MARINE RECREATION AT THE MOLOKINI SHOAL MLCD

Final Report Prepared By:

Brian W. Szuster, Ph.D.
Department of Geography
University of Hawai‘i at Mānoa

Mark D. Needham, Ph.D.
Department of Forest Ecosystems and Society
Oregon State University

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EXECUTIVE SUMMARY

Hawai‘i hosts approximately seven million visitors each year who spend more than $11 billion during their visit. More than 80% of these visitors engage in coastal or marine recreation activities such as snorkeling or scuba diving. Given this level of recreational use, Hawaii’s Department of Land and Natural Resources (DLNR) faces a set of management challenges in areas under their jurisdiction including: mitigating reef environments from degradation, protecting public access, determining recreational use thresholds and managing use levels to ensure that these thresholds are not violated, and ensuring that user experiences are not compromised. This study presents a comprehensive assessment of social impacts related to marine recreation activities at the Molokini Shoal Marine Life Conservation District (MLCD). It presents a rigorous scientific approach capable of assessing social impacts related to marine recreation use, and applies this approach at the Molokini Shoal MLCD to test its performance and potential transferability to other high priority marine recreation sites across the state.

ADMINISTRATIVE CONTEXT

Marine recreation planning and management in Hawai‘i takes place within an administrative context that includes several state agencies and a broad range of relevant regulations. Management of MLCD is the responsibility of the Division of Aquatic Resources (DAR) which is an administrative unit of the DLNR whose mission is to “manage, conserve, and restore” Hawaii’s aquatic resources and ecosystems for present and future generations. The Division of Boating and Ocean Recreation (DOBOR) is responsible for the management and administration of recreation and coastal areas programs in all waters out to three nautical miles, and the Division of Conservation and Resources Enforcement (DOCARE) is responsible for enforcement activities at state marine recreation sites.

Marine Life Conservation Districts (MLCD) in the State of Hawai‘i are regulated under the Marine Life Conservation Program as defined by *Hawai‘i Revised Statutes Chapter 190, Sections 1-5.* Fishing and other consumptive uses are usually prohibited in MLCD, but these areas commonly support non-consumptive commercial activities such as dive operations and snorkeling tours. DLNR regulation of commercial activities that affect MLCD is guided by a set of policies which includes a hierarchy of priorities. The highest priority is to conserve natural and cultural resources, and commercial activities should only occur on state owned or managed lands or waters if these do not unduly damage the resource. The second priority is public access which should only be maintained as long as natural and cultural resources are preserved. Commercial activities are third in this hierarchy and should only be permitted if impacts do not impinge on the resource or

use by the general public. The commercial use policy also states that Limits of Acceptable Change (LAC) principles should be used to manage commercial use of state controlled resources. The Molokini MLCD was created in 1977 through HAR 13-4-31 which outlines boundaries, prohibited and allowed activities, exceptions, permits, and penalties. The DLNR has issued 41 commercial use permits at the Molokini MLCD under the authority of HAR 13-31-5 to engage in commercial scuba diving, snorkeling, snuba, swimming, and sightseeing tours. Day use moorings were also installed at the site under the authority of HAR 13-4-257 which was enacted in 1994.

ENVIRONMENTAL CONTEXT

Molokini islet is the southern rim of an extinct volcanic crater and the shallow inner cove is the crater's submerged floor. The islet is owned by the U.S. Fish and Wildlife Service and managed as a bird sanctuary, and the Hawaiian Islands Humpback Whale National Marine Sanctuary surrounds the MLCD. The crater offers protection for fragile benthic species and the site is well removed from offshore sediment inflows that frequently disrupt nearshore reef habitats. The most common substrates are turf algae, sand, and approximately 38 species of hard corals. The environmental status of Molokini MLCD is regularly evaluated by DAR as part of a broader marine environmental monitoring program in the State of Hawai‘i. Coral reefs at Molokini are considered to be "relatively healthy" in spite of substantial marine recreation use and impacts associated with these activities are mitigated by the site's isolation and depth.

Fish surveys at Molokini MLCD have identified high species diversity, richness, and biomass that varies spatially due to factors such as food availability and habitat structure. Tropic structure among habitats was 42% herbivores, 41% predators, and 17% secondary consumers with dominant species such as surgeon fish, trigger fish, sharks, jacks, and parrot fishes. The most common fish are orangespine and unicornfish, but bluefin trevally, giant trevally, and the bigeye emperor fish are also widespread. Juvenile white tip reef sharks are frequently seen at Molokini, and abundant plankton along the outer crater wall can attract whale sharks and manta rays. Fish surveys at Molokini found more apex predators, herbivores, and larger fish of heavily-targeted species than in other comparable open access areas of Maui County.

FOCUS GROUP SUMMARY

Results of focus groups with commercial operators, government agencies, native Hawaiians, and recreation and environmental interest groups showed both similarities and differences among stakeholders with interests in Molokini. With respect to similarities, the focus groups demonstrated a lack of communication among agencies and stakeholders, and all groups desired improved collaboration. Stakeholders identified a lack of agency leadership, management, and enforcement, no clear

objectives or goals for the site, and a lack of rigorous human use data. Also, there was a lack of dedicated funds for management, planning, operations, maintenance, data collection, communication outreach and inreach, monitoring, and enforcement. Confusion over agency jurisdiction and responsibility, and lack of information from agencies were also identified as issues. There were significant concerns voiced over management of moorings. A desire for all types of sustainability, site enhancement, and effective education of users was present, but no one suggested making the area an "off limits" sanctuary or preserve. All participants agreed in principal on objectives for Molokini (sustainable environment, sustainable businesses, quality user experiences, respect Hawaiian culture) with a few minor differences in priorities.

Differences between commercial operators and community groups were also evident. Commercial operators were more concerned about business operations and client safety, and believe that that the existing situation works well (except agency – operator relations). Community groups, on the other hand, believed that changes need to occur. Disagreements were identified over the number and size of boats that should be allowed in the MLCD, and the appropriate amount of human use that should be allowed at the site. Ideas varied regarding the appropriate type and number of non-commercial moorings. Perceptions about the degree of non-commercial versus commercial conflict at Molokini were also identified. Different perspectives on educating visitors at Molokini were evident, with community groups believing that the Hawaiian cultural aspect is largely absent in interpretation provided on tour boats.

MARINE RECREATION USE AND SOCIAL CARRYING CAPACITY

Onsite Observations

Researchers traveled on 28 commercial trips to Molokini and documented that most trips departed harbors or boat ramps by 7:30 AM, returned by 12:30 PM, and visited a secondary site before or after visiting Molokini. All boats had onboard toilets and most trips offered meals and played music on the boats. Barbequing occurred on most large boats, but not on smaller boats. Guides handling or showing marine life to clients was observed on some trips, introductory diving was observed on some smaller boats, and fishing was observed on a few larger boats. Dumping waste overboard and feeding fish was not observed on any trips. Information about safety, equipment, nature, underwater species, coral reefs, proper etiquette, fish feeding, and touching marine life was provided on almost all trips. Most trips on large boats provided information about history and impacts on the environment, but smaller boats did not discuss these issues. Few trips provided information about native Hawaiian culture.

