AQUARIUM VISITOR PARKING - WOODS HOLE

by

Herbert Stern, Jr.

Bureau of Commercial Fisheries
Biological Laboratory
Woods Hole, Massachusetts 02543
Laboratory Reference 67-1
January 13, 1967

Aquarium Visitor Parking - Woods Hole

I. INTRODUCTION

Summer traffic and parking problems have been of concern to the local community for several years. Growth of the scientific institutions, increased traffic to the islands, and increased tourist traffic have all contributed to intensifying the local problem. Since attendance at the Aquarium during the summer season is over 200,000 persons, it has generally been assumed that this facility generates a high proportion of the traffic and parking problem. However, until the present study was made, there were no data on which to base any opinion regarding the degree to which the Aquarium aggravates the summer congestion in Woods Hole.

In order to obtain such data a statistical survey was conducted during the 1966 season to estimate the total number of Aquarium visitors, the total number of cars involved, the adequacy of the Bureau's parking facilities, and the relation of the Aquarium visitors to the Island visitors.

The results of this study are useful to the Bureau in clarifying its parking problem in Woods Hole and will be useful to any planning agency studying the future development of Woods Hole.

II. METHODS

In order to meet the objectives of the study it was necessary to obtain reliable estimates of attendance, of the number of cars that Aquarium visitors brought into Woods Hole, of the number that used the Bureau's lots, the length of stay in the parking lots and the primary reason for coming to Woods Hole.

These data were obtained from a stratified sampling design for attendance counts and interviews, and from car marking experiments in the Aquarium parking lot.

The season was pre-stratified into

1) Weekends and holidays (Stratum I) and

2) Weekdays (Stratum II), other than holidays.

It was known that weather is a dominant factor relative to attendance, so the data were post-stratified into two domains of fair and inclement weather. Although the number occurrence of such days is a random variable, the total number through the season was recorded and the whole of the survey data could thus be treated in four strata.

Attendance Estimates. An electronic counter located in a passageway of the Aquarium has been used since the Aquarium opened in 1961 and was continued during the present study. Counts from this device are subject to some error. A group of people can pass it simultaneously resulting in a single count for the group. On the other hand, a certain number of small boys discover it and amuse themselves for a while making it click. Although these two errors tend to compensate, spot checks in the past have indicated that the electronic counts tend to be somewhat high.

The ratio of the observed number of visitors to the counter total was estimated from 16 one-half-hour samplings per week (out of a possible 96), selected as follows: Each week, four days were selected at random and within each of the selected days, 4 one-half-hour time periods were selected at random. All persons entering

the Aquarium during these periods were counted and the electronic counter readings were recorded at the start and end of each sampling period.

Interview Survey. To obtain the other required information samples of visitors were interviewed. They were asked the following questions: Did you come to Woods Hole by car? If so, how many persons are in your party and where did you park your car? Did you come to Woods Hole primarily to see the Aquarium or for other reasons. Are you on your way to the Islands?

The sampling design was as follows: Initially, two days per week were selected at random from each of the two strata and within each day three periods were chosen at random within the time available after the selection of sampling periods for the attendance survey. It was then possible for one employee to conduct both the attendance counts and interviews.

For each sampling period, ten parties were interviewed. At the beginning of the period, the first adult entering the Aquarium was questioned. During the interview, free movement of visitors was allowed into the Aquarium. The next adult entering the Aquarium after the completion of the first interview was selected as the second sample. This procedure was continued until ten parties had been interviewed. Thus, there were 30 interview samples per day and 60 for each stratum per week.

After the third week of surveying, analysis showed that confidence limits for Stratum II (weekdays) were too wide so the sampling periods were increased by selecting two periods per day on four days of the week, making a total of eight sampling periods (80 interviews) per week in Stratum II. This increased sampling started with Week 5 (July 16).

Length of stay in parking lot. The rate of turnover in the parking lot was estimated from marking experiments conducted on two different weekdays. The details of estimation are in Appendix C.

