1997/1998
Final Report

Environmental Parameters and Use of Abandoned Trailer and 'Bat-condo' by the Southeastern Big-eared Bat *Corynorhinus rafinesquii macrotis* on the Disney Wilderness Preserve

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INTRODUCTION

In Florida, the Southeastern big-eared bat *(Corynorhinus rafinesquii macrotis)* is considered rare (Florida Committee on Rare and Endangered Plants and Animals [FCREPA] 1992). This species was formerly classified as C2 by the USFWS, but that protective category was dropped in 1995 (Federal Register Vol. 50, No. 181, p.37965). Presently this species has no legal protection and not enough is known about its' population status (either range-wide or statewide) to determine if protection is warranted. In 1993, a colony of bats roosting in an abandoned trailer on South Florida Water Management District property, adjacent to the Disney Wilderness Preserve (DWP), was confirmed as *Corynorhinus rafinesquii*. This was the first confirmed maternity colony of the species in Florida, and the DWP site remains the southernmost location for a maternity colony in this species range. This colony has been the focus of research since winter 1994.

Beginning 1 May 1997, under a contract between The Florida Nature Conservancy and Fly By Night, Inc., the Disney Wildlife Conservation Fund (DWCF) funded research to collect information about the roosting ecology of the DWP population of *Corynorhinus rafinesquii* and the environmental parameters in both the occupied trailer and a new 'bat condo'. Data collection was completed 30 April 1998. In April 1997, a bat-condo was erected by the South Florida Water Management District (SFWMD) in an attempt to provide the DWP *Corynorhinus* population with a suitable alternate roost site. The following is a Final Report with the results of environmental parameter and population monitoring in both roost structures, and recommendations for future research at this site.

MATERIALS AND METHODS

Bat Condo Design and Placement:

In April 1997, I met with Bill Helfferich of the SFWMD and we agreed upon a design for a new structure to be built near the occupied trailer (Appendix 1). I also solicited and received input on the design from other biologists working with *Corynorhinus* in the Southeast. SFWMD donated the needed materials and person-power to build the new structure.

The bat condo was built 63 meters (206 ft) north of the occupied trailer, on the DWP side of the fence line. It is within the same contiguous live oak (*Quercus virginiana*) hammock where the trailer is located. The opening to the bat condo faces west. It was originally intended that the opening face north similar to the opening to the trailer, but a miscommunication prevented this. After its initial placement on 27 April 1997, several modifications were made. These included: attachment of metal sheeting on the lower 2 feet of the structure to prevent entry of rat snakes *(Elaphe obsoleta* is a conspicuous predator of *Corynorhinus*). The bat condo was painted with a dark stain (Behr Natural Seal Plus no. 84, Brown-pressure treated wood) to increase solar warming, and all seams were caulked with a siliconized latex caulk (Red Devil; window, door and siding; Clear) to prevent entry of moisture. A soffit was not included in the bat condo design and due to a high light level inside the structure; three of the four areas on each side of the condo (north and south) were closed. One space was left open on each side to provide alternate entry and exit sites for the bats.

Environmental Parameter Monitoring:

The new bat condo was equipped with copper-constantan thermocouple wires attached to a Campbell CR10 datalogger and AM416 multiplexer (Figure 1). HOBO (Onset Corp.) humidity and light intensity dataloggers were placed inside the bat condo above the door. The north side of a nearby live oak was chosen as the ambient (Figure 2). In the occupied trailer,

HOBO temperature recorders were placed on the ceiling above the roosting area in each room, on the wall in the main room and occasionally in the same location where hygrothermographs had been placed in the past (Figure 3). Some comparisons were also made between the wall and ceiling locations in some rooms. Light intensity and humidity recorders were placed in the main and the west rooms of the trailer. Every two weeks (when weather permitted) the site was visited and datalogger information was downloaded onto a laptop computer (Epson ActionNote 4SLC/33) using Campbell PC208 and Onset Boxcar2 software. All dataloggers were then reset.

Population Monitoring:

During the twice monthly visits notes were taken as to number and position of bats in the trailer (Table 1). Notes were also taken as to evidence suggesting bat activity in the new bat-condo (Table 2).

Statistical Procedures:

Both environmental and population data were transferred from Boxcar2 and PC208 format to Lotus 123 (v 5.01) spreadsheets where it was organized. Spreadsheets were then transferred to Statgraphics Plus for Windows (v 3.1) for statistical analysis. Due to the serial nature of these data, most failed the variance check. For this reason all p-values reported below are for Krusal-Wallis (KW) tests of medians rather than standard ANOVA tests of means.

RESULTS

Population Monitoring

Locations and numbers of bats in the trailer roost are shown in Table 1. The population size remained stable and pups were born the weeks of 4 May 1997 and 3 May 1998. Visits to the bat-condo uncovered an almost immediate interest by the bats (Table 2). After two weeks, two *Corynorhinus* guano pellets were seen on the floor in the bat condo. On each subsequent visit 2 - 15 guano pellets were seen in the bat condo and on 25 August a lone *Corynorhinus rafinesquii* was found inside the bat condo near the roof on the west side. On each visit since this date a single *C. rafinesquii* has been present (Figure 4).

Microenvironment Monitoring

Relative humidity

Ambient relative humidity (RH) was significantly higher (p=0.00) than RH in the bat condo and both trailer locations (Figure 5, Table 3). RH in the west room of the trailer (TW) was higher than that in the other roost locations monitored and had the lowest range. The winter of 1997/1998 was significantly wetter and warmer than normal and the median ambient RH was above 90% on most dates monitored. In March 1998, ambient RH began to drop and at median RH below 90% the pattern seen in figure 5 begins to change. In March, with a median ambient RH of 79.6 there was no significant difference between ambient and any locations monitored (p=0.06). However, in April (median ambient RH=79.2%) the bat condo RH was significantly higher than ambient at 87.9% (p=0.00, Figure 6). X-Y plots of RH during these two distinct periods are shown in figures 7 & 8.

Light intensity

Due to high humidity levels the ambient HOBO LI datalogger failed after only one month. Analysis of light intensity (LI) in July 1997, while ambient LI was functional, revealed that ambient LI was significantly higher than LI in both the bat condo and the trailer (p=0.00, Figure 9). Although ambient LI is not available on all dates, a comparison of light intensities between

the roost structures can be made. Light intensity data for the entire period from July 1997- April 1998 revealed LI in the bat condo was significantly higher than that in the trailer main room (TM) and that the LI in TM was significantly lower than in TW ($p=0.00$, Figure 10). However, when separated by month, three patterns are revealed (Table 4). In August, LI in TM was greater than in the bat condo and LI in TW was the lowest (Figure 11). Light intensity in TW remains lowest from November through April, with bat condo LI being highest (Figure 12). Data collected in September and October, suggest LI is greatest in TW and no significant difference exists between the bat condo and TM. This was the only monitoring period when LI in TW remained higher than the other locations in the evening hours. An equipment malfunction is suspected (Figure 13).

Temperature

Trailer

Median temperature at all monitored locations in the trailer were significantly warmer than ambient (Figure 14). The west room was warmest ($p<0.01$) and the east was coolest but, not significantly different from the two interior rooms ($p=0.72$). When analyzed by month, ambient and mean trailer temperature was significantly different only in July and October. During these two months mean trailer temp was significantly warmer than ambient ($p<0.01$, $p=0.013$). No significant differences existed between rooms during any month monitored. On two dates, temperatures were compared between the wall, ceiling, and brick (location of hygrothermographs on previous dates). On both dates the brick location was significantly warmer than the wall or ceiling ($p=0.021$, $p=0.014$), and the ceiling was significantly warmer than the wall ($p=0.024$, $p=0.029$).

Bat condo

During the monitoring period, the median temperature at all monitored locations in the bat condo were significantly warmer than ambient ($p<0.01$). Most temperature ranges were significantly lower than ambient range (Figure 15). Only SFR ($p=0.02$) and SFC ($p=0.03$) were significantly different from the other locations monitored ($p=0.06$). When separated by month, November through April show no significant differences between ambient and mean bat condo temperature ($p>0.05$). Also, no significant differences existed between temperatures in any of the bat condo locations ($p>0.73$). Ambient temperature was not collected in July due to an equipment malfunction, but it was noted that NFR was significantly cooler than all other locations ($p<0.01$), which were not significantly different from each other ($p=0.82$). In August, no significant difference existed between bat condo mean and ambient ($p=0.85$), but NFR was significantly cooler and SFR significantly warmer, than the other locations (Figure 16). In September and October the bat condo mean was significantly warmer than ambient ($p<0.005$).

Bat condo / trailer comparison

Due to some minor equipment problems (i.e. low batteries) valid comparisons between bat condo and trailer temperatures were possible only in the months of July, September, October, March, and April. During these periods mean temperature was significantly higher than ambient temperature in both structures, with the bat condo remaining warmest ($p<0.01$, Figure 17). When analyzed by month, only July and October showed significant differences. Ambient temperature was lower than mean temperature in both roost sites ($p<0.01$). The bat condo was significantly warmer than ambient or trailer mean in October ($p<0.001$).

DISCUSSION

Figure 18 illustrates the mean number of bats in each room of the trailer since monitoring began in 1995. The number of bats in each room during the 1997-1998 monitoring session is shown in Figure 19. The east and west rooms appear to be preferred over all other potential roost locations. The west room of the trailer was occupied on 67% of visits to the site and always by a group of 5 or more bats. The east room was occupied on 83% of visits, but only 47% of those were by a group of 5 or more bats (Table 1).

Although LI in the west room was significantly higher than in the bat condo or ambient (Figure 10), these data included a monitoring period with questionable data for TW (Figure 13). When that data was removed and the analysis performed again, LI in TW was significantly lower than in the other locations, and LI in the bat condo was highest ($p=0.00$). Light intensity is probably only a significant factor in roost choice during the daytime hours since that is the time the bats are restricted to the roost area. When temperature data for daytime hours are analyzed (Figure 21), LI at TW remains significantly lower than the other two locations ($p=0.00$). The results of LI data collected to date, suggest the bats are choosing the roost location with the lowest median light intensity. *Corynorhinus* has been thought to roost in higher LI conditions than other bat species (Barbour and Davis 1969). No concrete conclusions can be drawn to support or reject this hypothesis for the DWP colony.

Relative humidity was highest in TW. Bat activity was greatest in this room suggesting that this colony is choosing a roost area with higher and more stable RH levels. Bats generally prefer higher humidity conditions and a stable humidity level is thought to be most desirable (Barbour and Davis 1969). If this is true, RH in the bat condo may be too low. Increasing RH in the bat condo may be possible by closing the two soffit areas left open when the bat condo was initially modified. This modification would also lower LI, which may provide an additional benefit if the bats are choosing a location with lower LI levels than previously believed.

Hygrothermographs were placed on the floor of each room during past monitoring sessions (Finn 1995, 1996, 1997). Comparisons between wall, ceiling, and brick locations (location of hygrothermographs on previous dates) illustrate the importance of placing the datalogger as close as possible to the area where bats are roosting. This comparison (see above) made it evident that temperature data collected with the hygrothermographs may have been significantly higher than temperatures the bats were actually experiencing.

There was also a significant difference between wall and ceiling temperatures on dates both were monitored with dataloggers. Since the bats are roosting flush on the wall and not hanging pendant from the ceiling, they may be taking advantage of heating or cooling from the substrate they are roosting on (the wall). The dataloggers are configured to monitor air temperature near the datalogger and not substrate surface temperature. Although ceiling temperature may not be a 100% accurate descriptor of roost temperature, the ceiling above the roosting area was chosen as the best location for the dataloggers to prevent the potential of monitoring bat body surface temperature rather than air temperature. Future comparisons should be made between wall orientations and ceiling temperatures in areas with and without bats.

