Visitor behavior research has become an essential component to many museum programs. Since its opening to the public in 1965, Oregon State University's Mark O. Hatfield Marine Science Center Aquarium in Newport, it has been visited by millions of people. A clear understanding of who this audience was and what they actually did while viewing the exhibits in the aquarium had never been achieved. This descriptive study describes fall season visitors and their circulation patterns. The goal of the study was to understand the interrelationships between visitors, exhibits and the physical layout of the aquarium. One purpose of the study was to provide information that would aid staff members with long range planning decisions that include the design of new exhibits and the renovation of older displays. Besides identifying the aquarium's fall audience, demographic data on visitors was desired to gain a clearer understanding of populations that did not visit the museum.
Two-hundred and forty participants responded to a survey questionnaire administered by HMSC volunteers and the author. Forty unobtrusive observations of visitors were collected by the author. Respondents included all age groups; however, the young adults (late teens, early twenties) were underrepresented. Over half of the respondents had visited HMSC before; 81% of repeat visitors were from Oregon.

A positive correlation was shown to exist between group size and the length of visit. The larger the group the longer the group tended to visit in the aquarium. The average time spent in the aquarium was 30.6 minutes. Most (82.5%) respondents overestimated the length of their visit by an average of 22 minutes. Overall, visitors were found to spend over 77% of their time at HMSC viewing the exhibits. Only 7.3% of the visitors observed traveled through the aquarium the way it was designed. The average amount of time spent at exhibits ranged from 16.6 seconds to 212.5 seconds; however, standard deviation and range indicate a great deal of variability in visitor behavior.

Visitor traffic patterns and competition between exhibits was shown to influence the visitor experience. Survey and observation results were consistent with examples at other museums, zoos and aquariums cited in the literature.
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VISITOR BEHAVIOR AT THE
MARK O. HATFIELD MARINE SCIENCE CENTER AQUARIUM

By

Susan Gaughan Tissot

A THESIS

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DEDICATION

This manuscript is dedicated to Parascevia Hrycak, for her spirit will always be with me.
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3. Average amount of time spent, in seconds, at the exhibits in Oregon State University's Mark O. Hatfield Marine Science Center Aquarium, by repeat and first time visitors under observation during the fall of 1988. 40
Museums are no longer limited to being eccentric collections enjoyed only by the elite. With the advent of the automobile and the creation of museum collections held in public trust, museums have become increasingly valued by the general public as a leisure time activity (Burcaw, 1983). This rise in popularity combined with increased visitor expectations has provided an incentive for specialized museum collections and has encouraged institutions to have specific missions and goals.

Besides providing entertainment, museums have become informal learning centers where families can expose their children to the concepts and materials (i.e., cultural artifacts) they value. It has been suggested that museums play an important role in strengthening family ties (Laetsch et al., 1980). The exhibits and educational programs provided by a museum represent the link between museum professionals, their goals, and their audience. But, how do museum professionals know that they are meeting their goals and/or serving the needs of their audience? Can attendance records alone provide the information needed to evaluate how well an audience has been reached? Many factors contribute to the visitor experience.
The social dynamics within individual groups in the museum audience can have an influence on the experience visitors have. Most visitors attend museums in groups of two or three with the dynamics of the group often determining the level of interaction the group will have with the exhibits (Screven, 1986). For example, the social dynamics within a family unit that includes two young children will probably differ from the dynamics between two retired couples traveling together. Because of these differences individual visitors will come away from a museum having had different experiences.

How a museum defines and addresses its target audience can influence the success of its programs. If a museum defined its target audience as families with young children the staff might decide to include interactive components in their exhibits. It has been suggested that participatory exhibits promote family interaction (Cone and Kendall, 1978; Laetsch et al., 1980). However, if the museum intended to address other types of visitor groups, e.g., retired couples, then the museum would need to consider what effect these components would have on this segment of its audience and how to balance the needs of the two groups.

The physical attributes of the museum can have an impact on the visitor experience (Melton, 1933, 1935). The layout of the museum may be a contributing factor to how successfully visitors receive messages. By controlling circulation patterns, the layout can influence visitor
behavior. The amount of orientation provided for the visitor can also have an impact on the visitor experience. Visitor behavior research, in the form of visitor survey questionnaires and unobtrusive behavioral studies, can provide valuable insights to understanding the role these types of physical attributes play within a museum.

Literature Review

Visitor behavior research, audience analysis, exhibit evaluation, naturalistic evaluation and focus groups are all buzz words used by the museum community to describe the tools used to assess and improve the effectiveness of museum programs and exhibits. Whether trying to measure the amount of learning that takes place or trying to understand the demographics of the audience and what people do when they visit museums, institutions around the world have begun to make themselves accountable for reaching their program goals and objectives (Wolf, 1980; Walsh, 1991). Different methods have been used to help make museum programs more user friendly. The type of study conducted must cater to the needs of the institution. Therefore, the institution must understand what kind of data the different methods will yield before starting the research.

Unobtrusive or systematic observation yields data for analyzing facets of visitor behavior that include: time spent at exhibits, length of visits, visitor traffic patterns and preferences and group dynamics. Survey questionnaires conducted by interview generally yield
demographic information and visitor preferences. Whether or not survey questionnaires can be used to measure learning is up for debate (Yalow et al., 1980). Naturalistic evaluation takes systematic observation and survey interviews one step further. In naturalistic evaluation the administrator asks the respondents why they reacted to the exhibits in the manner that they were observed (Wolf, 1980). Focus group methodology has been used in marketing and consumer research for years, but is relatively new to the museum community. Although it can not provide quantitative data, focus groups do provide detailed information about visitor expectations, needs, interests and behavior that are obtained directly from the visitor through a series of round table discussions (Walsh, 1991).

Exhibit evaluation is intended to measure whether or not the particular goals of an exhibit have been realized. Two types of exhibit evaluation have been launched: summative, which investigates the perception and use of existing exhibits by visitors and; formative, which functions on a trial and error basis in order to fine-tune an exhibit while still in the installation phase (Loomis, 1987). However, summative and formative evaluation often employ the use of survey questionnaires and unobtrusive observations to collect their data. Many papers discussing methodology have been published (e.g., Loomis, 1973; Newgren, 1973; Parsons and Loomis, 1973; Screven, 1974; Lakota, 1976; Wagar, Lovelady and Falkin, 1976; Borun, 1977;
Wolf, 1980; Stronck, 1983; Loomis, 1987). For the purposes of this paper, all types will be referred to as visitor behavior research.

Visitor behavior research started in 1925 by Edward S. Robinson laid the foundation for future studies (Robinson, 1928). During 1930-32 under the direction of Robinson, and after the completion of his Ph.D. in 1932, Arthur W. Melton expanded on Robinson's research (1933, 1935, 1936, 1972). In his environmental design study at the Pennsylvania Museum of Art in Philadelphia, Melton (1933, 1935, 1972) tested the physical attributes of the museum and determined that space and layout did influence visitor behavior. Melton discovered that competition between objects in a museum gallery was independent of aesthetic qualities and dependent upon the total number of other objects within the same gallery. Melton used the terms object satiation and museum fatigue to describe the phenomenon in visitors who were shown to lose interest in art objects after viewing a series of similar exhibits. Melton found that the average amount of time visitors spent viewing an exhibit, once they were stationed in front of it, was not influenced by crowding. He contended that the holding power of an exhibit remained stable; however, the attracting power was variable as crowding increased.

Melton's work was not limited to art institutions. During 1934-36 Melton and his staff conducted research at the New York Museum of Science and Industry (1936, 1972).
Melton expanded on his theories about object competition by testing whether or not the re-routing of visitors, and the operation of previously static objects (in this case a piece of machinery called a gear-shaper) to increase attention to particular exhibits, would have any detrimental effects on the rest of the visitor experience. Melton found that by making an object operational and without re-routing visitor traffic, he increased the time spent at the exhibit but generally decreased the time visitors spent looking at the other objects in the same gallery. When visitors were re-routed to the operational object, the holding power increased for that object and the other objects within the same gallery; however, the holding power of objects farther away decreased.

Cameron's (1967, 1968) viewpoint of the museum as a communication system further substantiated the need for visitor behavior research. When looking at the museum and its audience as a communication system, Cameron broke his model down into three links: the staff and the museum collections being the source or transmitter of communication, the interpreters and the exhibits being the medium of communication, and the visitor functioning as the receiver. Cameron concluded that as such the museum was a one-way communication system lacking any mechanism for feedback. Cameron stated that by linking audience research to the model, the system could become self-correcting. Cameron believed that ethics dictate the need for museum
professionals to understand "what our visitors think" based not only on experienced opinion but combined with the results of audience research. However, Cameron cautions future audience analysts to restrict their survey questions to those that will yield actionable information. For example, Cameron asked potential researchers to refrain from asking visitors to criticize, cautioning that respondents will feel awkward and generally not state their true feelings thus yielding unusable data. In other words, if the questions do not provide information on which a museum can take direct action, Cameron suggested that those questions be deleted from the survey.

How much time visitors actually spend within an institution and at individual exhibits, has been and remains an important component of visitor behavior studies (e.g., Robinson, 1928; Melton, 1933, 1935, 1936, 1972; Eason and Linn, 1976; Cone and Kendall, 1978; Yalow et al., 1980; Serrell, 1980; Carlisle, 1985; Bitgood, Patterson and Nichols, 1986). During the 1960's and 1970's it was suggested and accepted by museum professionals that visitors spent an average of 30 to 40 seconds per exhibit case (e.g., de Borhegyi, 1965; Parsons, 1968; Shettel, 1973; Cone and Kendall, 1978). Eason and Linn (1976) reported the average viewing time on two types of science exhibits, by fifth through eighth grade students, to be 1.25 minutes and 2.5 minutes. Falk (1982) questioned the validity of the 30 to 40 second time-frames and concluded that they were gross
generalizations of visitor behavior based on improper analysis. Falk (1982) noted that there was much greater variability in the results within and between institutions when the frequency distribution of these data were plotted out, and suggested that some of the studies resulting in averages with bimodal means were analyzed incorrectly. In the studies with a normal bell-shaped distribution Falk found that standard statistical analysis, using the mean, could be used.

