2		4	8	3			

## S.B. Co., CA. 8 km N. Palm Desert

30	20		13.2	Mf	3	NW	F	37	4	3.5	3.5	3		
30	20	18 1315	13.2	Cb	1	Fc		20	4	6.5	3	3		
30	20		13.3	Pb	5	NW		20	2	2	2	2		
29	20		13.4	Cb	2	Fc		20	4	2	2	3		
29	20		13.4	Mp	7	FcNW		8	1.5	2	3	3		
29	20		13.5	Cb	3	NW		4	3	2	3	3		
28	20		13.6	Cb	4			25	4	4	3	3		
28	20		13.6	Mp	1	NW	F	20	1.5	2	3	3		
27	20		13.7	Mf	1	NW	F	18	4	7	5	3		
27	20		13.8	Mf	2	NW		10	4	12	12	3		
26	19		13.9	Mp	2	close		0						
26	19		13.9	Pc	1	close		0						
26	19		14.0	Mf	4	NW		12	3	6.5	3.5	3		
25	19		14.1	Pb	4	NW		20	1.5	2	3	3		
25	19		14.2	Mp	3	Fc		40	2	2	3	3		
25	19		14.2	Mf	5	F	NW	75	4	5	5	3		
24	19		14.3	Pb	1	NW		20	3	6.5	2	2		
24	19		14.4	Mp	5	NW	F	60	3	2	3	3		
23	19	15 1430	14.5	Mf	3	NW	F	35	3	3.5	3.5	3.5		
23	19		14.5	Cb	1	NW	F	18	3	5	2	3		
23	19		14.6	Pb	5	NW	Fc	200	1.5	2	2	2		
23	19		14.6	Cb	2	NW	F	35	4	3.5	3.5	3		
23	19		14.7	Mp	4	NW		30	3	2	3	3		
23	19		14.7	Cb	3	NW		12	3	2	2	3		

Ts	Td	Tsh	Hour	Gs #	Act	Cnt	Clm	n	Blw	Crd	Bkr	Stps	Scds	Notes
22	19		14.8	Mp	1	F NW	10	1.5		2	3	3		
22	19		14.8	Cb	4	NW F	45	3		5	3	3		
22	19		14.9	Mf	6	NW	6			2	2	2		(Notes on Mz flight)
22	19	1500	15	Me	P	Fli	300	4		2	3	3		Workers patrolling in a zig-zag fashion in an ever widening circle (workers various sizes, circle dia. 2 m at 3 pm). About 15 males were motionless on small rocks and taking flight. 4 females were emerging from and reentering the nest.
21	19		15.1	Mf	1	P FL?	80	3		2	2.5	3		
21	18		15.2	Mf	2	NW	25	3		5	5	3		
21	18		15.3	Mp	2	close	0							
20	18		15.4	Pc	close	0								
20	18		15.5	Mf	4	P FL?	35	3		5	5	3		
20	18		15.6	Pb	4	Fc(2)	100	3		5	5	3		
19	17		15.7	Mp	3	NW Fc	35	3		2	3	3		
19	17		15.8	Mf	5	P FL?	100	3		2.5	3	3		The ground was moist from a recent rain.
19	17		15.9	Mp	5	F NW	40	2.5		4	4	3		
18	17	17	1600	Me	P		20			2	3	3		
18	17		16.1	Me?	Fc		30			2	2	2		

Ts Td Hour Gs # F NW P C #' #'' c d Clm Blw Notes

S.B. Co., CA. Thousand Palms; Willis Plus Oasis (el 120 m), Larrea, Encelia, cactus

Date: 12-9-83' AM partly cloudy, cool; PM sunny warm; 3:45 PM partly cloudy cooler

20	36	1230	12.5	12.7	Cb	1	b	a			8	15			Ts = unshaded surf. temp(c)
				12.9	Pc	4	b	a			2	4		6	Td = temp. 7.5 cm deep
				13.1	Pb	1					0	0			
				13.3	Cb	5	a				6	20		9	Gs # = Genus, species, replicate number
				13.5	Pc	1	b	a			2	3			
				13.7	Mk	1	b	a			1	4		4	
				13.9	Mp	1	a	b	c		30	50		2	Mp = <u>Messor pergandei</u>
				14.1	Mf	3			a		2	2		4	Pc = <u>Podonomurx californicus</u>
				14.4	Mk	3					0	0		4	Pm = <u>Podonomurx magnacanthus</u>
23	31	1430	14.5	15.5	Pm	5					0	0			Mf = <u>Mursecocustus flaviceps</u>
				15.2	Pc	3	b	a			6	8			Mk = <u>Mursecocustus kennedui</u>
				15.4	Pc	2	a				1	1			Cb = <u>Conomorpha bicolor</u>
				14.5	Mp	5	a	b			75	150			Pb = <u>Pheidole barbata</u>
				15.6	Mp	2		a			5	5			Sm = <u>Solenopsis maniosa</u>
				14.9	Pb	5					0	0			F = foraging
				15.1	Pb	4					0	0			NW = nestwork
				15.5	Pb	2					0	0			P = patrolling
				15	Mk	5		a			3	3			C = convening
				14.6	Mk	4	c	b	a		12	13			a, b, c, under above = order of most activ.
				15	Mf	5					0	0			# under above = count of each activity
				14.8	Mf	4					0	0			x = activity occurring
				15.3	Mf	2					0	0			
				14.7	Mf	1		a			25	25			
24	26	1545	15.7												#' = count in 1 m circle

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
Date: 2-20-84		clear, sunny, slight breeze										#" = count in .2 m circle			
		1300													
		13	Mp	1					75	100	c	se			c = column or columns(#)
		13.3	Mp	3					1	1					d = direction of column/s
		13.6	Mp	4					0	0					
		13.4	Mp	5	72	8			40	80					Clm = Climbing ability:
		13.7	Mf	1	x			x	2	5		n			10 ants placed in a 100
		13.1	Mf	3		5			5	10					ml beaker for 5 minutes
		13.8	Mf	4	x			x	5	6		n			1/2 = off the bottom
		13.8	Mf	5	x			x	10	12					1 = halfway up
		13.2	Mk	2		2			2	4					2 = to the top
		13.2	Mk	3					0	0					These added for 5 min
		13.5	Mk	4					2	4		n			to give a climbing
		13.9	Mk	5	x	x			5	6		n			value
		13.6	Cb	2				x	2	4	2c	ns			
		13.4	Cb	4					8	16	2c	nesw			Blw = response to blowing
24	38	1400													
Date: 2-21-84		some high clouds													
		15 830													
		8.5	Mp	1					30	30	30				1 = massive retreat
		8.58													
14	20	930													
		9.63	Mp	1	a	b			40	120	c	s			2 = retreat
		9.5	Mp	2		6			3	6	c	w		2	2.5 = caution, less emer-
		9.7	Mp	3			1		1	1				10	gence slowed activity
		9.8	Mp	4					0	0					3 = no response
		9.77	Mp	5	a	b			80	160	c	e		2	3.5 = slight increase in
		9.57	Mp	6					1	1					activity
		9.6	Pc	1		2			1	2				3	4 = increased act. & re-
		9.93	Pc	2				2	1	2				10	treat
		9.87	Pc	3		5			3	5				10	5 = increased activity
		9.53	Pc	4					2	4				7	5.5 = slight emergence
		9.97	Pm	5					0	0				3	6 = emergence
		9.73	Pc	6	(digging)				4	4				3	6.5 = slight emg & act
		9.83	Mf	1				4	3	4				10	7 = increased act & emer
		9.9	Mf	2					0	0				3	8 = frenzied activity
		9.67	Mf	3	x			x	15	22					9 = massive emergence
17	24	1010													
		11.2	Mf	4	x	x	x		8	8					10
		11.5	Mf	5	x			x	5	7		nw			10
		10.6	Mk	1				x	1	1					2
		10.8	Mk	2	x			x	10	12					2
		10.7	Mk	3					0	0					3
		10.9	Mk	4	a			b	2	5					
		11.6	Mk	5	x		x	x	25	30					2
		10.2	Cb	1	x		x		3	4	c	nw			10
		11.1	Cb	2					2	4	c	s			10
		11.4	Cb	3		30			5	30	c	se nw			10

Ts	Td	Hour	Gs #	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		10.9	Cb 4	x	x			15	22				10	
		10.4	Cb 5		28			8	18	2c	e w		10	
		10.3	Pb 1			6		6	6				2	
		11.8	Pb 2					0	0				3	
	hazy	10.9	Pb 3			1		1	1				2	
		11.7	Pb 4	x	x			2	3				3	
		11.3	Pb 5			2		2	2				2	
		11	Sm 1		4			2	4	c	s		2	
25	31	1200												
27	28	1415												
		14.5	Ap 1	x	x			35	90	c	s		2	
		14.2	Ap 2			11		11	11				2	
		14.7	Ap 3					0	0					
		14.9	Ap 5	x	x			100	150	c	e			
		14.3	Ap 6	c	x			30	100	c	s		2	
		14.4	Pc 1		3			1	3		s		7	
		15.3	Pc 2		8			8	8		ne		7	
		15.3	Pc 3	x	x			3	5		s		7	
		14.3	Pc 4	x	x			2	3		s		10	Retreat then frenz. act & mass emergence
		14.8	Pc 6					0	0					
		15	Nf 1		x	x		13	15				7	
		15.3	Nf 2					0	0					
		14.5	Nf 3					0	0				7	
		15.1	Nf 4				30	25	30	c	n s		10	
		15.2	Nf 5		b		a	4	4				10	
		15.2	Nf 6				15	15	15				7	
		14.5	Nk 1					2	2				7	
		14.7	Nk 2					0	0					
		14.6	Nk 3					0	0					
		14.9	Nk 4	x			x	2	4					
		15.2	Nk 5			5		5	5				2	
		14.2	Cb 1	?	x			6	10				10	
		15	Cb 2	b	a			7	9				10	
		15.1	Cb 3		30			10	30	2c	se nw		10	
		14.8	Cb 4	x	?			5	10	c	s		10	
		14.4	Cb 5		85			25	85	2c	e w		10	
		14.4	Pb 1			1		1	1					
		15.4	Pb 2					100	100	100			2	
		14.8	Pb 3					8	8	8			2	
		15.3	Pb 4		x	?		7	7				2	
		15.1	Pb 5			?	x	10	10				2	
		14.9	Sm 1		4			0	4					
		14.6	Sm 2	x	x			15	55	2c	n s			
26	24	1530												Cloudy
26	24	1630												Sunny
		16.7	Ap 1	x	x			45	75	c	s		2	

Ts	Td	Hour	Gs #	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		16.5	Mp 2	x	x			7	9	c	w		2	
		16.9	Mp 3					0	0					
		17	Mp 5	x	x			75	100	c	e			
		16.6	Mp 6	x	x			15	45	c	s		2	
		17.3	Pc 2			8		6	6				2	
		17.3	Pc 3			2		2	2				2	
		16.5	Pc 4			3		3	3				2	
		17.1	Mf 1			20		20	20		s		2	
		16.8	Mf 3					0	0				7	
		17.1	Mf 4			10		10	10		sw		7	
		17.2	Mf 6			10		10	10				2	
		16.7	Mk 1					0	0				7	
		16.5	Cb 1	x	x			5	7	c	e		7	
		17.1	Cb 2			15		15	15				2	
		16.9	Cb 4	x	x	x		9	15	c	n		10	
		16.7	Cb 5	x	x	x	x	50	100	2c	e w		10	
		16.6	Pb 1	x	x		x	50	250	2c	n se		2	
		17.4	Pb 2	x	x		x	60	200	2c	n e?		2	
		16.9	Pb 3					125	100	125			2	
		17.2	Pb 4	x	x		x	200	300	2c	s se			
		17.1	Pb 5	x			x	60	100	c	sw		2	Sunset 5:10 P.M.
		17	Sm 1		4			0	4					
		16.8	Sm 2	x	x			15	55	2c	n s			
15	21	1730												
		17.5	Pc 4											Closing nest
		17.5	Pb 1	x	x			50	150	2c	e w		2	
		17.6	Cb 5	x	x	x	x	10	22	2c	nw se		7	
		17.6	Mp 1			10		10	10				2	
		17.6	Mf 3					0	0				7	
Date:		2-22-84			Partly cloudy									
7.5	10	645												
		6.82	Mp 2					0	0					
		6.89	Pb 1			12		12	12				2	
		6.97	Cb 5	?		?	30?	17	30	2c	n s		5	
		7.04	Mp 1			4		4	4				2	
		7.11	Mp 3					1	1					
		7.18	Cb 4					3	3	3			2	
		7.25	Pb 3			5		5	5				2	
		7.33	Mp 5		x		x	5	5					
		7.4	Cb 2					2	2	2			2	
		7.47	Mp 4					0	0					
		7.54	Mf 1					1	1	1			2	
		7.61	Pb 5		x		x	5	5				2.5	
		7.68	Cb 3	x		x		15	35	2c	ne sw		2	
		7.76	Pb 4		x		x	10	10				2	
		7.83	Pc 2					0	0					closed
		7.9	Pb 2			3		3	3				2	

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
12	12	800													
		8.06	Cb	1	x	x		x	9	11				2	
		8.11	Ap	2				3	2	3					
		8.17	Pc	4			3		3	3				2	
		8.22	Ap	6	x	x			50	80	c	se		2	
		8.28	Pb	1	x	x			30	40	c	ne		2	
		8.34	Pc	1					0	0					
		8.39	Ap	1	x	x			150	600	c	se		2	column length 2 m
		8.45	Sm	2	?				1	1					
		8.5	Ap	3					0	0					
		8.56	Cb	4	b	?	a		10	12				10	
		8.62	Pb	3				?	1	1					
		8.67	Ap	5	x	x			60	160	c	e			column length 21 m
		8.73	Sm	1		15			5	15	2c	n s		4	
		8.78	Cb	2	x	x			8	15		sw		7	
		8.84	Ap	4					0	0					
		8.9	Mf	1	x	x		x	4	7				2	
		8.95	Mf	4					0	0				7	
		9.01	Pb	5			6		6	6				2	
		9.06	Cb	3		28			8	28	2c	ne sw		5	
		9.12	Mk	5					8	10	c?	w			
		9.18	Mf	6	x			x	8	11				4	
		9.23	Pb	4			x	x	4	5				2	
		9.29	Pc	3	x	x			3	5		s			
		9.34	Pc	2		x		?	2	2				4	
		9.4	Pb	2				x	2	2				2	
22	14	930													Partly cloudy, clearing
		9.55	Cb	1	x	x			5	13	c	nw		7	
		9.6	Ap	2	x	x			3	6	c	w		2	
		9.65	Pc	4	x	x			1	3		n			
		9.7	Ap	6	x	x			30	60	c	se		3	column length 13 m
		9.75	Pb	1			10		10	10				2	
		9.8	Cb	5	x		?		30	80	3c	ne s nw		5	column length 14 m
		9.85	Pc	1		6			2	6				3	
		9.9	Mk	1					0	0				3	
		9.95	Ap	1	a	b			80	160	c	se		2.5	column length 8 m
		10	Mf	3	x	x	?	x	15	35		e		5	
		10	Sm	2	x	x			5	15				7	
		10.1	Mk	3	x				0	3				3	
		10.1	Mk	2				x	3	5				2	
		10.2	Ap	3					0	0					
		10.2	Cb	4	x	x			10	17				10	
		10.3	Pb	3					0	0					
		10.3	Pc	6					0	0					
		10.4	Ap	5	x	x			50	70	c	e		3	
		10.4	Mk	4	x			x	3	5					
		10.5	Sm	1		8			3	8				2	
		10.5	Ap	4					0	0					column length 20 m