When mean trailer and bat condo temperatures were examined on time-series graphs (Figures 22,23, & 24) it became obvious that significantly warmer temperatures occurred only during late afternoon and evening hours when the bats are active or generally away from the roost. During the period when bats are returning to the roost in the morning, through mid-afternoon when decreased levels of activity are expected, roost temperatures are lower than

ambient. When daytime temperature data were analyzed, ambient temperature (median = 27.27C) was significantly higher than temperature at roost locations ($p<0.01$). The roost temperatures were not significantly different from each other ($p=0.06$). Figure 25 illustrates that although TW was occupied more often, the daytime temperature at this location (median = 25.8C) was not significantly different from the bat condo (median = 25.85C) or the trailer mean (median = 25.46C). These figures illustrate that when analyzing roost microclimate data a simple analysis of means or medians is not always sufficient to describe the complexity of these parameters.

Analysis of daytime temperatures in the trailer illustrated that median room temperatures were significantly lower than ambient (median = 28.92C, $p=0.00$). There was no significant difference between daytime temperatures in the east (median = 27.3C) and west rooms (median = 27.0C, $p=0.99$) or between the two interior rooms (median = 26.0C, $p=0.88$). The east and west rooms were significantly warmer than the interior rooms ($p<0.01$). No patterns of room occupation directly related to temperature were noted. If daytime roost temperature is a deciding factor in roost choice, no further modifications will need to be made to the bat condo to alter temperature.

Numerous guano pellets have been noted in this roost indicating the activity of more than one individual. It is hypothesized that additional bats are using the bat condo as a night roost. In June, culled moth wings were collected below the roosting bat indicating that the bat condo is used as a feeding roost, by this individual, on some occasions. This was the first time culled insect parts were noted. The trailer is an active feeding roost and culled insect parts (primarily moth wings) are abundant in all rooms.

RECOMMENDATIONS FOR FUTURE RESEARCH

During the July 1997 - April 1998 monitoring period, only the west room had all three environmental variables monitored. The data collected to date suggest that RH and LI may be more important than temperature in roost choice for the bats at this site. More intense data collection in additional rooms in the trailer should to be conducted to determine the importance of these two parameters. Bat condo parameters should continue to be monitored after modifications are made to increase RH and decrease LI (see above). This data will illustrate if modifications have been successful or if further modifications should be made.

Due to the sensitivity of *Corynorhinus* to disturbance at the roost site, no effort was made to capture the bat found roosting in the bat condo. It is presumed this is the same individual on each date and that it is a male, but without capturing and banding the animal this can not be confirmed. Future work at this site should include the placement a mist net outside the bat condo opening to capture this bat as it exits the roost. This will minimize disturbance in the roost site and the potential of roost abandonment. In addition to banding and recording standard measurements at the time of capture, this animal should also be radio-tagged to assist in locating alternate roosts in the event it does not return to the bat condo.

There remains much about these animals that is a mystery. Where do they forage, what is their home range, where are alternate roosts and how important are they? What is their distribution in the state, how many colonies are present and how big are they? I urge TNC and The Disney Conservation Fund to consider future work on *Corynorhinus* and other bat species in Florida, potentially the entire Southeastern region. A proposal to SFWMD to perform a radio-tracking study of the bats at this site has been submitted and informally approved. The goal of that project will be to locate alternate roosts used by the bats at this site. However, that project will not be able to answer vital questions about foraging sites or home-range.

Without further research on the habits of this species active conservation will be a challenge. Conservation efforts are largely focused on individual roost sites rather than on roosting or foraging habitat. Since neither of these have been described in detail for this species in Florida, conservation of specific habitat types is difficult.

The biggest threat to this species is the encroachment of humans. Florida's human population is undergoing rapid increases that result in the decrease of natural areas that support viable roost sites and foraging areas for all bat species. It is not known how well many species adapt to these increases in the human population. It is known that *Corynorhinus* is extremely sensitive to human disturbance. The recent fires in north central Florida are burning potential habitat and a fire in Osceola County was said to have destroyed over 20 hunting cabins. Cabins of this type are frequently used by *Corynorhinus* in other areas of its range.

Abandoned buildings in rural areas are the sites most often discovered to house this species. These structures are often seen as potential liability factors and are generally removed quickly. Without further research, protection of wild-lands and abandoned structures that occur on them is the biggest conservation step we should take at the present time. Placement of structures like the DWP bat condo can have positive effects on populations by providing secure, stable roost sites. The more we learn about the needs of this population of *Corynorhinus*, the more likely it will be that we can manage other populations in the region, now and in the future. Without this knowledge, we may lose a population or entire species before we know anything about it.

LITERATURE CITED

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Table 1: Location and numbers of bats in DWP bat trailer in 1997/1998.

Date	Number of bats	Location in trailer	Total number	Notes
5-5-97	1	1	27-32	1 dead bat W end of hall
	1	3		
	25-30	4		
5-11-97	1	1	30-34	pups have been born
	5	2		
	3	3		
	21-25	4		
7-1-97	1	1	31-36	
	30-35	4		
7-7-97	35-40	1	35-40	1st time bats seen in east bathroom
7-22-97	17	1	30	
	13	4		
8-8-97	30-40	4	30-40	
8-25-97	30	1	35	
	1	2		
	4	3		
9-18-97	1	1	34	
	31	2		
	2	3		
10-19-97	40-45	2	42-47	bats in tight cluster
	2	3		
11-3-97	1	1	26	
	25	4		
11-27-97	30-35	1	30-35	
12-10-97	31-36	1	33-38	3 with bands
	1	2		
	1	3		
1-10-98	35-40	4	35-40	3 with bands, most are torpid
	10	2		
	10-15	3		
	10	4		
2-16-98	18	1	28	very active,
	1	3		Pipistrelle in bathroom
	6	4		2 bats on s. wall of hallway, near bathroom.
	3	5		1 bat on wall near s. door
3-22-98	1	1	36-41	Mark Kiser from BCI took photos
	35-40	4		most torpid
4-1-98	35	4		replaced HOBO batteries
4-15-98	2	1	35-40	1 in hall outside middle bedroom
	1	2		
	1	3		
	30-35	4		
	1	5		
5-13-98	3	1	42-52	2 with bands, some with young pups
	39-49	4		
5-28-98	30-40	1	32-42	dead pup on floor in w room
6-4-98	42	4	42	29 adults, 2 banded. 12 visible pups, 1 pup grey. dead pup on floor in middle room

1: east room
2: middle room
3: bathroom
4: west room
5: other (hall or kitchen cabinet)

Summary

Location	Percent Occupancy	Percent >5 bats
1	83	47
2	39	43
3	50	11
4	67	100
5	11	0

Table 2. Location of bat in DWP bat condo.

Date	Notes
4-27-97	bat condo built
5-11-97	2 guano pellets near east wall
7-1-97	5-10 guano pellets, paint and place HOBO's
7-7-97	2 guano pellets near east wall
7-22-97	4-5 guano pellets near east wall
8-8-97	several guano pellets at center, and both north and south walls
8-25-97	1 bat on w wall above door (north side), close to ceiling
9-18-97	1 bat on w wall above door (south side), close to ceiling
10-19-97	1 bat on w wall above door (north side), close to ceiling
11-3-97	1 bat on w wall above door (north side), close to ceiling
11-27-97	1 bat on w wall above door (south side), close to ceiling
12-10-97	1 bat on w side of rafter at NBR, 2 feet from wall
1-10-98	1 bat on w side of rafter at NBR, 2 feet from wall, torpid
2-16-98	1 bat on w side of rafter at NBR, 2 feet from wall
3-22-98	1 bat on w wall above door (north side), close to ceiling
4-1-98	1 bat on w wall above door (north side), close to ceiling
4-15-98	1 bat on s side of rafter at SFR, 2 feet from wall
5-13-98	1 bat on w side of rafter at NBR, 2 feet from wall
5-28-98	1 bat on ceiling between NBR & NRC, 2 feet from wall
6-4-98	1 bat on ceiling between NBR & NMR, 2 feet from wall, moth wings

Table 3. Summary statistics for relative humidity measured at DWP s

Month	Location	Median	Mean	Range
July 1997	Ambient	95.95	86.13	64.5
	Bat condo	91.1	89.33	34.4
	Trailer (main)	90.1	86.1	47.3
	Trailer (west)	--	--	--
Aug 1997	Ambient	99.8	92.42	36.06
	Bat condo	87.9	85.85	30.55
	Trailer (main)	97.23	94.55	25.6
	Trailer (west)	96.9	96.19	16.7
Sept 1997	Ambient	95.6	86.57	57.13
	Bat condo	83.78	80.71	50.03
	Trailer (main)	90.06	87.76	40.87
	Trailer (west)	90.43	89.83	31.4
Oct 1997	Ambient	93.5	85.36	62.75
	Bat condo	83.15	80.02	56.15
	Trailer (main)	89.27	86.05	49.4
	Trailer (west)	91.1	89.72	33.4
Nov 1997	Ambient	94.55	86.82	55
	Bat condo	84.89	82.77	51.83
	Trailer (main)	90.1	87.55	43.65
	Trailer (west)	93	91.28	30.4
Dec 1997	Ambient	99.8	90.41	64.8
	Bat condo	94.4	89.42	58.65
	Trailer (main)	95.9	91.66	51.2
	Trailer (west)	99.2	94.6	41.05
Jan 1998	Ambient	95.95	88.7	64.77
	Bat condo	91.8	87.74	57.8
	Trailer (main)	94	90.59	52.65
	Trailer (west)	96.9	93.78	38.83
Feb 1998	Ambient	91.4	84.16	69.77
	Bat condo	86.63	84.18	65.05
	Trailer (main)	87.43	85.34	53.3
	Trailer (west)	91.1	89.28	47.1
March 1998	Ambient	79.6	74.83	72.97
	Bat condo	77.35	76.13	66.6
	Trailer (main)	77.25	75.49	59.37
	Trailer (west)	79.3	78.48	56.9
April 1998	Ambient	79.23	75.78	69.77
	Bat condo	87.92	82.5	60
	Trailer (main)	78.2	76.19	57.6
	Trailer (west)	--	--	--

Table 4. Summary statistics for light intensity measured at DWP site. The HOBO LI measures light intensity as log (lumens/sqm).