In his paper, "The Use of Time as a Measure of Visitor Behavior and Exhibit Effectiveness," Falk (1982) eloquently compared museum visitors to shoppers in a department store by placing visitors into two general categories, serious shoppers and window shoppers. He concluded that in a retail store the shopper's behavior is limited by his/her monetary resources where the museum visitor is limited by the availability of his/her time. Just like the retail consumer who enters a store expecting to purchase a specific item, Falk suggested that some museum goers enter museums with predetermined notions of what they intend to see. Retail consumers who use shopping as a way to engage in social activity are usually just looking but have the potential to buy on impulse if they see something they like. Similarly, museum goers, such as tourists, often visit museums without knowing much about the exhibits but visit because they think it will be an entertaining way to spend their time. Falk suggests that these window shoppers will try to see as much
of the museum as they can in one visit. He cautions, however, that such visitors can turn into the museum equivalent of buyers, i.e., they may be enticed into spending more time at particular exhibits.

Abrahamson, Gennaro and Heller (1983) examined the amount of time and the number of visits two select population groups made to the Zoo Lab at the Minnesota Zoological Gardens. By measuring the attraction and holding power of the exhibits their research provided exhibit designers and science center educators with a method of controlled learning. Abrahamson, Gennaro and Heller determined that successful exhibits captured and held the attention of their visitors long enough for learning to take place. Having monitored such behavior, exhibits lacking attraction or holding power were removed from the lab and replaced by more effective ones or were redesigned to increase their popularity. The research team had determined that the next logical step in their research would be to administer a visitor survey to determine what visitors liked about the popular exhibits.

Eleven U.S. Art museums, in cooperation with The Getty Center for Education in the Arts and The J. Paul Getty Museum, conducted an extensive visitor behavior project using focus groups (Walsh, 1991). Each participating museum in collaboration with Alan Newman Research, a private research firm, formed three focus groups: one consisting of museum staff whose primary responsibility was to outline
project objectives; one consisting of nonvisitors or individuals who had not visited the museum since childhood; and a group containing visitors who had visited the museum in the past. Round table discussions produced information about visitor expectations, experiences and reactions to the exhibits in the museum galleries. A consistent topic of discussion among focus groups at each institution was the issue of orientation or more specifically the lack of orientation and direction experienced by most focus group members during their visit. Most focus group members felt that the museum would be greatly improved if some sort of orientation and directional guidance were provided for visitors during their visit. Focus group members recommended that museums provide directional guidance by providing written information that included floor plan maps of the exhibit space and color coded carpets that broke the museum down into sections. Group members also expressed the desire for increased publicity on museum programs and an increase in the number and size of labels that included background information for each object.

In summary, visitor behavior research has become an essential component to many museum programs. Over the last twenty-five years, many visitor studies have been published (e.g., de Borhegyi, 1965; Washburne and Wagar, 1972; Prague, 1974; Eason and Linn, 1976; Serrell, 1977; Alt, 1980; Greenglass and Abbey, 1981; Griggs, 1981; Hayward and Larkin, 1983; Carlisle, 1985; Bitgood, Patterson and

Study: Visitor Behavior at HMSC

This study describes fall season visitors and their circulation patterns at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium (HMSC) in Newport, Oregon. The goal of the study was to understand the interrelationships between visitors, exhibits and the physical layout of the aquarium. One purpose of the study was to provide information that would aid staff members with long range planning decisions that include the design of new exhibits and the renovation of older displays. Besides identifying the aquarium's fall audience, demographic data on visitors were used to make assumptions about populations that did not visit the museum (nonvisitors).

Three specific objectives inspired the behavioral study: to compare the overall time spent in the aquarium by family units versus adult groups, to examine the time spent at each exhibit station and to examine the traffic patterns used by visitors. Data were collected during a five week period in the fall of 1988 using visitor survey questionnaires and unobtrusive behavioral observations. The results include a demographic profile of the visiting audience, visitor response and usage of the exhibits (e.g., time spent), and visitor traffic patterns at HMSC.
Study: Background

In June of 1965, HMSC opened with research and higher education as its primary functions. The front wing was designed as a public aquarium, however, and it included public meeting rooms available for use by the community. Exhibits in the aquarium were designed and installed in a textbook-like fashion. The University's original expectation was that HMSC would function like a highway wayside; visitors were expected to follow a self-guided path (personal communication with Dr. Lavern Weber, Director, HMSC). The aquarium component had no formal staff. It was thought that the research scientists could answer occasional questions that visitors might raise. The popularity of the aquarium was greatly underestimated; an estimated 26,867 people visited in 1965 (see Appendix A). In 1968 the first Marine Education Specialist was hired to run the aquarium. The popularity of the aquarium and its educational programs has grown steadily with 433,099 people visiting the facility in 1988 (Appendix A).

In 1971 the aquarium developed a formal Mission statement stating that the purpose of the aquarium was to:

increase public appreciation of marine and coastal environments, promote the responsibility of each individual in wise stewardship of the earth and sea, and communicate results of marine research conducted by Oregon State University and cooperating agencies at the Center (1991 IMS GOS proposal: p.9).

In order to meet these goals, HMSC developed exhibits and educational programs. These exhibits and educational
programs transmit their messages through the use of visual aides (i.e., artifacts, photographs, live animals) and written labels. The purpose or goal of the aquarium's exhibits and educational programs was/is to reinforce and promote the change of visitor attitudes with the hope of promoting desired forms of behavior, which in this case is wise stewardship of the earth and sea.¹ To accomplish this goal, part of the mission of HMSC is to encourage visitor awareness on ecological issues. For example: by presenting the visitor with an exhibit on marine debris, including graphic photos of animals strangled to death by plastics, the staff has asked the visitor to think about the consequences of dumping trash in the ocean; in an educational program, interpreters describe how the system in a tide pool environment breaks down when just one rock is carelessly overturned by a beachcomber. In presenting the program, the staff asks the visitor to think about the impact abrupt change can have on a fragile system like tide pools.

No formal method of evaluation has been used to determine what visitors learn from HMSC's exhibits and educational programs. Visitor comments about the aquarium and its programs have been tabulated on a monthly basis since 1965; however, the comments are collected without

¹ 1991 Institute of Museum Services General Operating Support (IMS GOS) grant proposal.
controls and participation is dependent upon visitor initiative.

While this study does not measure what visitors learn from HMSC's exhibits and educational programs, it does examine the audience at HMSC and describes how visitor groups use the facility during their visit(s). This study examines how the layout of HMSC and the composition of visitor groups contribute to the visitor experience at HMSC. This visitor study has two components. First, a visitor survey questionnaire administered randomly over a five week period provides a demographic profile of the audience. Data questions include age, sex, profession, museum preferences and educational levels (Appendix B). The survey results may be used by the staff to determine what types and levels of interpretation are needed.

The second component is an observational study in which the behavior of a sample population of visitors attending HMSC was described in detail. Observational data showed the traffic patterns used by visitors as well as the average amount of time spent at each exhibit. Combined with the demographic data, these data provide an understanding of who the visiting fall season population is and how they relate to the existing exhibits and physical layout.

Summary

This chapter has reviewed the literature on visitor behavior at museums (including aquariums and zoos) and on the effectiveness of museum exhibits. It introduced the
study of visitor behavior at the Mark O. Hatfield Marine Science Center in Newport, Oregon as a project involving a random survey of visitors during a five week period and an observational study of visitor behavior conducted in the fall of 1988.
CHAPTER 2: METHODS

Survey questionnaires and unobtrusive observational methodology were employed in this study. The survey provided necessary demographic information on visitors and allowed the visitors to directly state their opinions and interests in exhibits at the aquarium. The observational study permitted me to directly observe the activities and the attention visitors actually gave to the individual exhibits at HMSC.

Survey and observational data were collected during a five week period; October 1 - November 7, 1988. The time frame was chosen because this period was after the summer peak and considered to be typical of the off season and because it was logistically possible. As suggested by the literature on zoos and aquariums (Serrell, 1980), it is suspected that four different patterns of seasonal visitation exist at HMSC. During the summer season huge crowds, including as many as 2,000 people a day, visit the center making it difficult to survey and collect observations. In the spring the facility is heavily visited by school children who tend to monopolize the exhibits while participating in on-going aquarium programs. During the January and February winter months, traffic in the aquarium is generally very slow with few visitors attending the aquarium (personal communications with Dr. Lavern Weber,
Further study is needed to examine the differences in each season.

October 1-8 was a pre-testing period. During this time survey administrators, who were HMSC volunteers, were trained, 24 pre-test surveys were collected, and the questionnaire (Appendix B) was fine tuned. At this time, several questions were redefined to make the questionnaire less ambiguous. Four pre-test observations were completed. Observations were collected solely by the author in order to assume uniformity. Responses from pre-test surveys were not included in the sample.

During October 10 - November 7, 1988, 240 surveys and 37 observations were completed; 36 of the groups observed also were surveyed and were included in the survey total. Twelve members of HMSC's volunteer staff assisted with the administration of the survey.

Survey Data

Survey sampling took place during pre-determined time slots chosen on a systematic basis designed to equally sample all time periods. Operating hours were divided into two hour time slots; each time slot was represented equally. Surveys were conducted by interview Tuesday through Saturday during the following time slots: 1000 - 1200, 1100 - 1300, 1200 - 1400, 1300 - 1500, and 1400 - 1600. Sundays and Mondays were exempt from the survey project because no volunteers were available. However, I conducted several surveys on Mondays in connection with observations, which
were made Monday through Saturday. Initially, every fifth visitor, appearing to be over the age of 14, was asked to participate in the survey at the time of completing a visit, while exiting the center. Visitors under the age of 14 were not asked to participate in the survey due to the nature of the format of the survey questionnaire. Due to the traffic flow, this sampling procedure proved at times to be confusing for the survey administrators. Therefore, administrators were instructed to interview the first visitor to cross an imaginary line situated near the exit doors. After the interview was completed the administrator was asked to approach the first exiting visitor they spotted after leaving the previous survey participant. Frequently, more than one person crossed the line at the same time and in these cases administrators were asked to make a conscious effort to survey the visitor opposite the gender previously surveyed. This precaution was made to prevent the administrators from biasing the sample by approaching a participant because he or she felt more comfortable interviewing that particular gender. This sampling method proved to be much more efficient than the initial one.

Before participating in the survey, visitors were asked whether or not they had viewed the exhibits. If the individual(s) had not viewed the exhibits, e.g., if they came into the center only to use the bathroom, the interview ended and the survey administrator asked the next available visitor to participate in the survey. Administrators were
asked to tabulate these incidents and the number of visitors declining to participate in the survey.

For analysis, visitor groups were divided into two categories: family unit or adults. Family unit refers to nuclear and extended family types, women with children, men with children, multiple families traveling together and women and/or men (unrelated) accompanied by children. Adults refers to adult group(s) visiting without children, including: one male and one female, multiple couples, individuals of the same sex or family units that include mature (appearing to be over 18 years of age) children and individuals attending the aquarium alone.