Personal and Trip Expectations

Pre-trip (*n* = 712) and post-trip (*n* = 439) onsite surveys were administered to people visiting Molokini on tour boats in both high and lower use periods. Results showed that 85% of visitors to Molokini were snorkeling and 15% were scuba diving. Almost all people on large boats were snorkeling and all but a few on smaller boats were scuba diving. Approximately 30% of visitors were using their Molokini trip to try this activity for the first time with 32% snorkeling and only 12% diving for the first time. Most visitors were minimally or moderately experienced and involved in these activities. Only a few were highly specialized with snorkelers less specialized than scuba divers. In total, 81% of respondents were first-time visitors who had not previously been to Molokini, but visitors on smaller dive boats were more likely to have been to Molokini before. Most respondents visited Molokini in groups of two or four people, but group size was much smaller on dive boats with the largest proportion traveling on their own in these boats.

Almost all Molokini visitors had biocentric (nature oriented) values toward the environment, and there were no groups with mixed or anthropocentric (human focused) value orientations. Almost all visitors also had protectionist (nature oriented) specific values toward coral reefs, and there were no groups with mixed or use-related value orientations toward reefs. Visitors on smaller dive boats were more likely to hold stronger protectionist orientations toward reefs. Pre-trip and post-trip responses showed that trips to Molokini had no immediate change on visitor value orientations toward coral reefs (i.e., visitors were not more environmentally oriented or appreciative of coral reefs immediately after their trip). In total, 52% of survey respondents were female, but more males (61%) were present on the smaller dive boats and more females (55%) were present on larger snorkel boats. The largest proportion of visitors was between 40 and 49 years old, and average age of respondents was 41 years old. Almost all respondents did not live on Maui (97%) with only 4% residing in the state of Hawai'i. Over 79% of visitors resided in the United States and 15% were from Canada. Most visitors from the United States lived in the western states of California, Washington, and Oregon.

Satisfaction

Results showed that the overall satisfaction of Molokini visitors was extremely high, with 95% of respondents satisfied with their trip and almost no respondents dissatisfied. The majority of passengers also considered Molokini to be the best attraction in Maui. Over 60% of visitors considered their trip to be exactly what they expected and one-third believed that it was better than they expected. High overall satisfaction, however, is typical in recreation and tourism settings, and does not mean that visitors were satisfied with all aspects of their visit to Molokini. Visitors were most satisfied with customer service from tour staff and the equipment and boats used on these tours. A large

proportion of visitors, however, were dissatisfied with the inability to escape crowds of people, and that they did not learn about history of the area or native Hawaiian culture.

Visitors on smaller dive boats were much less likely to learn about nature, reefs, history, and Hawaiian culture. These visitors were also less likely to experience calm ocean conditions, try new activities, rest and relax, photograph marine life underwater, and spend time with friends or family. They were, however, more likely to meet new people and see a lot of fish, a variety of fish species, and different types of coral. Over 80% of visitors learned that feeding fish and touching marine life is harmful on their trip. A majority of visitors also increased their awareness of the marine environment, learned that their daily actions affect these areas, and that humans impact the marine environment and their own behaviors cause problems in there areas. Visitors also learned that that they can help the marine environment by donating or volunteering. Only a few visitors learned information that increased their awareness of native Hawaiian culture. Visitors on large snorkel boats were much more likely than those on smaller dive boats to experience these learning opportunities during their trip.

Visitors on large snorkel boats rated almost all experiential attributes of their trip to be important and were satisfied that they experienced these attributes, indicating that they felt managers and operators on these boats are doing a good job. Managers and operators should, however, monitor attributes such as seeing a large number and variety of fish, viewing larger marine life and colorful coral, and learning about nature, reefs, and marine species. Visitors strongly expected to encounter these attributes on their trip, but only slightly agreed that they actually experienced these on their trip. Visitors on smaller dive boats rated many attributes of their trip to be important and were satisfied that they experienced these on the trip. Many passengers on these smaller boats, however, expected to photograph marine life underwater and learn about history of the area and native Hawaiian culture, but most were dissatisfied that they did not experience these on their trip. Managers and operators should also address issues such as seeing large marine life and colorful coral, and learning about nature, reefs, and marine species because visitors on these smaller boats strongly expected to encounter these on the trip, but only slightly agreed that they actually experienced these features.

Attributes that met or exceeded visitor pre-trip expectations included those related to boat staff and equipment, trip organization and food, safety, spending time with friends or family and meeting people, time in the water, water cleanliness and visibility, scenery, coral conditions, having fun, and value for money. However, attributes that did not meet visitor pre-trip expectations involved educational information and opportunities for learning (e.g., marine life, coral, nature, Hawaiian culture), trying new activities, taking risks, being adventurous, and seeing many fish and other marine species.

Social Carrying Capacity

Respondents encountered an average of 62 people on their boat, but not surprisingly, this differed by boat size with respondents encountering an average of 78 people on large boats and 17 people on smaller boats. Encounters reported by visitors were similar to use levels counted by trained researchers (average or mean of *M*= 64 people per boat: 96 on large boats, 14 on smaller boats). Respondents also saw an average of 84 people in the water on their trip to Molokini, with visitors on large boats seeing more people in the water (*M* = 98 people) than what visitors on smaller boats encountered (*M* = 42 people). These encounters are likely related to boat size. Passengers remained close to their boats and only likely counted people they saw or encountered in the water surrounding the boat on which they were traveling (i.e., they did not count users on other boats moored in other areas of Molokini). Trained researchers recorded that the average number of people in the water was almost double (*M* = 162) the number reported by visitors. Respondents saw an average of 153 people in total at Molokini with visitors on large boats reporting more encounters (*M* = 177 people) than those on smaller boats (*M* = 82 people). Visitors likely only counted the number of people they saw on their boat, in the water surrounding their boat, and on and near boats moored immediately next to the boat on which they were traveling. Researchers recorded the average number of users at Molokini any one time was 326 people, which is double the number reported by visitors.

Most visitors (63%) reported seeing 6 or fewer boats on their trip at Molokini, but it can be challenging for visitors to accurately count since line of sight can easily be blocked by other boats at Molokini. Trained researchers counted an average of 12 boats at any one time at Molokini. Researcher counts of the average number of boats (12) and occupancy of boats (96 on large boats, 14 on small boats) can be used to estimate current visitation at the site. Assuming 6 large boats and 6 smaller boats, the number of people at Molokini at any one time is approximately 660 people (240,000 people visiting Molokini per year). This estimate should be treated with caution because it does not account for boats that make two or more trips to Molokini each day, differences in proportion of large and small boats, economic factors affecting tourism, and weather preventing boats from visiting. For example, if 75% of boats at Molokini were large and one of these boats was making a second trip each day, the estimate would be 1,002 people per day (365,000 people per year).