III. RESULTS

Attendance. Attendance was estimated in all cases by multiplying the counter total (for each day or stratum) by the corresponding estimate of the stratum ratio. This ratio varied somewhat from stratum to stratum; the overall estimate was 0.88 (See Appendix A).

In 1966 the Aquarium was open from June 18 to September 11. The estimated daily attendance and state of the weather is presented in Table 1. Total attendance for the 86-day season was 229,000 (± 7,960). The average daily attendance was 2,663.

The state of the weather has a marked effect on the Aquarium attendance. During days of inclement weather daily attendance is, on the average, about 1,500 higher than on fair days. Table 2 presents a breakdown of attendance by type of day and weather.

Total attendance has increased slightly each season since the new Aquarium opened in 1961. The average daily attendance, however, has not varied much and does not show any definite trend. The seasonal totals depended on the number of days the Aquarium was open. Seasonal and average daily attendance figures are presented in Table 3.

Table 1. --Daily Aquarium Attendance, Summer 1966

Date	Attendance	Weather
June 18 (Sat)	1,826	Fair
June 19 (Sun)	3,204	Inclement
June 20 (Mon)	1,619	Fair
June 21 (Tues)	1,535	Fair
June 22 (Wed)	1,476	Fair
June 23 (Thurs)	1,899	Fair
June 24 (Fri)	972	Fair
June 25 (Sat)	3,752	Inclement
June 26 (Sun)	3,634	Inclement
June 27 (Mon)	1,990	Fair
June 28 (Tues)	1,561	Fair
June 29 (Wed)	3,079	Inclement
June 30 (Thurs)	1,358	Fair
July 1 (Fri)	1,703	Fair
July 2 (Sat)	1,166	Fair
July 3 (Sun)	1,973	Fair
July 4 (Mon)	2,050	Fair
July 5 (Tues)	2,296	Fair
July 6 (Wed)	3,788	Inclement
July 7 (Thurs)	4,293	Inclement
July 8 (Fri)	1,726	Fair
July 9 (Sat)	2,259	Fair
July 10 (Sun)	3,502	Inclement
July 11 (Mon)	2,111	Fair
July 12 (Tues)	2,734	Fair
July 13 (Wed)	2,792	Fair
July 14 (Thurs)	3,737	Inclement
July 15 (Fri)	2,234	Fair
July 16 (Sat)	2,393	Fair
July 17 (Sun)	2,631	Fair
July 18 (Mon)	2,446	Fair
July 19 (Tues)	3,353	Fair
July 20 (Wed)	4,563	Inclement
July 21 (Thurs)	2,439	Fair
July 22 (Fri)	2,493	Fair
July 23 (Sat)	2,307	Fair

* Holiday

Date	Attendance	Weather
July 24 (Sun)	2,520	Fair
July 25 (Mon)	2,662	Fair
July 26 (Tues)	4,147	Inclement
July 27 (Wed)	3,098	Fair
July 28 (Thurs)	4,291	Inclement
July 29 (Fri)	2,892	Inclement
July 30 (Sat)	3,318	Inclement
July 31 (Sun)	3,117	Inclement
August 1 (Mon)	1,921	Fair
August 2 (Tues)	4,095	Inclement
August 3 (Wed)	2,919	Fair
August 4 (Thurs)	3,105	Fair
August 5 (Fri)	3,949	Inclement
August 6 (Sat)	1,947	Fair
August 7 (Sun)	2,502	Fair
August 8 (Mon)	4,209	Inclement
August 9 (Tues)	3,701	Inclement
August 10 (Wed)	4,459	Inclement
August 11 (Thurs)	3,845	Inclement
August 12 (Fri)	3,100	Inclement
August 13 (Sat)	2,079	Fair
August 14 (Sun)	2,707	Fair
August 15 (Mon)	3,905	Inclement
August 16 (Tues)	4,272	Inclement
August 17 (Wed)	2,324	Fair
August 18 (Thurs)	2,559	Fair
August 19 (Fri)	2,536	Fair
August 20 (Sat)	2,369	Fair
August 21 (Sun)	2,726	Fair
August 22 (Mon)	3,676	Inclement
August 23 (Tues)	3,745	Inclement
August 24 (Wed)	2,339	Fair
August 25 (Thurs)	2,773	Fair
August 26 (Fri)	2,066	Fair
August 27 (Sat)	2,058	Fair
August 28 (Sun)	2,489	Fair
August 29 (Mon)	2,273	Fair
August 30 (Tues)	3,323	Inclement
August 31 (Wed)	2,640	Fair
September 1 (Thurs)	2,809	Inclement
September 2 (Fri)	1,641	Fair
September 3 (Sat)	3,514	Inclement