Ts	Td	Hour	Gs #	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		10.6	Nf 1				2	2	2				10	
		10.6	Nf 4				x	4	4				10	
		10.7	Pb 5					0	0					
		10.7	Cb 3	x	x			3	9	c	ne sw		10	
		10.8	Nf 5	x			x	2	3				10	
		10.8	Nk 5	x	x		x	8	10				7	
		10.9	Nf 6	x			x	8	11				10	
		10.9	Pb 4					0	0					
		11	Pc 3		3			1	3				7	
		11	Nf 2					0	0				3	
		11.1	Pc 2					1	1				7	
		11.1	P# 5											
		11.2	Pb 2					0	0					
31	20	1115												Clear
33	23	1215												Clear
		12.2	Cb 1		4			4	4				5	
		12.3	Mp 2					0	0					
		12.3	Pc 4	x	x			2	4				3	
		12.3	Mp 6		16			15	16				2	
		12.4	Pb 1					0	0					
		12.4	Cb 5		55			15	55	3c	ne nw s		5	
		12.4	Pc 1		2			0	2					
		12.5	Nk 1	x			x	4	10		s		5	
		12.5	Mp 1		40			40	40				4	
		12.5	Nf 3		6			0	6				10	
		12.6	Sm 2		3			1	3				3	
		12.6	Nk 3	x	x		x	8	14				2	
		12.6	Nk 2	x			x	8	12				4	
		12.7	Mp 3					0	0					
		12.7	Cb 4	b	a			4	6				10	
		12.7	Pb 3					0	0					
		12.8	Pc 6					0	0				3	
		12.8	Mp 5		15			15	15				2	
		12.8	Nk 4	x			x	6	11				3	
		12.9	Sm 1					0	0				3	
		12.9	Cb 2				2	0	2				10	
		12.9	Mp 4					0	0					
		13	Nf 1	x			x	1	3				5	
		13	Nf 4	x			x	3	5				10	
		13	Pb 5					0	0					
		13.1	Cb 3		9			2	9	2c	ne sw		7	
		13.1	Nf 5	x	x	x		40	65		n s		10	
		13.1	Nk 5	x			x	7	10				5	
		13.2	Nf 6	x			x	4	10				10	
		13.2	Pb 4					0	0					
		13.2	Pc 3		5			2	5				3	
		13.3	Nf 2					0	0				3	

Ts	Td	Hour	Gs #	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		13.3	Pc	2				0	0					
		13.3	Pm	5		2		2	2				3	
		13.4	Pb	2				0	0					
33	23	1330												Clear
31	26	1400												Clear
		14	Cb	1		5		5	5				5	
		14	Ap	2	x	x		4	12	c	w		2	C. l. 10 m
		14.1	Pc	4	x	x		2	3				2	
		14.1	Ap	6	x	x		30	50	c	se			C. l. 22 m
		14.2	Pb	1				0	0					
		14.2	Cb	5	x		?	12	37	2c	nw e		5	C. l. nw 11 m
		14.3	Pc	1		1		1	1				3	
		14.3	Mk	1	x			5	6				5	
		14.4	Ap	1	x	x		75	150	c	e		2	Col. length 7 m
		14.4	Mf	3	x			3	10				7	
		14.4	Sm	2				0	0				3	
		14.5	Mk	3	x			4	5				2	
		14.5	Mk	2	x			5	9				2	
		14.6	Ap	3				0	0					
		14.6	Cb	4	x	x		10	18				10	
		14.7	Pb	3				0	0					
		14.7	Pc	6				0	0					
		14.8	Ap	5	x	x		75	125	c	ese		2	
		14.8	Mk	4	x			1	4				3	
		14.9	Sm	1		7		1	7	c	e		3	
		14.9	Cb	2		12		7	12	c?	sw		10	
		14.9	Ap	4				0	0					
		15	Mf	1				0	0				7	
		15	Mf	4	x			2	3				10	
		15.1	Pb	5				0	0					
		15.1	Cb	3		16		3	16	2c	nw se		4	Col. lengths: 15, 5 m
		15.2	Mf	5	x			10	15					
		15.2	Mk	5	x	x		1	2				2	
		15.3	Mf	6	x	x	x	12	20				12	
		15.3	Pb	4				0	0					
		15.3	Pc	3	x	?		2	3				3	
		15.4	Mf	2				0	0					
		15.4	Pc	2										Closed
		15.5	Pm	5		4		2	4				3	
		15.57	Pb	2				0	0					
28	27	1540												
		15.7	Cb	1	x		x	7	10	c?	se		7	
		15.7	Ap	2			8	6	8				2	
		15.7	Pc	4			3	3	3				2	
		15.8	Ap	6	x	x		35	55	c	se			Col. length 22 m
		15.8	Pb	1			15	15	15				2	
		15.8	Cb	5	x		?	12	42	2c	nw e			

Ts	Td	7 Hour	Gs #	F	NW	P	C	#'	#"	c	d	Clw	Blw	Notes
		15.9	Pc	1				0	0					
		15.9	Mk	1				0	0				3.5	
		16	Mp	1	x	x		40	90	c	e		2	C. l. 15 #
		16	Mf	3		x	x	3	3				4	
		16	Sm	2	10			3	10	c			2	
		16.1	Mk	3				0	0				3	
		16.1	Mk	2	1			0	1				3	
		16.1	Mp	3	x	x		30	55	c	nw		2	C. l. 9 #
		16.2	Cb	4	x	x		10	17				10	
		16.2	Pb	3		25		25	25				2	
		16.2	Pc	6				0	0					
		16.3	Mp	5	x	x		50	90	2c	e se			C. l. 14 #
		16.3	Mk	4				0	0				3	
		16.4	Sm	1	6			5	6				5	
		16.4	Cb	2	x	x		15	22	c	se		3.5	
		16.4	Mp	4				0	0					
		16.5	Mf	1				0	0				7	
		16.5	Mf	4		10		10	10				10	
		16.5	Pb	5	x	x		75	275	c	s		4	C. l. 2 #
		16.6	Cb	3	x	?		5	35	2c	nw se		5	
		16.6	Mf	5	10			10	10				7	At 4:40 AM, <u>Murmeococcus flaviceps</u>
		16.6	Mk	5				0	0				3	replicate # 6 ants were defending
		16.7	Mf	6	x		x	10	11				3.5	the nest from an attack by about
		16.7	Pb	4	350			200	350	3c				150 <u>Conomyrma bicolor</u> ants from
		16.8	Pc	3		1		1	1					a nest opening one meter away.
		16.8	Mf	2				0	0					<u>C. bicolor</u> ants were patrolling
		16.8	Pc	2				0	0					about the <u>M. flaviceps</u> nest and
		16.9	Pm	5		2		2	2				2	dropping gravel into the entrance.
		16.9	Pb	2		5		5	5				4	<u>M. flaviceps</u> ants encircled the
21	25	1700												nest entrance waving their antenni.
		17	Cb	1		8		8	8				5	Returning foragers were given chase
		17	Mp	2		3		3	3				2	by <u>C. bicolor</u> ants.
		17	Pc	4		2		2	2				2	
		17.1	Mp	6	x	x		40	60	c	se			C. l. 16 #; returning
		17.1	Pb	1	x	x		125	300	2c	nw e		4	C. l. 6 #
		17.1	Cb	5	x*			20	55	2c	nw e		5	*also transporting larvae
		17.1	Pc	1				0	0					
		17.2	Mk	1				0	0					
		17.2	Mp	1	x	x		35	55	c	e		2	C. l. 13 #
		17.2	Mf	3				0	0				3	
		17.3	Sm	2	x	?		5	30	2c	n s		5	
		17.3	Mk	3				0	0					
		17.3	Mk	2				0	0					
		17.3	Mp	3	x	x		70	100	c	w		2	C. l. 5 #
		17.4	Cb	4	x	x		5	10	c	n			
		17.4	Pb	3	x	x		200	350	2c	ne s		2	C. l. 2 #
		17.4	Pc	6										
		17.4	Mp	5		50		50	50				2	



Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Cle	Blw	Notes	
		18.4	Pc	3												
		18.4	Mf	2												
		18.4	Pc	2												
		18.4	Pm	5												
16	22	1830	18.45	Pb	2	x	x		50	100	c	n		4		
Date: 2-23-84																
3	11	700	7	Cb	1				0							A bait of bird seed, cracker
		7.03	Mp	2					0							crumbs, grape jelly, and peanut
		7.05	Pc	4					0							butter placed on a 8 by 15 cm
		7.08	Mp	6					0							paper 1m away from nest and
		7.11	Pb	1					0							usual foraging trails.
		7.13	Cb	5				2	2	2				3.5		
		7.16	Pc	1					0							closed
		7.19	Mk	1					0							closed
		7.21	Mp	1					0							
		7.24	Mf	3					0							closed
		7.26	Sm	2					0							
		7.29	Mk	3					0							s=birdseed
		7.32	Mk	2					0							c=crackers
		7.34	Mp	3					0							j=jelly
		7.37	Cb	4					0					3		p=peanut butter
		7.4	Pb	3					0					3		o=none of the above
		7.42	Pc	6					0							a=all of the above
		7.45	Mp	5					0							
		7.48	Mk	4					0							
		7.5	Sm	1					0							
		7.53	Cb	2					0							
		7.56	Mp	4					0							
		7.58	Mf	1					0							
		7.61	Mf	4					0							
		7.64	Pb	5					0							
		7.66	Cb	3					0							
		7.69	Mf	5					0							
		7.71	Mk	5					0							
		7.74	Mf	6					0							
		7.77	Pb	4					0							
		7.79	Pc	3					0							
		7.82	Mf	2					0							
		7.85	Pc	2					0							
		7.87	Pm	5					0							
		7.9	Pb	2					0							
8	11	800	8.04	Cb	1	x	?		5	20	c	e		7		s C. l. 1 m
		8.08	Mp	2	x			x	20	45	c	w		4		a C. l. 1 m
		8.12	Pc	4	x	x	x		6	16				3.5		s

Ts	Td	Hour	Gs #	F	NW	P	C	#'	#"	c	d	Clw	Blw	Notes
		8.16	Ap 6	x	x			50	125	c	se		4	o C. l. 3 m
		8.2	Pb 1	x	x			11	15	c			10	C. l. 1 m
		8.24	Cb 5	x		x		25	75	2c	nw ne		2.5	o C. l. 8 m
		8.28	Pc 1											closed
		8.32	Mk 1					0						
		8.36	Ap 1	x	x			125	275	c	e		4	o Col. length 3 m
		8.4	Mf 3					0						
		8.44	Sm 2		30			10	30					pjs
		8.48	Mk 3					0						
		8.52	Mk 2					0						
		8.56	Ap 3					0						
		8.6	Cb 4	x	x	x		8	12				10	C. l. 2 m?
		8.64	Pb 3	x	x			3	5	c	n		2	
		8.68	Pc 6					0						
		8.72	Ap 5	x	x			80	180	c?	e		4	o C. l. .5 m
		8.76	Mk 4					0						
		8.8	Sm 1		30			5	30	2c	n s		3.5	C. l. .25 m
		8.84	Cb 2	x	x			10	20	c	sw		7	o
		8.88	Ap 4			5		5	5				2	o
		8.92	Mf 1					0						
		8.96	Mf 4					0						
		9	Pb 5					0						
		9.04	Cb 3											
		9.08	Mf 5					0						
		9.12	Mk 5					0						
		9.16	Mf 6					0						
		9.2	Pb 4	x	x			5	13	c	s		2	C. l. .5 m
		9.24	Pc 3					0						
		9.28	Mf 2					0						
		9.32	Pc 2											closed
		9.36	Pm 5					0						
		9.4	Pb 2		1			1						
26	14	930												
		9.5	Cb 1	x	x			5	10				7	o
		9.54	Ap 2	x	x			10	25	c	w			ps C. l. 1 m
		9.58	Pc 4		12			5	12		n		2	a
		9.62	Ap 6	x	x			35	50	c	se		4	o
		9.66	Pb 1			5		5	5				3	o
		9.71	Cb 5	x		x		12	30	2c	nw ne		5	pjs
		9.75	Pc 1	x		x		8	11		a		2	a
		9.79	Mk 1					0						
		9.83	Ap 1	x	x			75	78	c	e		4	C. l. 4 m
		9.87	Mf 3					0						
		9.91	Sm 2		100			20	100	c	s		5	pjs C. l. .5 m
		9.95	Mk 3				2	2	2				2	o
		9.99	Mk 2					15	35		a		2	o
		10.04	Ap 3					0	0					
		10.08	Cb 4	x	x			15	23	c	ne		7	a

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clw	Blw	Notes
		10.12	Pb	3		2			2	2				3	o
		10.16	Pc	6		2			0	2				2	o
		10.2	Ap	5		60			60	60				4	o
		10.24	Mk	4	x			x	2	4				2	o
		10.28	Sm	1	50				5	50	c	n		5	pjs C. l. .5 m
		10.32	Cb	2	x	x			4	9	c	s		7	o
		10.36	Ap	4					0	0				3	o
		10.41	Mf	1					0						
		10.45	Mf	4	x		x		15	20				10	s
		10.49	Pb	5			x?		2	2					o
		10.53	Cb	3		8			2	8	2c	nw se		10	o
		10.57	Mf	5					0	0					
		10.61	Mk	5	x	x	x		10	15				3.5	o
		10.65	Mf	6	x			x	8	9				4	o
		10.69	Pb	4					0	0					
		10.74	Pc	3		15			2	15		e		2	ps
		10.78	Mf	2					0						
		10.82	Pc	2	x	x			8	19		n		4	pjs
		10.86	Pm	5		4			1	4				3	o
		10.9	Pb	2		1			0	1					
33	19	1100													
		11.01	Cb	1	b	a			3	4				2	o
		11.03	Ap	2		3			1	3	c	w			p
		11.05	Pc	4	x	x			3	10	c	ne		2	pjs
		11.08	Ap	6			3		3	3				3	o
		11.11	Pb	1					0						
		11.13	Cb	5	x		x		14	30	2c	nw ne		7	pj C. l. 11 m
		11.16	Pc	1		12			6	12				3	spj
		11.19	Mk	1	x			x	8	12				5	o
		11.21	Ap	1		15			15	15	c	s		2	o
		11.24	Mf	3	x			x	3	4				3	o
		11.26	Sm	2		x	x		5	5				7	p(ate this only)
		11.29	Mk	3	x	x		x	3	5				2	o
		11.32	Mk	2	x	?		x	5	8				3	o
		11.34	Ap	3				3	3	3				3	o
		11.37	Cb	4	?	?	x		5	7				10	?
		11.4	Pb	3					0						
		11.42	Pc	6		4			1	4	c	e?		3	sp
		11.45	Ap	5			3		3	3					o
		11.48	Mk	4	x		x	x	15	24		n		2	o
		11.5	Sm	1					0	0				3	
		11.53	Cb	2			2		2	2				10	o
		11.56	Ap	4					0						
		11.58	Mf	1	x			x	10	17		a		5	c
		11.61	Mf	4	x			x	2	4				10	o
		11.64	Pb	5					0						
		11.66	Cb	3	x	x			2	8	2c	nw se		7	s
		11.69	Mf	5	x	x			15	40		n		10	cs