During the 1989-90 season 96,009 visiting school children, organized tour groups and special activities participants registered for aquarium programs (Oregon State University HMSC 1991 IMS GOS proposal: p.12). Educational programs are conducted in the aquarium's auditorium and laboratories, as well as in the aquarium exhibit spaces, outside on the aquarium's nature trail and at three locations off the aquarium grounds. The school group programs result in an ebb and flow of (packs of) children viewing the aquarium exhibits. When reviewing the total number of other visitors in the aquarium at the time of the observed group's visit, large numbers (over 80) generally indicate the presence of a school group or organized tour. Due to the nature of their visit, school and tour groups were excluded from the survey. However, exceptions did occur
when the survey participant did not appear to be part of the larger group. These subjects were included in the sample.

Observational Data

Observational data were collected solely by the author in order to assure uniformity and minimize bias. Visitors were observed without their prior knowledge during pre-determined two-hour time slots. The time slots were limited to two, two hour slots per day because it was thought that fatigue, on the part of the observer, could bias the results. Visitors were followed from the moment they entered the aquarium until they terminated their visit. Visits were terminated when the group exited the aquarium, exited the exhibit areas to enter the bookstore, or entered the front lobby temporarily to wait for party members to use the rest rooms. A hand held stop watch was used to record the total time spent inside the facility and the time spent at the exhibit stations. A floor plan map of the aquarium was labeled and keyed out in order to define the exhibit stations (see Appendix C). When possible, target groups were approached for surveying after the termination of their visit. Two groups declined to be surveyed and three groups exited the facility before they could be asked to participate in the survey. All pre-test observations were included in the results; however, because of format changes, the first pre-test observation was deleted from the time spent at each exhibit computation.
Subjects were categorized by approximate age, sex and the number of individuals in their party, i.e., single adult, adult(s) with children, group of adults. Traffic patterns and the time spent by individual(s) at each exhibit were recorded. Initially all party members from each group were observed. As this proved to be confusing, observations were limited to following only one party member from each group. General comments made by the individual under observation, in reference to the exhibits, were recorded on paper.

Initially, a procedure suggested by Loomis (1987) was used to collect the observations. A map of the aquarium's floor plan was used to record observations of visitor behavior. Although the information published by Loomis (1987) proved to be very helpful in the design of the overall project, the procedures suggested for conducting observations proved confusing and were terminated after the first pre-test. All observational data following the first pre-test and continuing through the sampling period were recorded in a small notebook. For analysis, the circulation patterns were later determined using a floor plan map of the aquarium. Visitors under observation were timed using a strapless digital watch that fit into the palm of the investigators hand. In general, the visitors under observation were oblivious to the fact that they were under observation. Three observations had to be terminated early and discarded from the sample when the investigator was
interrupted by HMSC staff who, unaware of the observational study, engaged the investigator in conversation.

Description of Exhibits

Exhibits at HMSC can be divided into three categories: living, non-living and temporary (see Appendix C). Live exhibits refer to 18 aquarium tanks, an octopus tank and a touch pool, which house a variety of marine invertebrates and intertidal fish. Non-living exhibits refer to all permanent static exhibits. Temporary exhibits refer to changing and traveling exhibits with a life span of 6-24 months. During the survey period the temporary exhibits included a Marine Debris exhibit, a Siletz Basketry exhibit and a traveling exhibit entitled, Transformations in Time, which left the center November 1. (This factor was noted on the appropriate surveys.) Audio components are incorporated into four of the non-living and one of the living exhibits (see Appendix C).

At the time of the study, live exhibits at HMSC featured: an oval shaped 700 gallon tank that is open on the top with glass viewing panels on each side to assist visitor viewing of a giant Pacific octopus; a touch pool containing a variety of marine invertebrates and intertidal fish; eight 35 gallon aquarium tanks (referred to as the small aquarium tanks) all grouped by units of two and located along one wall, and treated as one exhibit station; and ten large aquarium tanks each simulating a particular ecosystem (which is changed periodically by the aquarists). At the time of
the study eight 500 gallon tank exhibits included: tank one or Yaquina Head Subtidal Zone; tank two or Kelp Forest; tank three or Offshore Sandy Bottom; tank four or San Juan Island; tank five, which housed a rather friendly octopus\textsuperscript{2} who would regularly put on a show, especially on feeding days at which time she would stretch herself across the front of the tank and display her underside while she ate her lunch; tank six or Rocky Intertidal Surge Channel, a very active station that shows tidal fluctuations at two minute intervals with water emptying the tank to show a diverse fauna and water rushing back into the tank like waves actually do in a real surge channel; tank seven or Eel Grass Nursery Ground; and tank nine or Going to School, an exhibit on schooling fishes. Two larger tanks include: a 1500 gallon tank, tank eight or Yaquina Bay Estuary and a 2,500 gallon tank, tank ten or Near Shore Rocky Reef. Tank 10 has an audio unit.\textsuperscript{3} Interpretive labels at the live exhibits include natural history information with either back-lit photographs or printed labels.

At the time of this study, the octopus tank, the touch pool and tank 5 often were staffed by an HMSC volunteer. The animals in the live exhibits were fed three or four times a week at which time visitors were invited to watch, usually

\textsuperscript{2} This octopus had previously been housed in the octopus tank. She would regularly stretch her tentacles out of the water. It appeared that she liked to be touched.

\textsuperscript{3} At the time of the study, the unit was out of order, however, visitors, children especially, seemed to be attracted to and tried to use the equipment.
resulting in large crowds gathering around the appropriate tank(s). At these times volunteer staff usually gave interpretive talks and answered questions. The octopus tank and touch pool were almost always staffed by HMSC volunteers for safety reasons and also to answer questions or give interpretive talks. In the survey, questions about live exhibits at HMSC addressed three components: labels or written text, photographs and/or illustrations and live animals.

At the time of the study the non-living exhibits at HMSC featured: People and the Living Sea, an introductory exhibit; Motions of the Earth’s Crust, an overview of plate tectonics that includes three dimensional models of the earth's inner core and the continental shelf along the Oregon coast; Coastal Geology, an overview of coastal erosion processes featuring the Jump off Joe site, a local erosion problem and an audio unit; Tides, an explanation of tides and how they change, using a tide gauge recorder, other marine instruments and an audio unit; Oregon’s Marine Birds, a large collection of taxidermic marine birds specific to the Oregon coast with an audio unit; Circulation of the Oceans, an overview of the upwelling phenomena along the Oregon coast and an audio unit; Estuaries and People, a look at resource use in Oregon's estuaries featuring historic photos; Marine Life and Energy in the Sea, an overview of the food chain including biological specimens and an audio unit; Marine Resources, an overview of
commercially important species featuring fish models; Coastal Archaeology, an explanation of shell middens including artifacts from the Seal Rock, Oregon site; Gray Whales, the natural history of gray whales and their migration patterns including biological specimens; Marine Mammal Strandings, an explanation of the stranding phenomena featuring an updated map of strandings found along the Oregon coast and instructions for beach combers who discover strandings; an atrium housing two exhibit stations, the lower jaw from a Blue whale with natural history interpretation and articulated Minke Whale and Harbor Porpoise skeletons suspended in the atrium with little interpretation; and the Touch Table, an exhibit station with various marine items mounted onto Plexiglass. In general, the non-living exhibits also contained printed or silk screened labels with photos and/or scientific illustrations. In the survey, questions on non-living exhibits addressed the following parts: labels or written text, artifacts or objects, skeletons or bones, photographs and/or illustrations and other.

At the time of the study the temporary exhibits at HMSC included three exhibits: Marine Debris, an exhibit from the port of Newport, Oregon consisting of two 4' X 8' exhibit panels that included graphic photos of marine mammals

4 In 1989 interpretive units were installed at the minke whale, harbor porpoise and blue whale jaw bone exhibit stations.
suffering the consequences of human induced pollution; 
*Siletz Basketry*, an exhibit on loan from the Confederated 
Tribes of Siletz Indians consisting of one 4' X 8' exhibit 
panels that included textile samples and photographs; 
*Transformations in Time*, an exhibit on loan from the 
Department of Anthropology at Oregon State University 
consisting of six 40" X 48" free standing exhibit panels 
that included archaeological artifacts, a salmon and fur 
seal skull, photographs and other graphics. In the survey, 
questions on temporary exhibits addressed: labels or written 
text, artifacts or objects and photographs and/or 
illustrations.

In addition to the exhibits, HMSC has a paved nature 
trail four tenths of a mile long; for logistical reasons, 
the nature trail was not included in the study. The aquarium 
also has a 165 seat auditorium. During the survey period 
films were shown to the public in the auditorium on 
Saturdays.

**Summary**

This chapter has described the methodology used in this 
study to collect visitor survey questionnaires and 
unobtrusive observational data. A detailed narration of the 
exhibits at the study site, Oregon State University's Mark 
O. Hatfield Marine Science Center Aquarium, Newport, Oregon 
was also described.
CHAPTER 3: RESULTS

Observational Data

The 40 groups that were observed ranged in size from two to six individuals. Sixty-one percent of these groups were adults; 39% were family units. Sixty percent of all adult groups visited HMSC as a group of two; 20% attended as a group of four; 12% as a group of three; less than 8% as a group of five. By contrast, 38% of all family units attended HMSC as a group of four; 25% as a group of six; 19% as a group of three; 13% as a group of five; and 6% as a group of two (Figure 1).

1. Overall Time-spent

At the time of this project, HMSC was open to the public from 10 a.m. to 4 p.m. Visitors were observed during these opening hours with visitation beginning in one of five possible time-slots between the hours of 10 a.m. and 3 p.m. (1000-1100; 1101-1200; 1201-1300; 1301-1400; 1401-1500). The relationship between these time-slots (or time of day that a visit began) and the length of that visit is described in Figure 2. Average visit lengths were consistent except for the earliest time slot (1000 - 1100), during which visits of the sample were shorter. Peak visitation occurred between 1100 and 1200 with reoccurring surges between 1200 - 1300 and 1400 - 1500 (Figure 2).