Date	Attendance	Weather
September 4 (Sun)	3,785	Inclement
* September 5 (Mon)	2,073	Fair
September 6 (Tues)	851	Fair
September 7 (Wed)	908	Fair
September 8 (Thurs)	912	Fair
September 9 (Fri)	1,253	Inclement
September 10 (Sat)	1,108	Fair
September 11 (Sun)	1,879	Fair

* Holiday

Table 2. --Daily attendance in relation to type of day and weather.

Stratum	Attendance		
	Average	Min.	Max.
Weekdays, fair weather	2,119	851	3,353
Weekend days (+ holidays), fair weather	2,190	1,108	2,726
Weekdays, inclement weather	3,686	1,253	4,563
Weekend days (+ holidays), inclement weather	3,475	3,117	3,785
Average	2,663		

Table 3. --Seasonal and average daily attendance for a six-year period, adjusted electronic counter readings.

Year	No. days open	Season attendance	Average daily attendance
1961	72	186,000	2,583
1962	78	199,300	2,555
1963	72	208,900	2,901
1964	86	224,900	2,615
1965	86	219,400	2,551
1966	86	229,000	2,663

Number of cars. The number of persons per car, obtained from the interviews, varied from 1 to 13 with an overall average of 4.2. It is interesting to note that the number was higher in inclement weather than on clear days (Table 4).

The number of cars per day was computed by dividing the daily attendance by the average number of persons per car. These estimates are shown for different attendance levels in Table 5. On 85% of the days, the number of cars varied between 240 and 950 (Table 5). The average numbers for the four strata are shown in Table 6. For estimators and confidence limits of the interview survey see Appendix B.

Parking spaces required. The number of parking spaces required depends upon the length of time each car is parked. An analysis of the data from the turnover rate experiments show that the average length of stay is about 30 minutes. Approximately 50% of the cars in the parking lot stayed a little less than 30 minutes, 23% stayed three-quarters of an hour and the maximum length of stay was about two hours. The Aquarium lot with its 30 parking spaces can accommodate about 260 cars per day (Appendix C). The spaces required for different attendance levels are shown in Table 5 and for the four strata in Table 6.

Table 4. --Number of persons per car.

Weekend days, fair weather	4.1
Weekend days, inclement weather	4.3
Weekdays, fair weather	4.0
Weekdays, inclement weather	4.6
Average	4.2

Table 5. --Parking requirements for different attendance levels.

Attendance class (No. persons/day)	Frequency of occurrence Days (percent)	Estimated no. cars/day	Estimated no. parking spaces required
500 (0-1000)	4 (4.65%)	120 (0-239)	14 (0-28)
1500 (1001-2000)	18 (20.93%)	359 (239-478)	42 (29-56)
2500 (2001-3000)	34 (39.53%)	598 (478-717)	69 (57-83)
3500 (3001-4000)	22 (24.42%)	837 (717-956)	97 (84-111)
4500 (4001-5000)	8 (9.30%)	1076 (956-1195)	125 (112-138)

Table 6.--Parking requirements for different types of conditions.

	Average		
	Attendance	Cars	Spaces required
Weekdays, fair weather	2,119	527	61
Weekend days (+ holidays), fair weather	2,190	537	62
Weekdays, inclement weather	3,686	803	93
Weekend days (+ holidays), inclement weather	3,475	801	94
Average	2,663	637	74

Where did they park? Visitors to the Aquarium may park their cars (1) in commercial parking lot if they are going to the Islands, (2) on the street, or (3) in Government parking lot. There are two Government parking areas: (1) the Aquarium visitor parking lot which is open to the public every day, and (2) the Laboratory staff parking area which is open to the public only on non-work days. The Aquarium lot has spaces for 30 cars; the Laboratory parking area can accommodate 50 cars. Thus, there are 30 spaces available on work days and 80 spaces on non-work days.