Visitors to Molokini would accept encountering a maximum of approximately 63 people on their boat, 102 people in the water, and 160 people in total at one time. Respondents on large boats would accept encountering substantially more people than what those on smaller boats would accept encountering. Using the maximum acceptable number of people as a standard for management at Molokini may be inappropriate, however,

because the ability to distinguish or count people is constrained when visitors are underwater or when line of sight is impeded by waves and boats. Use levels at Molokini are also directly linked to the number and size of boats carrying passengers to the site, and these factors are likely more appropriate for determining standards of quality.

Number of boats had a stronger influence than size of boats on acceptable use levels. The majority of people visiting Molokini did not accept the presence of more than a relatively even mixture of 15 small and large boats at one time, and this could represent a possible standard of quality for management purposes. The acceptable use level would rise to 17 boats if all boats present were “small” and fall to only 12 boats if all boats present were “large”. These minimum acceptable boat numbers can also be combined with researcher counts of average boat occupancy to estimate social carrying capacities at Molokini. For example, if half of the boats are small and half are large, estimated site capacity would be 915 people at one time. If all boats are large, the maximum acceptable site capacity would be approximately 1,105 people at one time.

The majority of visitors expected to escape crowds at Molokini, but over two-thirds of respondents felt crowded at this site with 67% feeling crowded by the number of boats and number of people on their boat, 70% feeling crowded by the number of people in the water, and 73% feeling crowded by the total number of people at Molokini. Crowding levels this high suggest that Molokini is "overcapacity" and immediate management action is necessary to improve and preserve visitor experiences. Without immediate action, the site is likely destined to become a "sacrifice area" of high-density use where the quality of the environment and visitor experiences are compromised. A majority of respondents reported encountering more people on their boat, in the water, and in total at Molokini than they would tolerate. This suggests that human use levels (i.e., number of people) are a problem at Molokini and the site is operating over its capacity. A majority of respondents reported encountering fewer boats at Molokini than they would tolerate, suggesting that although the number of people visiting Molokini is problematic, the number of boats may be less of a concern. However, over 65% of visitors still felt crowded by the number of boats at Molokini, and this suggests that managers should consider actions that control both the number of people and number of boats at this site.

Conflict

Over 70% of snorkelers observed other snorkelers being too close, not looking where they were going, and bumping into people. Fewer than 26% of divers observed these snorkeler behaviors. The majority (56%) of snorkelers and 30% of scuba divers experienced conflict with other snorkelers, with almost all of this being interpersonal or face-to-face conflict. Approximately 30% of scuba divers observed other divers being too close, not looking where they were going, and bumping into people. Fewer than 5% of snorkelers observed these scuba diver behaviors. Over 75% of scuba divers did not

experience conflict with other divers and almost 90% of snorkelers did not experience conflict with scuba divers at Molokini. These results suggest that there was relatively little conflict with scuba divers, but quite a high amount of conflict with snorkelers, and most of this conflict was in-group interpersonal conflict with other snorkelers.

Only 18% of respondents saw snorkelers chase or harass marine life at Molokini. Fewer than 10% of visitors saw snorkelers or scuba divers feeding fish or bumping, handling, or standing on coral at this site. More people on larger boats saw snorkelers chase or harass marine life (21%) and more users on smaller dive boats saw scuba divers bump, handle, or stand on corals (23%). Only 13% of respondents saw tour boat staff handle or touch marine life at secondary sites (e.g., Turtle Arches / Turtle Town) and 8% witnessed staff handling marine life at Molokini. Approximately one-third of people on both the large snorkel boats (31%) and smaller dive boats (36%) believed that it would be acceptable for tour boat staff to handle or touch marine life during the tours.

Support for Management

Over 83% of respondents supported prohibiting fish feeding at Molokini. Over two-thirds of visitors supported restricting use levels at Molokini by limiting the number of boats allowed per day (79%), limiting the number of people allowed per day (73%), and restricting the size of boats allowed (66%). These high levels of support for such direct and restrictive actions on use levels and visitation are rare in recreation and tourism. Over two-thirds of respondents also supported doing more to inform passengers about the marine environment (75%), appropriate behavior (67%), and native Hawaiian culture (64%). Approximately 50% of visitors supported improving maintenance and upkeep of harbor and boat ramp facilities, 41% supported designating some boat moorings solely for non-commercial use, and 36% supported spatially zoning activities at Molokini. Fewer than 30% of visitors supported prohibiting music, barbequing, and introductory dive training on boats, but users on smaller dive boats were more supportive of these restrictions. Few visitors (9%) supported closing Molokini to all recreation and tourism use. Approximately 66% of respondents believed that there are currently too many moorings at Molokini and that there should be fewer moorings. Most respondents (74%) were aware that Molokini was a marine life conservation district, 26% were unsure, and only 1% believed that it was not a conservation district.

Future Visitation

Almost all visitors (82%) said that they would return to Molokini. Approximately 44% would come back with different expectations about the site; 16% would not come back because they felt that they do not need to visit twice; and 11% would not come back because they believed that they can have better experiences elsewhere on Maui.

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1.0 INTRODUCTION

1.1 MARINE RECREATION AND TOURISM IN HAWAIʻI

Hawaiʻi hosts approximately seven million visitors each year who spend more than US $11 billion in the state and in the last 20 years tourism has increased over 65% (Friedlander et al., 2005). More than 80% of Hawaii's visitors engage in recreation activities in the state's coastal and marine areas with the majority of these individuals participating in scuba diving (200,000 per year) or snorkeling (3 million per year) when visiting (Hawaiʻi DBEDT, 2002; van Beukering & Cesar, 2004). Other popular marine recreation activities include ocean kayaking, parasailing, swimming, outrigger canoeing, and surfing. Coral reef areas are a focal point for much of this recreation use, but these areas are also a natural resource that has considerable social, cultural, environmental, and economic importance to the people of Hawaiʻi. For example, the state's reefs generate US $800 million in revenue and $360 million in added value each year (Cesar & van Beukering, 2004; Davidson et al., 2003). These reefs are also important for local residents, as approximately 30% of households in the state have at least one person who fishes for recreation and almost 10% of households also fish for subsistence purposes (QMark, 2005).

As popularity of Hawaii's reef areas continues to increase, demand for access and use can disrupt coastal processes, damage ecological integrity of reef environments, reduce the quality of user experiences, and generate conflict among stakeholders regarding appropriate management responses (Orams, 1999). As a result, state regulatory agencies such as Hawaii's Department of Land and Natural Resources (DLNR) are faced with a set of challenges that include determining use thresholds and how to

manage and monitor use levels to ensure that thresholds are not violated, protecting reef environments from degradation, and ensuring that user experiences are not compromised. Given this context, there is an urgent need to: (a) develop a comprehensive approach capable of assessing social impacts related to marine recreation use, and (b) apply this approach at a high use priority area to test its performance and potential transferability to other sites.