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clw	Blw	Notes
		11.71	Mk	5	x			x	5	8				7	
		11.74	Mf	6	x		x?	x?	10	16		a		5	?
		11.77	Pb	4					0						
		11.79	Pc	3	x	?			2	5	c	se		2	a
		11.82	Mf	2					0	0					
		11.85	Pc	2	x	x			2	6	c	n		5	a
		11.87	Pm	5				1	1	1				3	o
		11.9	Pb	2					0						
39	23	1200													
37	26	1345													
		13.75	Cb	1	?	x			2	2				2	o
		13.79	Mp	2					0						
		13.83	Pc	4	x	x			2	3				2	a
		13.87	Mp	6			20		20	20	c	se		4	o
		13.91	Pb	1					0						
		13.96	Cb	5		20			5	20	2c	ne nw		5	
		14	Pc	1		6			1	6		n*		3	a *to bait
		14.04	Mk	1	x			x	5	8				5	o
		14.08	Mp	1			75		75	75	c	se		4	o
		14.12	Mf	3	x			x	1	5				7	o
		14.16	Sm	2	?	?			3	3				7	o
		14.2	Mk	3				2	2	2				3	o
		14.24	Mk	2	x			x	5	8				2	o
		14.29	Mp	3					1						
		14.33	Cb	4	x	x			10	15				10	pj
		14.37	Pb	3					0						
		14.41	Pc	6		3			1	3		ez			j *to bait
		14.45	Mp	5				60	60	60				4	o
		14.49	Mk	4		1			0	1				3	o
		14.53	Sm	1					0					3	
		14.57	Cb	2	?				3	6				7	o
		14.61	Mp	4					0						
		14.66	Mf	1	x	x			20	30				7	o
		14.7	Mf	4	x	x			12	20				10	o
		14.74	Pb	5					0						
		14.78	Cb	3		14			3	14	2c	nw se		2	o
		14.82	Mf	5	x	?		x	25	45	2c	s ne		5	js
		14.86	Mk	5	x	x		?	3	6				3	s
		14.9	Mf	6	?			?	5	6				3	NOTE: Same observation as on 2-22-84 at 4:40AM.
		14.94	Pb	4					0						
		14.99	Pc	3	x	?			4	5				2	o
		15.03	Mf	2					0						
		15.07	Pc	2		22			3	22				7	c, Pulling in large piece
		15.11	Pm	5		1			1						
		15.15	Pb	2					0						
34	27	1515													
		15.25	Cb	1	x	x			3	5				5	o



Ts	Td	Hour	Gs #	F	NW	P	C	#'	#"	c	d	Cl#	Blw	Notes
		15.28	Ap 2	x	x			3	13	c	w		4	ps C. l. 1 m
		15.32	Pc 4			5		5	5				2	
		15.35	Ap 6	x	x			15	30	c	se		4	o C. l. 20 m
		15.39	Pb 1					0						
		15.42	Cb 5		30			10	30	2c	ne nw		5	
		15.45	Pc 1	x			x	1	5				3	p
		15.49	Ak 1	x			x	3	4				3	o
		15.52	Ap 1	x	x			30	70	c	ese		4	o C. l. 17 m
		15.55	Mf 3					0						
		15.59	Sm 2		30			10	30	c	sw		5	ps C. l. .25 m
		15.62	Ak 3					0					3	
		15.66	Ak 2		2			0	2				3	
		15.69	Ap 3				6	6	6					o
		15.72	Cb 4	x	x			6	10				10	o
		15.76	Pb 3		x	?		10	10				2	o
		15.79	Pc 6			1		1					2	o
		15.83	Ap 5			60		60	60	c	e		4	o
		15.86	Ak 4		1?			1						
		15.89	Sm 1		35			5	35	2c	n s		5	ps
		15.93	Cb 2	x	x			10	13	c	s		7	o
		15.96	Ap 4	x	x			20	45	c	ese		4	ps C. l. .5 m
		15.99	Mf 1	x	x			25	40		n&all			o
		16.03	Mf 4	x	x	x		8	10	3				o
		16.06	Pb 5		4?			4	4				3	o
		16.1	Cb 3		26			6	26	2c	nw se		3.5	
		16.13	Mf 5		4			3	4				7	s?
		16.16	Ak 5	x			x	2	4				3.5	
		16.2	Mf 6				25	25					3.5	o Note: same observation
		16.23	Pb 4			6		6	6				2	o as on 2-22-84 Wed. at 4:40PM.
		16.26	Pc 3			2		2	2				2	
		16.3	Mf 2					0						
		16.33	Pc 2			3		3	3				2	
		16.37	Pm 5					0						
		16.4	Pb 2					0						
28	27	1630												
		16.5	Cb 1	?x	x			5	7				5	o
		16.52	Ap 2	x	x			6	10	c	w			p C. l. 1 m
		16.54	Pc 4			1		1						
		16.56	Ap 6	x	x			30	45	c	se			C. l. 19 m
		16.58	Pb 1	x	x		x?	200	350	c	ne		2	o C. l. .5 m
		16.6	Cb 5		30			10	30	2c	ne nw		5	
		16.61	Pc 1			3		3	3				3	
		16.63	Ak 1					0						nest
		16.65	Ap 1	x	x			60	90	c	se		4	o C. l. 1 m?
		16.67	Mf 3					0						
		16.69	Sm 2		20			10	20	c	sw		5	
		16.71	Ak 3					0						
		16.73	Ak 2					0						

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	H"	c	d	Clw	Blw	Notes
		16.75	Ap	3	x	x		x?	40	70	c	w		2	a C. l. 3 m?
		16.77	Cb	4	x	x			5	10	?			10	a
		16.79	Pb	3	x	x			120	140	c	w		2	C. l. .25 m
		16.81	Pc	6											closed
		16.83	Ap	5		50			50	50					
		16.84	Mk	4					0						
		16.86	Sm	1	35				5	35	c	n		5	C. l. .5 m
		16.88	Cb	2	?x	x			10	12				2	
		16.9	Ap	4	x	x			15	30	c	e		2	jp C. l. .5 m
		16.92	Mf	1	x	x	x?		15	20				2	a
		16.94	Mf	4		2			2	2				2	
		16.96	Pb	5	x	x			150	275	c	s		2	C. l. 3.5 m
		16.98	Cb	3	65				10	65	2c	nw se			
		17	Mf	5					0						
		17.02	Mk	5					0						Less <u>C. bicolor</u> ants
		17.04	Mf	6		10			10	10				2	around <u>M. flaviceps</u> nest
		17.05	Pb	4	x	x			50	275	c	se		2	C. l. 7 m
		17.07	Pc	3		3			3	3				3	
		17.09	Mf	2					0						
		17.11	Pc	2		1			1						
		17.13	Pm	5					0						
		17.15	Pb	2	x	?			40	55	x	n		2	
20	25	1715	Sunset												
		17.25	Cb	1		12			12	12				3.5	
		17.27	Ap	2					1	3					returning
		17.28	Pc	4					1						closing
		17.3	Ap	6	x	x			40	60	c	se			C. l. 13 m; returning
		17.32	Pb	1	x	x			75	175	c	e		2	C. l. 2.5 m
		17.34	Cb	5	a	b			10	50				5	
		17.35	Pc	1		1			1						
		17.37	Mk	1					0						
		17.39	Ap	1	x	x			15	60	c	se		2	C. l. 10 m; foragers returning
		17.4	Mf	3					0						
		17.42	Sm	2	5?				3	5				5	
		17.44	Mk	3					0						
		17.45	Mk	2					0						
		17.47	Ap	3		70			70	70	c	nw		2	
		17.49	Cb	4	x	x			4	7				5	
		17.51	Pb	3	x	x			200	400	2c	nw se		2	C. l. 1.5 m
		17.52	Pc	6											closed
		17.54	Ap	5					0						
		17.56	Mk	4					0						
		17.57	Sm	1	15				5	15	c	n		5	p C. l. .25 m to bait
		17.59	Cb	2		8			8	8				2.5	
		17.61	Ap	4	b	a			10	14					
		17.63	Mf	1	x	x			15					2	
		17.64	Mf	4					0						
		17.66	Pb	5	x	x			100	175	c	s		2	C. l. 4.5 m

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		17.68	Cb	3		50			10	50				5	
		17.69	Nf	5					0						
		17.71	Mk	5					0						
		17.73	Nf	6		10			10	10			2		C. bicolor gone
		17.74	Pb	4	100				30	100	c	s	2		C. l. 9 m
		17.76	Pc	3					0						
		17.78	Nf	2					0						
		17.8	Pc	2					0						
		17.81	Pm	5					0						
		17.83	Pb	2	x	x		x?	50	200	c	n	2		C. l. 6 m
17	24	1750													

Date: 3-5-84, Willis Palms clear, windy, cool, sunrise 6:30 AM.

9 13 610

6.17	Cb	1													
6.19	Np	2							0						
6.21	Pc	4							0						
6.23	Np	6							0						
6.25	Pb	1							3	3					
6.27	Cb	5							0						closed
6.3	Pc	1							0						
6.32	Mk	1							0						
6.34	Mk	6													
6.36	Np	1							0						
6.38	Nf	3							0						
6.4	Sm	2							0						
6.42	Mk	3							0				3		
6.44	Mk	2							0						
6.46	Np	3							0						
6.48	Cb	4							0						
6.5	Pb	3							0						
6.52	Pc	6							0						
6.55	Np	5							0						
6.57	Mk	4							0						
6.59	Sm	1							0						
6.61	Cb	2							0						
6.63	Np	4							0						
6.65	Nf	1							0						
6.67	Nf	4							0						
6.69	Pb	5				7			7						
6.71	Cb	3	x?			x			3	31?					foragers from another colony?
6.73	Nf	5							0						
6.75	Mk	5							0				3		
6.77	Nf	6							0				3		
6.8	Pb	4							0						
6.82	Pc	3							0				0		
6.84	Nf	2							0						
6.86	Pc	2							0						

Ts	Td	Hour	Gs #	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		6.88	P# 5					0						closed
		6.9	Pb 2					0						
9	14	700												
		7	Cb 1					0	0					
		7.03	Mp 2					0	0					
		7.05	Pc 4					0	0				3	
		7.08	Mp 6					0	0					
		7.1	Pb 1				2	2	2				2	
		7.13	Cb 5	x			x	8	18				5	(5then7then2)with Blw
		7.15	Pc 1					0	0					
		7.18	Mk 1					0	0				3	
		7.21	Mk 6											
		7.23	Mp 1					0	0				3	
		7.26	Mf 3											Clm: Glass Climbing ability
		7.28	Sm 2					0	0					found by placing 10
		7.31	Mk 3					0	0				3	(or less) ants in a
		7.33	Mk 2					0	0				3	100ml beaker for 5(or
		7.36	Mp 3										3	less) minuets. Rating:
		7.39	Cb 4			4		4	4				6	
		7.41	Pb 3					0	0				3	.5 = off the bottom
		7.44	Pc 6											1 = about 1/2 way up
		7.46	Mp 5					0	0				3	2 = up to the lip
		7.49	Mk 4					0	0				3	
		7.51	Sm 1					0	0				3	
		7.54	Cb 2					0	0				3	
		7.57	Mp 4					0	0				3	
		7.59	Mf 1					0	0					** = either only one ant
		7.62	Mf 4					0	0					tested for 1 or more
		7.64	Pb 5		11			11	11				2	minuets or more than one
		7.67	Cb 3	x		x		10	22				2.5	ant tested for less than
		7.69	Mf 5					0	0				3	5 minuets; most likely
		7.72	Mk 5					0	0				3	one ant for 5 minuets.
		7.75	Mf 6					0	0				3	
		7.77	Pb 4					0	0				3	
		7.8	Pc 3					0	0				3	
		7.82	Mf 2					0	0				3	
		7.85	Pc 2					0	0				3	
		7.87	P# 5					0	0					
		7.9	Pb 2					1	1				2	
11	14	800												
11		8	Cb 1	x	x			10	20			*5*	2	
11		8.04	Mp 2					0	0				3	
12		8.08	Pc 4					0	0				3	
12		8.12	Mp 6											
12		8.16	Pb 1	x	x			5	6			*2*	2	
13		8.2	Cb 5											
13		8.24	Pc 1					0	0					
14		8.28	Mk 1			2		2	2			*5*	3	

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clw	Blw	Notes
14		8.32	Mk	6											
14		8.36	Mp	1					0	5					3
15		8.4	Mf	3					0	0					3
15		8.44	Sm	2					0	0					3
16		8.48	Mk	3					0	0					3
16		8.52	Mk	2					0	0					3
17		8.56	Mp	3											
17		8.6	Cb	4	x		x		8	23					2
17		8.64	Pb	3					0	0					3
18		8.68	Pc	6	x		x?		6	6				?	3
18		8.72	Mp	5					0	0					3
19		8.76	Mk	4					0	0					3
19		8.8	Sm	1					5	25			*0*		
19		8.84	Cb	2					0	0					3
20		8.88	Mp	4					0	0					3
20		8.92	Mf	1					0	0					3
21		8.96	Mf	4					0	0					3
21		9	Pb	5			6		6	6					2
22		9.04	Cb	3		x	x		10	10					7
22		9.08	Mf	5					0	0					3
23		9.12	Mk	5	x			x	2	3					6
23		9.16	Mf	6					0	0					3
24		9.2	Pb	4					0	0					3
24		9.24	Pc	3	x	x			4	6			*0*		6
25		9.28	Mf	2					0	0					3
25		9.32	Pc	2											
26		9.36	Pm	5					0	0					3
26		9.4	Pb	2					0	0					3
27	18	930													
27		9.5	Cb	1	x	x			10	15					4.5
27		9.54	Mp	2					0	0					3
28		9.58	Pc	4			1		1	1					
28		9.62	Mp	6											
28		9.66	Pb	1					1	1					3
29		9.7	Cb	5	x		x		3	7					5
29		9.74	Pc	1		4			3	4					5
29		9.78	Mk	1	x			x	5	5					9
30		9.82	Mk	6											
30		9.86	Mp	1	x	x	x		4	6			*4*		
30		9.9	Mf	3					0	0					3
30		9.94	Sm	2											
31		9.98	Mk	3											
31		10.0	Mk	2	x			x	2	2					
31		10.0	Mp	3					0	0					3
31		10.1	Cb	4		x	x		8	16					7
32		10.1	Pb	3					0	0					
32		10.1	Pc	6		1			1	1					
32		10.2	Mp	5					0	0					3

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clw	Blw	Notes
32		10.2	Mk	4					0	0				3	
33		10.3	Sm	1					4	10					
33		10.3	Cb	2					0	0				3	
33		10.3	Mp	4					0	0				3	
33		10.4	Mf	1					0	0				3	
34		10.4	Mf	4					0	0				3	
34		10.5	Pb	5					0	0				3	
34		10.5	Cb	3	16				4	16					
35		10.5	Mf	5	1				0	1				6	
35		10.6	Mk	5	x	x		x	15	17					
35		10.6	Mf	6	x		x	x	5	8					
35		10.7	Pb	4											
36		10.7	Pc	3					2	4				3	
36		10.7	Mf	2											
36		10.8	Pc	2	1				0	1					
37		10.8	Pm	5					0	0				3	
37		10.9	Pb	2					0	0				3	
37	23 1100														
37		11	Cb	1	6				4	6			*3*	3	
37		11.0	Mp	2											
37		11.0	Pc	4											
37		11.1	Mp	6											
37		11.1	Pb	1					0	0				3	
37		11.2	Cb	5					0	0				3	
37		11.2	Pc	1	2				1	2			*0*	3.5	
37		11.2	Mk	1											
37		11.3	Mk	6											
37		11.3	Mp	1		x	x		1	4			*1*	2	
37		11.4	Mf	3				1	1	1				3	
38		11.4	Sm	2					0	0				3	
38		11.4	Mk	3					0	0				3	
38		11.5	Mk	2				10	10	10			*2*	7	convening in entrance
38		11.5	Mp	3					0	0				3	
38		11.6	Cb	4	x	x			8	12				2	
38		11.6	Pb	3					0	0				3	
38		11.6	Pc	6					0	0				3	
38		11.7	Mp	5					0	0				3	
38		11.7	Mk	4					0	0			*2*	3	
38		11.8	Sm	1	2				2	2				3	
38		11.8	Cb	2	3?				3?	3?					
38		11.8	Mp	4					0	0				3	
38		11.9	Mf	1				x	?	?			*5*	9	convening in entrance
39		11.9	Mf	4				2	2	2			*2*	9	
39		12	Pb	5					0	0				3	
39		12.0	Cb	3	6				3	6				6	
39		12.0	Mf	5	x		x		4	4			*3*	9	
39		12.1	Mk	5	x			x	5	8			*1*	5	
39		12.1	Mf	6	x		x		2	3			*2*		