The bulk of the visitors interviewed said they parked their cars either in a Government lot or on the street. The average percentage using Government parking areas varied from 36 to 58 depending upon type of day and weather (Table 7).

Adequacy of Government parking areas. As noted above, the Aquarium parking lot experiment showed that the Aquarium parking lot can handle a peak load of about 260 cars per day. Using the ratio of 8.6 cars per space derived from the study we estimate that the staff parking area can accommodate another 430 cars or a total of 690 cars per day for the two lots.

On non-work days there never was a parking problem. The staff parking lot was never completely filled. Table 7 shows that on the average inclement weekend day 801 cars were parked in Woods Hole by Aquarium visitors. This is more than the 690 cars the Government lots can handle. In actual fact, only 58% or 465 cars used the Government lots on average inclement weekend days, indicating a large surplus of Government parking space on those days. Evidently, street parking areas were not taxed to their limits on these days.

Table 7. --Average daily parking pattern (number of cars and percent).

	Non-work days		Weekdays		
	Fair weather	Inclement weather	Fair weather	Inclement weather	Average
Government parking lot	312 (58%)	465 (58%)	221 (42%)	289 (36%)	306 (48%)
On street	188 (35%)	280 (35%)	239 (45%)	466 (58%)	274 (43%)
Commercial parking lot	5 (1%)	8 (1%)	23 (4%)	8 (1%)	12 (2%)
Other areas *	32 (6%)	48 (6%)	44 (8%)	40 (5%)	45 (7%)
Total	537 (100%)	801 (100%)	527 (100%)	803 (100%)	637 (100%)

* Private and motel areas

On weekdays in fair weather there was again no problem, because the average use of the Aquarium lot was only 221 cars, which is less than its capacity of 260 cars. Apparently, on these days also, the street parking was not overtaxed.

On inclement weekdays a problem develops. The average attendance on these days results in 803 cars which overtaxes both the street and the Aquarium parking lot. Visitors parked 466 cars on the street on average inclement weekdays, which, assuming the Aquarium lot turnover rate, would require about 54 spaces; and on peak weekdays when the attendance ran to 4,000, the number of cars parked on the streets ran to more than 505 requiring about 59 parking spaces.

The Aquarium as a tourist attraction. The survey questioning provided information on the extent to which the Aquarium attracted persons to Woods Hole. We were interested in knowing whether the Aquarium actually attracted large numbers of people to Woods Hole or whether it simply served those who came for other reasons. There is a heavy traffic through Woods Hole to Martha's Vineyard and Nantucket and we were interested in knowing how many of the Aquarium visitors were persons waiting for the ferry or combining a trip to Woods Hole and the Islands.

Results of the survey show that only 10% of the Aquarium visitors were on their way to the Islands (Table 8). This is important information as it means that traffic and parking problems associated with the Aquarium and the Steamship Authority are for

Table 8. --Purpose of visit to Woods Hole.

To see Aquarium	43%
To visit the Islands	10%
Residents	3%
For other reasons	44%

the most part independent. Only 43% of the visitors said they came specifically to see the Aquarium. The greatest percentage of the visitors stated they came to Woods Hole for "other" reasons, such as "just drove down to see Woods Hole" or "we had always heard of Woods Hole" or "we were just driving around the Cape." Apparently, these people were part of that great body of summer tourists who choose a general area to see and then visit all the available points of interest.

IV. CONCLUSIONS

1. Average daily attendance at the Aquarium in the summer of 1966 was 2,663. This is somewhat higher than the daily attendance in the previous year but not so high as that for 1963. There has been no definite trend in daily attendance since the new Aquarium opened in 1961.