Visitors who were surveyed after they were observed were asked how much time they thought they had spent in the
Figure 1. Composition of groups observed at Oregon State University’s Mark O. Hatfield Marine Science Center Aquarium during the fall of 1988. Groups were placed into two categories: adults and families. Adult groups consisted of all adult party members generally ranging in size from one to six. Family groups included adults with children ranging in size from two to six.
Figure 2. Relationship between time of day and average length of visit made by survey respondents at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium during the fall of 1988.
aquarium. When asked how much time they had spent, 67% declared that they spent between 31-60 minutes, while 22% declared that they had spent between 15 and 30 minutes. Eleven percent felt that they had spent more than one hour inside the aquarium. None of the respondents estimated that they had spent less than 15 minutes in the aquarium.

When compared to the actual time recorded on the stopwatch, discrepancies were noted. Thirty-three (82.5%) of the 40 respondents under observation estimated that their visit was much longer than it actually was; seven (17.5%) respondents actually spent more time than they estimated. This discrepancy could create a problem when estimating the average amount of time people spend inside a facility if the figures had been derived solely from the visitors themselves. On average, visitors over-estimated their time spent in the aquarium by 71.8%. The average time spent, recorded by stopwatch, was 30.6 minutes. The average time visitors thought they spent in the aquarium was 52.5 minutes or an average of 22 minutes longer than reality. Accordingly, the time estimated by the respondents was decreased to 58% of the respondent's estimate of their time spent to present a more accurate measure (hereafter referred to as adjusted time).

2. Time spent at Each Exhibit

Exhibits have been labeled on a floor plan map of the aquarium (see Appendix C). The term Time spent refers to the amount of time a visitor was observed (to look) at a
particular exhibit. Verbal interactions among visitors were included in the calculation if the conversations included questions and/or responses about the exhibit station the individual(s) was currently viewing, but conversations or family interactions of a personal nature were deleted. Discussion within the groups appeared to follow label reading. Adults within family units were observed reading text out loud to small children within the group.

Overall, visitors were found to spend over 77% of their time at HMSC viewing the exhibits. The majority, or roughly 64%, of exhibit time was spent viewing live exhibits (Figure 3a). When examining the live exhibits, visitors spent the most time at the eight small aquarium tanks, the touch pool and the octopus tank, respectively. Roughly 30% of the exhibit time was spent at the non-living exhibits (Figure 3b). In the non-living exhibits, the longest average time was spent at the Tides, Motions of the Earth’s Crust, Oregon’s Marine Birds, and Marine Mammal Stranding exhibits, respectively. The Tides and Oregon’s Marine Birds exhibits both have audio units. Unfortunately, no observations were conducted to test the presence of audio units and their influence on time spent. Visitors were repeatedly observed using the audio units and generally, if undistracted by other group members i.e., their children, listening to most if not all of the audio message. Over 5% of the exhibit time was spent viewing the temporary exhibits with the most time spent at the Marine Debris exhibit (Figure 3c).
Figure 3a. Sixty-four percent of the time spent at exhibits by observed visitors was spent at the live exhibits.

Figure 3a-c. Percentage of time visitors were observed to spend at the exhibits and the breakdown of the time spent at individual exhibits at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium during the fall of 1988.
Figure 3b. Thirty percent of the time spent at exhibits was spent at the non-living exhibits.
Figure 3c. Only 5.6% of the time spent at exhibits was spent at the temporary exhibits.
The average amount of time spent at each exhibit ranged from 16.6 seconds at the People and the Living Sea exhibit to 212.5 seconds at the small tanks (Table 1). Exhibits that were interactive, either by having a live interpreter present or containing a tactile or audio component, tended to hold visitor attention longer. The touch pool and the octopus tank are two of the three most popular attractions in the facility. The touch pool is popular with all age groups, especially young children, and provides a ledge for visitors to sit on while they touch the various animals in the tank. Among the ten large aquarium tanks, tank five, six and ten had more holding power over the other large tanks. At the time of the study, tank five housed a very active octopus who regularly spread her tentacles across the front of the tank. Tank six was an active surge tank with water rushing in and out at two minute intervals. Tank ten, the largest, housed the largest of the fish and invertebrates in the collection, with fish generally active in the tank.

Some obvious differences occurred between how much viewing time group types spent at the exhibits (Table 2). Adult groups spent over twice as much of their viewing time as family units at the Motions of the Earth's Crust and Tides exhibits. Both exhibits include audio units as previously mentioned. Adults were observed using the audio units and they appeared to listen to most if not all of the messages. Families were observed using the audio units; however, their children tended to distract or pull them away
Table 1. Average amount of time spent, standard deviation, and range, in seconds, at the exhibits in Oregon State University's Mark O. Hatfield Marine Science Center Aquarium, by visitors under observation during the fall of 1988.

<table>
<thead>
<tr>
<th>Non-Living Exhibits</th>
<th>AVERAGE TIME</th>
<th>S.D.</th>
<th>RANGE LOW</th>
<th>RANGE HIGH</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>People &amp; The Living Sea</td>
<td>16.6</td>
<td>7.2</td>
<td>10.0</td>
<td>31.0</td>
<td>10</td>
</tr>
<tr>
<td>Motions of the Earth's Crust</td>
<td>106.0</td>
<td>112.6</td>
<td>18.0</td>
<td>535.0</td>
<td>22</td>
</tr>
<tr>
<td>Coastal Geology *</td>
<td>56.2</td>
<td>35.1</td>
<td>18.0</td>
<td>136.0</td>
<td>17</td>
</tr>
<tr>
<td>Tides *</td>
<td>122.0</td>
<td>125.1</td>
<td>22.0</td>
<td>525.0</td>
<td>14</td>
</tr>
<tr>
<td>Circulation of the Ocean *</td>
<td>57.2</td>
<td>37.5</td>
<td>11.0</td>
<td>153.0</td>
<td>17</td>
</tr>
<tr>
<td>Oregon's Marine Birds *</td>
<td>104.8</td>
<td>84.1</td>
<td>7.0</td>
<td>324.0</td>
<td>24</td>
</tr>
<tr>
<td>Estuaries &amp; People</td>
<td>48.5</td>
<td>36.7</td>
<td>2.0</td>
<td>120.0</td>
<td>13</td>
</tr>
<tr>
<td>Marine Life &amp; Energy in the Sea *</td>
<td>53.5</td>
<td>31.9</td>
<td>15.0</td>
<td>130.0</td>
<td>20</td>
</tr>
<tr>
<td>Marine Resources</td>
<td>39.2</td>
<td>18.7</td>
<td>5.0</td>
<td>79.0</td>
<td>21</td>
</tr>
<tr>
<td>Coastal Archaeology</td>
<td>37.5</td>
<td>23.6</td>
<td>4.0</td>
<td>84.0</td>
<td>22</td>
</tr>
<tr>
<td>Gray Whales</td>
<td>76.9</td>
<td>45.6</td>
<td>19.0</td>
<td>196.0</td>
<td>19</td>
</tr>
<tr>
<td>Marine Mammal Strandings</td>
<td>77.7</td>
<td>51.8</td>
<td>9.0</td>
<td>194.0</td>
<td>21</td>
</tr>
<tr>
<td>Blue Whale Jaw</td>
<td>38.2</td>
<td>23.3</td>
<td>13.0</td>
<td>105.0</td>
<td>17</td>
</tr>
<tr>
<td>Minke Whale &amp; H. Porpoise</td>
<td>45.8</td>
<td>26.5</td>
<td>11.0</td>
<td>109.0</td>
<td>19</td>
</tr>
<tr>
<td>Touch Table</td>
<td>64.6</td>
<td>48.9</td>
<td>8.0</td>
<td>183.0</td>
<td>19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Live Exhibits</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Octopus Tank</td>
<td>141.3</td>
<td>129.7</td>
<td>15.0</td>
<td>569.0</td>
<td>40</td>
</tr>
<tr>
<td>Touch Pool</td>
<td>186.5</td>
<td>172.7</td>
<td>5.0</td>
<td>748.0</td>
<td>40</td>
</tr>
<tr>
<td>Small Tanks</td>
<td>212.5</td>
<td>178.8</td>
<td>9.0</td>
<td>954.0</td>
<td>35</td>
</tr>
<tr>
<td>Tank 1</td>
<td>49.5</td>
<td>27.9</td>
<td>5.0</td>
<td>113.0</td>
<td>26</td>
</tr>
<tr>
<td>Tank 2</td>
<td>60.1</td>
<td>43.1</td>
<td>4.0</td>
<td>155.0</td>
<td>27</td>
</tr>
<tr>
<td>Tank 3</td>
<td>47.9</td>
<td>39.4</td>
<td>4.0</td>
<td>165.0</td>
<td>24</td>
</tr>
<tr>
<td>Tank 4</td>
<td>34.0</td>
<td>28.7</td>
<td>1.0</td>
<td>88.0</td>
<td>20</td>
</tr>
<tr>
<td>Tank 5</td>
<td>105.4</td>
<td>65.1</td>
<td>4.0</td>
<td>262.0</td>
<td>33</td>
</tr>
<tr>
<td>Tank 6</td>
<td>76.6</td>
<td>76.2</td>
<td>10.0</td>
<td>305.0</td>
<td>24</td>
</tr>
<tr>
<td>Tank 7</td>
<td>44.8</td>
<td>35.4</td>
<td>7.0</td>
<td>169.0</td>
<td>17</td>
</tr>
<tr>
<td>Tank 8</td>
<td>47.8</td>
<td>39.8</td>
<td>6.0</td>
<td>165.0</td>
<td>28</td>
</tr>
<tr>
<td>Tank 9</td>
<td>47.5</td>
<td>38.9</td>
<td>3.0</td>
<td>152.0</td>
<td>25</td>
</tr>
<tr>
<td>Tank 10 *</td>
<td>119.4</td>
<td>86.4</td>
<td>18.0</td>
<td>325.0</td>
<td>33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temporary Exhibits</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Siletz Basketry</td>
<td>47.1</td>
<td>40.1</td>
<td>6.0</td>
<td>142.0</td>
<td>8</td>
</tr>
<tr>
<td>Transformations in Time</td>
<td>41.1</td>
<td>26.8</td>
<td>8.0</td>
<td>87.0</td>
<td>14</td>
</tr>
<tr>
<td>Marine Debris</td>
<td>118.2</td>
<td>55.5</td>
<td>31.0</td>
<td>220.0</td>
<td>20</td>
</tr>
</tbody>
</table>

* indicates the presence of an audio component
Table 2. Percentage of total time spent, at each exhibit in Oregon State University's Mark O. Hatfield Marine Science Center Aquarium, during the fall of 1988.