Ts	Td	Hour	Gs #	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		13.71	Pb	1										
		13.72	Cb	5				0	0				3	
		13.73	Pc	1										
		13.74	Mk	1	x		x	2	4				6	
		13.75	Mk	6										
		13.75	Mp	1		80		80	80				2	(moved 2 m north)
		13.76	Mf	3	1			0	1				6	
		13.77	Sm	2				0	0					
		13.78	Mk	3				0	0				3	
		13.79	Mk	2				0	0				3	
		13.8	Mp	3										
		13.81	Cb	4										
		13.82	Pb	3				0	0				3	
		13.83	Pc	6		1		1	1				3	
		13.84	Mp	5				0	0				3	
		13.85	Mk	4				0	0				3	
		13.86	Sm	1										
		13.87	Cb	2										
		13.88	Mp	4				0	0				3	
		13.89	Mf	1			1	1	1				6	
		13.9	Mf	4				4	7				9	
		13.91	Pb	5				2	2				2	
		13.92	Cb	3										
		13.92	Mf	5				3	6				9	
		13.93	Mk	5		3		3	3					
		13.94	Mf	6	x	x		9	12				7	
		13.95	Pb	4				0	0				3	
		13.96	Pc	3										
		13.97	Mf	2										
		13.98	Pc	2				0	0				3	
		13.99	Pm	5		1		1	1					
		14	Pb	2										
36	30	1400												
36		14.05	Mf	4								57		Clm: 10 ants for 5 min.
35		14.1	Mf	5								48		
34		14.15	Mf	6								46		
34		14.2	Mk	5								37		
33		1425												
32		14.3	Mp	1								25		
32		14.35	Mf	3								62		Clm: only 5 ants tested
31		14.4	Mk	1								50		so 31x2 = 62
21	29	1615												
		16.25	Cb	1	x	x		3	5				5	
		16.28	Mp	2										
		16.31	Pc	4				0	0				3	
		16.34	Mp	6										
		16.37	Pb	1				5	5				2	



Ts	Td	Hour	Gs #	F	NW	P	C	H'	H"	c	d	Clm	Blw	Notes
		16.4	Cb 5	x	x	x		10	25				5	
		16.44	Pc 1					0	0				3	
		16.47	Mk 1				2	2	2				5	
		16.5	Mk 6											
		16.53	Mp 1	x	x			80	150	c	sw		3	C. l. 1 m
		16.56	Mf 3					0	0				3	
		16.59	Sm 2					0	0					
		16.62	Mk 3					0	0					
		16.65	Mk 2					0	0					
		16.68	Mp 3	x	x			150	275	c	ne			
		16.71	Cb 4	x	x			20	30				7	
		16.74	Pb 3			x		18	18				2	
		16.77	Pc 6											
		16.81	Mp 5					0	0				3	
		16.84	Mk 4					0	0					
		16.87	Sm 1	x	x			4	10				3	
		16.9	Cb 2					0	0					
		16.93	Mp 4					0	0					
		16.96	Mf 1			25		25	25				2	
		16.99	Mf 4				2	2	2				3	
		17.02	Pb 5		x	x		60	60					
		17.05	Cb 3	x	x	x		12	25				3	
		17.08	Mf 5				2	(2)	(2)					
		17.11	Mk 5					0	0					
		17.14	Mf 6				2	(3)	(3)					
		17.18	Pb 4					0	0					
		17.21	Pc 3					0	0				3	
		17.24	Mf 2											
		17.27	Pc 2					0	0				3	
		17.3	Pm 5											
		17.33	Pb 2	x		x		45	45				2	

20 27 1720

Date: 3-6-84 Teus. Clear, no wind, SE slope  
5 8 700 7

Hour	Gs #	F	NW	P	C	H'	H"	Blw
7.083	Cb 1					0	***	
7.1	Mp 2							
7.12	Pc 4					0		
7.13	Mp 6							
7.15	Pb 1					0		
7.17	Cb 5					0		
7.18	Pc 1					0	***	
7.2	Mk 1					0		
7.22	Mp 1					0		
7.23	Mf 3					0		
7.25	Sm 2					0		
7.27	Mk 3					0		

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		7.28	Mk	2					0						
		7.3	Mp	3					0						
		7.32	Cb	4					0						
		7.33	Pb	3					0						
		7.35	Pc	6											
		7.37	Mp	5					0						
		7.38	Mk	4					0						
		7.4	Sm	1					1						
		7.42	Cb	2					0						
		7.43	Mp	4					0						
		7.45	Mf	1					0						
		7.47	Mf	4					0						
		7.48	Pb	5					0						
		7.5	Cb	3					0						
		7.52	Mf	5					0						
		7.53	Mk	5					0						
		7.55	Mf	6					0						
		7.57	Pb	4											
		7.58	Pc	3					0						
		7.6	Mf	2					0						
		7.62	Pc	2					0						
		7.63	Pm	5					0	***					
		7.65	Pb	2					0						
14	10	745	7.75												
		7.76	Cb	1					1	1					
		7.77	Mp	2											
		7.78	Pc	4					0	0					
		7.8	Mp	6											
		7.81	Pb	1	??	3?			10	10					
		7.82	Cb	5	20?	8?			14	28					
		7.83	Pc	1					0	0					
		7.84	Mk	1					0	0					
		7.85	Mp	1					0	0					
		7.86	Mf	3					0	0					
		7.88	Sm	2					0	0					
		7.89	Mk	3					0	0					
		7.9	Mk	2					0	0					
		7.91	Mp	3					0	0					
		7.92	Cb	4					12	16					
		7.93	Pb	3					0	0					
		7.94	Pc	6											
		7.96	Mp	5					0	0					
		7.97	Mk	4					0	0					
		7.98	Sm	1					0	0					
		7.99	Cb	2					0	0					
		8	Mp	4					0	0					
		8.01	Mf	1					0	0					
		8.02	Mf	4					0	0					







Ts	Td	Hour	Gs	#	F	NW	P	C	H'	H"	c	d	Clm	Blw	Notes
		14.5	Pc	1					0	0					
		14.5	Mk	1					1	1					
		14.6	Mp	1			5		5	5					
		14.6	Mf	3					0	0					
		14.6	Sm	2											
		14.6	Mk	3					0	0					
		14.6	Mk	2					0	0					
		14.6	Mp	3											
		14.6	Cb	4											
		14.6	Pb	3					0	0					
		14.6	Pc	6											
		14.7	Mp	5											
		14.7	Mk	4											
		14.7	Sm	1					0	0					
		14.7	Cb	2											
		14.7	Mp	4					0	0					
		14.7	Mf	1			12		10	12					
		14.7	Mf	4					1	1					
		14.7	Pb	5					0	0					
		14.8	Cb	3					5	5					
		14.8	Mf	5					4	4					
		14.8	Mk	5					0	0					
		14.8	Mf	6											
		14.8	Pb	4					0	0					
		14.8	Pc	3					0	0					
		14.8	Mf	2					0	0					
		14.8	Pc	2											
		14.8	Pw	5			2		2	2					
		14.9	Pb	2											
35	30	1500		15											
		15.0	Cb	1			5		3	5					
		15.0	Mp	2											
		15.0	Pc	4					0	0					
		15.0	Mp	6											
		15.1	Pb	1					0	0					
		15.1	Pc	1			2		1	2					
		15.1	Mk	1			1		1	1					
		15.1	Mp	1			60?	30?	*8*	60	90				
		15.1	Mf	3					0	0					
		15.2	Mk	3					0	0					
		15.2	Mk	2			1		1	1					
		15.2	Mp	3					0	0					
		15.2	Cb	4			3?	2?	3	5					
		15.2	Pb	3					0	0					
		15.3	Pc	6											
		15.3	Mp	5					0	0					
		15.3	Mk	4			2		2	2					
		15.3	Sm	1			1		1	1					

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		15.3	Cb	2					0	0					
		15.3	Ap	4					0	0					
		15.4	Mf	1		12			12	12					
		15.4	Mf	4	7?	3?			6	10					
		15.4	Pb	5											
		15.4	Cb	3	7?	3?			3	10					
		15.4	Mf	5			2		2	2					
		15.5	Mk	5			2		2	2					
		15.5	Mf	6			7		7	7					
		15.5	Pb	4					0	0					
		15.5	Pc	3					0	0					
		15.5	Mf	2											
		15.6	Pc	2					0	0					
		15.6	Pm	5											
		15.6	Pb	2					0	0					
32	29	1545	15.7												
		15.7	Cb	1	10?	5?			4	15					
		15.7	Ap	2					0	0					
		15.8	Pc	4					0	0					
		15.8	Pb	1					0	0					
		15.8	Cb	5	9?	4?			5	13					
		15.8	Ap	1	50?	30?			25	80					
		15.8	Mf	3					0	0					
		15.9	Sm	2					1	1					
		15.9	Mk	3					0	0					
		15.9	Mk	2					0	0					
		15.9	Pb	3					0	0					
		15.9	Ap	5					0	0					
		15.9	Ap	4					0	0					
		16.0	Mf	1		13			12	13					
		16.0	Mf	4		10			10	10					
		16.0	Pb	5					0	0					
		16.0	Cb	3	17?	5?			10	22					
		16.0	Mf	5					2	2					
		16.1	Mk	5	3?	1?			3	4					
		16.1	Mf	6		3			3	3					
		16.1	Pb	4					0	0					
		16.1	Pc	3					0	0					
		16.1	Mf	2					0	0					
		16.2	Pc	2		2			2	2					
		16.2	Pm	5					2	2					
		16.2	Pb	2					0	0					
28	29	1620	16.3												
		16.3	Cb	1	8?	3?			8	11					
		16.3	Ap	2					0	0					
		16.3	Pc	4					0	0					
		16.4	Pb	1		5			5	5					
		16.4	Cb	5	22				22	22					

Ts	Td	Hour	Gs	#	F	NW	P	C	H'	H"	c	d	Clm	Blw	Notes
		16.4	Mk	1					0	0					
		16.4	Mp	1					60	110					
		16.4	Sm	2					2	2					
		16.5	Mk	3					0	0					
		16.5	Mk	2					0	0					
		16.5	Mp	3					0	0					
		16.5	Cb	4			8		8	8					
		16.5	Pb	3			30		30	30					
		16.5	Pc	6					0	0					
		16.6	Mp	5					0	0					
		16.6	Sm	1					5	5					
		16.6	Cb	2					0	0					
		16.6	Mp	4					0	0					
		16.6	Mf	1	15?	5?			17	20					
		16.7	Mf	4					0	0					
		16.7	Pb	5			25		25	25					
		16.7	Cb	3	6?	3?			6	9					
		16.7	Mf	5					0	0					
		16.7	Mk	5	2?	1?			2	3					
		16.7	Mf	6					±3*	0	0				
		16.8	Pb	4	70?	40?			60	110					
		16.8	Pc	3					0	0					
		16.8	Mf	2					0	0					
		16.8	Pc	2					0	0					
		16.8	Pm	5			2		2	2					
		16.9	Pb	2					0	0					
23	28	1700		17											
		17.0	Cb	1	3?	2?			4	5					
		17.0	Mp	2			1		1	1					
		17.1	Pc	4					0	0					
		17.1	Pb	1	150?	50?			100	200					
		17.1	Pc	1					0	0					
		17.2	Mk	1					0	0					
		17.2	Mp	1			120		100	120					
		17.3	Mf	3					0	0					
		17.3	Mk	3					0	0					
		17.3	Mk	2					0	0					
		17.4	Mp	3					0	0					
		17.4	Cb	4	5?	3?			6	8					
		17.4	Pb	3					100	210					
***		17.5	Pc	6					0	0					***Sunset 5:30 P.M.
		17.5	Mp	5					0	0					
		17.6	Sm	1					0	0					
		17.6	Mf	4					0	0					
		17.6	Cb	3	15?	9?			4	24					
		17.7	Mf	5					0	0					
		17.7	Mk	5			1		1	1					
		17.7	Mf	6					±3*	0	0				*** = ants just inside ent.



Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Cl <sub>w</sub>	Bl <sub>w</sub>	Notes
		17.8	Pb	4		240			240	240					
		17.8	P <sub>w</sub>	5					0	0					
		17.9	Pb	2		6			6	6					
17	25	1800		18											
		18.0	Cb	1					0	0					
		18.0	Mp	2					0	0					
		18.0	Pc	4					0	0					
		18.0	Pb	1	100				50	100					
		18.0	Cb	5	10?	6?			8	16					
		18.0	Pc	1					0	0					
		18.1	Mk	1					0	0					
		18.1	Mp	1		70			70	70					
		18.1	Mf	3					0	0					
		18.1	Sm	2					0	0					
		18.1	Mk	3					0	0					
		18.1	Mk	2					0	0					
		18.1	Mp	3					0	0					
		18.2	Cb	4		3			3	3					
		18.2	Pb	3	200				100	200					
		18.2	Pc	6					0	0					
		18.2	Mp	5					0	0					
		18.2	Mk	4					0	0					
		18.2	Sm	1					0	0					
		18.2	Cb	2					0	0					
		18.3	Mf	1		20			20	20					
		18.3	Mf	4					0	0					
		18.3	Cb	3	7				5	7					
		18.3	Mf	5					0	0					
		18.3	Mk	5		5			5	5					
		18.3	Mf	6					0	0					
		18.3	Pb	4	60?	40?			50	100					
		18.4	Pb	2	200				150	200					
14	24	1830		18.5											
		18.5	Cb	1					2	2					
		18.5	Mp	2					0	0					
		18.6	Mp	1		50			50	50					
		18.6	Mf	3					0	0					
		18.7	Sm	1					0	0					
		18.7	Pb	5		70			70	70					
		18.8	Mf	5					0	0					
		18.8	Mk	5					2	2					
		18.9	Pb	2		150			150	150					
14	22	1900		19											
		19.0	Cb	1		2			2	2			3		
		19.1	Mp	2					0	0					
		19.1	Pc	4					0	0					
		19.1	Cb	5	7?		2?		9	9					
		19.2	Pc	1					0	0					

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clw	Blw	Notes
		19.2	Mk	1					0	0					
		19.3	Mp	1					0	0					
		19.3	Mf	3					0	0					
		19.4	Sm	2					0	0					
		19.4	Mk	3					0	0					
		19.5	Mk	2					0	0					
		19.5	Pb	3	100?	50?			100	150					
		19.6	Mk	4					0	0					
		19.6	Sm	1					1	1					
		19.7	Mf	1					0	0					
		19.7	Mf	4					0	0					
		19.8	Pb	5			100		100	100					
		19.8	Cb	3					0	0					
		19.9	Mk	5					2	2					
		19.9	Pw	5					0	0					
		20	Pb	2	50?	20?			70	70					

Date 3-7-84 Wed.