Month	Location	Median	Mean	Range
July 1997	Ambient	1.77	0.88	60.2
	Bat condo	-0.05	-0.07	3.6
	Trailer (main)	--	--	--
	Trailer (west)	-0.51	-0.42	4.09
Aug 1997	Ambient	--	--	--
	Bat condo	0.51	0.13	2.86
	Trailer (main)	0.59	0.01	3.26
	Trailer (west)	-0.17	-0.43	2.86
Sept 1997	Ambient	--	--	--
	Bat condo	-0.72	-0.15	3.67
	Trailer (main)	-0.69	-0.24	3.27
	Trailer (west)	0.12	0.19	1.88
Oct 1997	Ambient	--	--	--
	Bat condo	-0.99	-0.15	4.51
	Trailer (main)	-1.05	-0.25	3.63
	Trailer (west)	0	-0.14	3.18
Nov 1997	Ambient	--	--	--
	Bat condo	-1.14	-0.16	3.78
	Trailer (main)	-1.42	-0.27	3.73
	Trailer (west)	-1.66	-0.65	3.27
Dec 1997	Ambient	--	--	--
	Bat condo	-1.09	-0.22	3.3
	Trailer (main)	-1.55	-0.39	3.76
	Trailer (west)	-1.72	-0.71	3.55
Jan 1998	Ambient	--	--	--
	Bat condo	-1.12	-0.14	4.28
	Trailer (main)	-1.55	-0.28	3.76
	Trailer (west)	-1.72	-0.62	3.43
Feb 1998	Ambient	--	--	--
	Bat condo	-1.09	0	3.34
	Trailer (main)	-1.31	-0.12	3.86
	Trailer (west)	-1.62	-0.52	3.35
March 1998	Ambient	--	--	--
	Bat condo	-0.09	0.13	3.45
	Trailer (main)	-0.59	0.03	3.89
	Trailer (west)	-0.84	-0.04	3.45
April 1998	Ambient	--	--	--
	Bat condo	0.29	0.14	3.16
	Trailer (main)	0	0.04	3.66
	Trailer (west)	-0.41	-0.41	3.29

Location	Median	Mean	Range
Ambient	22.50	22.26	27.06
SFR	23.44	22.93	25.95
NBR	23.47	22.85	24.71
NFC	23.37	22.80	24.57
NFR	23.23	22.77	26.36
NMR	23.10	22.55	24.60
NRC	23.20	22.60	23.91
SBR	23.18	22.73	25.12
SMR	23.28	22.68	24.54
SRC	23.04	22.51	24.18

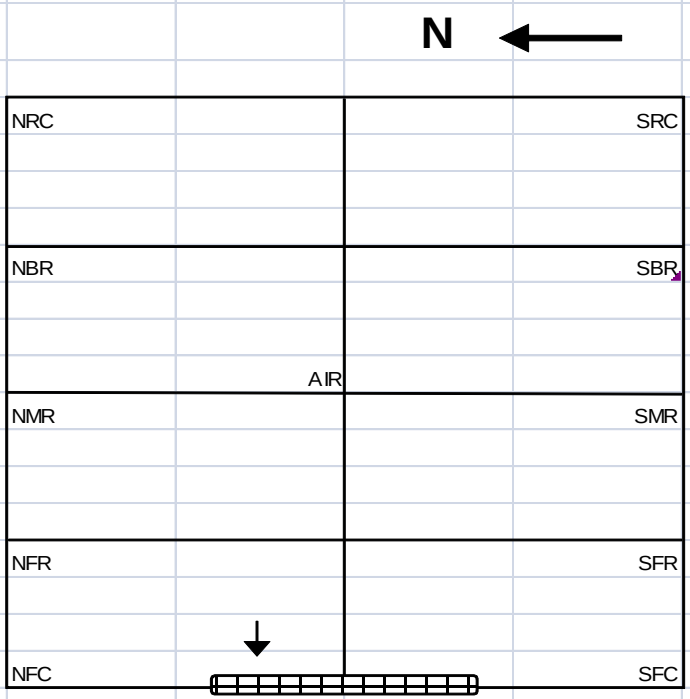


Figure 1. Locations of thermocouple wires in DWP bat condo. Arrow is location of humidity and light intensity dataloggers (on frame above door).

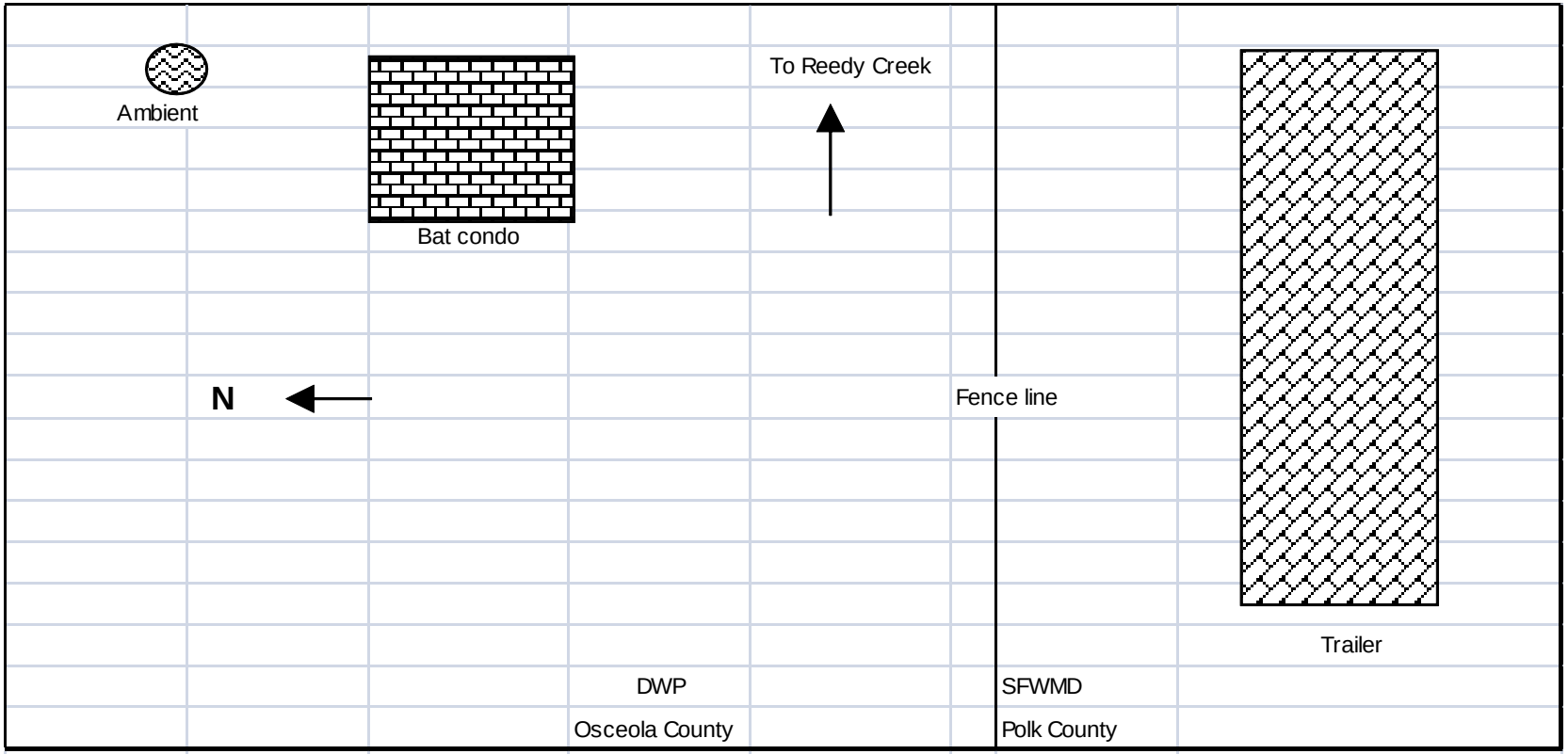


Figure 2. Diagram illustrating comparative locations of bat condo, trailer, and ambient box at DWP site. Ambient box is on the north side of a live oak tree. Bat condo is 63 meters from trailer. Diagram not to scale.

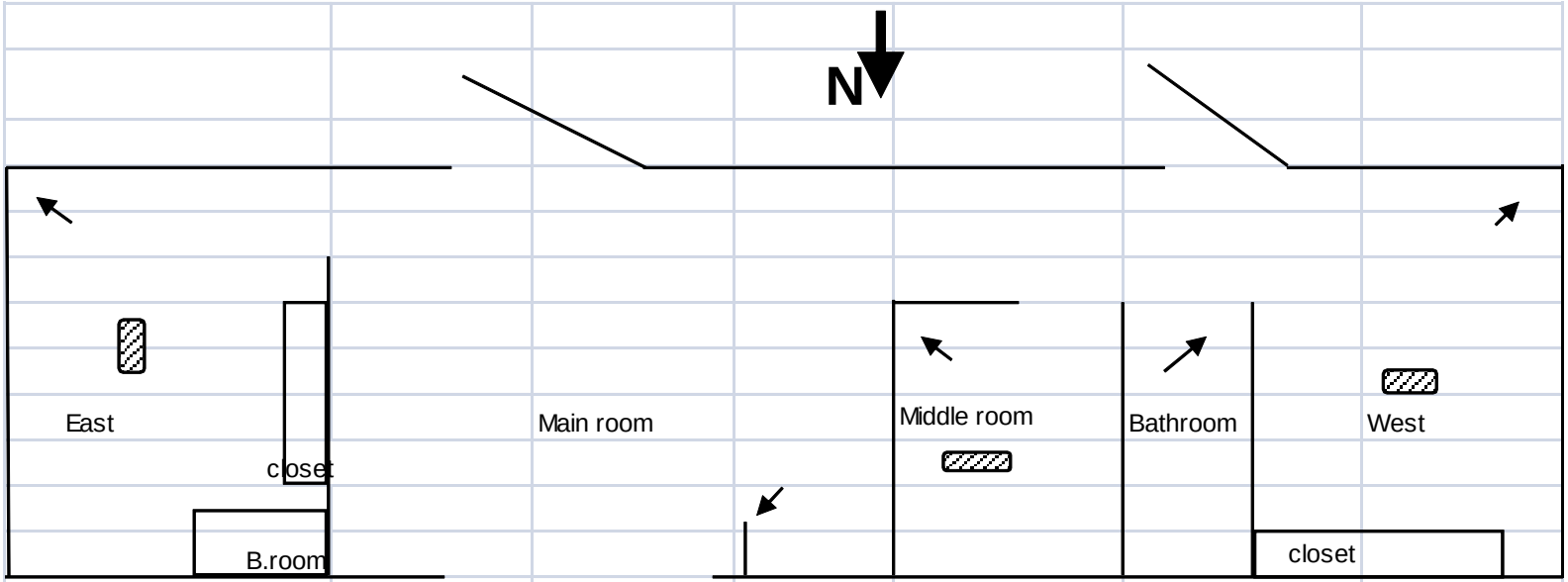


Figure 3. Locations of dataloggers in DWP trailer. Arrows are locations of temperature loggers in each room (on wall or ceiling near roosting areas). Hatched box is past location of hygrothermographs (on floor). Arrow in main room notes location of temperature, light level and humidity dataloggers. Bat entry is through large hole in North wall. South doors were closed in 1995 to restrict bat entry and minimize further wind and rain damage to trailer.