2. Very few Aquarium visitors are on their way to the Islands. Therefore, any traffic or parking problem generated by the Aquarium visitors is separate from those of the Steamship Authority.

3. Less than half of the Aquarium visitors came to Woods Hole specifically to see the Aquarium. Almost half came as general tourists to see the Woods Hole area and the ocean.

4. The station's parking facilities made available to Aquarium visitors on Saturday, Sunday, and holidays (80 spaces) are more than adequate to handle the Aquarium visitors' cars on those days even on the most crowded days.

5. On the average fair weather weekday the Aquarium parking lot (30 spaces) was not overtaxed, indicating the combined available parking on the street and in the Aquarium parking lot was adequate on such days.

6. On inclement weekdays parking is a problem. Judging from the number of cars parked on the street (239) on fair weather weekdays when the Aquarium parking lot was not utilized to capacity, we may assume there were roughly 28 parking spaces readily available on the street. The average inclement weekday requires about 93 parking spaces. With 28 available on the street and 30 in the Aquarium lot, another 35 are required. On a day of high density (4,000 visitors), about 50 additional parking spaces are required in order to prevent an undesirable parking pressure on the quiet residential section of Woods Hole and annoyance to the Aquarium visitors.

APPENDIX A - ATTENDANCE SURVEY

The estimated ratio for each stratum is

$$\hat{R}_h = \bar{y}_h / \bar{x}_h \ ,$$

where y_h = mean of the observed counts of visitors in the h stratum,

x_h = mean of the electronic counter record during the observed counting period in the h stratum.

and the combined ratio is,

$$\hat{R}_c = \frac{\Sigma N_h \bar{y}_h}{\Sigma N_h \bar{x}_h}$$

The estimate of total attendance for any stratum is computed by,

$$\hat{Y}s_h = \hat{R}_h X_h$$

and total attendance is estimated by,

$$\hat{Y}_s = \Sigma \hat{R}_h X_h$$

Variances and confidence limits of these estimates follow Cochran (1963)* and are presented in Table A-1.

The estimated confidence limits for total attendance fell within the 5% limits while those for three of the individual strata were a little greater (7-8%). Variances of the ratios were very low.

---

* Cochran, William G. 1963. Sampling Techniques. John Wiley and Sons. pp. 154-170.

Table A-1. --Statistical evaluation of the attendance survey.

Statistic *	Weekends & Holidays: Fair weather	Weekends & Holidays: Inclement weather	Weekdays: Fair weather	Weekdays: Inclement weather	Total
N_h	280	112	504	308	1,204
n_h	48	16	74	53	191
$\bar{y}_h$	159.667	251.063	123.514	292.623	
$\bar{x}_h$	187.042	255.000	150.649	317.264	
X_h	51,245	28,251	93,000	87,993	260,489
S^2_{yh}	3,124	8,115	3,779	9,348	
S^2_{xh}	5,861	6,134	4,451	3,865	
r_h	.6512	.9199	.8763	.5533	
$\hat{R}_h$	.854	.985	.820	.922	.885
Z_h	2,539	1,281	878	6,494	
$v(\hat{Y}_{Rh})$	3,436,959	860,966	2,571,135	9,624,142	16,493,203
$\hat{Y}_{Rh}$	43,763	27,827	76,260	81,129	228,980
$D(\hat{Y}_{Rh})$	$\pm$ 3,111	$\pm$ 1,977	$\pm$ 3,193	$\pm$ 6,223	$\pm$ 7,960
$D/\hat{Y}_{Rh}$	.0852	.0710	.0419	.0767	.0348
$v(\hat{R}_{sh})$	.0000067	.0000055	.0000015	.0000063	.0000200
D(95%)	$\pm$ .0164	$\pm$ .0158	$\pm$ .0078	$\pm$ .0160	$\pm$ .0088
$D/\hat{R}_{sh}$	.0192	.0160	.0095	.0173	.0099

* Definitions of statistics

r = correlation coefficient x, y

$Z = S^2_y + \hat{R}^2 S^2_x - Z\hat{R}\, r\, Sy\, Sx$

v ( ) = variance

N_h = population number of observational periods

n_h = sample number

D = confidence limits at 95% probability level

D/estimate = precision of estimate

APPENDIX B. INTERVIEW SURVEY

The interviews provided estimates of the number of persons per car, the proportion of cars parked in various areas and the proportion of attendees who were in Woods Hole for various reasons. These data, combined with the attendance estimates provided the following estimates of interest, which are tabulated in Table B-1.