8 11 700 7

Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clw	Blw	Notes
7.01	Cb	1					0	0					
7.03	Mp	2					0	0					
7.04	Pc	4					0	0					
7.06	Pb	1					0	0					
7.07	Cb	5					0	0					
7.08	Pc	1					0	0					
7.1	Mk	1					0	0					
7.11	Mp	1					0	0					
7.12	Mf	3					0	0				3	
7.14	Sm	2					0	0					
7.15	Mk	3					0	0				3	
7.17	Mk	2					0	0					
7.18	Pb	3					0	0					
7.19	Pc	6					0	0					
7.21	Mp	5					0	0					
7.22	Mk	4					0	0					
7.23	Sm	1					0	0					
7.25	Cb	2					0	0					
7.26	Mp	4					0	0					
7.28	Mf	1					0	0					
7.29	Pb	5					2	2				2	
7.3	Cb	3	12				12	12				?	
7.32	Mf	5					0	0					3
7.33	Mk	5					0	0					3
7.34	Mf	6					0	0					
7.36	Pc	3					0	0					
7.37	Mf	2					0	0					3
7.39	Pc	2					0	0					

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		7.4	Pm	5					0	0					
10	11	730	7.5												
		7.51	Cb	1			2 (?)	1?	3	3				3	
		7.53	Mp	2					0	0					
		7.54	Pc	4					0	0					
		7.56	Pb	1	7?	4?			10	11				?	
		7.57	Cb	5		8			4	8				2	
		7.59	Pc	1					0	0					
		7.6	Mk	1					0	0					
		7.61	Mp	1					0	0					
		7.63	Mf	3					0	0					
		7.64	Sm	2					0	0					
		7.66	Mk	3					0	0					
		7.67	Pb	3					0	0					
		7.69	Mp	5					0	0					
		7.7	Mk	4					0	0					
		7.71	Sm	1					0	0					
		7.73	Cb	2					0	0					
		7.74	Mp	4					0	0					
		7.76	Mf	1					0	0					
		7.77	Mf	4					0	0					
		7.79	Pb	5					0	0					
		7.8	Cb	3		17			9	17					
		7.81	Mf	5					0	0					
		7.83	Mk	5					0	0					
		7.84	Mf	6					0	0					
		7.86	Pc	3					0	0					
		7.87	Mf	2					0	0					
		7.89	Pc	2					0	0					
		7.9	Pb	2					0	0					
18	13	800	8												
		8.03	Cb	1	9?	4?			7	14					
		8.06	Pc	4					0	0					
		8.1	Cb	5	15?	8?			8	23					
		8.13	Pc	1					0	0					
		8.16	Mk	1					0	0				3	
		8.19	Mp	1			20		20	20					
		8.23	Mf	3					0	0					
		8.26	Sm	2					0	0					
		8.29	Mk	3					0	0				3	
		8.32	Mk	2					0	0				3	
		8.35	Cb	4											
		8.39	Pb	3					0	0					
		8.42	Mp	5					0	0					
		8.45	Mk	4					0	0					
		8.48	Sm	1		20			0	20					
		8.51	Cb	2					0	0					
		8.55	Mp	4					0	0					

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clw	Blw	Notes
		8.58	Mf	1			4		4	4					3
		8.61	Mf	4					0	0					3
		8.64	Pb	5			5		5	5					
		8.68	Cb	3	19?	10?			25	29					
		8.71	Mf	5					0	0					
		8.74	Mk	5			*4*		0	0					
		8.77	Mf	6					0	0					7
		8.8	Pb	4			2		2	2					3
		8.84	Pc	3			2		2	2					?
		8.87	Mf	2					0	0					
		8.9	Pc	2					0	0					
23	15	900		9											
		9.03	Cb	1	3?	1?			3	4					
		9.06	Pm	5					0	0					
		9.1	Cb	5	9?	5?			10	14					
		*** 9.13	Pc	1		2			2	2					*** Conflict with <u>C. bicolor</u>
		9.16	Mk	1					1	1					
		9.19	Mp	1	60?	30?			60	90					
		9.23	Mf	3					0	0					
		9.26	Sm	2		4			4	4					
		9.29	Mk	3					0	0					
		9.32	Mk	2					0	0					
		9.35	Cb	3	5?	3?			5	8					
		9.39	Pb	1			3		3	3					
		9.42	Mp	5					0	0					
		9.45	Mk	4					0	0					
		9.48	Sm	1		12			8	12					
		9.51	Cb	2					0	0					
		9.55	Mp	4					0	0					
		9.58	Mf	1	6?	4?			8	10					
		9.61	Mf	4					0	0					
		9.64	Pb	5			3		3	3					
		9.68	Cb	4	7?	5?			8	12					
		9.71	Mf	5					2	2					
		*** 9.74	Mk	5	4?	2?			3	6					*** Conflict with <u>C. bicolor</u>
		9.77	Mf	6	4?	2?			5	6					
		9.8	Pb	3					0	0					
		9.84	Pc	4					0	0					
		9.87	Mf	2					0	0					
		9.9	Pc	2					0	0					
30	19	1000		10											
		10.0	Cb	1	5?	3?			5	8					2
		10.0	Pc	4					0	0					
		10.1	Pb	1			6		3	6					2
		10.1	Pc	1					1	1					
		10.1	Mk	1	x	x			0	0					3
		10.2	Mp	1			20		20	20					3
		10.2	Mf	3					0	0					3

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		10.2	Sm	2					0	0					
		10.3	Mk	3					0	0					
		10.3	Mk	2				*1*	0	0				2	
		10.3	Pb	3					0	0					
		10.4	Mp	5					0	0					
		10.4	Mk	4					0	0					
		10.4	Sm	1					2	2					
		10.5	Cb	2					0	0					
		10.5	Mp	4					0	0					
		10.5	Mf	1	4?	2?			3	6				2	
		10.6	Mf	4					0	0					
		10.6	Pb	5			2		2	2				2	
		10.6	Cb	3					2	5					
***		10.7	Mf	5					0	0					
		10.7	Mk	5		1			1	1					*** Conflict with <u>C. bicolor</u>
		10.8	Mf	6	10?		7?		15	17					
		10.8	Pb	4					0	0					
		10.8	Pm	5					0	0					
		10.9	Pb	2					0	0					
33	21	1100		11											
		11.0	Cb	1			5		5	5				2	
		11.0	Pc	4					0	0					
		11.1	Pb	1					0	0					
		11.1	Cb	5	4?	2?			3	6				5	
		11.2	Pc	1			3		2	3				3	
		11.2	Mk	1				*5*	0	0				7	
		11.3	Mp	1			10		10	10				2	
		11.3	Mf	3					0	0					
		11.4	Sm	2					0	0					
		11.4	Mk	3					0	0					
		11.5	Mk	2				*2*	0	0					
		11.5	Pb	3					0	0					
		11.5	Mp	5					0	0					
		11.6	Mk	4					0	0					
		11.6	Sm	1					0	0					
		11.7	Cb	2					0	0					
		11.7	Mp	4					0	0					
		11.8	Mf	1		5			3	5				3	
		11.8	Pb	5			2		2	2				2	
		11.9	Cb	3	3?	2?			2	5					
		11.9	Mk	5			*5*		0	0				6	
		12	Pb	2					0	0					
Date: 3-10-84 Partly cloudy, windy just before dawn															
		1330	13.5	Cb	1				0	0					
			13.5	Mk	1	4?	2?		*8*	3	3				
			13.6	Mp	1				0	0					
			13.6	Mf	3				0	0					

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		13.69	Sm	2					0	0					
		13.74	Mk	3					0	0					
		13.79	Mk	2	2			≈5x ?		2					
		13.83	Cb	4	2				1	2					
		13.88	Pb	3					0	0					
		13.93	Mk	4	2				0	2					
		13.98	Cb	2					0	0					
		14.02	Mp	4					0	0					
		14.07	Mf	1	4				2	4					
		14.12	Mf	4	4				2	4					
		14.17	Pb	5					0	0					
		14.21	Cb	3					0	0					
		14.26	Mf	5	4?	3?		≈5x ?		7					
		14.31	Mk	5	3?	1?			3	4					
		14.36	Mf	6	3?	1?			3	4					
		14.4	Pc	3					0	0					
		14.45	Pc	2					0	0					
		14.5	Pm	5xxx											

xxxPm 5 excavated to about  
2.4 m; tunnel continued on  
at a slight angle to the SE.

Date: 3-12-84 Mon. Sunrise about 6:10 AM, slight breeze at 6:30 AM.  
clouds to the east before dawn.

18.5 18 700

		7.083	Cb	1					16	27					
		7.12	Cb	5					?	?					
		7.16	Mk	1					0	0					
		7.2	Mf	3	2xx			3	3	5					Mf 3 nest disturbed
		7.23	Mk	3xxx					0	0					xxx Nest disturbed
		7.27	Mk	2	2				0	2					
		7.31	Cb	4	5?	4?			7	9					
		7.35	Mk	4					0	0					
		7.39	Cb	2					9	11					
		7.42	Mf	1					0	0					
		7.46	Mf	4					0	0					
		7.5	Cb	3xxx					10	15					xxx Nest disturbed
		7.54	Mf	5xxx			2		1	2					xxx Nest disturbed
		7.57	Mk	5	6			4?	3	10					
		7.61	Mf	6					0	0					
		7.65	Mf	2					0	0					
23	18.5	745	7.75												
		7.79	Cb	1	20?	2?	3?		9	25					
		7.88	Mk	1	20?		8?		6	28					
		7.89	Cb	5					0	0					
		8.04	Mf	3					0	0					
		8.11	Mk	3					0	0					
		8.18	Mk	2	1				1	1					
		8.25	Cb	4	2	4	4?		8	10					
		8.32	Mk	4					0	0					

Ts	Td	Hour	Gs	#	F	NW	P	C	#'	#"	c	d	Clm	Blw	Notes
		8.39	Nf	1					0	0					
		8.46	Cb	3	75?	3?	2?		20	80	c				Column 1. 25 m
		8.54	Nf	5					0	0					
		8.61	Nk	5		2	2	8?	10	12					
		8.68	Nf	6	2		6 (?)		6	8					
		8.75	Nf	2					0	0					

Is Td Hour Hour Gs # For Nstwk Pat Con Sm 0 Lg 0 c l Blw Clm Notes

Date: 3-13-84 Teus. Windy, clear; previous day cloudy, evening very windy

21 18.5 730

7.55	Cb	1	10				4	10						
7.59	Cb	5-	19	1	5		6	25	c					
7.64	Mk	1					0	0						
7.68	Mk	6					0	0						
7.73	Mf	3**					0	0						
7.77	Sm	2					0	0						
7.82	Mk	3**					0	0					**Nests disturbed by	
7.86	Mk	7					0	0					animal or lizzard digging	
7.91	Mk	2-	1				0	1						
7.95	Cb	4	13	3	3*		16	19					*Defense	
8	Mk	4					0	0						
8.04	Sm	1	35				1	35						
8.09	Cb	2	9	1			6	10						
8.13	Mf	1					0	0						
8.18	Mf	4**					0	0					(Spider)	
8.22	Cb	3-	25	1			12	26	c					
8.27	Mf	5**					0	0						
8.31	Mk	5	2	1		5	6	8						
8.36	Mf	6-	2			4	4	6						
8.4	Mf	2**				0?	0						(Spider)	

28 20 830

8.5														
8.55	Cb	1	6				3	6						
8.59	Cb	5-	21				5	21						
8.62	Mk	1					0	0						
8.66	Mk	6					0	0						
8.69	Mf	3					0	0						
8.72	Sm	2					0	0						
8.74	Mk	3					0	0						
8.77	Mk	7					0	0						
8.79	Mk	2	1			1	1	2						
8.81	Cb	4	13	3	(3)		16	19					(3) Defense	
8.83	Mk	4					0	0						
8.85	Sm	1					0	0						
8.87	Cb	2					0	0						
8.88	Mf	1					0	0						
8.9	Mf	4					0	0						
8.91	Cb	3	11	2			5	13						
8.93	Mf	5					0	0						
8.94	Mk	5	3	6			6	9						
8.95	Mf	6	10			4	7	14						
9.4	Mf	2					0	0						

32 22 930

9.5														
9.55	Cb	1	3		2		3	5						
9.59	Cb	5-	5		2	2	4	8						
9.64	Mk	1	1	2	3	3	8	9						
9.68	Mk	6					0	0						



Ts	Td	Hour	Hour	Gs	#	For	Hstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Clm	Notes
				9.73	Mf	3					0		0					
				9.77	Sm	2					0		0					
				9.82	Mk	3					0		0					
				9.86	Mk	7					0		0					
				9.91	Mk	2			2		2		2					
				9.95	Cb	4	3		2		3		5					
				10	Mk	4					0		0					
				10.0	Sm	1					0		0					
				10.0	Cb	2					0		0					
				10.1	Mf	1	19		3	3	20		15					
				10.1	Mf	4			1		1		1					
				10.2	Cb	3	3				1		3					
				10.2	Mf	5	17				5		17					
				10.3	Mk	5	8	2			6		10					
				10.3	Mf	6	1			1	1		2					
				10.4	Mf	2					0		0					
37	25	1030		10.5														
				10.5	Cb	1	2				1		2					
				10.5	Cb	5	5				4		5					
				10.6	Mk	1	10				5		10					
				10.6	Mk	6	5	5			5		10					
				10.7	Mf	3	3				3		3					
				10.7	Sm	2					0		0					
				10.8	Mk	3					0		0					
				10.8	Mk	7	6				3		6					
				10.9	Mk	2	8				4		8					
				10.9	Cb	4			1		1		1					
				11	Mk	4	1				1		1					
				11.0	Sm	1					0		0					
				11.0	Cb	2					0		0					
				11.1	Mf	1	20				15		20					
				11.1	Mf	4					0		0					
				11.2	Cb	3	1				1		1					
				11.2	Mf	5	1				1		1					
				11.3	Mk	5	6				2		6					
				11.3	Mf	6	3			1	2		4					
				11.4	Mf	2					0		0					
42	27	1130		11.5														
				11.5	Cb	1					0		0					
				11.5	Cb	5	4				4		4					
				11.6	Mk	1	12	1		6*5*	10		19					
				11.6	Mk	6	3	3			4		6					
				11.7	Mf	3	4				2		4					
				11.7	Sm	2					0		0					
				11.8	Mk	3					0		0					
				11.8	Mk	7	4				3		4					
				11.9	Mk	2	5	2			5		7					
				11.9	Cb	4					0		0					

Ts	Td	Hour	Hour	Gs	#	For	Nstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Clm	Notes
				12	Mk	4		3			3		3					
				12.0	Sm	1					0		0					
				12.0	Cb	2			2		2		2					
				12.1	Mf	1	14				6		14					
				12.1	Mf	4					0		0					
				12.2	Cb	3					0		0					
				12.2	Mf	5					0		0					
				12.3	Mk	5	4	3			3		7					
				12.3	Mf	6	1				1		1					
				12.4	Mf	2					0		0					
43	29	1230		12.5														
				12.5	Cb	1					0		0					
				12.5	Cb	5-	8				3		8					
				12.6	Mk	1	14				8		14					
				12.6	Mk	6	4	6			6		10					
				12.7	Mf	3	5				3		5					
				12.7	Sm	2					0		0					
				12.8	Mk	3					0		0					
				12.8	Mk	7	2	1			1		3					
				12.9	Mk	2	4				1		4					
				12.9	Cb	4					0		0					
				13	Mk	4	3				2		3					
				13.0	Sm	1					0		0					
				13.0	Cb	2					0		0					
				13.1	Mf	1	6				3		6					
				13.1	Mf	4	7	1			3		8					
				13.2	Cb	3					0		0					
				13.2	Mf	5	3				1		3					
				13.3	Mk	5	3	6			6		9					
				13.3	Mf	6	2				2		2					
				13.4	Mf	2					0		0					
43	30	1330		13.5														
				13.5	Cb	1					0		0					
				13.5	Cb	5-	5				3		5					
				13.6	Mk	1	6				3		6					
				13.6	Mk	6	4	2			2		6					
				13.7	Mf	3	4				2		4					
				13.7	Sm	2					0		0					
				13.8	Mk	3					0		0					
				13.8	Mk	7	3				2		3					
				13.9	Mk	2	2				2		2					
				13.9	Cb	4					0		0					
				14	Mk	4	1				1		1					
				14.0	Sm	1					0		0					
				14.0	Cb	2					0		0					
				14.1	Mf	1	8				4		8					
				14.1	Mf	4	4				2		4					
				14.2	Cb	3					0		0					