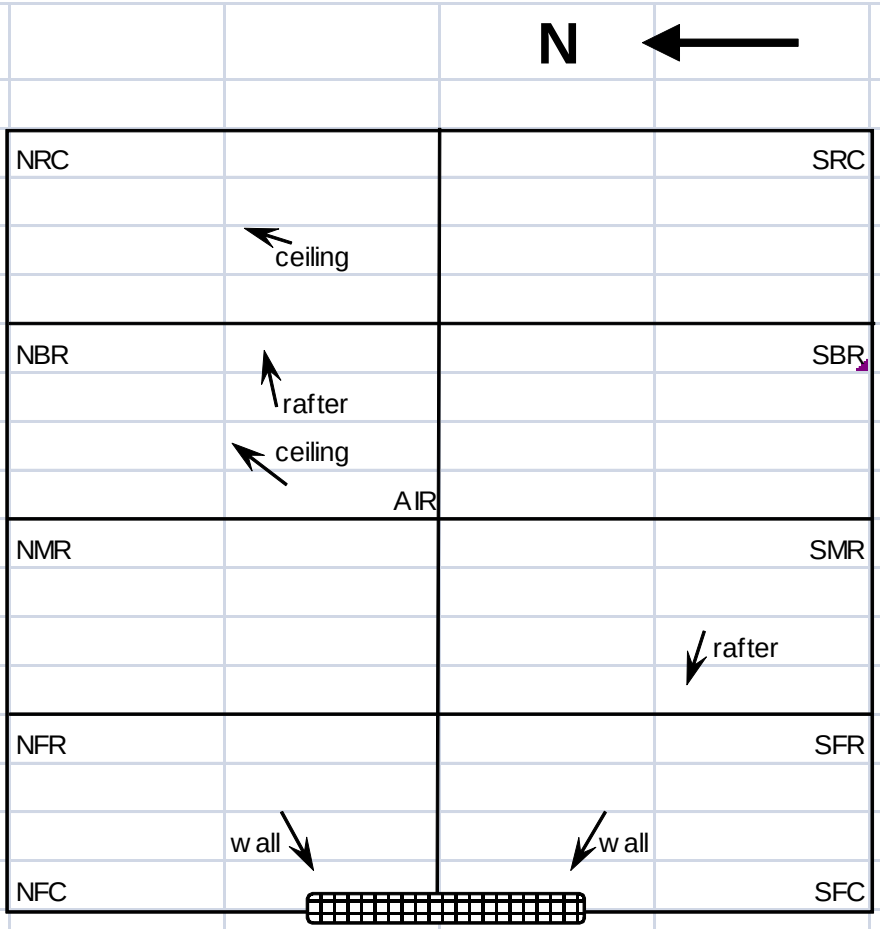


Figure 4. Areas in DWP bat condo where bat was seen roosting.

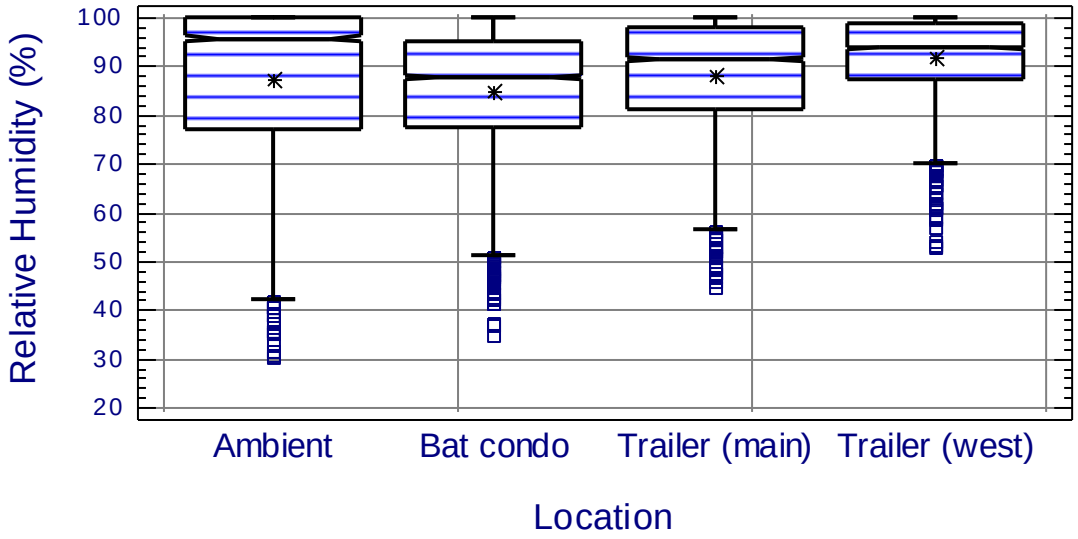


Figure 5. Box and Whisker plot illustrating relative humidity at the DWP bat condo site. Data shown are from a period monitored from July 1997 - April 1998. Asterisks (*) indicate mean values and notch indicates median values.

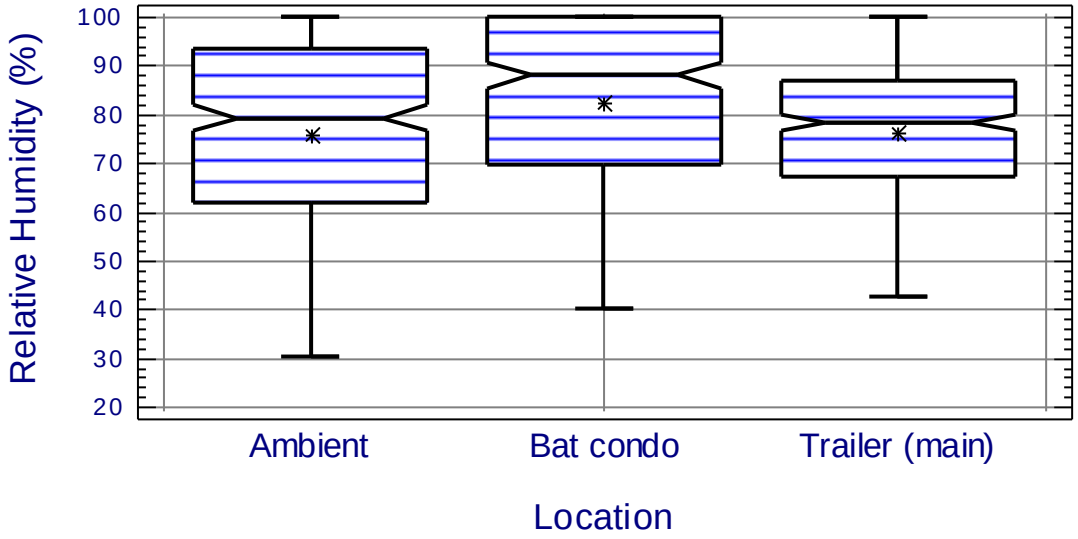


Figure 6. Box and Whisker plot illustrating relative humidity at the DWP bat condo site. Data shown are from a period monitored in April 1998. An equipment malfunction prevented data collection at the trailer west room. Asterisks (*) indicate mean values and notch indicates median values.

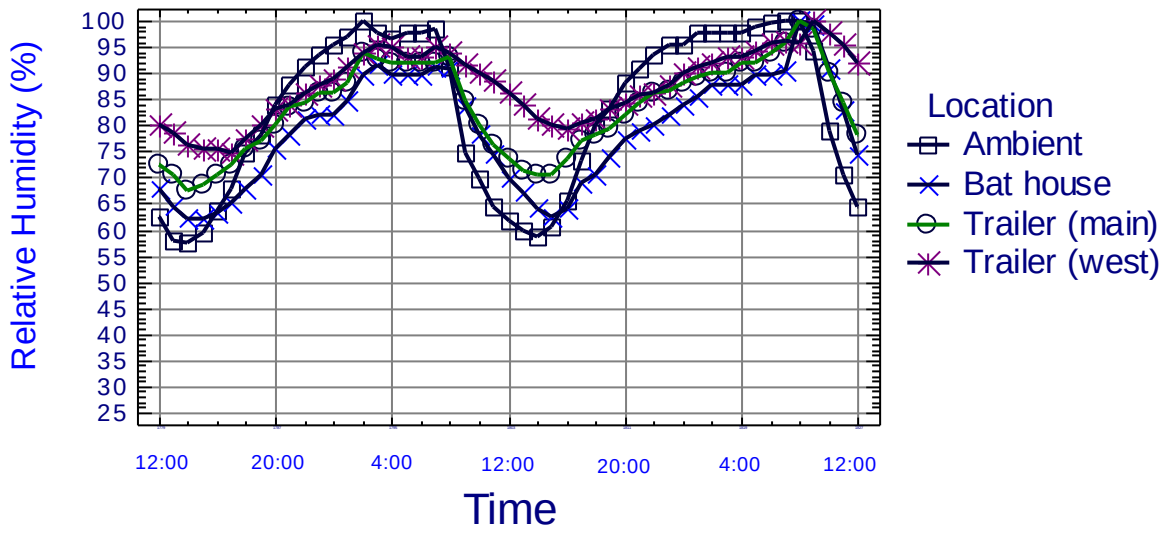


Figure 7. Time-series plot illustrating relative humidity at the DWP site for the time period from 12:00 8 November -12:00 10 November 1997.

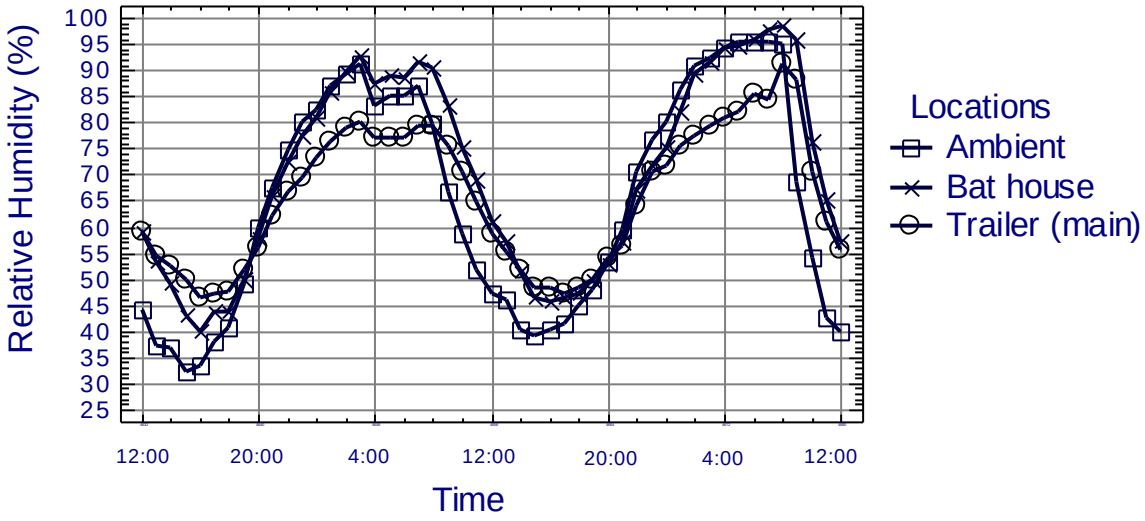


Figure 8. Time-series plot illustrating relative humidity at the DWP site for the time period from 12:00 10 April 1998 - 12:00 12 April 1998. An equipment malfunction prevented data collection at the trailer west room on the dates shown.

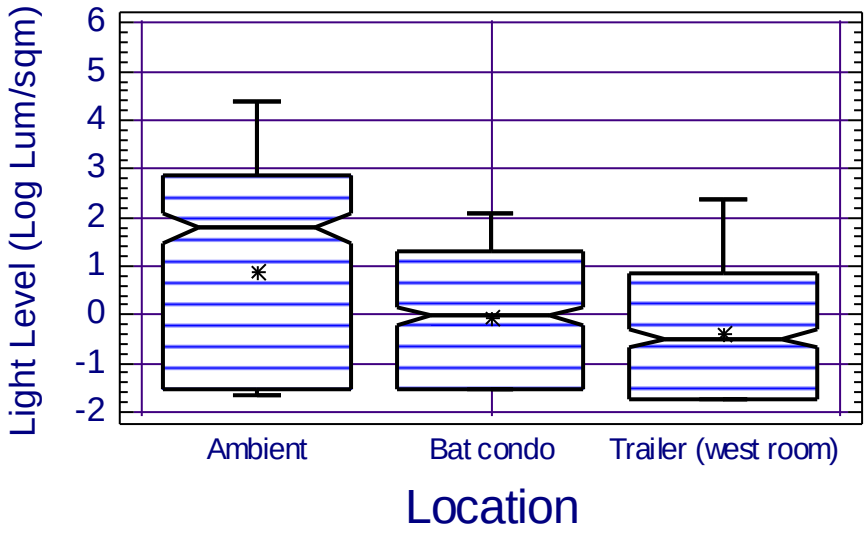


Figure 9. Box and Whisker plot illustrating light intensity (log lumens/sqm) at the DWP bat condo site. Data shown are from a period monitored in July 1997. Asterisks (*) indicate mean values and notch indicates median value.