<table>
<thead>
<tr>
<th></th>
<th>ADULTS</th>
<th>FAMILIES</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Living Exhibits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>People &amp; the Living Sea</td>
<td>0.3</td>
<td>0.1</td>
<td>10</td>
</tr>
<tr>
<td>Motions of the Earths Crust</td>
<td>3.8</td>
<td>1.8</td>
<td>22</td>
</tr>
<tr>
<td>Coastal Geology</td>
<td>1.2</td>
<td>1.3</td>
<td>17</td>
</tr>
<tr>
<td>Tides</td>
<td>2.8</td>
<td>1.2</td>
<td>14</td>
</tr>
<tr>
<td>Circulation of the Ocean</td>
<td>1.5</td>
<td>1.0</td>
<td>17</td>
</tr>
<tr>
<td>Oregon's Marine Birds</td>
<td>3.0</td>
<td>3.8</td>
<td>24</td>
</tr>
<tr>
<td>Estuaries &amp; People</td>
<td>0.9</td>
<td>0.8</td>
<td>13</td>
</tr>
<tr>
<td>Marine Life &amp; Energy in the Sea</td>
<td>1.5</td>
<td>1.3</td>
<td>20</td>
</tr>
<tr>
<td>Marine Resources</td>
<td>1.1</td>
<td>1.1</td>
<td>21</td>
</tr>
<tr>
<td>Coastal Archaeology</td>
<td>1.2</td>
<td>0.9</td>
<td>22</td>
</tr>
<tr>
<td>Gray Whales</td>
<td>2.2</td>
<td>1.4</td>
<td>19</td>
</tr>
<tr>
<td>Marine Mammal Strandings</td>
<td>2.6</td>
<td>1.3</td>
<td>21</td>
</tr>
<tr>
<td>Blue Whale Jaw</td>
<td>0.9</td>
<td>0.8</td>
<td>17</td>
</tr>
<tr>
<td>Minke Whale &amp; Harbor Porpoise</td>
<td>1.2</td>
<td>1.0</td>
<td>19</td>
</tr>
<tr>
<td>Touch Table</td>
<td>1.6</td>
<td>1.7</td>
<td>19</td>
</tr>
</tbody>
</table>

| **Live Exhibits**      |        |          |    |
| Octopus Tank           | 7.4    | 7.5      | 40 |
| Touch pool             | 7.7    | 13.3     | 40 |
| Small Tanks            | 11.2   | 7.3      | 35 |
| Tank 1                 | 1.7    | 1.7      | 26 |
| Tank 2                 | 2.2    | 2.0      | 27 |
| Tank 3                 | 1.7    | 1.1      | 24 |
| Tank 4                 | 0.9    | 0.8      | 20 |
| Tank 5                 | 4.3    | 5.0      | 33 |
| Tank 6                 | 1.9    | 3.3      | 24 |
| Tank 7                 | 1.0    | 1.0      | 17 |
| Tank 8                 | 1.6    | 2.0      | 28 |
| Tank 9                 | 1.6    | 1.5      | 25 |
| Tank 10                | 4.9    | 5.6      | 33 |

| **Temporary Exhibits**  |        |          |    |
| Siletz Basketry        | 0.2    | 0.9      | 8  |
| Transformations in Time| 0.6    | 1.0      | 14 |
| Marine Debris          | 3.1    | 3.1      | 20 |
from the units. Children were observed picking up and activating the audio units and persuading the rest of their group to use the units, but, they did not appear to listen to whole messages.

Adults spent twice as long as families at the Marine Mammal Strandings exhibit; almost twice as long at the Gray Whales exhibit; and one third longer at the Tides exhibit. Adults were observed reading the labels to themselves and out loud to each other. Adults also were observed discussing the exhibits with other visitors. Family members were observed reading portions of labels; however, they were observed mainly reading the tank labels to identify specific animals.

Family units spent almost twice as long as adult groups at the touch pool and tank six. Both exhibits are very active and are either participatory or stimulating. Adults tended to enjoy these exhibits; however, when there were children present in the aquarium, children tended to dominate the touch pool. Adults were observed using the touch pool and actually spending a great deal of time at the touch pool when the visitor traffic was slow. Both group types spent similar amounts of their time at the octopus tank (Table 1).

Whether or not the parties observed had previously visited the aquarium appears to have had some influence over the average amount of time spent in the aquarium and the time spent at the exhibits. Overall, participants who were
repeat visitors spent 5% less time in the aquarium. The average time spent at the exhibits, by repeat visitors, varied depending on the type of exhibit. Repeat visitors were observed to spend twice the amount of time as first time visitors at the following non-living exhibits: Motions of the Earth's Crust, Tides, Oregon's Marine Birds, Marine Mammal Strandings, and the temporary exhibit: Siletz Basketry (Table 3).

3. Circulation Patterns

The floor plan of the aquarium was designed with the intent that visitors would follow a particular circulation pattern. The design prescribed that visitors would enter the aquarium and make an immediate left into the main exhibit loop, tour the loop and flow around the atrium to end the visit in the lobby and book shop (see Appendix C). Unfortunately this does not usually work; only 7% of the observed visitors followed the original pattern (Figure 4a-c). The most common pattern, shown by 37% of visitors observed, was to tour the aquarium backwards, starting first at the octopus tank, then moving to the touch pool, later viewing the aquarium loop and then ending their visit in the lobby often times completely missing the exhibits in and near the atrium; many respondents assumed the parameter around the atrium was off limits to the public. Seven general traffic patterns were observed (see Figures 4a-g). The observation results do not suggest any obvious
Table 3. Average amount of time spent, in seconds, at the exhibits in Oregon State University's Mark O. Hatfield Marine Science Center Aquarium, by repeat and first time visitors under observation during the fall of 1988.

<table>
<thead>
<tr>
<th>Non-Living Exhibits</th>
<th>Repeat Visit</th>
<th>First Visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>People &amp; The Living Sea</td>
<td>11.3</td>
<td>17.3</td>
</tr>
<tr>
<td>Motions of the Earth's Crust</td>
<td>130.6 *</td>
<td>47.0</td>
</tr>
<tr>
<td>Coastal Geology</td>
<td>54.0</td>
<td>63.4</td>
</tr>
<tr>
<td>Tides</td>
<td>162.5 *</td>
<td>73.2</td>
</tr>
<tr>
<td>Circulation of the Ocean</td>
<td>53.7</td>
<td>66.8</td>
</tr>
<tr>
<td>Oregon's Marine Birds</td>
<td>140.2 *</td>
<td>68.0</td>
</tr>
<tr>
<td>Estuaries &amp; People</td>
<td>51.6 *</td>
<td>29.0</td>
</tr>
<tr>
<td>Marine Life &amp; Energy in the Sea</td>
<td>49.2</td>
<td>52.1</td>
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<tr>
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<td>51.2 *</td>
<td>24.1</td>
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<tr>
<td>Coastal Archaeology</td>
<td>44.8 *</td>
<td>32.1</td>
</tr>
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<td>84.4 *</td>
<td>61.3</td>
</tr>
<tr>
<td>Marine Mammal Strandings</td>
<td>110.6 *</td>
<td>57.7</td>
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<tr>
<td>Blue Whale Jaw</td>
<td>43.1 *</td>
<td>33.8</td>
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<tr>
<td>Minke Whale &amp; H. Porpoise</td>
<td>49.0 *</td>
<td>44.5</td>
</tr>
<tr>
<td>Touch Table</td>
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<td>161.2</td>
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<tr>
<td>Touch Pool</td>
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<td>31.4</td>
<td>34.4</td>
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<tr>
<td>Tank 5</td>
<td>112.7 *</td>
<td>99.7</td>
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<td>Tank 6</td>
<td>64.5</td>
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<tr>
<td>Tank 8</td>
<td>54.4 *</td>
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<td>Tank 9</td>
<td>52.9 *</td>
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<td>41.8 *</td>
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<td>Marine Debris</td>
<td>126.8 *</td>
<td>105.5</td>
</tr>
</tbody>
</table>

* indicates exhibits where repeat visitors spent more time than first time visitors
4a. Seven percent traveled through the aquarium as it was designed; however, they did not wander into the bookshop.

4b. Seven percent of observed visitors traveled through the aquarium almost as it was designed; they did not stop at the touch pool or the bookshop.

Figure 4a-g. Circulation patterns used by visitors observed at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium, Fall of 1988. Floor plan details are seen in Appendix C.
4c. Five percent traveled through the aquarium as it was designed however, they completely missed the exhibit areas in and around the atrium.

4d. Ten percent traveled from the octopus tank and touch pool to the atrium exhibit space after which time they traveled backward, from the original design, through the aquarium.
4e. Almost 32% traveled through the aquarium backwards from the original design.

4f. Thirty-seven percent traveled through the aquarium backwards, from the original design, completely missing the exhibit areas in and around the atrium.
4g. Two percent started their visit in the bookshop proceeding left through the aquarium.
difference between the way family units and adults toured
the aquarium.

Survey Questionnaires

Relational data base systems were used to process the
data in this study. Thirteen people administered the 243
survey questionnaires. Three survey questionnaires were
deleted from the sample because they contained too many
errors, made during their administration, to be considered
valid. Only four people who were asked declined to
participate in the survey project; this represents a
rejection rate of only 1%. One of two methods was used by
survey administrators to count the attendance level inside
the aquarium during each of the survey time-slots: actual
head counts were taken by the administrator on duty or the
administrator used HMSC's electronic eye tally. The
reliability of each method was tested at HMSC during May of
1988 by Dr. Kathleen Heide, former Marine Education
Specialist, who found no significant difference between the
two; the electronic eye proved to be 98% accurate (Appendix
D). During the 25 day sampling period, October 10 through
November 7, 1988, 240 surveys were collected and the
electronic eye tally recorded 17,774 visitors to the
aquarium; therefore, 1.35% of the HMSC audience was sampled.

The attendance levels at HMSC vary depending on the day
of the week. As expected, average attendance levels increase
as the week progressed towards the weekend. Surveys were
collected six days a week (including the surveys collected on Mondays from subjects who were under observation); no surveys were conducted on Sundays. During the survey period the average attendance level in the aquarium, on an hourly basis, was computed (Figure 5).

Respondents were placed into two categories or types of user groups: adults and family units. All percentages given are rounded up, therefore not all figures will equal exactly 100%.

1. Demographics

Of the respondents, slightly over half were male. Very few teenagers and elderly (over 81 years of age) individuals are represented in the sample. The largest number in the sample, or 24% were age 61-70. Adults in the childrearing years 31-40 represented the next largest portion, or 20% of the sample. Eighteen percent of the sample were age 51-60, while 16% of the sample were 41-50 years old. Only 10% of the sample were 26-30. Only 4% were 22-25 years old and an additional 4% were 71-80 years old (Figure 6).