The estimated number of cars brought into Woods Hole by Aquarium visitors,

$$\hat{C}_h = \hat{Y}_{sh} / \bar{c}_h$$

where $\bar{c}_h$ = number of persons per car in the $\underline{h}$ stratum. Fiducial limits of this estimate were calculated using Fieller's theorem with the Behrens distribution (Finney, 1964*). The density distribution of c was skewed right, but a normal distribution was used for calculating variance.

The estimated number of cars that utilized the various parking areas,

$$\hat{A}_{hi} = \hat{C}_h \; p_{hi}$$

where p_{hi} = proportion of cars from the interview survey using the $i^{\underline{th}}$ area

---

*Finney, D. J. 1964. Statistical Method in Biological Assay. Charles Griffin & Co., pp. 24-35.

The estimated number of persons visiting Woods Hole for reasons of interest,

$$\hat{Y}_{hj} = \hat{Y}_{sh} \; p_{hj}$$

where p_{hi} = proportion of people from the interview survey who came to Woods Hole for the $j^{\underline{th}}$ reason.

The variances of $\hat{A}_{hi}$ and $\hat{Y}_{hj}$ were estimated by adding the component variances, using binomial variation, pq/n, for the proportions.

Table B-1. Estimates, variances and confidence limits for certain items from the interview survey.

Estimate of	Estimate	Variance	Confidence Limits (95%)	Precision (95%)
No. of cars	53,800		+ 2,204 - 2,161	
People per car				
Total	4.184	.0018	± .0832	.0199
Weekends, fair weather	4.078	.0051	± .1400	.0343
Weekends, inclement weather	4.340	.0162	± .2495	.0575
Weekdays, fair weather	4.016	.0052	± .1413	.0353
Weekdays, inclement weather	4.592	.0100	± .1960	.0427
Proportion of cars in Aquarium parking lots				
Total	.4822	.0002	± .0239	.0495
Weekends, fair weather	.5749	.0005	± .0607	.0723
Weekends, inclement weather	.5800	.0012	± .0678	.1169
Weekdays, fair weather	.4194	.0005	± .0416	.0991
Weekdays, inclement weather	.3564	.0008	± .0555	.1556
Proportion of persons who came to Woods Hole primarily to see Aquarium				
Total	.4265	.00004	± .0071	.0166
Weekends, fair weather	.4071	.00011	± .0206	.0506
Weekends, inclement weather	.4782	.00029	± .0334	.0698
Weekdays, fair weather	.4076	.00011	± .0206	.0505
Weekdays, inclement weather	.4559	.00019	± .0268	.0588

APPENDIX C. Length of Stay and Capacity of Aquarium Parking Lot.

Operational design of survey. To ascertain lengths of stay in the Aquarium parking lot and to determine the number of cars that the lot could accommodate per day, cars were counted and marked at 15-minute intervals over a 1-1/2 hour period as follows:

1st count - At the beginning of the period to be checked the number of cars in the parking lot were recorded and each car was marked (on a rear tire) with an "I".

2nd count - Fifteen minutes from the start of the period, the lot was again checked and the number of cars remaining with an "I" mark were counted and recorded.

3rd count - Thirty minutes from the beginning of the period the number of cars remaining in the lot with "I" marks were recorded and all cars without a mark were counted and marked with a "II".

4th count - Forty-five minutes from the period's start, the number of cars in the lot that had "I" or "II" markings were counted and separately recorded.

This process continued at 15-minute intervals, so each 1-1/2 hour sampling period contained seven counts. Because of the limited amount of time available in which to conduct each count, the counting and marking routine was carried out at every other time interval (1, 3, 5, 7) while counts only were conducted at the remaining intervals (2, 4, 6).