1.2 STUDY SITE BACKGROUND

The Molokini Shoal Marine Life Conservation District (MLCD) study site consists of waters surrounding a crescent shaped volcanic islet located in the Alalakeiki Channel, which is approximately three miles west of the Kihei coast on the island of Maui (Figure 1.1). Access to the site is typically by boat with commercial charter / tour operations operating out of Lahaina, Ma'alaea, and Kihei on Maui. The MLCD has been a popular scuba diving and snorkeling destination for several decades, and after the mid-1970s, has been used infrequently for fishing. The islet is a federally owned seabird sanctuary and permission to land on it is required from the U.S. Coast Guard and Hawai'i Department of Fish and Wildlife. The MLCD was created by the Hawai'i DLNR in 1977 to protect fisheries, marine wildlife, and marine habitats in waters surrounding the islet.

Figure 1.1 Molokini MLCD Study Site

Native Hawaiian's utilized Molokini as both a source of fish, birds, feathers, and eggs, and traditional fishing stone sinkers and lures can still be found in the waters surrounding the islet. The crater's origins have been described in Hawaiian story and chant (Severns & Fiene, 2008) with several different stories describing places on Molokini that are associated with four major gods: Lono, Kü, Kanaloa, and Kāne. The chant *Mele a Pakaui* describes how earth mother Papa gave birth to the Big Island of Hawai'i then crossed the Alenuihāhā Channel to create Maui. With help from the gods Kāne and Kanaloa, Papa delivered Mololani (Molokini) and Kaho'olawe in the Alalakeiki Channel. In another chant, Molokini is connected to the birth of nearby Kaho'olawe whose placenta was cut by Uluhina and tossed into the sea where it became the islet of Molokini. In ancient times, parents who wanted a newborn son to be a seafarer placed his placenta into the waters of the Kealaikahiki Channel between Kaho'olawe and Molokini. This channel is significant because Kealaikahiki means 'the path to Kahiki," which is better known as Tahiti. Another story of Molokini describes a love triangle that angered the goddess Pele. The focus of this story was the lizard girl Pu'uoinaina who jumped into the ocean off Kaho'olawe to escape Pele, but she was captured and had her body cut in half with the lizard head forming Molokini and the tail Pu'uolan'i, which is another cinder cone at Makena on Maui. The final story tells of a hill rising up on Moloka'i, which is destroyed by the *kupua* Kana who scatters it all over Hawai'i with one small piece falling into the adjacent Alalakeiki Channel to form Molokini.

In historic times, Molokini was charted by the French explorer Jean-Francoise de Galoup Compte de La Perouse in 1786, and King David Kalakaua hired Baldwin and Alexander to survey the island in 1883. A navigational light was installed on the islet in

1911, but was extinguished during WWII for security purposes and ultimately destroyed by practice bombs when Molokini was used for target practice during this period. Although Molokini did not suffer as much damage as nearby Kaho'olawe, the U.S. Navy detonated two large unexploded bombs that remained inside the crater after cessation of military activities. This pulverizing of a large area of coral reef and damage from this event can still be seen today in the crater. Public outcry over the handling of unexploded munitions at Molokini persuaded the Navy to finally remove most remaining WWII-era bombs from the crater. A wooden light tower was erected on Molokini after WWII, which lasted 42 years before it was destroyed by a storm; this was replaced by a stainless steel tower that is still standing and regularly serviced by the U.S. Coast Guard.

Figure 1.2 Molokini Shoal MLCD

Commercial recreation use of Molokini is known to have begun in 1974 with afternoon catamaran rides to the site from Ma'alaea harbor, and business operators subsequently received permission to bring scuba divers to the area. During these early days of commercial recreation activity at Molokini, operators would use steel anchors to moor vessels at the site, but concerns over anchor-induced damage to coral reefs eventually led to installation of 26 mooring buoys at the site. Recreation use at Molokini has increased dramatically since installation of these moorings, which can be used multiple times per day. Up to 30

vessels visit Molokini in each 24 hour period and as many as 2,180 people could visit the site in a single day if all permitted vessels were present (Figure 1.2). Visitation at Molokini has been estimated at 400,000 people per year and annual revenue from activities associated with the permitted vessels has been estimated at $20 million to $36 million (Friedlander et al., 2005; Markrich, 2004).

Increasing regulation of commercial activities at Molokini for the protection of biological, recreational, and economic resources has been necessary as visitation has increased. Rules for the Molokini Shoal MLCD prohibit fishing, fish feeding, and any form of collecting, anchoring, or using commercial moorings without a permit. The DLNR also mandated a limit on the number of vessels operating at Molokini in 1994 and permits were granted to operators who could prove that they had visited the site at least eight times during the previous year. Permits were capped at a total of 42 and operators are charged $50 for two-year mooring buoy access. In addition, 2% of revenue is charged to commercial operators by the Division of Boating and Recreation (DOBOR) as a license fee. There are currently no other agency fees required to enter Molokini.

1.3 CONCEPTUAL BACKGROUND OF RECREATION MANAGEMENT STUDIES

Many studies have empirically demonstrated that recreation activities such as snorkeling and scuba diving can cause environmental damage to coral reefs and related coastal resources (e.g., Barker & Roberts, 2004; Dinsdale & Harriott, 2004; Hawkins et al., 1999; Kay & Liddle, 1989; Liddle & Kay, 1986; Lynch et al., 2004; Rodgers & Cox, 2003; Tratalos & Austin, 2001). Schleyer and Tomalin (2000), for example, found that a use level of approximately 9,000 annual dives at a South African reef site damaged 10% of the coral. In Hawai‘i, Rodgers and Cox (2003) estimated that 200,000 visitors

caused a 100% coral mortality rate in both Kane'ohe and Kahalu'u Bays. This study also showed a pattern of decreasing fish abundance with increasing scuba diving and snorkeling use. Over a one-year period, Tissot and Hallacher (2000) found that high use levels of scuba diving at Kealakekua Bay increased the potential for trampling and deleterious environmental consequences such as coral breakage. These studies suggest that marine and coastal areas may possess inherent numerical and behavioral thresholds where recreation use simply overwhelms the biological capacity of resources supporting these activities. The issue of how much use can be accommodated without deteriorating user experiences and threatening the preservation or conservation of natural areas has conventionally been addressed under the rubric of "carrying capacity." Recreation carrying capacity is the amount of use that an area can support and still offer quality recreation experiences based on social, ecological, and managerial attributes. In other words, it attempts to address "how much use is too much" (Manning, 1999).