Based on the adjusted time spent that was determined by the corrected observational data mentioned previously (see page 31), the average amount of time spent in the aquarium was $33.5 \pm 16.18$ minutes ($\pm 1$ standard deviation, $N=240$). A positive correlation exists between the adjusted time spent and the total number of visitors in the aquarium ($R = .30$, $N = 224$, $P < .01$). As attendance inside the facility rises so does the time spent by the individual visitor groups. This
Figure 5. Average hourly attendance levels recorded in Oregon State University's Mark O. Hatfield Marine Science Center Aquarium during the survey period, fall of 1988.
Figure 6. Age and sex distribution of fall survey respondents at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium.
correlation may be due in part to aquarium programs; for example, on weekends and extremely busy days staff show films, give talks and/or feed animals to divert as well as educate the crowds.

Most visitor groups observed were small in size, generally consisting of two to six people (see Figure 1). Large groups visiting HMSC were generally tour or school groups. Due to the structured nature of their visit, most large groups were unable to participate in the survey project so large groups were not consciously recruited, but, some school and tour group members were inadvertently surveyed. Four adults who visited the aquarium by themselves were included in the survey sample; however, no single member groups were included in the observational study.

Whether or not individual group size influences the amount of time a group spends in the aquarium was examined. A positive correlation exists between group size and length of visit (R = .40, N = 239, P < .01). The larger the group, the longer the groups tend to visit in the aquarium.

The majority of respondents resided in the state of Oregon. However, a surprising number of other geographical areas were represented in this sample. Foreign countries included: Australia, Canada, Denmark, France, Germany and Switzerland. From within the United States, California, Washington and Idaho were represented as well as a few individuals from: Arizona, Colorado, Hawaii, Iowa, Illinois, Indiana, Kansas, Massachusetts, Maine, Missouri, Montana,
North Carolina, Nebraska, New Mexico, Nevada, Pennsylvania, South Dakota, Texas, Utah, Vermont, Wisconsin, West Virginia and Wyoming.

When asked how they first learned about the aquarium, 39% of all subjects said they had learned from friends or family; 21% learned by seeing the highway road sign; 10% did not remember; 9% learned from television or other media; 7% learned from road guides; 6% learned from comments made by employees from other attractions; 2% learned about HMSC when they were in school; 2% learned about HMSC when they were in college; 2% learned from a guided tour taken to HMSC; and 1% learned while they were teaching a class and had brought students to HMSC for a field trip.

When Oregon residents were asked how they first learned about the aquarium, the most frequently answered category (43.5%) first learned about HMSC through friends and family; 23% learned from the highway road sign; 10% learned from television and other media; 2.4% learned when they were in school; 6.8% learned from employees at other attractions i.e., local museum, hotels, and restaurants; 8.2% learned from a road guide; 2.4% learned when they were in college; 1.4% learned while they were teaching a class and had brought students to HMSC; less than 2% learned from a guided tour taken to HMSC (Figure 7).

When asked if they had visited HMSC before the survey date, over half reported that they had been to the aquarium before. Of the repeat visitors to HMSC, 81% were Oregon
Figure 7. How fall 1988 survey respondents at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium first discovered the aquarium.
residents; 8% were Washington residents; 2% were Idaho residents; 7% were residents outside the pacific northwest; less than 1% were residents of foreign countries.

When asked how many visits they had made to HMSC in the last year, 30% of all repeat visitors had made one other visit that year; 29% had not made any previous visits that year; 20% had made two; 10% had made three; 6% had made four; and 5% had made five or more visits that year (Figure 8).

Respondents attend HMSC for a variety of reasons; 70% of those surveyed visited HMSC to learn something new; 65% of those surveyed visited to view unusual animals; 60% of those surveyed visited because they wanted to share something with someone; 54% visited to be entertained; 51% visited to experience something different; 3% had other reasons for visiting the facility; and 2% did not respond to the question. Other reasons respondents had for visiting HMSC included: to visit the bookstore, because the facility is free, because of a school project or field trip, to see the ship models, and to identify a fossil.

Concerning employment of respondents, 28% were retired; 21% were professionals; 10% were homemakers; 9% were managerial; 8% were technical; 5% were sales; 3% were clerical; 3% were students; less than 1% were unemployed; and less than 1% were self-employed.

The educational level of the respondents at HMSC is unusually high; 56% had attended at least one year of
Figure 8. Frequency of repeat visitation by fall 1988 survey respondents at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium. Important note: The one visit column indicates the first repeat visit made by respondents.
college with 80.5% of males and 66.7% of females having attended some type of post-high school education. Twice as many males as females had graduate school educations (Figures 9 & 10).

2. Visitor Preferences

When respondents were asked to declare their museum preference, 27.8% of males and 38.1% of females stated their first choice to be a zoo or aquarium; almost equal numbers of males and females preferred art, natural history and history museums; more males preferred a technology/ science museum than females; only .5% of the women declared that they preferred a children's museum (Figures 11 & 12). Of course, consideration must be given to the type of museum where respondents were surveyed. A survey at an art museum might produce quite different responses. However Bitgood, in his study of visitor attitudes, found that respondents viewed zoos (I place aquariums in the same category) as being more child-oriented, informal and less complicated than other types of museums (1987, p.3). Hood (1983) reported that occasional and nonvisitors to the Toledo Museum of Art in Toledo, Ohio limited or excluded themselves from visiting the museum because they preferred to spend their leisure time doing family activities at parks, zoos and picnic areas because they felt the activities in those settings better met the needs of their family.
Figure 9. Educational backgrounds of male respondents to fall of 1988 survey of visitors at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium.
Figure 10. Educational backgrounds of female respondents to fall of 1988 survey of visitors at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium.
Figure 11. Museum preferences of male respondents to fall of 1988 survey of visitors at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium.
Figure 12. Museum preferences of female respondents to fall of 1988 survey of visitors at Oregon State University's Mark O. Hatfield Marine Science Center Aquarium.
When respondents were asked to select their favorite component in the live exhibits at HMSC, as expected, the majority preferred the animals over labels or photos.

When respondents were asked to select their favorite component of the wall exhibits at HMSC, an almost equal distribution of preferences was shown between wall exhibit components. Artifacts or objects were ranked just slightly above the rest of the exhibit components. When respondents were asked to select their favorite component of the temporary exhibits, the majority preferred the photographs and/or illustrations. One fifth of the visitors preferred the artifacts or objects. Twelve percent of the survey participants said they had completely missed the temporary exhibit area in the hallway around the atrium, suggesting the need for orientation improvements.

When respondents were asked to declare if they had read some, all, or none of the exhibit labels: 76.7% claimed they read some of the labels; and 21.7% claimed to have read all of the labels, whereas only 1.7% claimed to have read none of the labels. On the survey questionnaire exhibit labels were classified as being easy to understand, hard to understand, too wordy, and uninteresting. Most respondents (97.48%) found the labels easy to understand; only 0.42% and 1.26%, respectively, found the labels to be hard to read or too wordy. Whether or not the respondents were first time or repeat visitors seemed to have little or no impact on how much label reading or comprehension (if you will) occurred.
Respondents were also asked their opinions about the size of the print in the exhibit labels. Overall, 93% of the respondents found the size of the print to be easy to read whereas, 6% found the print hard to read. Of the participants who declared that they wore prescription glasses, 85.5% still found the print sizes easy to read; 11.8% found the print hard to read. In comparison, 96.1% of the participants, who declared that they did not wear prescription glasses, found the print easy to read.

Summary

The results of the survey questionnaires and the observational data were discussed in some detail. The average length of visitation and the amount of time spent at individual exhibits was examined. Two visitor group types, adult groups and family units were identified. Group dynamics, demographics and behavior were described. The circulation patterns, used by the visitor group types, were examined. Visitor preferences and responses to the exhibits were also discussed.
CHAPTER 4: DISCUSSION OF INTERPRETIVE RESULTS

General Observations

As one would expect, stiff competition for visitor time exists between the live and static exhibits. Children in particular paid close attention to things that moved or things that they could touch. As a result, visits by family groups were generally dictated by the children. Children were generally drawn to a static exhibit only if it contained audio units or a tactile component. Adult family members were frequently observed explaining exhibit content to the children in their group. Cone and Kendall (1978) suggested that family members learned more by this form of instruction than by reading the actual labels themselves.

The level of enthusiasm appeared to differ among children of different age groups. Small children tended to be very excited during their visit and tended to dictate their group's agenda. As Carlisle (1985) found, most children seemed to orient themselves once they entered the aquarium often leading the rest of the group directly to the octopus tank and then the touch pool, thus dictating the direction in which the group would circulate around the aquarium (see Figure 4a-g). These children were often observed returning to interactive exhibits such as the touch pool after the authority figure in the group had forced them to move on to other exhibits in the aquarium. This would cause part or all of the group to revisit those exhibits, often times preventing them from viewing the exhibits at
their own leisure. Groups comprised of adults without children were also observed making repeat visits to the touch pool and the octopus tank; however, these incidents tended to occur when the exhibits were not crowded. (Due to the interactive nature of the touch pool and the octopus tank, children, when present in the aquarium, tended to dominate the space allocated for visitors to touch the animals or to view the octopus at close range.)

The level of verbal interaction observed among adult groups was high. In contrast, most of the verbal interaction within family groups occurred between the parents and children rather than between parents. Similar findings have been reported in the literature (Cone and Kendall, 1978). During the HMSC survey questionnaire interview many of the adults accompanied by children informally stated that their main purpose for visiting the aquarium was to expose their children to the animals. Walsh (1991) reported that many visitors who participated in a focus group experiment stated their primary motive for museum visits was to teach and inspire their children.

Demographics and Museum Preferences

People of all ages made up the family groups in the sample; however, adults in their teenage years and early twenties represented a very small portion of the sample. The cause of this distribution is unclear. However, Bitgood (1987), using what he called an adjective 7-point rating scale, conducted a study of 160 undergraduate and graduate
student attitudes toward visitor-oriented facilities. Respondents were asked to rate different types of facilities (art museums, science museums, state parks, theme parks and zoos) using bipolar adjectives. Complicated and simple represented the extremes of one scale. Results suggest that visitors view museums as more complicated than zoos and parks. Bitgood (1987) suggests that this factor may explain why people avoid visiting museums. The results in Bitgood's 1987 study from a scale with work and fun as the two extreme points suggested that science museums were rated as less fun than the other types of institutions. On grant applications, the public wing of HMSC has been categorized as an aquarium (OSU, 1989, 1990, 1991 Institute of Museum Services, General Operating Support grant proposal). Because the aquarium is publicly known as the Mark O. Hatfield Marine Science Center rather than the Mark O. Hatfield Aquarium, it may be that teenage couples who have never visited HMSC may have a predisposed idea as to what kind of experience they would have if they visited it. Because the teen population may perceive the public wing of HMSC as being a science center, not an aquarium, some may be labeling it as a complicated rather than a fun leisure activity, and may have decided not to visit. This could account for the low level of representation by that age group in this study.