Ts	Td	Hour	Hour	Gs	#	For	Nstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Clm	Notes
				14.2	Mf	5		3			2		3					
				14.3	Mk	5		5			2		5					
				14.3	Mf	6		0			0		0					
				14.4	Mf	2		3			1		3					
41	31	1430	14.5			(High clouds)												
			14.5	Cb	1						0		0					
			14.5	Cb	5	7		1 2**			5		10					**Defense
			14.6	Mk	1	5					3		5					
			14.6	Mk	6	10					3		10					
			14.7	Mf	3						0		0					
			14.7	Sm	2						0		0					
			14.8	Mk	3						0		0					
			14.8	Mk	7						0		0					
			14.9	Mk	2						0		0					
			14.9	Cb	4	3			2		3		5					
			15	Mk	4						0		0					
			15.0	Sm	1						0		0					
			15.0	Cb	2	8			6		8		14					
			15.1	Mf	1	1					1		1					
			15.1	Mf	4	1					1		2					
			15.2	Cb	3	3					1		3					
			15.2	Mf	5	1					1		1					
			15.3	Mk	5	2					1		2					
			15.3	Mf	6	3					3		3					
			15.4	Mf	2						0		0					
31	30	1530	15.5			(Cloudy)												
			15.5	Cb	1	6			3		3		9	c				
			15.5	Cb	5	50			10		10		60	c				
			15.6	Mk	1						0		0					
			15.6	Mk	6				*3*		0		0					
			15.7	Mf	3						0		0					
			15.7	Sm	2						0		0					
			15.8	Mk	3						0		0					
			15.8	Mk	7						0		0					
			15.9	Mk	2						0		0					
			15.9	Cb	4	10		2	8		5		20					
			16	Mk	4						0		0					
			16.0	Sm	1	14		3			5		17	c				
			16.0	Cb	2	24		3	7		16		34	c				
			16.1	Mf	1	3			2		3		5					
			16.1	Mf	4						0		0					
			16.2	Cb	3	7		1	2		6		10	c				
			16.2	Mf	5	1					1		1					
			16.3	Mk	5	6					6		6					
			16.3	Mf	6			2	*4*		2		2					
			16.4	Mf	2						0		0					
28	30	1630	16.5			Sunny below clouds												
			16.5	Cb	1	8					3		8					

Ts	Td	Hour	Hour	Ge	#	For	Nstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Clw	Notes
				16.5	Cb	5	62	?	8		20	70						
				16.6	Mk	1					0	0						
				16.6	Mk	6					0	0						
				16.7	Mf	3					0	0						
				16.7	Sm	2					0	0						
				16.8	Mk	3					0	0						
				16.8	Mk	7					0	0						
				16.8	Mk	2			1		0	0						
				16.9	Cb	4	2		6	4	10	12						
				16.9	Mk	4					0	0						
				17.0	Sm	1	20				20	20	c					
				17.0	Cb	2	23			7	15	30						
				17.1	Mf	1					0	0						
				17.1	Mf	4					0	0						
				17.1	Cb	3	15			5	10	20						
				17.2	Mf	5					0	0						
				17.2	Mk	5			10		10	10						
				17.3	Mk	8					0	0						
				17.3	Mf	6		?		*3*	1	1						
				17.4	Mf	2					*3*	0	0					*3* Inside nest entrance
24	28	1730		17.5				Cloudy;										Sunset about 5:30 AM.
				17.5	Cb	1	1				1	1						
				17.6	Cb	5	25			7	12	32	c					
				17.7	Mk	1					0	0						
				17.7	Mk	6			3		3	3						
				17.8	Mf	3					0	0						
				17.9	Sm	2					0	0						
				17.9	Mk	3					0	0						
				18.0	Mk	7					0	0						
				18.1	Mk	2					*2*	0	0					
				18.1	Cb	4	2		3		7	10	12					
				18.2	Mk	4					0	0						
				18.3	Sm	1	13		2		5	15	c					
				18.3	Cb	2	15			5	10	20	c					
				18.4	Mf	1					0	0						
				18.5	Mf	4					0	0						
				18.5	Cb	3	10			3	5	10	c					
				18.6	Mf	5					0	0						
				18.7	Mk	5			15		15	15						
				18.7	Mk	8			1		*3*	1	1					
				18.8	Mf	6			1		1	1						
				18.9	Mf	2					0	0						
23	27	1900		19				Partly cloudy,										windy
				19.1	Cb	1					0	0						
				19.2	Cb	5	7	?		7	8	15						
				19.3	Mk	1			6		6	6						
				19.4	Mk	6			6		6	6						
				19.5	Mf	3					0	0						

Ts	Td	Hour	Hour	Gs #	For	Nstwk	Pat	Con	Sm 0	Lg 0	c	l	Blw	Cl#	Notes
			19.6	Sm 2	1?				1	1					
			19.7	Mk 3					0	0					
			19.8	Mk 7					0	0					
			19.9	Mk 2		12			12	12					
			20.0	Cb 4	8				6	8					
			20.1	Mk 4					0	0					
			20.2	Sm 1	12				2	12	c				
			20.3	Cb 2	5				3	5					
			20.4	Mf 1	3	1			3	4					
			20.5	Mf 4					0	0					
			20.6	Cb 3	8				6	8					
			20.7	Mf 5					0	0					
			20.8	Mk 5		8			8	8					
			20.9	Mk 8		8			8	9					
			21.0	Mf 6				*1*	0	0					
			21.1	Mf 2					0	0					
20	25	2115	21.2												
			21.3	Cb 1					0	0					
			21.3	Cb 5			1		1	0					
			21.3	Mk 1		12			12	12					
			21.4	Mk 6		5			5	5					
			21.4	Mf 3					0	0					
			21.5	Sm 2					0	0					
			21.5	Mk 3					0	0					
			21.6	Mk 7					0	0					
			21.6	Mk 2		5			5	5					
			21.7	Cb 4	2	6	6		12	14					
			21.7	Mk 4					0	0					
			21.8	Sm 1					0	0					
			21.8	Cb 2					0	0					
			21.9	Mf 1					0	0					
			21.9	Mf 4					0	0					
			22.0	Cb 3					0	0					
			22.0	Mf 5					0	0					
			22.1	Mk 5				*3*	0	0					
			22.1	Mk 8		5			5	5					
			22.2	Mf 6					0	0					
			22.2	Mf 2					0	0					

Date: 3-14-84 Wed.

17 21 250

Full moon; a few scattered high clouds; gusty

2.89	Cb 1								0	0					
2.94	Cb 5								0	0					
3	Mk 1				3				3	3					
3.06	Mk 6				4				4	4					
3.11	Mf 3								0	0					
3.17	Sm 2								0	0					

Ts	Td	Hour	Hour	Gs	#	For	Nstwk	Pat	Con	Sm	0	Ld	0	c	l	Blw	Clm	Notes
			3.23	Mk	3						0		0					
			3.28	Mk	7						0		0					
			3.34	Mk	2			5			5		5					
			3.4	Cb	4			3			3		3					
			3.46	Mk	4						0		0					
			3.51	Sm	1						0		0					
			3.57	Cb	2						0		0					
			3.63	Mf	1						0		0					
			3.68	Mf	4						0		0					
			3.74	Cb	3			?	?		3		3					
			3.8	Mf	5						0		0					
			3.85	Mk	5			1			1		1					
			3.91	Mk	8			1			1		1					
			3.97	Mf	6						0		0					
			4.02	Mf	2						0		0					
16	20	530																
			5.5	Cb	1						0		0					
			5.52	Mp	2													
			5.54	Pb	2		5	26			25		31	c				
			5.56	Pc	4						0		0					
			5.59	Pb	1													
			5.61	Pc	1						0		0					
			5.63	Mp	6													
			5.65	Pm	3						0		0					
			5.67	Cb	5		2	27	3		15		32	c				
			5.69	Mk	1					1	1		1					
			5.71	Mk	6													
			5.74	Pm	2	?				2	2		2					
			5.76	Sm	2						0		0					
			5.78	Mp	1					80	80		80					
			5.8	Mf	3						0		0					
			5.82	Pm	4													
			5.84	Pm	1						0		0					
			5.86	Pc	7													
			5.89	Pc	5													
			5.91	Mk	3						0		0					
			5.93	Mk	7						0		0					
			5.95	Mk	2			5			5		5					
			5.97	Mp	3						0		0					
			5.99	Cb	4		9	8	1	2	10		20					
			6.01	Pb	3						0		0					
			6.04	Pc	6						0		0					
			6.06	Mp	5						0		0					
			6.08	Mf	1						0		0					
			6.1	Mk	4						*							*Nest disturbed
			6.12	Sm	1		10				4		10	c				
			6.14	Mp	4						0		0					
			6.16	Cb	2						0		0					

Is	Td	Hour	Hour	Gs	#	For	Hstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Clm	Notes
				6.19	Mf	4					0	0						
				6.21	Pb	5	35	2			17	37	c*	ne				#2 majors in column
				6.23	Cb	3	15		4		10	19	c					
				6.25	Mf	5					0	0						
				6.27	Mk	5		2			2	2						
				6.29	Mk	8					0	0						
				6.31	Mf	6					0	0						
				6.34	Pb	4												
				6.36	Pc	3					0	0						
				6.38	Mf	2					0	0						
				6.4	Pc	2												
17	20	630		6.5	Cb	1	8	3	1	3	10	15						
				6.53	Mp	2												
				6.55	Pc	4					0	0						
				6.58	Pc	1												
				6.61	Cb	5	30		4	1	13	35						
				6.64	Mk	1					0	0						
				6.66	Mk	6		3			3	3						
				6.69	Pm	2					0	0						
				6.72	Sm	2					0	0						
				6.75	Mp	1	116	5	4		75	125	c	n				
				6.77	Mf	3					0	0						
				6.8	Pm	1	5			3	7	8						
				6.83	Mk	3					0	0						
				6.85	Mk	7					0	0						
				6.88	Mk	2		4			4	4						
				6.91	Mp	3												
				6.94	Cb	4	4	2	4		6	10						
				6.96	Pb	3	5	61			60	66						
				6.99	Mf	1					0	0						
				7.02	Mk	4					0	0						
				7.05	Sm	1	15				5	15	c					
				7.07	Mp	4	17	3	2		10	22	c	e				
				7.1	Cb	2		17	5*		15	22						#Defense
				7.13	Mf	4					0	0						
				7.15	Pb	5	5				1	5	c					
				7.18	Cb	3	17				5	17						
				7.21	Mf	5					0	0						
				7.24	Mk	5					0	0						
				7.26	Mk	8					0	0						
				7.29	Mf	6	?	?	*3*		0	0						
				7.32	Pb	4		6			6	6						
				7.35	Pc	3	10			3	6	13						
				7.37	Mf	2					0	0						
				7.4	Pc	2			3		3	3						
19	20	730		7.5	Cb	1	15	5	3		7	23	c					

Ts Td Hour Hour Gs # For Hstwk Pat Con Sm 0 Lg 0 c l Blw Clm Notes

7.53 Pb 2 10 10 10  
 7.56 Pc 4 0 0  
 7.58 Pb 1 3 11 12 14  
 7.61 Pw 3 3 1 1 3 5  
 7.64 Cb 5 31 2 2 15 35  
 7.67 Ak 1 0 0  
 7.7 Ak 6 3 3 3  
 7.73 Pw 2 3 3 9 tr s  
 7.75 Sm 2 1 1  
 7.78 Ap 1 70 130 80 200  
 7.81 Af 3 0 0  
 7.84 Pw 1 4 2 3 6 tr s  
 7.87 Pc 7 4 4 4  
 7.89 Ak 3 0 0  
 7.92 Ak 7 0 0  
 7.95 Ak 2 0 0  
 7.98 Ap 3 17 3 10 20 c  
 8.01 Cb 4 6 6 3 10 15  
 8.03 Pb 3 125 \*5\* 50 125 c s  
 8.06 Pc 6 3 1 1 4  
 8.09 Af 1 ? ? 1 1  
 8.12 Ak 4 0 0  
 8.15 Sm 1 30 2 7 32 c nw  
 8.18 Cb 2 5 3 3 8 11  
 8.2 Af 4 0 0  
 8.23 Pb 5 5 3 5  
 8.26 Cb 3 19 3 8 22  
 8.29 Af 5 0 0  
 8.32 Ak 5 2 2 2  
 8.34 Ak 8 0 0  
 8.37 Af 6 1 \*2\* \*3\* \*3\*  
 8.4 Af 2 0 0

21 20.5 830

29 23.5 1030 10.5 Cloudy, breezy

30 25 1200

12 No 2 8 8 8  
 12.0 Pb 2 0 0  
 12.0 Pc 4 2 0 2  
 12.1 Pb 1 0 0  
 12.1 Pc 1 4 2 2 6  
 12.2 Ap 6 2 1 3 3  
 12.2 Pw 3 3 3 3 6  
 12.2 Pw 2 4 1 2 5 tr n  
 12.3 Ap 1 3 3 3  
 12.3 Pw 4 1 2 2 3  
 12.4 Pw 1 0 0



Ts	Td	Hour	Hour	Gs	#	For	Nstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Clm	Notes	
			12.4	Pc	7			3			3		3						
			12.4	Pc	5	2		1			1		2						
			12.5	Pm	5	1					0		1						
			12.5	Ap	3						0		0						
			12.6	Pb	3						0		0						
			12.6	Pc	6	3					0		3						
			12.7	Ap	5						0		0						
			12.7	Ap	4				1		1		1						
			12.7	Pb	5						0		0						
			12.8	Pb	4						0		0						
			12.8	Pc	3	3					1		3						
			12.9	Pc	2				1	1	1		2						
31	26	1300	Partly cloudy, clear, breezy to windy																
			13	Ap	2			5			5		5						
			13.0	Pb	2						0		0						
			13.0	Pc	4	2					2		2						
			13.1	Pb	1						0		0						
			13.1	Pc	1					*									*Closed; defensive action against <u>C. bicolor</u> trail.
			13.2	Pm	3	1		3			3		4						
			13.2	Pm	2	3					0		3						
			13.2	Ap	1			2			2		2						
			13.3	Pc	8						0		0						
			13.3	Pm	4	1					1		1						
			13.4	Pm	1	2					0		2						
			13.4	Pc	7					*									*Closed
			13.4	Pc	5	1					0		1						
			13.5	Pm	5	2		1*			1		3						*Offensive action
			13.5	Ap	3						0		0						
			13.6	Pb	3						0		0						
			13.6	Pc	6	1					1		1						
			13.7	Ap	5						0		0						
			13.7	Ap	4						0		0						
			13.7	Pb	5						0		0						
			13.8	Pb	4						0		0						
			13.8	Pc	3	3					3		3						
			13.9	Pc	2						0		0						
32.5	28	1400	Sunny, breezy																
			14	Ap	2			4			4		4						
			14.0	Pb	2						0		0						
			14.0	Pc	4	2					1		2						
			14.1	Pb	1						0		0						
			14.1	Pc	1	1					1		1						
			14.1	Ap	6			6			6		6	c		w			
			14.2	Pm	3	1		2			2		3						
			14.2	Pm	2	13					3		13						
			14.3	Ap	1			2	1	3	6		6						
			14.3	Pc	8			5			5		5						
			14.3	Pm	4	2					2		2						