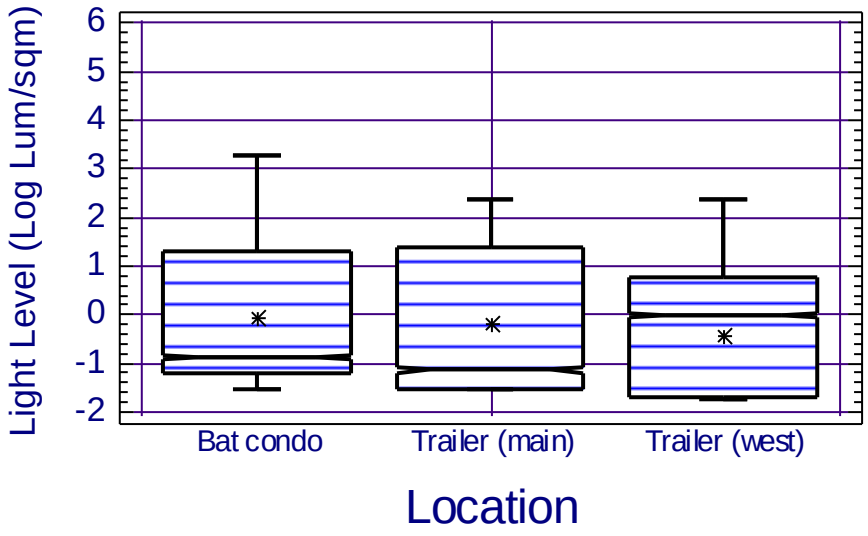


Figure 10. Box and Whisker plot illustrating light intensity (log lumens/sqm) at the DWP bat condo site. Data shown are from a period monitored from July 1997 - April 1998. Asterisks (*) indicate mean values and notch indicates median value.

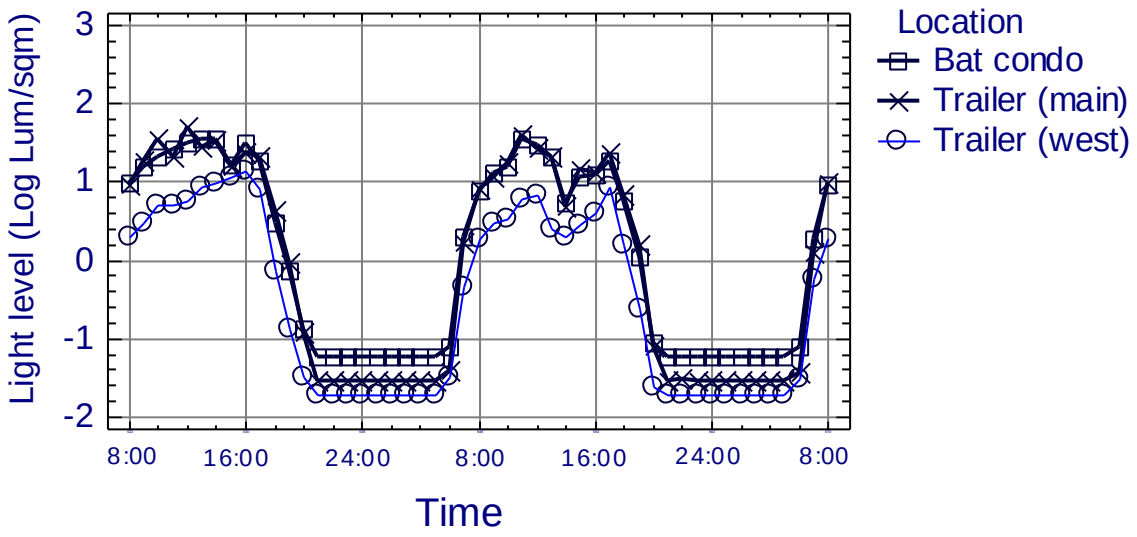


Figure 11. Time-series plot illustrating light intensity at the DWP site for the time period from 8:00 6 August 1997 - 8:00 8 August 1997.

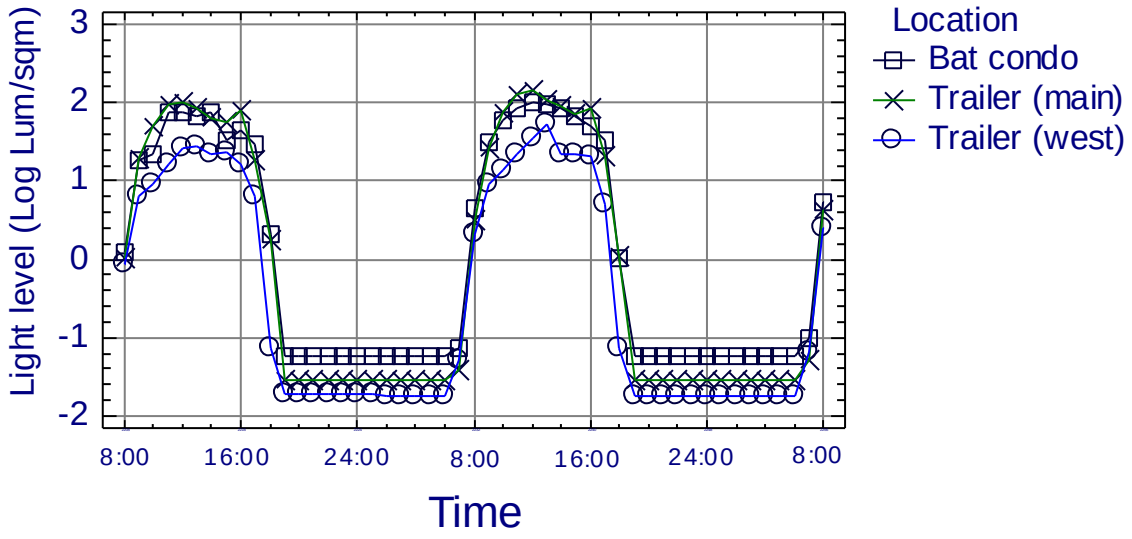


Figure 12. Time-series plot illustrating light intensity at the DWP site for the time period from 8:00 5 December 1997 - 8:00 7 December 1997.

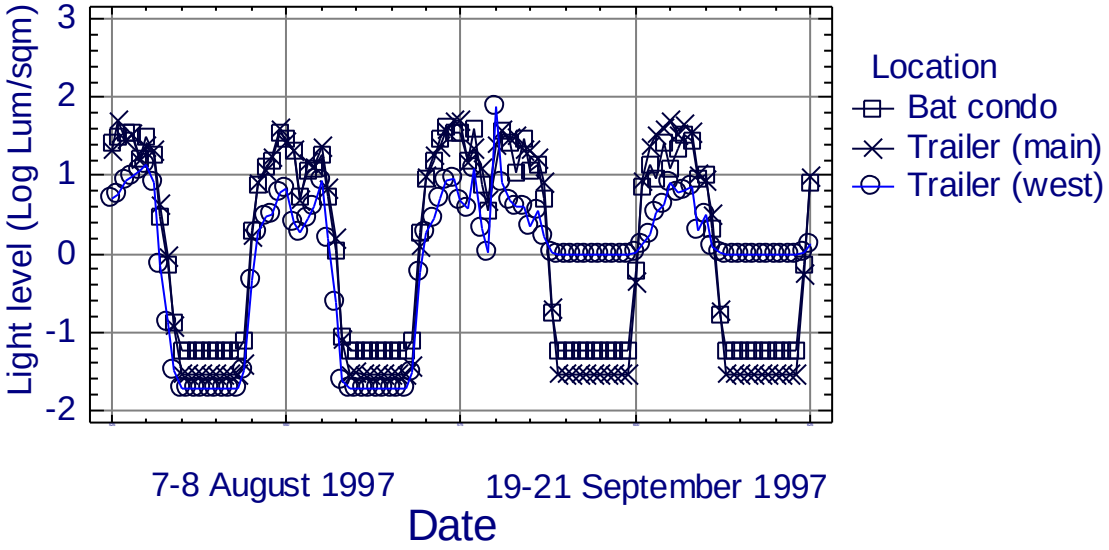


Figure 13. Time-series plot illustrating light intensity at the DWP site for illustrating a possible equipment malfunction.

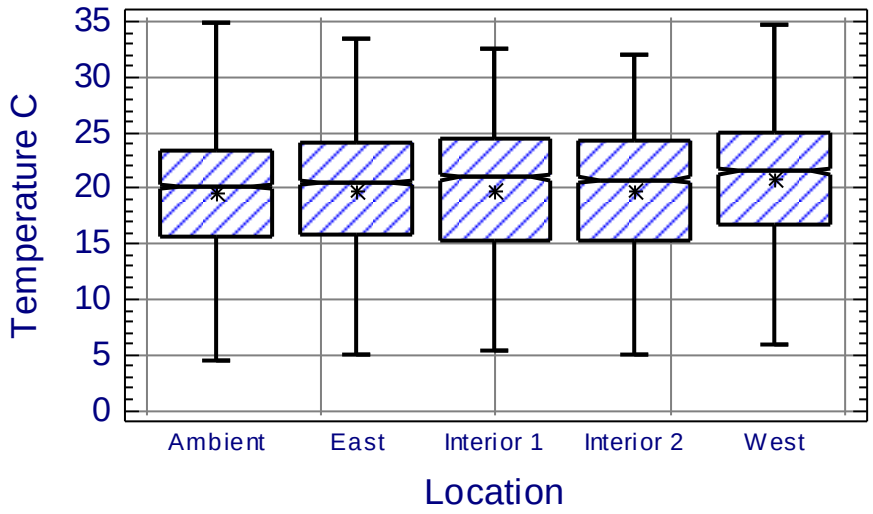


Figure 14. Box and Whisker plot illustrating temperature at the DWP trailer. Data shown are from a period monitored from July 1997 - April 1998. Asterisks (*) indicate mean values and notch indicates median value. Interior 1 is the middle bedroom and Interior 2 is the bathroom (see Figure 3).

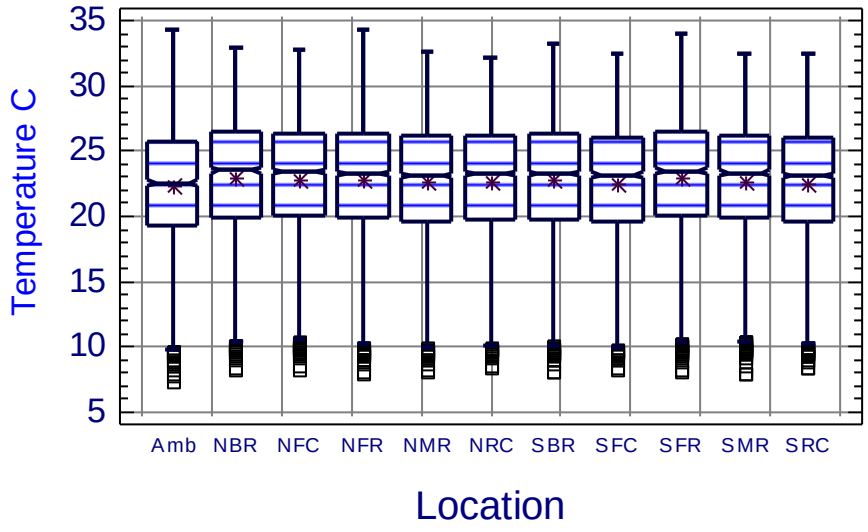


Figure 15. Box and Whisker plot illustrating temperatures in the DWP bat condo. Data shown are from a period monitored from July 1997 - April 1998. Asterisks (*) indicate mean values and notch indicates median value. Squares are outliers.