The lack of awareness by the teen population as to what there is to see and do at museums such as HMSC may be attributed to the fact that museums do not advertise their
programs in appropriate forums. HMSC is generally featured in publications appealing to older audiences e.g., *Sunset Magazine* and the *Oregon Coast Magazine*. Walsh's (1991) findings from a focus group experiment in Art museums reported that nonvisitors held stereotypes about what kind of people visited Art museums, the staff, and the kinds of behavior prescribed by the museum environments all of which prevented them from visiting the museum. If the aquarium determines that the teen portion of the population is part of their target audience, the aquarium may want to take a closer look at its public image and visitor perceptions of science.

Bitgood's (1987) study also examined data for a formal-informal adjective comparison and found that museums were classified as being more formal than zoos and parks. When HMSC survey respondents were asked to declare their museum preference, 27.8% of males and 38.1% of females declared their first choice to be a zoo or aquarium. Since the HMSC study placed zoos and aquariums into the same category, and Bitgood's data found that the public preferred more informal than formal surroundings, it is possible that the HMSC results on museum preference may be reflective of museum goers as a whole.

The educational level of the respondents was higher than expected; 56% had attended at least one year of college. Demographics from the survey results at other institutions have reported similar findings in the
Fifty-one percent of respondents were repeat visitors to the aquarium. Most individuals surveyed said they had discovered the museum through word of mouth rather than through the media.

A large percentage or 76.7% of the respondents claimed to have read some of the exhibit labels with 21.7% claiming to have read them all. Wolf (1980) found that visitors were interested in reading labels; however, due to the large amount of information and time constraints they were selective about which labels they would read. Visitors to the Stanford University Art Museum (Yalow et al., 1980) were also reported to read labels.

Traffic Patterns and Time Spent

The average amount of time spent at exhibits in the aquarium ranged from 16.6 seconds to 212.5 seconds (or 3.54 minutes); standard deviations and range (see Table 1) indicate a great deal of variability in visitor behavior. This finding proved to be consistent with some sources in the literature (Eason and Linn, 1976; Falk, 1982) and inconsistent with others (Parsons, 1968; Shettel, 1973). The average length of a visit, based on actual stopwatch recordings, was 30.63 minutes. Yalow et al., (1980) in their study of visitors to the Stanford University Art Museum reported the average visitor to spend between 30 and 60 minutes. Of their 30.63 minute visit to the aquarium, visitors spent 77% of their time viewing exhibits. The rest
of the visitor experience included use of the rest rooms, traveling from one exhibit to the next, chasing children through the aquarium, reorganizing party members and shopping in the aquarium bookshop.

During the survey interview process, some respondents informally commented that they enjoy the small size of HMSC and compared their experience with the one(s) they had had at larger facilities specifically the Seattle Aquarium and the Monterey Bay Aquarium. They further stated that because of the smaller size, their first impression did not overwhelm or pressure them to "see it all" like they had experienced in the larger aquariums. Some stated that they actually preferred to visit HMSC because they felt they could "see it all" in one visit, if they chose to.

The interactive nature of the surge tank, the octopus tank, the touch pool, and tank five generally increased the time spent at these exhibits. The surge tank is an active exhibit in the sense that the water level in the tank fluctuates; water rushes in and out of the tank mimicking the turbulence found in natural surge channels. The octopus tank is the first exhibit the visitor sees when entering the facility. The octopus tank is also interactive in that it is usually staffed with a volunteer interpreter. However, the level of interaction is variable; interpreters personalize their tours and presentations. When at the touch pool exhibit, visitors are encouraged to sit along the edge of the pool and put their hands into the pool to touch live
animals from the Pacific ocean's intertidal zone. Visitors can see the touch pool exhibit from the octopus tank and are usually drawn to it, causing them to view the aquarium in reverse fashion from the original intent. At the time of the survey, tank five, which is located in approximately the center of the aquarium, was home to a second octopus and its den; this octopus was generally very active during the open hours of the aquarium and as a result attracted many visitors to the exhibit space. During the observation period, when a large group of visitors would view tank five, their presence often worked as a catalyst for other visitors who would come over to the tank to see what was going on. The same sort of behavior was observed at the surge tank, located in tank six and next to tank five.

If the traffic patterns are examined in a more general sense, one sees that the octopus tank functions like an orientation area; the majority of visitors enter the facility and go directly to the octopus tank. It is from this area that almost all visitors orient themselves. Few (19%) visitors observed then took an immediate left into the aquarium loop. The majority or 79% leave the octopus tank and go to the touch pool, after which time they enter the aquarium's main exhibit hall, in reverse order from the original plan. Melton's observations (1936, 1972), would suggest that the octopus tank and the touch pool exhibits exercise control over visitor behavior similar to the operating gear-shaper at the New York Museum of Science and
Industry. There, visitors were drawn to the machinery and spent more of their time at the machinery and less of their time with objects in other parts of the museum, thus contributing to the museum fatigue syndrome and possibly preventing the transmission of information from other exhibits in the aquarium. Yalow et al., (1980) reported that visitors spent much of their time on the most extensive collections in the museum. Cone and Kendall (1978) found that as visitors advanced through the museum the frequency of stops made at exhibits, the time they spent at exhibits, and the level of interaction within the group, decreased. At HMSC, this same phenomena was observed with visitors spending more time at interactive exhibits.

Only 12% of the visitors under observation randomly viewed the exhibit stations. The circulation patterns of subjects observed in the aquarium were fairly consistent; no significant difference appeared between how family units and adults tour the aquarium. If the aquarium staff still intends for patrons to make an initial left turn into the aquarium and desires patrons to spend more time at other exhibit stations, some sort of barrier, a deflector exhibit as de Borhegyi (1965) called it, needs to be installed to block the visitor's view of the touch pool.

Adults traveling in adult groups tended to view the aquarium at a much slower pace overall than those adults in family units with children.
Implications for Future Research

This study raises many questions that it can not answer conclusively. Although the question was not asked of all subjects, many of the respondents from family units informally stated that their primary reason for visiting was to expose their children to marine organisms. As reported in the literature (Wolf, 1980), many respondents informally commented that one of the reasons they visited the aquarium was to learn something new. Future studies should formally ask participants to identify their primary reason for attendance.

Other improvements in the survey format could include changes in the way participants disclosed their relationships to other members of their party. Respondents should be asked to classify each member of their party as a family member or a friend. This would eliminate reliance on assumptions about party members; survey questions could then be made more specific to the group dynamics.

The results from two of the questions in the survey questionnaire have not been reported because they did not appear to yield any useful results. When participants were asked what they would change in the existing exhibits, many stated that they were unqualified to make such an evaluation with 71.43% responding that they would change nothing. When asked their preferences on new exhibit topics, respondents usually could not limit their answer to one choice. Similar questions have been asked in focus group experiments and
proved useful (Walsh, 1991). If these two questions were restructured they might prove to be more useful; however, it may be that these types of questions are inappropriate when employing survey methodology.

When asked about the size of the print in the exhibit labels, most respondents declared the print size easy to read. Because the exhibit labels were not categorized by exhibit type, i.e., aquarium tank labels generally use smaller type than labels in the static exhibits, I do not feel completely confident with the results from this question. Further research, that asks for comment on exhibit labels placed into specific categories rather than in general, is needed.

Regrettably, nonvisitors to the aquarium were not sampled. Future research could yield interesting findings if it were to include survey questionnaire results from a sample population (e.g., tourists from the Newport's bay front) of potential visitors to find out why they did not visit the aquarium and to compare their demographic characteristics with visitors. Pre and post visit expectations recorded from focus group experiments modeled after those reported by Walsh (1991) could provide an interesting perspective on visitor behavior as well as strengthen the relationship between the staff and their audience.

While the random sampling process may be considered to accurately reflect the attributes of visitors in fall of
1988, readers of this study must be advised that seasonal differences in the demographics of the aquarium visitors probably occur. This study can only be used to make inferences about fall visitors. Seasonal sampling would provide a more complete description of the HMSC audience. Personal observations and communications with HMSC staff during my four years of affiliation with the center lead me to suspect that the demographics of the visitors during the different seasons vary somewhat according to that season; e.g., summer season probably differs from the fall season in that the number of families traveling with children appears higher.

Twelve members of the HMSC volunteer pool helped collect these data. Originally, I had requested the help of three or four volunteers to work with me full-time throughout the survey collection period. Due to scheduling problems beyond my control, my request was denied, and twelve part-time volunteers were hand picked and recruited by Dr. Kathleen Heide, former Marine Education Specialist, HMSC. This strategy proved to be adequate, but not ideal; a smaller number of administrators would have been more manageable. Because I could not be in two places at one time, some control over how the surveys were administered was lost. For example, survey administrators were trained to conduct the surveys by interview and to record responses directly on to the questionnaire. One of the administrators did not follow this procedure and allowed visitors to fill
out the questionnaires themselves. As anticipated, not all of the survey questions were answered. Because I could not determine the meaning of blank spaces, questions with no response or any other indication marked on them had to be deleted from the sample.

In the three years following the study period, many changes have been made in the aquarium. Two waist high orientation maps have been placed in areas earlier lacking orientation. These maps do not, however, seem to have resolved the orientation problems. It appears that the maps are too small and not obvious enough to attract the casual visitor's attention. Some of the exhibit spaces that had previously presented problems for visitors have been changed. Interpretive signage has been added to the atrium exhibits to encourage further utilization of the space and new permanent and temporary exhibits have been added.

Aside from aiding the HMSC staff with future planning, the methods and results reported in this study, though specific to HMSC, will be useful to other museums and aquariums. The location of HMSC along the Oregon Coast and the high density of tourists who visit HMSC during their stay along the coast is an important element in determining the relevance of this study to other aquariums, zoos, visitor centers, and museums. Because tourists make up a large portion of the audience at HMSC, it can be assumed that the sample is representative of a large population and therefore, reflects the opinions and behavior of the general
public. The challenges faced by HMSC staff are not unique to others in the field. Each institution, regardless of its type, competes for visitor time, attention, energy, and funding. This study provides insights on methodology and results that may aid those institutions in the planning stages of their own research, and may serve as a reference for those institutions unable to conduct their own visitor studies.