Ts	Td	Hour	Hour	Gs #	For	Nstwk	Pat	Con	Sm 0	Ld 0	c	l	Blw	Clm	Notes
			14.41	P# 1	1	1			2	2					
			14.45	Pc 7	1	1			1	2					
			14.49	Pc 5	1				1	1					
			14.53	P# 5					0	0					
			14.56	Ap 3	15	15			15	30					
			14.6	Pb 3					0	0					
			14.64	Pc 6*					1	1					*Closing
			14.68	Ap 5--					0	0					
			14.71	Ap 4					0	0					
			14.75	Pb 5					0	0					
			14.79	P# 8	2	3			3	5					
			14.83	Pb 4					0	0					
			14.86	Pc 3				*1*	0	0					
			14.9	Pc 2					0	0					
30.5	28.5	1500													
			15	Ap 2		6			8	8					
			15.04	Pb 2					0	0					
			15.08	Pc 4					0	0					
			15.11	Pb 1					0	0					
			15.15	Pc 1				*1*	*						*Closing
			15.19	Ap 6	20	20			20	40	c	se			Col. length 10 #
			15.23	P# 3	2	4			4	6					
			15.26	P# 2	4			2	2	6					
			15.3	Ap 1	105	5	10		60	120	c	se			
			15.34	Pc 8		5			5	5					
			15.38	P# 4	2	1		2	2	5					
			15.41	P# 1	2	2		1	2	5					
			15.45	Pc 7	1				1	1					
			15.49	Pc 5--		4			4	4					
			15.53	P# 5					0	0					
			15.56	Ap 3	20	10			15	30	c	sw			Col. length 10 #
			15.6	Pb 3		1			1	1					
			15.64	Pc 6				*							*Closed
			15.68	Ap 5					0	0					
			15.71	Ap 4--	19	8		8	15	35	c	se			Col. length 4 #
			15.75	Pb 5					0	0					
			15.79	P# 8					0	0					
			15.83	Pb 4					0	0					
			15.86	Pc 3				*1*	0	0					*Defense
			15.9	Pc 2					0	0					
29	28	1600													
			16	Ap 2	5	12			12	17					
			16.04	Pb 2					0	0					
			16.08	Pc 4--					0	0					
			16.12	Pb 1					0	0					
			16.16	Pc 1				*							*Closed
			16.2	Ap 6	20	10	10		20	40	c				

Is	Td	Hour	Hour	Gr #	For	Mstwk	Pat	Con	Sm	0	Ld	0	c	l	Blw	Clw	Notes
				16.23	P#	3~	1	5	2	7	8						
				16.27	P#	2~	1			0	1						
				16.31	Ap	1	70	20	20	70	110	c					
				16.35	Pc	8		5		5	5						
				16.39	P#	4~	1	2	1	3	4						
				16.43	P#	1	1			0	1						
				16.47	Pc	7				0	0						
				16.51	Pc	5~		?		1	1						
				16.55	P#	5				0	0						
				16.59	Ap	3	15	5	3	7	23	c					
				16.63	Pb	3	15	15		30	30	c					
				16.67	Pc	6				0	0						
				16.7	Ap	5				0	0						
				16.74	Ap	4~	16	12	2	15	30	c					
				16.78	Pb	5				0	0						
				16.82	Pb	4~				0	0						
				16.86	Pc	3				0	0						
				16.9	Pc	2~			*								#Closed
22	27	1700		Cloudy, windy													
				17	Ap	2	3	10	10	20	23	c					
				17.04	Pb	3	250	20	30?	150	300	3c					
				17.08	Pc	4				0	0						
				17.12	Pb	2		2	8	10	10						
				17.16	Pc	1			*								#Closed
				17.2	Ap	6	33	32		50	65	c					
				17.23	P#	3		5		5	5						
				17.27	P#	2				0	0						
				17.31	Ap	1	50	30		30	80	c					
				17.35	Pc	8		2		2	2						
				17.39	P#	4	2	2		2	4						
				17.43	P#	1	1	2		1	3						
				17.47	Pc	7				0	0						
				17.51	Pc	5				0	0						
				17.55	P#	5				0	0						
				17.59	Ap	3	8	2	5	7	15	c					
				17.63	Pb	4	275	25	50?	150	350	2c					Col. length 2 #
				17.67	Pc	6*				0	0						#Closed
				17.7	Ap	5*				0	0						#Closed
				17.74	Ap	4	7	20	2	15	22	c					
				17.78	Pb	1	360	20	70?	150	450	3c					
				17.82	Pb	5				0	0						
				17.86	Pc	3				0	0						
				17.9	Pc	2			*								#Closed
19.5	26	1800		Windy, clear, chilly													
				18	Ap	2		3		3	3						
				18.08	Pb	3	270	22	33	300	325	c					
				18.16	Pb	2	1?	5	15	20	21						
				18.23	Ap	6~	5	25		25	30						



Ts	Td	Hour	Hour	Gs	#	For	Nstwk	Pat	Con	Sm	0	Lg	0	c	1	Blw	Clw	Notes
		21.3	Pm	1						*								*Closed
		21.3	Pc	5						*								*Closed
		21.3	Pm	5						*								*Closed
		21.4	Ap	3							0	0						
		21.4	Pb	3	15	10					15	25	c					
		21.4	Ap	5							0	0						
		21.5	Ap	4		6					12	12						
		21.5	Pb	5				8			8	8						
		21.5	Pb	4	70	30					45	100						
		2135																
15	21	2255																
		22.9	Ap	2							8	8						
		22.9	Pb	2							6	6						
		23.0	Pb	1							20	30						
		23.0	Ap	6		50					50	50						
		23.1	Pm	3		4					4	4						
		23.1	Ap	1							15	15						
		23.2	Ap	3							0	0						
		23.2	Pb	3	50						10	50	c*					*Returning foragers
		23.3	Ap	5							0	0						
		23.3	Ap	4		20					20	20						
		23.4	Pb	5	60						40	60	c					
		23.5	Pb	4	70						30	70	c					

3-16-84 Fri. Very gusty, clear(Thurs. clear also), full moon

14 19 100

		1	Ap	2							0	0						
		1.06	Pb	2							1?	1?						Defense
		1.12	Pc	4							0	0						
		1.18	Pb	1	94	6					40	100	c		nw			
		1.23	Pc	1							*							*Closed
		1.29	Ap	6							0	0						
		1.35	Pm	3							*							*Closed
		1.41	Pm	2							*							*Closed
		1.47	Ap	1					2*		2	2						*Defense
		1.53	Pc	8							*?							*Closed?
		1.58	Pm	4							*							*Closed
		1.64	Pm	1							*							*Closed
		1.7	Pc	7							*							*Closed
		1.76	Pc	5							*							*Closed
		1.82	Pm	5							0	0						
		1.88	Ap	3							0	0						
		1.93	Pb	3	1	3					15	19	19					
		1.99	Pc	6							*							*Closed
		2.05	Ap	5							*							*Closed? (spider)
		2.11	Ap	4	1	2					2	4	5					
		2.17	Pb	5							*2*	0	0					Defense
		2.23	Ak	5*		2					2	2						*2 Solpugids circling jaws locked

Ts	Td	Hour	Hour	Gs	#	For	Hstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Clm	Notes
				2.28	Pb	4	7	10	32		42	49	c		se			
				2.34	Pc	3				*								*Closed
				2.4	Pc	2				*								*Closed?
14	18.5		230															
				2.5	Ap	2					0	0						
				2.56	Pb	2		1	6		7	7						
				2.63	Pb	1	60	5			40	65	c					Col. length .5 #
				2.69	Ap	6					0	0						
				2.76	Sm	2					0	0						
				2.82	Ap	1				2	2	2						Motionless
				2.89	Ap	3					0	0						
				2.95	Pb	3		3	4	1	8	8						
				3.01	Ap	5					0	0						
				3.08	Ap	1					0	0						
				3.14	Mk	4		3			3	3						
				3.21	Sm	1					0	0						
				3.27	Ap	4		3	5		8	8						Defense
				3.34	Pb	5		1	2	1	4	4						
13.5	18		330	3.4	Pb	4	60	10	4	3	32	77	c		s			
				3.5	Ap	2					0	0						
				3.53	Pb	2		2	8	5	15	15						
				3.55	Pb	1*	10	6	20	17	35	53	c					C. l. .1 # '6 ants closing
				3.58	Ap	6					0	0						
				3.61	Sm	2					0	0						
				3.63	Ap	1				6	6	6						Motionless
				3.66	Ap	3					0	0						
				3.69	Pb	3				1	1	1						
				3.71	Ap	5					0	0						
				3.74	Ap	1					0	0						
				3.77	Mk	4		1			1	1						
				3.79	Sm	1					0	0						
				3.82	Ap	4				1	1	1						
				3.85	Pb	5				5	4	5						
				3.87	Mk	5		2			2	2						
				3.9	Pb	4	40	5			35	45	c					Col. length 1 n
			400															
				Partly cloudy, windy														
13	18		430															
				4.5	Ap	2					0	0						
				4.58	Pb	2		4	3	3	10	10						
				4.67	Pb	1	8	5	15	13	35	41	c					Col. length .05 #
				4.75	Ap	6					0	0						
				4.83	Ap	1		1		4	5	5						
				4.92	Ap	3					0	0						
				5	Pb	3	5	5	40	15	60	65	c					Col. length .1 #
				5.08	Ap	5					0	0						
				5.17	Ap	4					2	2						Motionless

Ts	Td	Hour	Hour	Gs #	For	Nstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Clm	Notes
			5.25	Pb	5			6		6	6						
			5.333	Pb	4	25	5	3	2	20	35	c					
		520															Dawn, Partly cloudy, windy
13.5	17	530															
			5.5	Mp	2					0	0						
			5.54	Pb	2		2	2	1	5	5						
			5.58	Pc	4					0	0						
			5.62	Pb	1	5	5		4	14	14	c					Closing?
			5.66	Pc	1				*								*Closed
			5.7	Mp	6		140			110	140						Offense
			5.73	Pm	3				*								*Closed
			5.77	Pm	2				*								*Closed
			5.81	Mp	1		1	1		2	2						
			5.85	Pc	8					0	0						
			5.89	Pm	4				*								*Closed
			5.93	Pm	1					0	0						
			5.97	Pc	7					0	0						
			6.01	Pc	5				*								*Closed
			6.05	Pm	5					0	0						
			6.09	Mp	3					0	0						
			6.13	Pb	3			1	3	4	4						
			6.17	Pc	6					0	0						
			6.2	Mp	5					0	0						
			6.24	Mp	4					0	0						
			6.28	Pb	5	?		2		2	2						
			6.32	Pb	4	6	4		2	6	12	c					Returning
			6.36	Pc	3					0	0						
			6.4	Pc	2					0	0						
14.5	17	630															Wind dying by 7AM, Sunrise about 6:45AM.
			6.5	Mp	2	11	4	10	6	16	31	c	e				Col. length 4 #
			6.54	Pb	2		4			4	4						
			6.58	Pc	4					0	0						
			6.62	Pb	1		19		4	19	19						
			6.66	Pc	1				*								*Closed
			6.7	Mp	6	41	10	4		25	55	c	e				C. l. 5 #
			6.73	Pm	3				*								*Closed
			6.77	Pm	2				*								*Closed
			6.81	Mp	1			5		5	5						
			6.85	Pc	8					0	0						
			6.89	Pm	4	2	2	2	1	5	7						
			6.93	Pm	1				*								*Closed
			6.97	Pc	7					0	0						
			7.01	Pc	5				*								*Closed
			7.05	Pm	5					0	0						
			7.09	Mp	3					0	0						
			7.13	Pb	3		9	1		10	10						
			7.17	Pc	6					0	0						
			7.2	Mp	5					0	0						

Ts	Td	Hour	Hour	Gs	#	For	Nstwk	Pat	Con	Sm	0	Lg	0	c	i	Blw	Clw	Notes
			7.24	Mo	4						0	0						
			7.28	Pb	5*			2			2	2						*Closed
			7.32	Pb	4						10	10						Offense (Ap)
			7.36	Pc	3						0	0						
			7.4	Pc	2						0	0						
19	17.5	730				Mostly clear												
			7.5	Ap	2	11	8				10	19						C. l. 7 #
			7.54	Pb	2		4				4	4						"
			7.58	Pc	4	1					1	1						
			7.62	Pb	1		8				8	8						1 ant trying to close
			7.66	Pc	1					*								*Closed
			7.7	Ap	6	50?	25				40	75	c					
			7.73	Pm	3	5	5	2		1	8	13						
			7.77	Pm	2	7		1		3	8	11						
			7.81	Ap	1	375	30			15	120	420	c	se				C. l. 1 #
			7.85	Pc	8					*								*Closed
			7.89	Pm	4	6	4		2		6	12						
			7.93	Pm	1	3		2			3	5						
			7.97	Pc	7						0	0						
			8.01	Pc	5						0	0						
			8.05	Pm	5						0	0						
			8.09	Ap	3						0	0						
			8.13	Pb	3		3				3	3						
			8.17	Pc	6	2					0	2						
			8.2	Ap	5						0	0						
			8.24	Mo	4						0	0						
			8.28	Pb	5					*								*Closed
			8.32	Pb	4					1	1	1						
			8.36	Pc	3	1		4		1	5	6						
			8.4	Pc	2						0	0						
26	19	830																
			8.5	Ap	2	4	20				20	24	c					
			8.54	Pb	2						0	0						
			8.58	Pc	4	5					1	5						
			8.62	Pb	1					*								*Closed
			8.66	Pc	1	2				2?		2						
			8.7	Ap	6	25	20				25	45	c					
			8.73	Pm	3	2		1	1		2	4						
			8.77	Pm	2	6					0	6						
			8.81	Ap	1	55	10				20	65	2c	nw se				
			8.85	Pc	8					0?		0						
			8.89	Pm	4	2	1				1	3						
			8.93	Pm	1	2					0	2						
			8.97	Pc	7						0	0						
			9.01	Pc	5						0	0						
			9.05	Pm	5						1	1						Defense
			9.09	Ap	3						0	0						
			9.13	Pb	3		5				5	5						



Ts	Td	Hour	Hour	Gs	#	For	Nstwk	Pat	Con	Sm	0	Ld	0	c	l	Blw	Cl#	Notes	
			9.17	Pc	6	2					1	2							
			9.2	Mp	5						0	0							
			9.24	Mp	4						0	0							
			9.28	Pb	5	10				*		10							*Closing
			9.32	Pb	4					*									*Closed
			9.36	Pc	3	3			1		1	4							
			9.4	Pc	2	2					0	2							
33	22	930																	
			9.5	Mp	2	2	15				15	17	c						
			9.58	Pb	2					*									*Closed
			9.67	Pc	4	1					1	1							
			9.75	Pb	1					*									*Closed
			9.83	Pc	1	1					1	1							
			9.91	Mp	6	1?					1	1							
			10	Pm	3		1				1	1							
			10.0	Pm	2	5					2	5							
			10.1	Mp	1		1				1	1							
			10.2	Pc	8						0	0							
			10.3	Pm	4	1	2				2	3							
			10.4	Pm	1	2					0	2							
			10.4	Pc	7	1					1	1							
			10.5	Pc	5						0	0							
			10.6	Pm	5						0	0							
			10.7	Mp	3						0	0							
			10.8	Pb	3						0	0							
			10.9	Pc	6	3					1	3							
			10.9	Mp	5						0	0							
			11.0	Mp	4						0	0							
			11.1	Pb	5						0	0							
			11.2	Pb	4						0	0							
			11.3	Pc	3						0	0							
			11.4	Pc	2		4				0	4							
38	26	1130																	Clear, breezy
			11.5	Mp	2						0	0							
			11.5	Pb	2					*									*Closed
			11.6	Pc	4						0	0							
			11.6	Pb	1					*									*Closed
			11.7	Pc	1						0	0							
			11.7	Mp	6						0	0							
			11.8	Pm	3	2	3				3	5							
			11.8	Pm	2						0	0							
			11.9	Mp	1						0	0							
			11.9	Pc	8						0	0							
			12.0	Pm	4	2	1				1	3							
			12.0	Pm	1						0	0							
			12.1	Pc	7						0	0							
			12.1	Pc	5	1					1	1							
			12.2	Pm	5	1?					1	1							