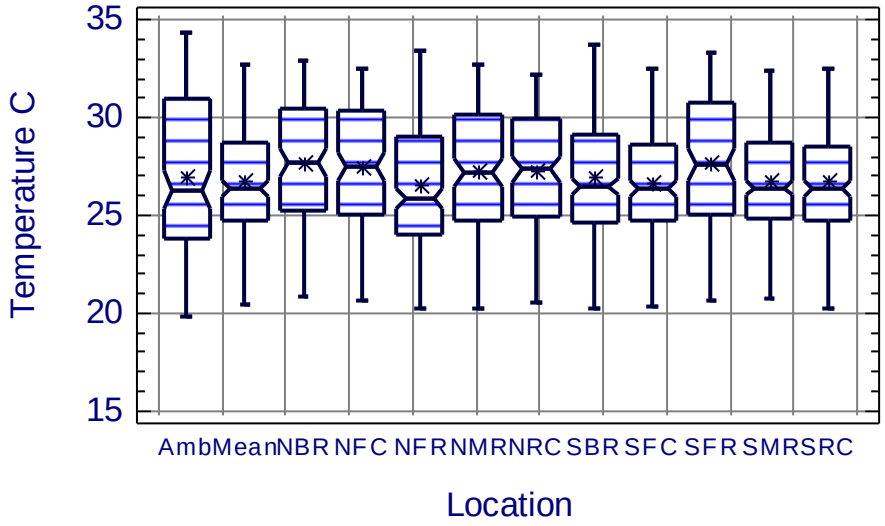


Figure 16. Box and Whisker plot illustrating temperatures in the DWP bat condo. Data shown are from a period monitored from August 1997. Asterisks (*) indicate mean values and notch indicates median value.

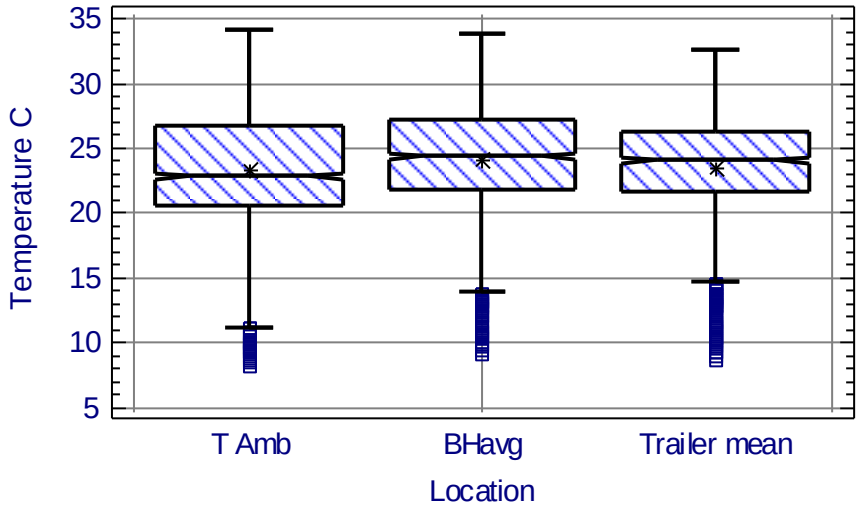


Figure 17. Box and Whisker plot illustrating temperatures in the DWP bat condo and the occupied trailer. Data shown are from a period monitored from July 1997 - April 1998. Asterisks (*) indicate mean values and notch indicates median value. Squares are outliers.

.

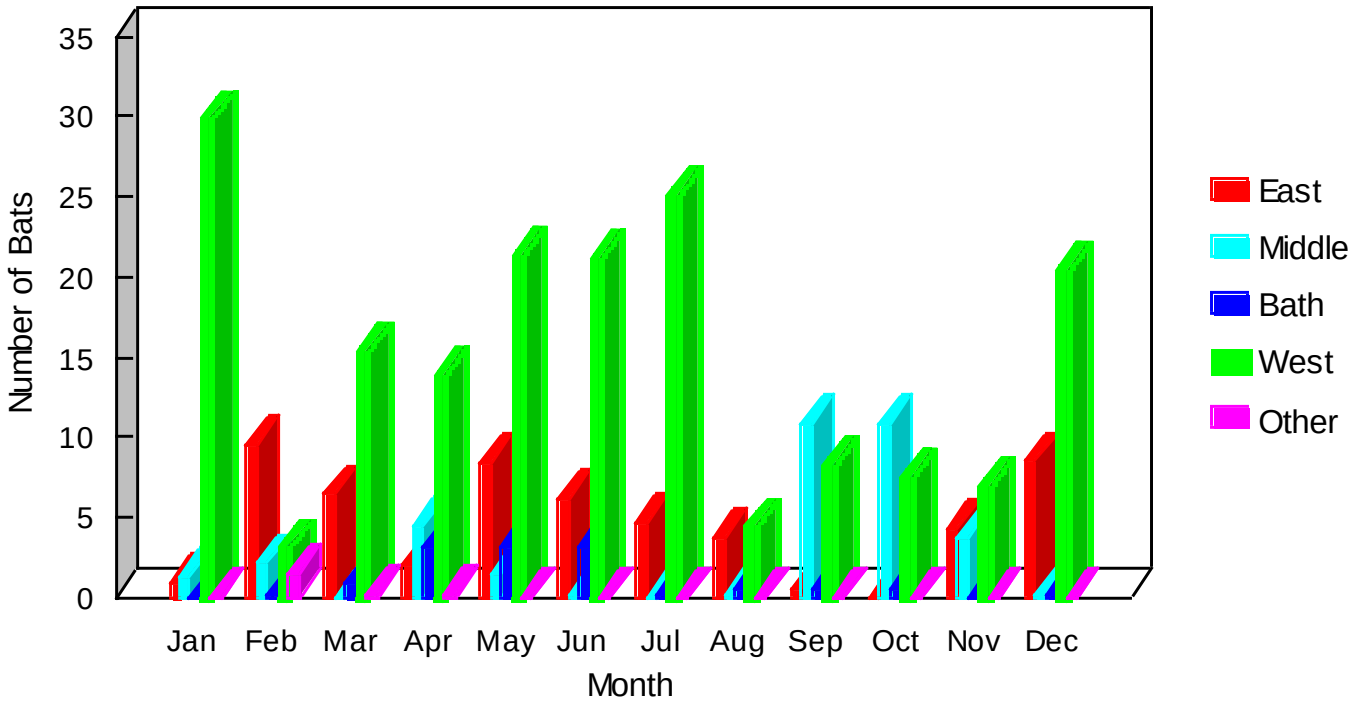


Figure 18. Mean number of bats in each room of DWP trailer, by month. Data are combined for 1995 -1998.

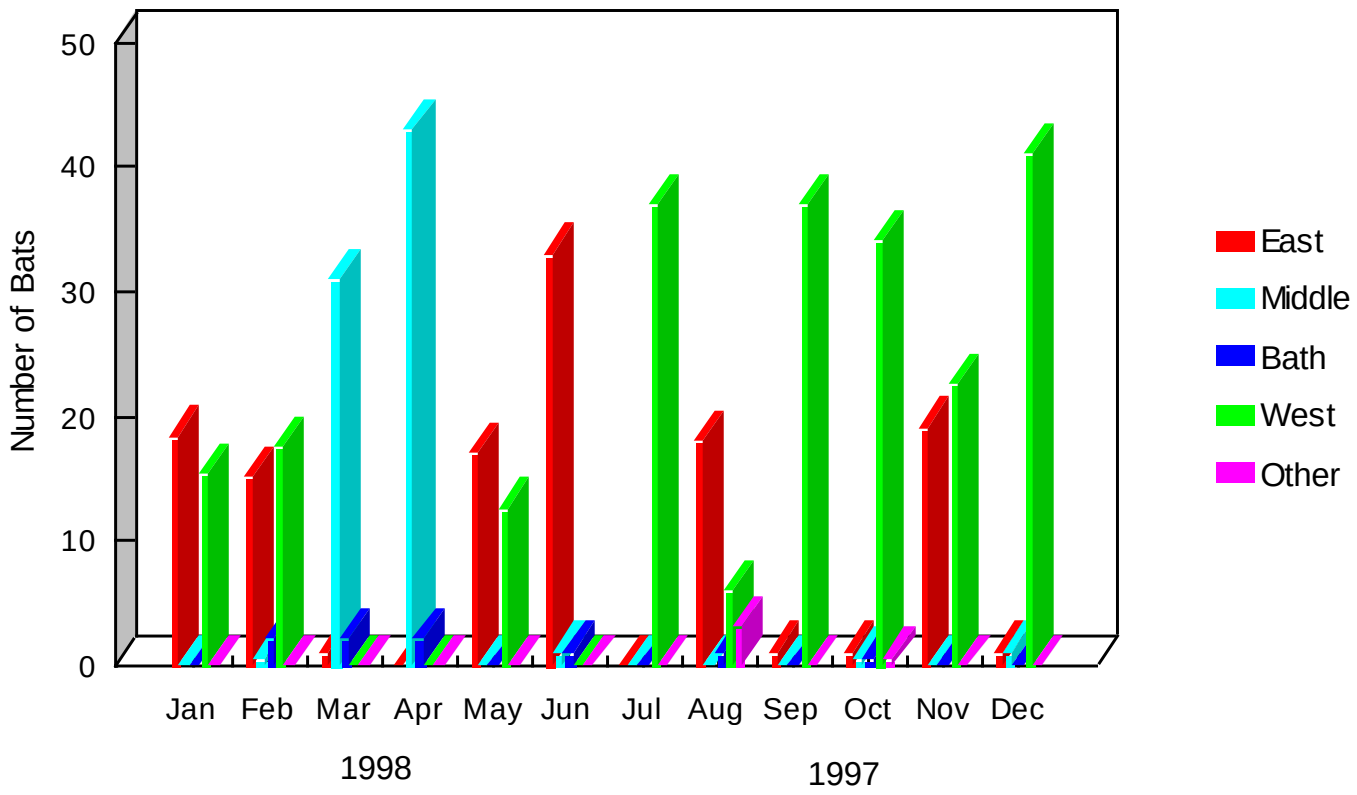


Figure 19. Number of bats in each room of DWP trailer during the 1997-1998 monitoring period.