Previous recreation studies in Hawai'i have focused largely on environmental carrying capacity, or the level that biophysical resources are significantly impacted by human use. The Rogers and Cox (2003) study that showed 200,000 visitors caused 100% coral mortality is one of several studies illustrating attempts to measure an environmental carrying capacity of marine recreation areas in Hawai'i. Environmental carrying capacity is, however, difficult to measure because it is influenced by factors such as weather, site characteristics, type of use, time and duration of use, and species composition (Cole, 1992). It is also recognized and accepted in the tourism and recreation literature that this resource-oriented view must be augmented by consideration of other critical issues. Shelby and Heberlein (1986), for example, described two additional types of capacity:

(a) social carrying capacity, or the level of use beyond which social impacts and experiences such as crowding and user conflict are unacceptable; and (b) facility or managerial carrying capacity, which is the amount and type of facilities and management presence acceptable for accommodating a given use level. Most studies in Hawai‘i have focused on environmental carrying capacities and largely ignored social and facility capacities. This oversight is problematic because management actions such as use limits or quotas that are designed to alleviate environmental impacts such as coral breakage may not address social problems such as crowding and user conflict.

The concept of recreation carrying capacity has received considerable attention in the literature (see Manning, 1999; Needham & Rollins, 2005; Needham et al., 2004; Shelby & Heberlein, 1986 for reviews), but efforts to apply the concept in natural resource settings have often resulted in frustration. The term “carrying capacity” implies that it is possible to identify a single number that represents a threshold where human use of a resource overwhelms the ability of the resource to sustain itself. Unfortunately, several types of carrying capacity exist (e.g., social, environmental, facility) and numerous indicators can be used to measure each type of capacity. Social carrying capacity, for example, consists of multiple indicators such as encounters, crowding, conflict, noise, and satisfaction. Environmental carrying capacity indicators may include coral breakage, trampling, fish abundance, and water quality. Measuring all of these indicators would be expensive and time consuming, and each indicator would yield a different capacity number on scales that are not compatible or comparable. Calculating a single recreation capacity number is, therefore, neither feasible nor realistic.

There are also additional difficulties in attempting to apply the carrying capacity concept. For example, carrying capacity has often been misapplied to set visitor numbers without considering how these numbers meet management objectives. In addition, a capacity number can sometimes be changed in response to political pressures without considering relevant stakeholders or other interest groups (e.g., visitors, local communities, private operators, cultural groups). Carrying capacity numbers are often too simplistic, based on arbitrary judgments, and fail to minimize impacts. The concept tends to overemphasize the importance of "amount" of use and fails to consider other important factors such as type of use, behavior of users, and cultural capacity issues that are particularly important in Hawai‘i. Finally, by focusing on amount of use, carrying capacity numbers imply use limits if they are exceeded, which draws attention away from a range of other strategies that may be available to managers such as temporal and / or spatial zoning and education. Use limits are also: (a) controversial and heavy-handed because they may unnecessarily restrict user freedom; (b) difficult and expensive to implement; and (c) perceived as a threat to generating tourism income, thus causing a lack of interest group or stakeholder “buy in” (Farrell & Marion, 2002).

Recreation almost always causes social and environmental impacts, but descriptive scientific studies that attempt to identify a cause and effect relationship between human use and impact typically fail to provide clear guidance on where and when use thresholds are exceeded. These studies are technically challenging and impose substantial data collection, and their outputs do not provide any guarantee of better management decisions or reduced impacts. It is important to recognize that some impact and change is inevitable, and at some point the amount, nature, and type of

change becomes unacceptable. The critical question, therefore, is not “how much use is too much,” but more importantly “how much impact or change is acceptable or should be allowed” (Manning, 1999, 2004).

To overcome difficulties associated with carrying capacities, recreation researchers have turned to contemporary planning and management frameworks that have proven useful in addressing this question of “how much impact is acceptable” (see Manning, 2004 for a review). Frameworks such as Limits of Acceptable Change (LAC, Stankey et al., 1985), Visitor Experience and Resource Protection (VERP, Manning, 2001), and Visitor Impact Management (VIM, Graefe et al., 1990) combine planning and scientific approaches to provide a sophisticated and systematic process for evaluating and managing conditions in recreation and tourism settings. Common themes stressed in these frameworks include: (a) input from multiple interest groups or stakeholders; (b) focus on management of recreation impacts; (c) establishment of clear and measurable objectives for a site; (d) collection of both physical and social science data that is linked to these objectives; (e) definition of recreation opportunities comprised of natural, social, and managerial conditions; (f) linkages among activities, settings, experiences, and benefits; (g) implementation of a range of management strategies; and (h) monitoring and evaluation. Another important aspect of these frameworks involves quantitatively measuring select social, facility, and resource indictors at specific sites, and using these indicators to reveal standards of quality or thresholds where indicator conditions become unacceptable (Manning, 1999). These indicators are subsequently monitored by field personnel to ensure that standards are maintained, and if violated, the

application of acceptable management actions may be imposed (e.g., zoning, education, fees, quotas that limit use).

A second important component of these frameworks is the inclusion of input from multiple interest groups or stakeholders. Although managers are responsible for ensuring that standards comply with jurisdictional and regulatory mandates and objectives, understanding how users and other stakeholders perceive impacts and how this influences their behavior is crucial if agencies are to make effective management decisions (Shelby & Shindler, 1992). If standards are similar among individuals, managers may be able to condense the number of groups that they need to consider, thus making complicated decisions simpler. If differences are exposed, then these conflicting views among stakeholders must be addressed during the development of appropriate managerial responses (Needham & Rollins, 2005). All of these frameworks necessitate multi-stakeholder input to inform carrying capacity related decisions (Shelby & Shindler, 1992) and provide a strong basis for recreation and tourism planning. These frameworks also offer a proven tool for managers to understand the extent that indicator impacts are acceptable or unacceptable, identify the importance of indicators, and describe the amount of consensus among stakeholders regarding acceptable indicator conditions (McCool & Cole, 1997; Needham et al., 2005; Shelby et al., 1992). This approach provides a conceptual basis for addressing tradeoffs that are inherent in recreation and tourism, a structured process within which values are explicitly considered and presented, and a context for development of transparent and defendable plans that are derived from and linked to clear objectives and empirical data (Manning, 2004). In addition, these frameworks emphasize consideration of desired

future outcomes, and the inclusion of monitoring ensures that managers are explicitly aware of changing resource and experiential conditions, which enhances the capability of managing agencies to respond to changing conditions.

1.4 PROJECT OBJECTIVES

This project was funded as a Hawai‘i Recreation Impacts to Reefs – Local Action Strategy (RIR-LAS) initiative that represents a locally driven roadmap for collaboration and cooperative action among governmental and non-governmental partners to reduce threats to coral reef resources (RIR-LAS, 2008). The overall goal of Hawaii’s RIR-LAS is to determine impacts of marine recreation and tourism activities on Hawaii's coral reef ecosystems and develop innovative management techniques that increase the sustainability of those activities. Specific objectives include:

1. improving understanding of links between marine recreation and reef ecosystem health, and providing a scientific basis for management decisions;

2. implementing management tools such as regulations and infrastructure to support a reef's carrying capacity or control user behavior at various sites; and

3. increasing awareness and engaging stakeholders in reef education, monitoring, and stewardship efforts.