Results. Two samplings were conducted on both August 22 and August 30, and the number of cars remaining at each interval was recorded (Table C-1). The proportion (P) of cars remaining of the original number marked at each time interval was determined. As an example: to find the proportion of cars present for 1/4 hour on the morning sampling of August 22, divide 21 by 28. All proportions are given in Table C-2.

These proportions were plotted on logarithmic probability paper and the percent of cars remaining at each time interval was read directly from the plots (Figure C-1).

To determine the number of cars that could be handled by the Aquarium parking lot,

$$L = \Sigma\, t_i\, p_i\, S$$

where t_i = total hours/i^{th} time interval

p_i = proportion of the cars utilizing the i^{th} time interval (average of both experiments)

$S = 30$ = number of parking spaces available.

We chose to make our estimate conservative by not including the first hour when attendance is usually low and by using three discrete points on the probability duration curve (50%, 75%, 100% at two hours) rather than integrating completely over the curve.

The results are shown in Table C-3.

To generate the number of parking spaces required per day for any attendance level,

$$S = A/(\sim\overline{c})$$

where A = attendance level desired

$\curvearrowright$ = the number of cars per day per parking space

$\bar{c}$ = number of people per car.

For our data, $\curvearrowright = 260/30 = 8.6$

$c = 4.2$

Table C-1. Number of cars remaining in Aquarium parking lot at 1/4 hour intervals for four 1-1/2 hour periods.

1. August 22, Morning

Interval No.	Time	No. cars remaining at each time interval I	II	III	IV
1	1100	28			
2	1115	21			
3	1130	17	12		
4	1145	13	10		
5	1200	5	4	13	
6	1215	2	3	8	
7	1230	2	3	6	16

2. August 22, Afternoon

Time	No. cars remaining at each time interval I	II	III	IV
1400	29			
1415	25			
1430	16	9		
1445	12	9		
1500	8	6	12	
1515	7	6	11	
1530	4	3	5	15

3. August 30, Morning

Interval No.	Time	No. cars remaining at each time interval I	II	III	IV
1	1030	21			
2	1045	19			
3	1100	13	12		
4	1115	6	5		
5	1130	3	3	18	
6	1145	2	1	16	
7	1200	1	0	10	15

4. August 30, Afternoon

Time	No. cars remaining at each time interval I	II	III	IV
1400	27			
1415	15			
1430	10	15		
1445	7	9		
1500	3	4	19	
1515	3	2	15	
1530	2	0	10	13

Table C-2. --Proportion of cars remaining in Aquarium parking lot for each time interval.

Time interval (hr)	1. August 22, Morning			2. August 22, Afternoon		
	Proportions of cars remaining in lot			Proportions of cars remaining in lot		
1/4	.7500	.8333	.6154	.8621	1.0000	.9167
1/2	.6071	.3333	.4615	.5517	.6667	.4167
3/4	.4643	.2500		.4138	.6667	
1	.1786	.2500		.2759	.3333	
1-1/4	.0714			.2414		
1-1/2	.0714			.1379		
	3. August 30, Morning			4. August 30, Afternoon		
1/4	.9048	.4167	.8889	.5556	.6000	.7895
1/2	.6190	.2500	.5556	.3704	.2667	.5263
3/4	.2857	.0833		.2593	.1333	
1	.1429	.0000		.1111	.0000	
1-1/4	.0952			.1111		
1-1/2	.0476			.0741		

Table C-3. --Estimate of number of cars that can be accommodated per day by the Aquarium parking lot

1. Weekdays				
i	t	p	s	No. parked per day
1/2	12	.50	30	180
3/4	8	.23	30	55.2
2	3	.27	30	24.3
				259.3 = 260
2. Weekends				
1/2	12	50	80	480
3/4	8	23	80	147.2
2	3	27	80	64.8
				692.0

Fig. 4. Plots of duration of stay in Aquarium parking lot. (Open circles represent average stay for each time interval.)