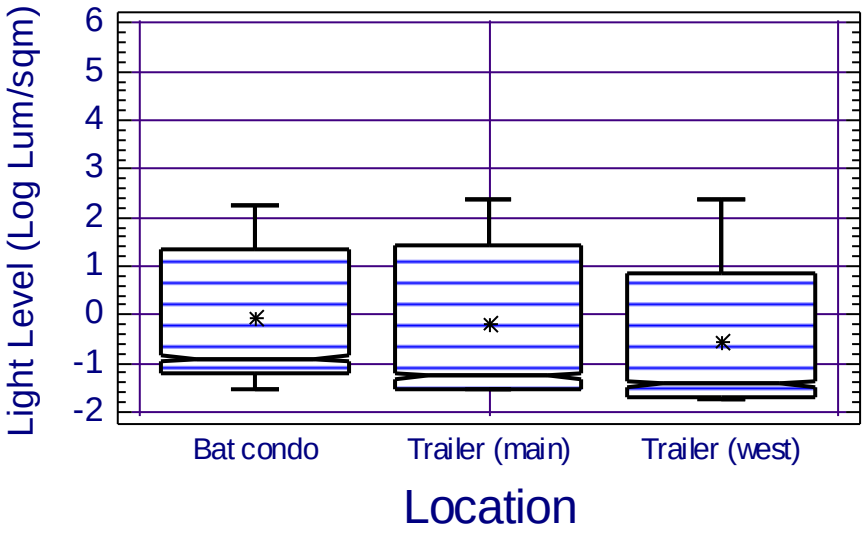


Figure 20. Box and Whisker plot illustrating light intensity (log lumens/sqm) at the DWP bat condo site. Data shown are from a period monitored from July 1997 - April 1998. Monitoring period with questionable TW data has been removed. Asterisks (*) indicate mean values and notch indicates median value.

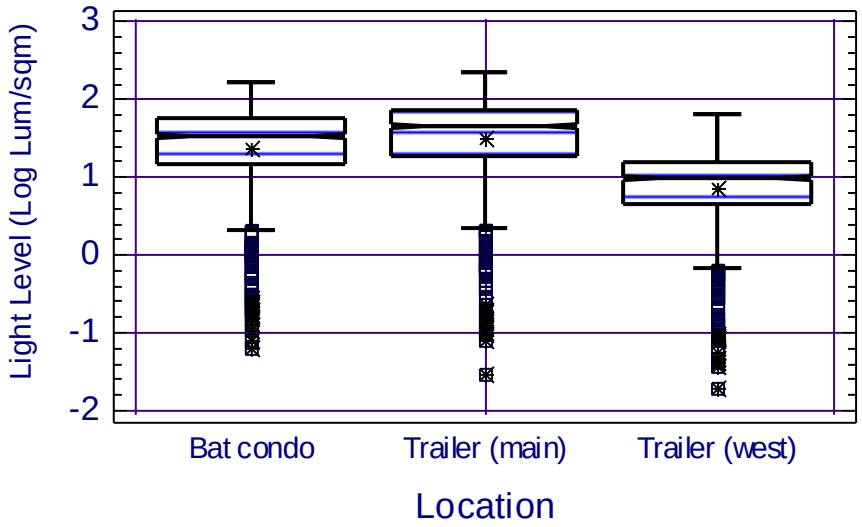


Figure 21. Box and Whisker plot illustrating light intensity (log lumens/sqm) during daylight hours only at the DWP bat condo site. Data shown are from a period monitored from July 1997 - April 1998. Monitoring period with questionable TW data has been removed. Asterisks (*) indicate mean values and notch indicates median value. Squares are outliers.

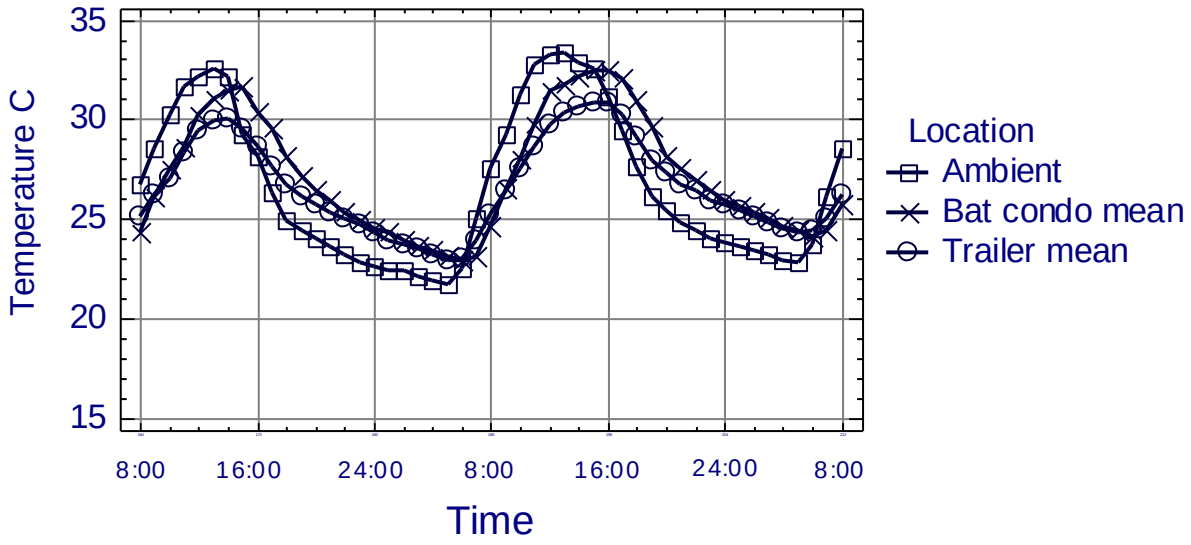


Figure 22. Time-series plot illustrating temperature at the DWP site for the time period from 8:00 15 July 1997 - 8:00 17 July 1997.

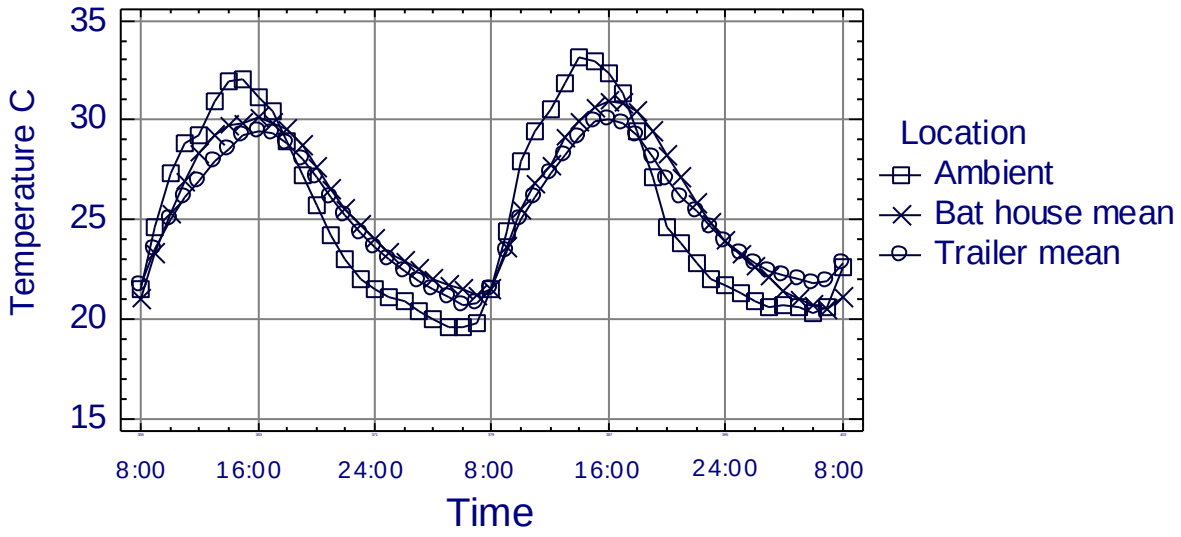


Figure 23. Time-series plot illustrating temperature at the DWP site for the time period from 8:00 20 September - 8:00 22 September 1997.

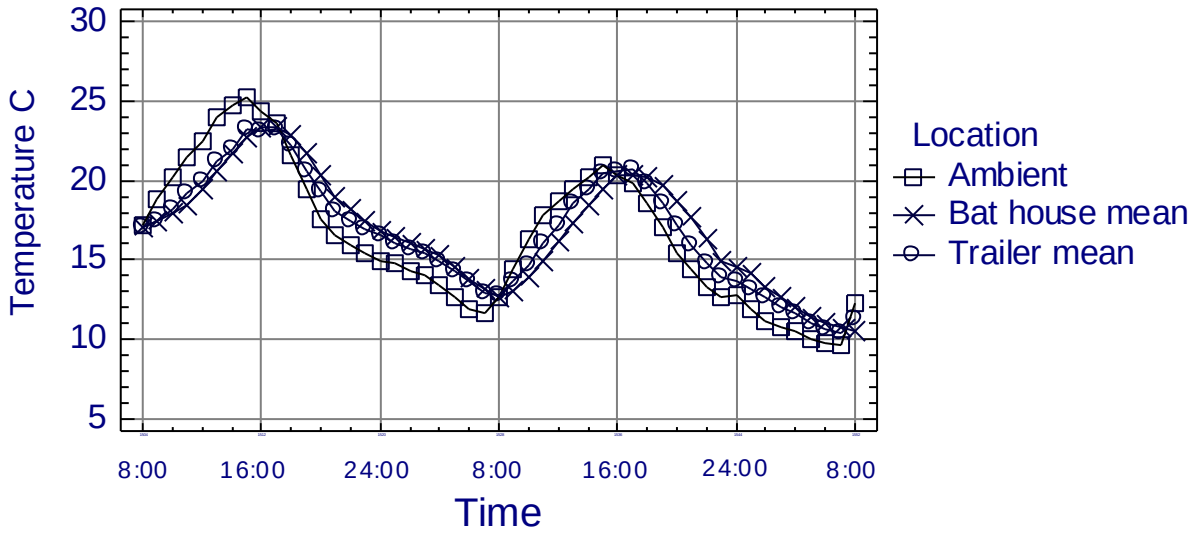


Figure 24. Time-series plot illustrating temperature at the DWP site for the time period from 8:00 10 April 1998 - 8:00 12 April 1998.

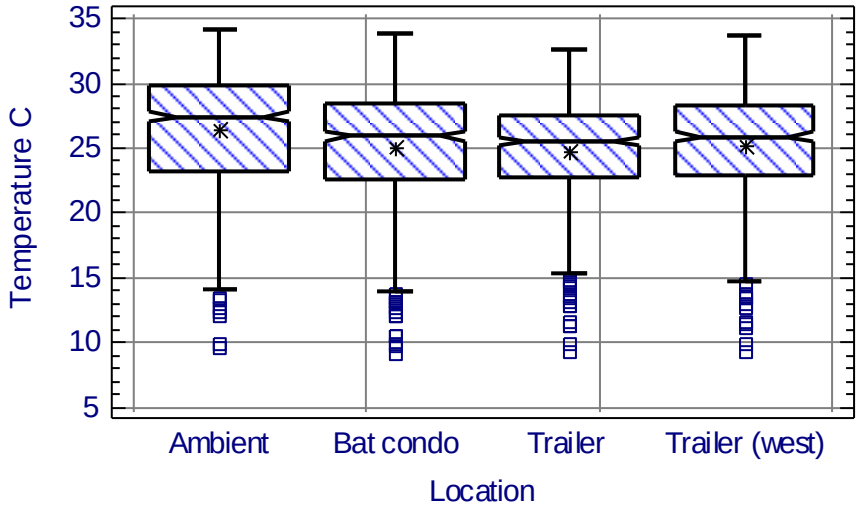
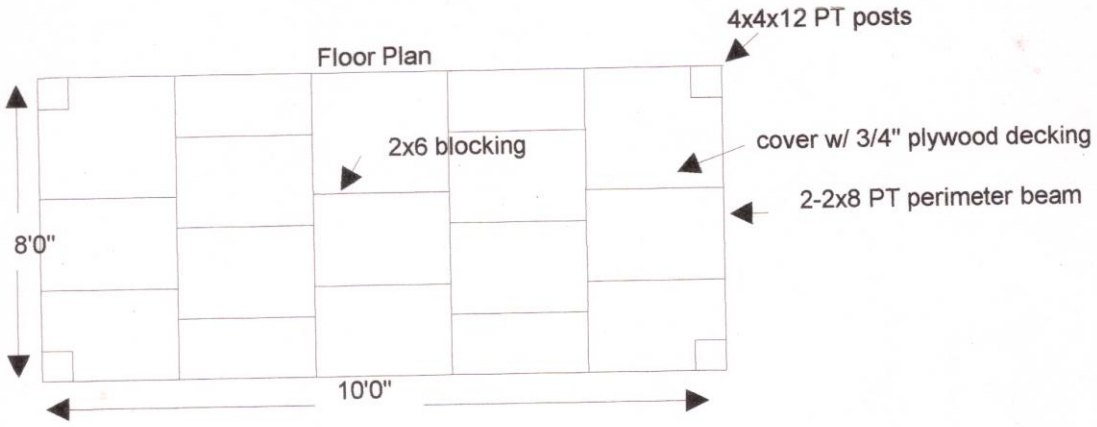