In particular, this project specifically addresses the RIR-LAS management objective related to carrying capacity, and will attempt to shift the emphasis and definition of carrying capacity in Hawai‘i from “how many visits can be accommodated” in priority marine recreation areas to “what are the desired conditions and to what extent do we meet or exceed these standards.” This clarifies management goals by formulating

positive and output-oriented measures of success, and opens and exposes the process of planning to public participation and scrutiny by explicitly emphasizing tradeoffs and value judgments inherent in recreation management. Responsible authorities such as the DLNR that manage marine recreation areas are also working under increasingly difficult circumstances as a result of financial limitations, human resource issues (e.g., inadequate employee training; lack of skilled planners, facilitators, and technical or scientific experts), time constraints, and data inadequacies. Given these local conditions, this project will:

1. outline the administrative context and environmental conditions at the Molokini Shoal MLCD using existing background information and secondary data;
2. present new rigorous scientific research conducted at the Molokini MLCD that documents marine recreation use and social carrying capacity information which has been largely unavailable until now;
3. provide a set of indicators that can serve as “standards of quality” to support subsequent planning and management initiatives at Molokini; and
4. provide an example of how human use and social carrying capacity information can be collected to support the management of marine recreation and tourism at other high priority sites identified by the RIR-LAS.

1.5 DATA COLLECTION

Primary data collection that documented human use and social carrying capacity information proceeded in three phases. First, focus group meetings were conducted in February 2009 with commercial operators and other stakeholders on Maui including

government agencies, native Hawaiians, recreation interest groups, and environmental groups. Second, researchers traveled on 28 commercial trips to Molokini in March and April 2009, and used a standardized checklist to observe and document site characteristics. Observations were documented on four boats operating from Ma‘alaea harbor: two large boats that carry snorkelers (typically 50 feet or more in length carrying up to 150 snorkelers) and two smaller boats that mainly focus on scuba divers (typically less than 30 feet in length carrying fewer than 15 scuba divers). Observations were also conducted on a smaller dive boat operating from Lahaina harbor and a small dive boat operating from the Kihei boat ramp. Third, pre-trip and post-trip onsite surveys were administered to people visiting Molokini on these tour boats in both high use (spring break March 2009) and lower use (April 2009) periods. These surveys included questions on a range of topics including prior visitation, activity groups, satisfaction, encounters, crowding, conflict, value orientations, support of management, and demographic characteristics. Pre-trip surveys were completed at the harbor or boat ramp prior to leaving for Molokini and post-trip surveys were completed when returning to the harbor or boat ramp.

2.0 ADMINISTRATIVE CONTEXT

Marine recreation planning and management in Hawai‘i takes place within an administrative context that includes several state agencies and a broad range of relevant regulations. The following information identifies responsible state authorities and describes both general statutes that support planning and management of marine recreation in the State of Hawai‘i, and specific rules and regulations that apply to Molokini Shoal MLCD.

2.1 DEPARTMENT OF LAND AND NATURAL RESOURCES

Planning and management on state lands and waters within Hawai‘i falls within the overall responsibility of the Department of Land and Natural Resources (DLNR). This department’s mission is to “enhance, protect, conserve, and manage Hawaii’s unique and limited natural, cultural, and historic resources held in public trust for current and future generations of visitors and the people of Hawai‘i in partnership with others from the public and private sectors." This overall mission with respect to marine recreation is carried out by several divisions of the DLNR as outlined below.

2.1.1 Division of Aquatic Resources

The State of Hawai‘i Division of Aquatic Resources (DAR) is an administrative unit of the Department of Land and Natural Resources whose mission is to “manage, conserve, and restore” Hawaii’s unique aquatic resources and ecosystems for present and future generations. The mission statement directs ongoing activities and new initiatives in the areas of aquatic ecosystem protection, education and public

involvement, fisheries management, and support services. More specific goals stemming from this mission statement are to:

- protect, conserve, and enhance the ecological integrity of Hawaii's marine and freshwater ecosystems and facilitate the recovery of native aquatic species;
- educate the public about Hawaii's aquatic resources and the ecological, economical, and socio-cultural importance of managing these resources in a sustainable manner;
- manage and sustain Hawaii's aquatic resources, as well as habitats for optimal use and benefit of the people; and
- build and organize structures that are responsive to management, conservation, and restoration needs for Hawaii's aquatic ecosystems.

2.1.2 Division of Boating and Ocean Recreation

The Division of Boating and Ocean Recreation (DOBOR) is responsible for the management and administration of recreation and coastal areas programs in all waters out to three nautical miles, all interisland traffic, and in navigable streams of the State of Hawai‘i as outlined in *HRS Section 200-23*. This division is also responsible for managing boat harbors, independent boat launching facilities, and designated offshore mooring areas. It registers small vessels, administers programs, manages facilities, and issues permits to ensure public safety, and provides facilities for recreational boating and supporting opportunities for ocean activities. This agency's regulatory and rule-making responsibilities include permit issuance for mooring use, vessel registration, implementation of boating laws and other applicable statutes such as user fee rates.

2.1.3 Division of Conservation and Resource Enforcement

The Division of Conservation and Resources Enforcement (DOCARE) is responsible for enforcement activities for the Department of Land and Natural Resources. This division enforces all state laws and rules involving state lands, parks, historical sites, forest reserves, aquatic life and wildlife areas, coastal zones, conservation districts, and county ordinances involving county parks. The division also enforces laws relating to firearms, ammunition, and dangerous weapons.

2.2 STATE OF HAWAIʻI RULES AND REGULATIONS

2.2.1 Marine Life Conservation District Program

There are currently 11 Marine Life Conservation Districts (MLCD) in Hawaiʻi, all of which are popular sites for marine recreation and tourism. MLCD sometimes allow limited fishing and other consumptive uses, but these uses are generally prohibited. MLCD also commonly provide for marine recreation activities that often support commercial activities such as dive operations and snorkeling tours. MLCD are regulated under Hawaii's Marine Life Conservation Program as defined by *Hawaiʻi Revised Statutes Chapter 190, Sections 1-5* (Appendix A). This document describes the purpose of MLCD as protecting marine life to the greatest extent and restricting the taking of marine life or non-living habitat unless permitted otherwise. MLCD are located within state marine waters and administered by the DLNR. State marine waters are defined from the upper reaches of the wash of the waves on shore seaward to the limit of the state's policing power and management authority within the United States territorial sea. Chapter 190 also outlines the role of the DLNR in establishing and maintaining the conservation district, and describes the "no take" concept and other rules regulating

fishing. Permits are issued for scientific, education, and other public purposes based on conditions not deemed to affect the conservation district, and the regulations also describe anchoring, boating, and mooring in conservation districts. A number of penalties are outlined for any person violating the conditions of a permit with fines applicable to the misdemeanor.