Recommendations

The HMSC aquarium has many options for improving their programs. As previously mentioned, the installation of some sort of deflector exhibit, either in front of the octopus tank or between the octopus tank and the touch pool, could help control visitor traffic flow to the left. The octopus tank is in need of natural history interpretation in any case so the deflector panel(s) could serve two purposes; the panel(s) would put some parameters around the octopus tank exhibit space serving as an orientation area, and also interpret the exhibit when a live interpreter is unavailable. Currently, most natural history information is transmitted through a live interpreter.

HMSC should increase the size of the two waist high orientation maps. The cabinetry and the maps themselves are both too small for visitors to locate and too small for many visitors to read. A subtle border of color painted along the walls directly above the floor molding, through out the public areas of the aquarium might also help define the
exhibit spaces for the visitor. Changing the color of the walls in the temporary exhibit spaces around the atrium could also help define the exhibit spaces and orient visitors through that portion of the aquarium.

Since this study was completed, the permanent exhibit of bronze whale sculpture, *Whale Watching*, was installed in the atrium hallway; it appears to have helped flow visitors through the exhibit space for visitors can see the exhibit through the atrium glass and therefore can assume that the hallway is open to the public rather than just office space. This exhibit is located near the staff lunch and mail room and when the exhibit was installed, the mailroom door was reversed so that it swung inward and could remain closed. However, the staff need to be trained to keep the door closed during operating hours so that the visitors do not hesitate to circulate through the hallway.

After the HMSC staff complete their long range plan, and new exhibit themes are determined, the original static exhibits in the aquarium loop (see Appendix C) should be renovated. At the time of installation, in 1965, the static exhibits were considered state of the art. Because the static exhibits compete for attention with the live exhibits, and because visitor expectations have become more sophisticated, these exhibits, in general, seem to have lost their attracting and holding power. Low-tech interactive units, i.e., tactile components such as raised-relief resin castings of marine organisms and discovery boxes like those
seem in the Discovery Room at the National Museum of Natural History in New York, should be incorporated into the exhibits. Interactive components such as these can attract the attention of visitors of all ages, allow for further interpretation of exhibit content and increase the accessibility of the exhibits for visitors with special needs. Interactive components can also provide a means to increase the level of group interaction at the static exhibits. By providing group members with hands-on activities at each exhibit, the time spent at the static exhibits will most likely increase. The components within the discovery boxes could include biological samples related to the static exhibit but also to the animals on exhibit in the live exhibit cases near the static exhibit, thus communicating to the visitor that there may be a link between the exhibits. Dysfunctional audio units should be replaced with new units and interpretive messages.

Static exhibits like HMSC's, *Oregon's Marine Birds*, should be modified so that the taxidermic specimens are placed into actual habitats rather than just put into display cases in front of a scenic photo mural.

If the exhibits were to be renovated, the shape of the exhibit spaces could be changed. Rather than lining exhibits directly up along the architectural walls, false walls or smoked plexiglass partitions could be installed to help segregate and define the exhibit spaces. Colorful nylon banners with exhibit logos or marine organisms silkscreened
onto them could be installed to help divide the exhibits into thematic categories and increase attracting power.

Summary

This chapter analyzed the interpretive significance of the results found in this study. Discussion included speculations by the investigator, supported by references in the literature, as to why certain age groups, i.e., teenagers, do not visit museums. The level of interaction between visitor group members and its significance to the museum experience was discussed. Visitor traffic patterns and the competition between exhibits for visitor time was examined. Suggestions for future research and the relevance of this study to other museums, zoos and aquariums was also discussed, and recommendations were provided.
REFERENCES CITED


Cameron, Duncan F. 1967. "How Do We Know What Our Visitors Think?" Museum News, 45/7: 31-33.


Information. Syracuse University, PHD dissertation. UMI dissertation information service.


APPENDIX A.

HMSC Attendance Records
APPENDIX A.

HMSC Attendance Records for 1965 - 1989

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NUMBER OF VISITORS</th>
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</tr>
<tr>
<td>1966</td>
<td>63313</td>
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<tr>
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</tr>
<tr>
<td>1988</td>
<td>433099</td>
</tr>
<tr>
<td>1989</td>
<td>421546</td>
</tr>
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</table>

Attendance records provided by Education Office, Oregon State University's Mark O. Hatfield Marine Science Center Aquarium.
APPENDIX B.
HMSC Visitor Survey
Questionnaire
APPENDIX B.
HMSC Visitor Survey
QUESTIONNAIRE

Interviewer's Name:

Today's Date:

PART ONE: Demographic information

1. Where do you live?
   Town or City? ____________________________
   State or Country? ________________________
   Zipcode? _____

2. What is your age? ___

3. What is your sex? ___M ___F

4. What is (or was) your occupation?
   ______________________________________

5. What classification best fits your current employment?
   ___ Professional   ___ Homemaker   ___ Student
   ___ Managerial    ___ Technical    ___ Unemployed
   ___ Sales        ___ Clerical     ___ Other
   ___ Labor       ___ Retired

6. What level of schooling have you completed?
   ___ grade school   ___ GED        ___ graduate school
   ___ high school   ___ college     ___ other (please specify)

PART TWO: Visitor Background

7. If you took post-high school education, what was your academic major?
   ______________________________________

8. If you were visiting a city and someone suggested visiting a museum, which one of the following types would be your first choice?
9. Please check off the categories that apply to you:

__ A natural history museum  __ A children's museum
__ A historical site or museum  __ An art museum
__ A technology/science museum  __ A zoo or aquarium

10. Below is a list of reasons one might have for visiting this aquarium. Please check off the reason(s) you had for visiting the aquarium today:

__ to be entertained
__ to experience something different
__ to learn something new
__ to share something with someone
__ to view unusual animals
__ other (please specify) ____________________________

11. Is this your first visit to the Hatfield Marine Science Center's Aquarium/museum?

__ yes  __ no
12. If you answered no to question 11, how many visits have you made in the last year? (please check one)
   ___ 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 or more

13. How did you first learn about the marine science center?
   ___ highway road sign   ___ road guide (specify)
   ___ friends or family
   ___ television, magazines or newspaper articles
   ___ comments from employees at other or attractions, hotels
      or restaurants
   ___ I don't remember
   ___ other (please specify) ________________________________

14. How many people are in your party today? ___ Please specify age(s) and sex ____________

PART FOUR: Visitor Reactions

15. What component of the live exhibits did you like most? (check one)
   ___ labels/text   ___ photographs   ___ animals

16. What component of the wall exhibits did you like most? (check one)
   ___ labels/text   ___ photographs/illustrations
   ___ artifacts/objects   ___ other (specify) ____________
   ___ skeletons/bones

17. What component of the temporary exhibits did you like most? (check one)
   ___ labels/text   ___ photographs/illustrations
   ___ artifacts/objects   ___ other (specify) ____________
18. When viewing the exhibits, what portion of the labels/text did you read?
   ___ some    ___ all    ___ none

19. I found the labels/text in the aquarium/museum to be?
   ___ easy to understand    ___ too wordy
   ___ hard to understand   ___ uninteresting

20. I found the size of the print in the labels/text in the aquarium/museum to be?
   ___ easy to read
   ___ hard to read (please specify) ______________________________

21. Did you find the layout of the museum easy to follow?
   ___ yes
   ___ no (please specify) ______________________________

22. Did you have any trouble finding the exhibits?
   ___ yes (please specify) ______________________________
   ___ no

23. If you could change the existing exhibits, what would you change (please specify for each)?
   ___ the size of the print ______________________________
   ___ the amount of labels/text ______________________________
   ___ the colors ______________________________
   ___ the museum's layout ______________________________
   ___ other ______________________________
   ___ nothing

24. If you could add a new exhibit to the museum what topic would you prefer? (if more than one please put in numerical order)
__ Native Americans __ fishing
__ fossils and geology
__ marine mammals (circle one: living/non-living)
__ birds (circle one: living/non-living)
__ other (specify)_____________________

25. In a few words, describe your overall feelings about the museum today:

________________________________________________________________________

26. In the future, if possible, I would like to make a return visit to the Marine Science Center.

__ yes __ no

27. If your answer to the above question is no, please tell us why:

________________________________________________________________________

________________________________________________________________________

28. Approximately how much time did you spend in the museum today?

_____________________

29. SURVEY ADMINISTRATOR: Please enter the number of visitors in the center at this time ____________.
APPENDIX C.

Floor Plan Map
Appendix C. Floor plan map of exhibit space at the HMSC Aquarium at the time of study, fall 1988.
APPENDIX D.

Results of Comparison Experiment Between Electronic Eye Tally and Hand Tally at HMSC
APPENDIX D.

Results of Experiment Conducted by Ms. Harriet Martin and Dr. Kathleen Heide: Accuracy of Electronic Eye Tally Compared to Hand Tally for Visitor Count at HMSC Aquarium.

<table>
<thead>
<tr>
<th>Date</th>
<th>Type of Day</th>
<th>Hand Tally</th>
<th>Electronic Tally</th>
<th>*Ratio</th>
<th>Number of Doors Unlocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/16/88</td>
<td>Busy</td>
<td>672</td>
<td>652</td>
<td>.97</td>
<td>One</td>
</tr>
<tr>
<td>5/18/88</td>
<td>Busy</td>
<td>807</td>
<td>756</td>
<td>.94</td>
<td>Two</td>
</tr>
<tr>
<td>5/23/88</td>
<td>Busy</td>
<td>717</td>
<td>703</td>
<td>.98</td>
<td>One</td>
</tr>
<tr>
<td>5/17/88</td>
<td>Busy</td>
<td>710</td>
<td>696</td>
<td>.98</td>
<td>Two</td>
</tr>
<tr>
<td>5/24/88</td>
<td>Slow</td>
<td>324</td>
<td>384</td>
<td>1.19</td>
<td>One</td>
</tr>
<tr>
<td>5/25/88</td>
<td>Slow</td>
<td>365</td>
<td>426</td>
<td>1.17</td>
<td>Two</td>
</tr>
</tbody>
</table>

* Ratio of tally made by electronic eye to tally made by hand.

Results provided by Dr. Kathleen Heide, former Marine Education Specialist, Oregon State University's Mark O. Hatfield Marine Science Center Aquarium, Newport, Oregon.