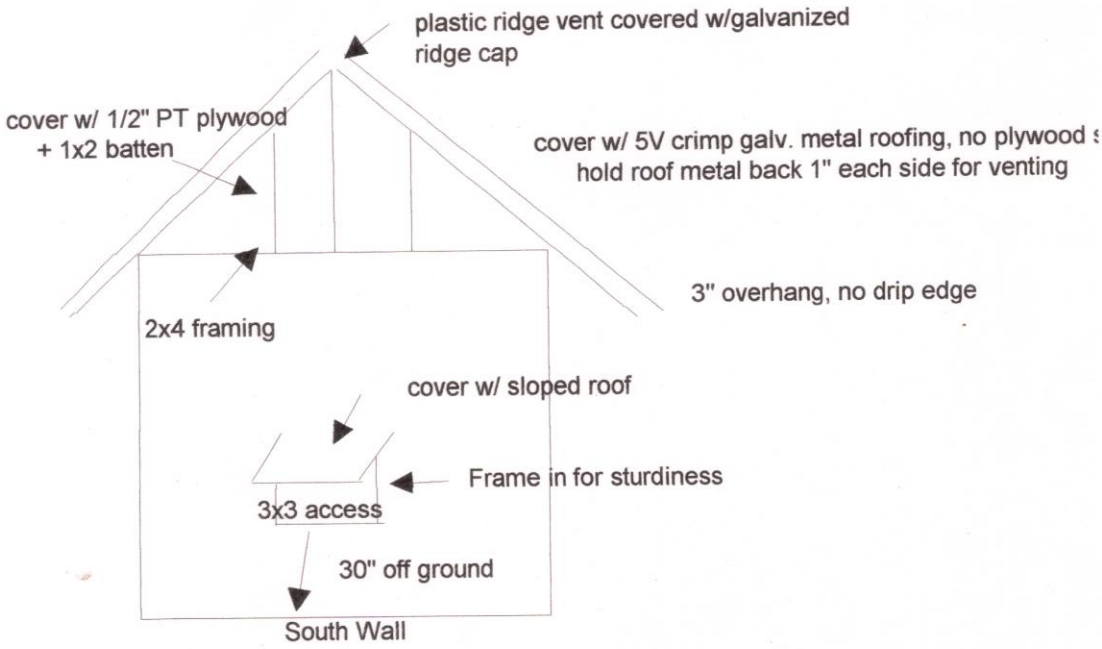
Figure 25. Box and Whisker plot illustrating daytime temperatures in the DWP bat condo and the occupied trailer. Data shown are from a period monitored from July 1997 - April 1998. Asterisks (*) indicate mean values and notch indicates median value. Squares are outliers.

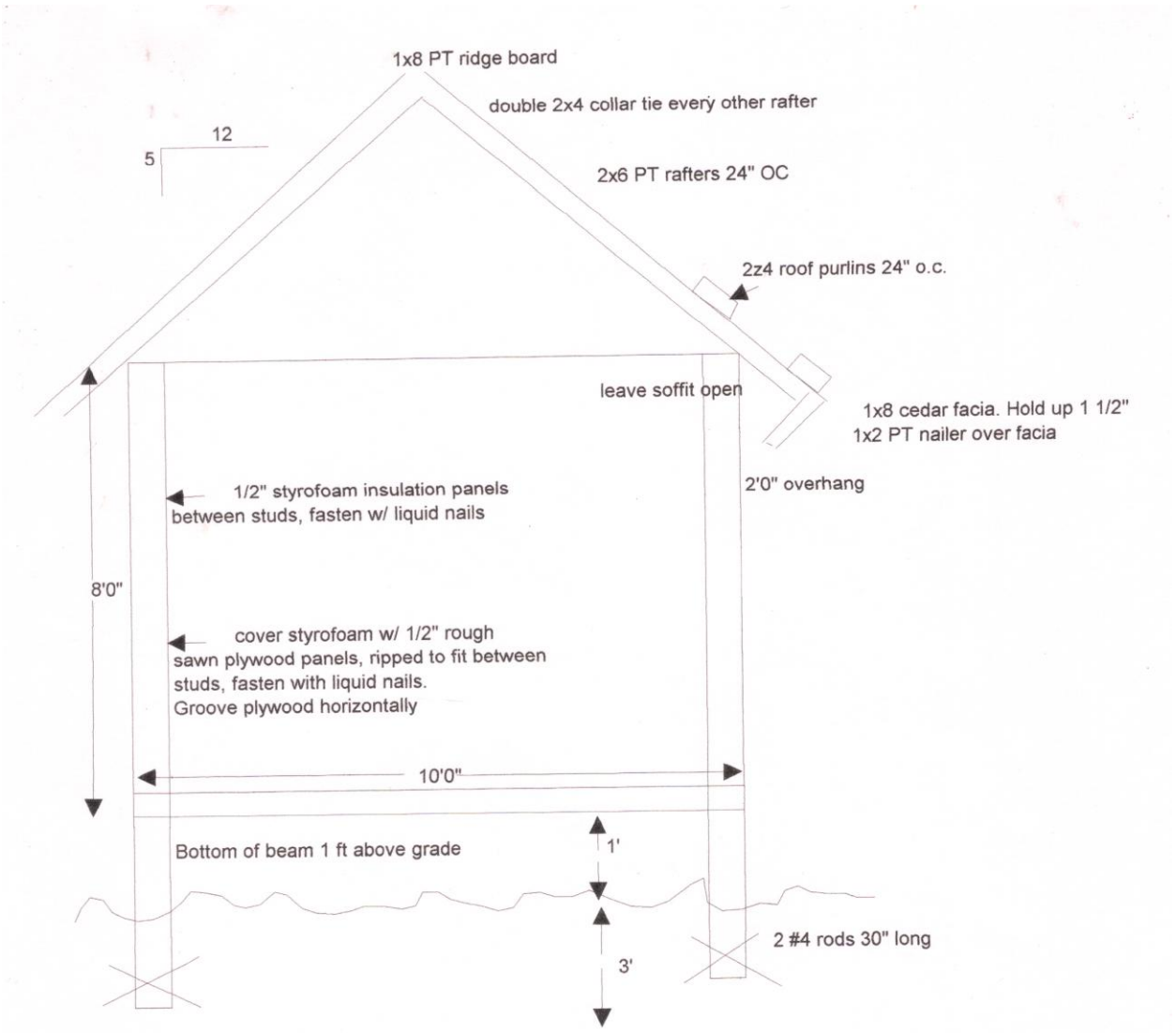
APPENDIX I

Design plans for DWP bat condo

DWP Corynorhinus Bat House







Add: 1. Since soffit is open, close spaces between wall & roof, 3 of 4 spaces on each side.
This decreases light level
2. Attach metal sheeting around bottom of house to deter predators (i.e. snakes)
3. Paint or stain a medium color
4. Caulk all seams to prevent drafts & entry of moisture

Drawing by: SFWMD

Fly By Night, Inc. The Bat Specialists
407-324-647
www.flybynightinc.com

1996 Disney Conservation Project Summary

Project Title: Environmental parameters and use of abandoned trailer and 'bat-condo' by the Southeastern big-eared bat *Corynorhinus rafinesquii macrotis* on the Disney Wilderness Preserve.

Organization Name: The Nature Conservancy / Fly By Night, Inc.
Person Completing This Report: Laura S. Finn
Address: 6075 Scrub Jay Trl., Poinciana, FL 34739 / 431 Sheryl Dr. Deltona, FL 32738
Phone: 407-935-0002 / 407-324-0647
E:Mail Address: monicaf@phoenixat.com / lsfinn@aol.com

1) What was the major goal of this project? Did you accomplish what you had planned?

The southeastern big-eared bat is a rare little known species that is highly sensitive to disturbance. There are only four known maternity colonies in Florida. The southernmost maternity colony in the species range occupies an abandoned trailer on property adjacent to the Disney Wilderness Preserve (DWP). This colony has been the focus of population monitoring supported by The Nature Conservancy, since 1995. In April 1997, Fly By Night, Inc. designed a bat condo that was constructed by volunteers from the South Florida Water Management District. The bat condo was built on DWP property, near the existing roost. Evidence of activity in the bat condo was seen after only two weeks and in August 1997 it became occupied by a single *Corynorhinus*, presumably a male. Microclimate parameters were monitored and comparisons were made between the bat condo and the occupied trailer. Results indicated that the median temperature in the bat condo is favorable for colonization. However, the relative humidity may be too low and the light level too high. A modification to the open soffit should correct this.

Goal:	Met?:
1. Design and oversee construction of bat condo on DWP property	Yes
2. Monitor environmental parameters and make comparisons between bat condo and occupied trailer	Yes
3. Make modifications to bat condo that will increase the potential of successful occupation	Yes

Firsts:
1. Design and build structure specifically for *Corynorhinus*
2. Occupation of structure specifically designed for *Corynorhinus*

2) Additional comments and conservation priorities for the region encompassed by the project.

Additional monitoring of microclimate parameters and population movements in the bat condo and trailer should continue for another full year. A radio-telemetry study to determine the location of alternate roost sites, preferred foraging area and home-range size will greatly assist our ability to prescribe conservation and management goals for this species. A statewide search for the location of additional colonies in Florida will assist managers with the knowledge of its abundance and range.

3) <u>Please share one poignant anecdote from your experience with this project</u>.
While the *Corynorhinus* colony that uses the trailer is somewhat skittish and nervous when I enter the trailer, the same can not be said for the bat that has been in the bat condo since August 1997. This bat is very watchful, the huge rabbit-like ears are always moving around, listening to everything. But, he does not appear nervous and never attempts to fly out of the roost or change his position. This is his new home.

4) <u>Please attach three or more slides that are descriptive of your project, along with appropriate captions.</u>
1. *Corynorhinus* in hand. This slide was taken by Mark Kiser of Bat Conservation International when he came to visit me and Florida bat houses. It was a cool day and although most of the bats were torpid this bat attempted to fly into another room and ended up on my leg. I picked her up and we photographed her before putting her back on the wall.
2. Bat condo with Laura Finn at the entrance
3. Group of bats in the trailer. Some have yellow bands.

5) <u>Feel free to include any materials (annual report, newsletter, etc.) which features the project.</u>
1. see attached report to TNC
2. see attached Florida Bat Center newsletter 'The Night Flyer'

Signature: _____ **Date:** _____