The process of creating an MLCD begins with an area being recommended for designation. The area is then evaluated by the DAR using a number of criteria including: public accessibility, marine life and future potential values, safety from a public usage standpoint, compatibility with adjoining area usage, and minimal environmental or ecological change from the natural state. Potential MLCD should have clearly defined boundaries to enforce rules and ensure compliance, and the size of the MLCD is an important consideration given the role these areas play in restoring fish populations in adjacent areas. After an initial review of these criteria, bottom topography and fish surveys are studied, and input is sought from the public, commercial groups, interest groups, and public agencies. Draft regulations are developed and a public hearing is held with final approval of the MLCD provided by both the Board of Land and Natural Resources and the Governor.

2.2.2 Policy for Commercial Activities on State Lands and Waters

The DLNR regulates activities in state lands and waters, and its *Commercial Use Task Force* developed a set of policies in 1998 to guide the department's actions in this area (Appendix B). The first policy applies a hierarchy of priorities when considering commercial proposals or management actions that affect existing commercial operations. The highest priority is to conserve natural and / or cultural resources, and

commercial activities should only occur on state owned or managed lands or waters if these do not unduly damage the resource. The second priority is public access, which should only be maintained as long as natural and cultural resources are preserved. Commercial activities are third in this hierarchy, and should only be permitted if “their impacts do not impinge on the resource or use by the general public.” If commercial activities or public access is occurring and resource impacts indicate the need for restrictions, these will be levied on commercial operators first with the general public being the last group to have restrictions imposed upon them. The second policy states that the principles of *Limits of Acceptable Change* (LAC) will be used to monitor commercial activities on state lands and water, and manage use on these resources. As discussed in the introduction, LAC is a framework for assessing impacts that applies indicators to establish standards of quality and measure change to ensure that these standards are not being violated. The third policy outlines a requirement that new permits should include explicit conditions allowing the DLNR to change or terminate activities based on these standards being violated. Policies four and five discuss the *Managing Agency* having the responsibilities to coordinate the applicant’s activity application (i.e., submitting environmental impact statements or assessments) and the issuing of activity permits for routine activities and organizations that are not for profit. The sixth policy discusses reasonable fees for commercial users based on the revenues or impacts of the activity. Groups conducting the activity are encouraged to work to mitigate impacts or improve resources. The seventh and final policy states that the DLNR will generate a list of sites eligible for commercial activity and will determine the intensity of commercial activity permitted.

2.2.3 Day Use Mooring Rules

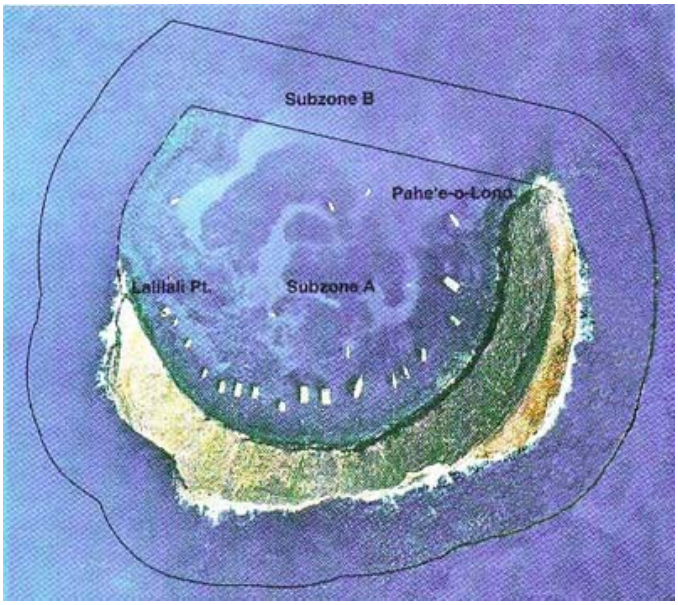
Day use moorings in Hawai‘i are regulated under *Hawai‘i Administrative Rules Title 13, Subtitle 11, Chapter 257* (Appendix C). General provisions have been developed to improve the purpose and scope of day use mooring activities, and ultimately reduce damage to coral and other marine life as a result of use of anchors by commercial and recreational vessels in high use zones. The rules describe provisions for mooring buoys throughout state locations. Day use mooring permits are not required unless required by the state, and the use of any state installation is at the risk of the owner or operator of the vessel using the mooring. Use of the mooring should not exceed two and a half hours if another vessel is waiting, and overnight use of moorings is prohibited except in the case of emergencies or use by enforcement or rescue craft. Anchoring is prohibited within one hundred yards of any day use mooring buoy except as explicitly allowed. Anchoring in a day use mooring zone is permitted in areas where no live coral exist.

2.3 MOLOKINI RULES AND REGULATIONS

2.2.1 Molokini Shoal MLCD Rules

Molokini MLCD was created in 1977 through *Hawai‘i Administrative Rules Title 13, Subtitle 4, Chapter 31*, which is administered by the DLNR (Appendix D). This MLCD encompasses all marine waters surrounding the crescent shaped Molokini Islet out to 30 fathoms and is located in the Alalakeiki Channel approximately three miles off the southeastern coast of the island of Maui. This diverse and valuable marine ecosystem is protected under statute as described in HRS 13-4-31, which outline boundaries, prohibited activities, allowed activities, exceptions, permits, and penalties.

Figure 2.1 Molokini MLCD Boundaries



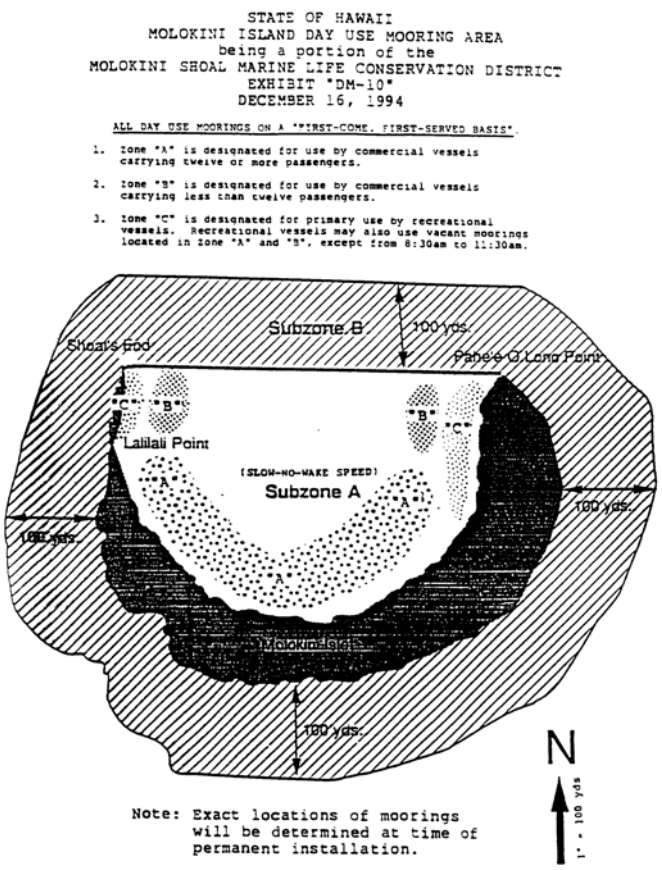
Subzone A of the MLCD (Figure 2.1) includes most of the submerged crater floor. The southern boundary is defined by a line that begins at the high-water mark off Lalilali Point and continues along the high water mark of the inner crater wall until Pahe'e O Lono Point. The northern boundary is a straight line drawn west of Pahee O Lono Point to the end of the submerged crater ridge, then south along the top of this shoal back to Lalilai Point. **Subzone B** is defined by a 100 yard boundary drawn out from the high water marks of the outer crater wall and submerged areas of Subzone A.