Ts Td Hour Hour Gs # For Nstwk Pat Con Sm 0 Lg 0 c l Blw Clm Notes

-----  
 12.2 Ap 3 0 0  
 12.3 Pb 3 0 0  
 12.3 Pc 6 1 0 1  
 12.4 Ap 5 0 0  
 12.4 Ap 4 0 0  
 12.5 Pb 5 0 0  
 12.6 Pb 4 0 0  
 12.6 Pc 3 0 0  
 12.7 Pc 2 1 0 1

Date: 4-22-84 Sunny, slight breeze

43 43 1445

14.7 Cb 1 0 0  
 14.8 Ap 2 \*3\* 0 0  
 14.8 Pc 4 0 0  
 14.9 Pc 1 1 1 1  
 14.9 Pm 3 0 0  
 15.0 Cb 5 1 1 1  
 15.0 Ak 1 0 0  
 15.1 Pm 2 0 0  
 15.2 Ap 1 0 0  
 15.2 Af 3 7 3 7  
 15.3 Pm 1 0 0  
 15.3 Pc 7 1 0 1  
 15.4 Pc 5 0 0  
 15.4 Pm 5 0 0  
 15.5 Ak 3 0 0  
 15.6 Ak 2 3 2 3  
 15.6 Ap 3 0 0  
 15.7 Cb 4 1 1 1  
 15.7 Pc 6 0 0  
 15.8 Ap 5 0 0  
 15.8 Af 1 0 0  
 15.9 Ap 4 0 0  
 16 Cb 2 21 15 21  
 16.0 Af 4 2 0 2  
 16.1 Cb 3 1 1 1  
 16.1 Af 5 0 0  
 16.2 Ak 5 0 0  
 16.2 Af 6 2 2 2  
 16.3 Pc 3 0 0  
 16.4 Pc 2 0 0

39 39 1630

16.5 Cb 1 0 0  
 16.5 Ap 2 0 0  
 16.6 Pc 4 0 0  
 16.7 Pc 1 0 0  
 16.7 Pm 3 0 0

Ts Id Hour Hour Gs # For Nstwk Pat Con Sm 0 Lg 0 c l Blw Clm Notes

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16.8	Cb	5	3	5			3	8						
16.9	Mk	1					0	0						
16.9	P#	2					0	0						
17.0	Mp	1					0	0						
17.1	Mf	3					1	1						
17.1	Pc	8					0	0						
17.2	P#	4					0	0						
17.3	P#	1	1				1	1						
17.4	Pc	7					0	0						
17.4	Pc	5					0	0						
17.5	P#	5					0	0						
17.6	Mk	2					0	0						
17.6	Mp	3					0	0						
17.7	Cb	4	5				8	9	13					
17.8	Pc	6					0	0						
17.8	Mp	5					0	0						
17.9	Mf	1		6			1	6	7					
18.0	Mp	4					0	0						
18.1	Cb	2	15				7	11	22					
18.1	Mf	4					0	0						
18.2	Cb	3--			3		2	5	5					
18.3	Mf	5					0	0						
18.3	Mk	5--					0	0						
18.4	Mf	6			*2*		0	0						
18.5	Pc	3--					0	0						
18.5	Mf	2					0	0						
18.6	Pc	2					0	0						

26 34 1845 Still twilight

18.7	Cb	1	25				10	10	35					
18.8	Mp	2						0	0					
18.8	Pb	2				50		50	50					
18.9	P#	3						0	0					
19	Cb	5	15				10	10	25					
19.0	Mk	1						0	0					
19.1	P#	2						0	0					
19.1	Mp	1						0	0					
19.2	Mf	3						0	0					
19.3	Pc	8						0	0					
19.3	P#	4						0	0					
19.4	P#	1						0	0					
19.4	Pc	5						0	0					
19.5	P#	5						0	0					
19.6	Mk	2			*1*			0	0					
19.6	Cb	4					4	4	4					
19.7	Mp	5						0	0					
19.8	Mf	1						0	0					
19.8	Mk	4		4				4?	4					

Ts	Td	Hour	Hour	Gs #	For	Nstwk	Pat	Con	Sm 0	Lg 0	c	l	Blw	Clm	Notes
		19.9		Mp 4					0	0					
		19.9		Cb 2				1	1	1					
		20.0		Mf 4					0	0					
		20.1		Pb 5	3		14	16	30	33					
		20.1		Cb 3	3			11	9	14					
		20.2		Mf 5					0	0					
		20.3		Mk 5					0	0					

Date: 4-23-84 Clear, slight wind, area shaded  
12 19 545

Hour	Gs #	For	Nstwk	Pat	Con	Sm 0	Lg 0
5.75	Cb 1	8		3	3	8	14
5.82	Mp 2					0	0
5.89	Pb 2	30	17			17	47
5.96	Pc 4					0	0
6.03	Pb 1	45	15			30	60
6.1	Pc 1					0	0
6.17	Cb 5	20		4		12	24
6.24	Pm 2					0	0
6.31	Mp 1					0	0
6.38	Pc 8					0	0
6.44	Pm 4					0	0
6.51	Pm 1					0	0
6.58	Pc 5					0	0
6.65	Mp 3					0	0
6.72	Cb 4	1			4	4	5
6.79	Pb 3	3	15			15	18
6.86	Mp 5					0	0
6.93	Mf 1					0	0
7	Mk 2					0	0

Other Mp colonies active

Date: 5-7-84 Clear, very slight breeze, sunrise 5:30 AM.

Hour	Hour	Gs #	For	Nstwk	Pat	Con	Sm 0	Lg 0	c	Notes
16.8	21.7	6.5	Cb 1	1		2	3	3		2
17.7	21.9	6.61	Mp 2	8	3	5	8	16		5
18.6	22.1	6.73	Pb 2	30	10		15	40		3
19.4	22.3	6.84	Pc 4				0	0		
20.3	22.5	6.96	Mp 6	13	2	1	13	16		10
21.2	22.8	7.07	Pc 1			4	4	4		3
22.0	23.0	7.19	Cb 5	10			0	10		2
22.9	23.2	7.3	Mk 1			1	1	1		2
23.8	23.4	7.41	Pm 2			1 *6x	1	1		5
24.7	23.6	7.53	Sm 2				0	0		
25.5	23.8	7.64	Mp 1				?			5
26.4	24.1	7.76	Sm 3	100			50	50	150 c	5
27.3	24.3	7.87	Mf 3	34	1		5	10	40	3
28.1	24.5	7.99	Pc 8				?			

Ts	Td	Hour	Hour	Gs	#	For	Nstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Clw	Notes
29.0	24.7		8.1	Pm	1					?								
29.9	24.9		8.21	Pm	4					?								
30.7	25.2		8.33	Pc	7					?								
31.6	25.4		8.44	Pc	5					?								
32.5	25.6		8.56	Pm	5						0		0					
33.3	25.8		8.67	Cb	4	4					1		4					
34.2	26.0		8.79	Pc	6						0		0					
35.1	26.2		8.9	Mf	1						1		1					3
36	26.5	900																
36.4	26.7		9	Mk	3	17		5			15		22					11
36.8	27.0		9.07	Mk	7						0		0					
37.2	27.3		9.14	Mk	2	4		5	1		6		10					2
37.6	27.6		9.21	Mp	3	3	4				7		8					5
38	27.8		9.27	Cb	4	4					1		4					
38.4	28.1		9.34	Pb	3						0		0					
38.8	28.4		9.41	Mp	5						0		0					
39.2	28.7		9.48	Mf	1	3		4			4		7					3
39.6	28.9		9.55	Mk	4	6		6			6		12					7
40	29.2		9.62	Sm	1						0		0					
40.4	29.5		9.69	Mp	4						0		0					
40.8	29.8		9.75	Cb	2	3			8		8		11					9
41.2	30.0		9.82	Pb	5	1					1		1					
41.6	30.3		9.89	Cb	3	2					2		2					
42	30.6		9.96	Mf	5	3			2		3		5					10
42.4	30.9		10.0	Mk	5						0	?	0					
42.8	31.1		10.1	Mf	6						0		0					6
43.2	31.4		10.1	Pc	3	3					0		3					
43.6	31.7		10.2	Mf	2				2		2		2					3
44	32	1020																
53.5	42.5	1320																
53.3	42.5		13.3	Cb	1						0		0					
53.2	42.5		13.4	Mp	2						0		0					
53.0	42.5		13.4	Pb	2						0		0					
52.9	42.6		13.5	Pc	4						0		0					
52.7	42.6		13.6	Mp	6						0		0					
52.6	42.6		13.7	Pm	3						0		0					
52.4	42.7		13.7	Pb	1						0		0					
52.3	42.7		13.8	Pc	1						0		0					
52.1	42.7		13.9	Cb	5						0		0					
52.0	42.7		13.9	Mk	1	7		8			10		15			45		2
51.8	42.8		14.0	Pm	2						0		0					
51.7	42.8		14.1	Mp	1						0		0					
51.5	42.8		14.2	Mf	3						0		0					
51.4	42.9		14.2	Mk	3						0		0					
51.2	42.9		14.3	Mk	2			*1*			0		0					
51.1	42.9		14.4	Mf	1						0		0					
51	43		14.5	Mk	4						0		0					

Ts Td Hour Hour Gs # For Nstwk Pat Con Sm 0 Lg 0 c l Blw Cl# Notes

45.5 44 1700

44.8	43.7	17	Cb	1	2			0	2					2
44.2	43.4	17.1	Mp	2				0	0					
43.6	43.2	17.2	Pb	2				0	0					
42.9	42.9	17.3	Mp	6				0	0					
42.3	42.6	17.4	Pm	3				0	0					
41.7	42.4	17.5	Pb	1				0	0					
41.0	42.1	17.6	Pc	1				?						
40.4	41.8	17.7	Cb	5				0	0					
39.8	41.6	17.8	Mk	1	1			0	1					3
39.1	41.3	17.9	Pm	2				0	0					
38.5	41.0	18	Sm	2				0	0					
37.9	40.8	18.1	Mf	3	7		3	3	10			30		2
37.2	40.5	18.2	Pm	1	1			0	1			0		6
36.6	40.2	18.3	Sm	1				0	0					
36	40	18.4	Pb	5				0	0					

1830 Pm 2 1 ant closing

28 37.5 1930

27.7	37.2	19.5	Cb	1	6		4	4	10					5
27.5	36.9	19.5	Mp	2				0	0					
27.2	36.7	19.6	Pb	2				0	0					
27.0	36.4	19.6	Pc	4				?						
26.7	36.2	19.7	Mp	6				0	0					
26.5	35.9	19.8	Pm	3				?						
26.3	35.7	19.8	Pc	1				?						
26.0	35.4	19.9	Cb	5	9		3	2	12					
25.8	35.1	19.9	Mk	1				0	0					
25.5	34.9	20.0	Pm	2*	1			1	1					*5/6 active pm.
25.3	34.6	20.1	Sm	2				0	0					
25.0	34.4	20.1	Mp	1				0	0					
24.8	34.1	20.2	Sm	3				0	0					
24.5	33.9	20.2	Mf	3				0	0					
24.3	33.6	20.3	Pc	8				?						
24.1	33.3	20.4	Pm	1				0	0					
23.8	33.1	20.4	Pm	4				?						
23.6	32.8	20.5	Pc	7				?						
23.3	32.6	20.5	Pc	5				?						
23.1	32.3	20.6	Pm	5	2			2	2					2
22.8	32.1	20.6	Mk	3				0	0					
22.6	31.8	20.7	Mk	7				0	0					
22.4	31.5	20.8	Mk	2				0	0					
22.1	31.3	20.8	Mp	3				?						
21.9	31.0	20.9	Cb	4	3		5	5	8					3
21.6	30.8	20.9	Pb	3				?						
21.4	30.5	21.0	Pc	6				?						



Ts	Td	Hour	Hour	Gs	#	For	Nstwk	Pat	Con	Sm	0	Lg	0	c	l	Blw	Cl#	Notes
14	21.5	530																
14.3	21.4	5.5		Cb	1	1			1		1	2						
14.7	21.4	5.63		Ap	2			60		60	60							3
15.0	21.3	5.75		Pb	2	21*				18	21							3 #Closing
15.4	21.3	5.88		Pc	4					0	0							
15.7	21.3	6.01		Pb	1	35	10	10		40	55							3
16.1	21.2	6.14		Pc	1					0	0							
16.5	21.2	6.26		Cb	5	30			5	5	35							5
16.8	21.2	6.39		Mk	1					0	0							
17.2	21.1	6.52		Ap	1	300		30	20	150	350							3
17.5	21.1	6.65		Mf	6					0	0							
17.9	21.1	6.77		Pm	8					*								#Closed
18.2	21.0	6.9		Pb	4					?								
18.6	21.0																	
19	21	700																
19.5	21.1	7		Cb	1	8		1	1	2	10					15		3
20.0	21.3	7.06		Ap	2					8	13					11.5		
20.5	21.5	7.12		Pb	2					*								
21.0	21.7	7.17		Pc	4					?								
21.5	21.9	7.23		Pb	1	10	5			15	25					15		3
22.0	22.0	7.29		Pc	1	3				3	3							
22.5	22.2	7.35		Cb	5	6			6	6	12					30		5
23.1	22.4	7.41		Mk	1					0	0							
23.6	22.6	7.46		Pm	2	6		4		3	10					0		
24.1	22.7	7.52		Sm	2					0	0							
24.6	22.9	7.58		Ap	1	75				30	75					17.5		3
25.1	23.1	7.64		Sm	3	20				5	20					1		5
25.6	23.3	7.7		Mf	3	8		5		5	13					5.5		3
26.1	23.5	7.76		Pc	8					?								
26.6	23.6	7.81		Pm	1					0	0							
27.2	23.8	7.87		Pm	4	1				?1								
27.7	24.0	7.93		Pc	7					?								
28.2	24.2	7.99		Pc	5					?								
28.7	24.4	8.05		Pm	5					?0								
29.2	24.5	8.1		Mk	3					0	0							
29.7	24.7	8.16		Mk	7					0	0							
30.2	24.9	8.22		Mk	2	1		4		4	5							3
30.7	25.1	8.28		Cb	4	5				2	5							5
31.3	25.3	8.34		Pb	3					?								
31.8	25.4	8.39		Pc	6	3				?	3							
32.3	25.6	8.45		Ap	5					?								
32.8	25.8	8.51		Mf	1			*1*		0	0							
33.3	26.0	8.57		Mk	4					0	0							
33.8	26.2	8.63		Sm	1					0	0							
34.3	26.3	8.69		Ap	4					?								
34.9	26.5	8.74		Mf	4					0	0							
35.4	26.7	8.8		Pb	5			1		1	1							
35.9	26.9	8.86		Cb	3	3			2	2	5							5