Activities not allowed in the MLCD include fishing for take or removal of any finfish, crustacean, mollusk, live coral, algae, or other marine life. Sand, coral, rock or other geological features may not be disturbed or removed, and devises such as spears, traps, nets are not allowed in these waters. Deliberately feeding fish or introducing any food materials or attractants is not allowed, and anchoring or moor boats for commercial purposes without a permit is forbidden. Fishing for take or trolling is allowed only in Subzone B.

2.2.2 Day Use Mooring Rules at Molokini

The need for a mooring system at Molokini MLCD became apparent as frequent use and anchoring in the area created impacts on coral reef habitat. A day use mooring was

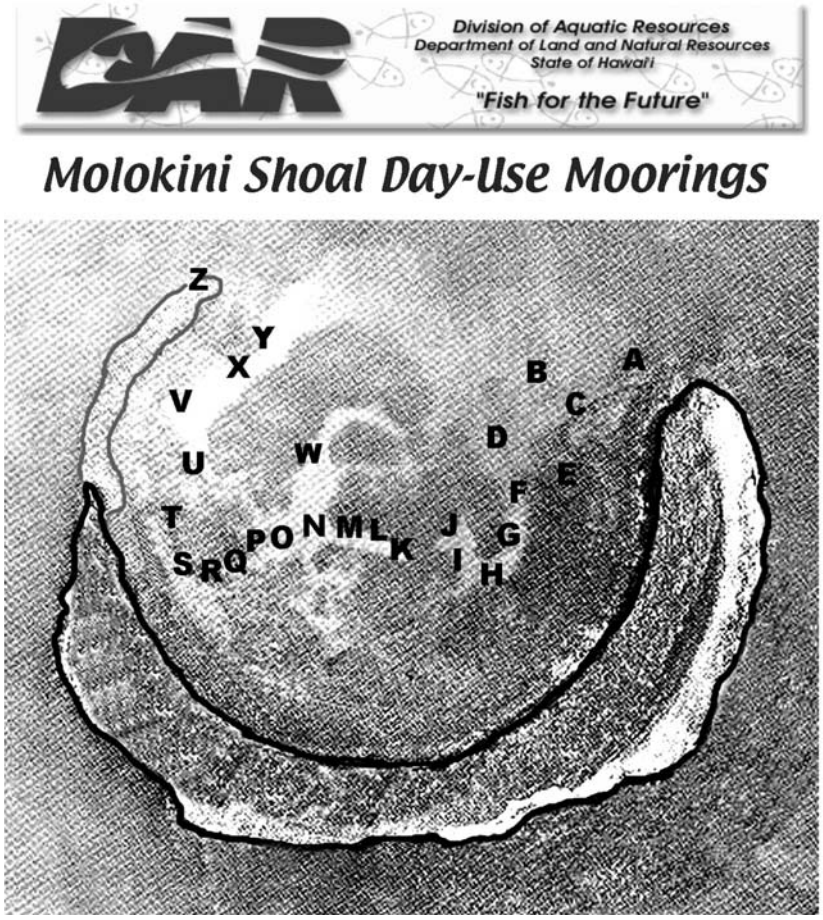
Figure 2.2 Day Use Mooring Area



created by Hawai‘i Administrative Rules Chapter 13, Subchapter 4, Section 257, which was enacted in 1994. The boundary of the day use mooring area is contiguous with Subzone A of the Molokini MLCD boundaries, and vessels cannot use day use moorings in this area for commercial purposes unless they are in possession of the required permit (Figures 2.2 and 2.3). Mooring zones are broken into several different zones with **Mooring Zone A** reserved for commercial vessels with 12 or more passengers. **Mooring Zone B** is designated for commercial vessels carrying less than 12 passengers, and **Mooring Zone C** is reserved for primary use by recreational vessels. The use of day use moorings is on a first come first served basis, and recreational vessels may also use vacant moorings in Subzones A and B except between the hours of 8:30 AM to 11:30 AM. The DLNR may authorize infrequent use of moorings (less than 8 times per year) for owners of commercials vessel not in possession of a MLCD permit. The fee for a commercial use mooring permit is the greater of $100 or 2% percent of the gross receipts, but this fee is waived for commercial operators paying commercial vessel user fees at state boating facilities.

The speed of vessels within the Subzone A is “slow-no wake” and anchoring is prohibited throughout the day use mooring area.

Figure 2.3 Day Use Moorings



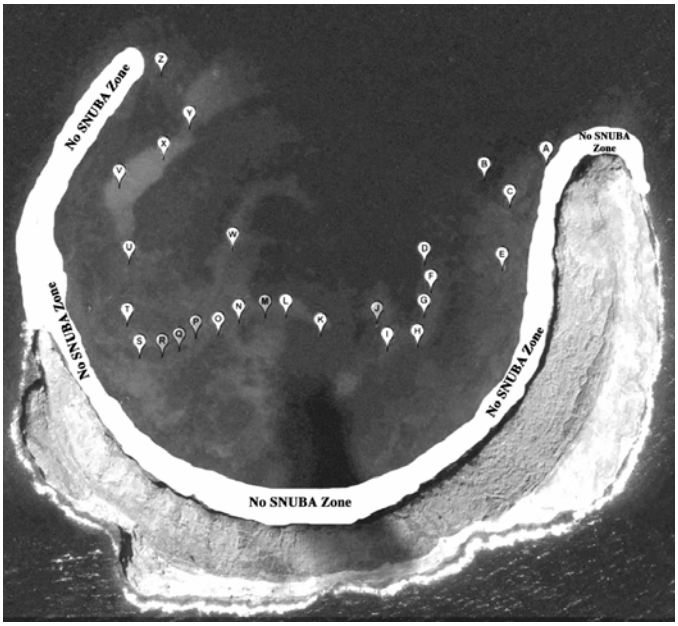
Mooring	Latitude(N)	Longitude(W)
A	20 38.043’	156 29.647’
B	20 38.037’	156 29.680’
C	20 38.023’	156 29.667’
D	20 37.996’	156 29.713’
E	20 37.992’	156 29.672’
F	20 37.982’	156 29.710’
G	20 37.970’	156 29.714’
H	20 37.955’	156 29.718’
I	20 37.954’	156 29.734’
J	20 37.967’	156 29.739’
K	20 37.962’	156 29.769’
L	20 37.972’	156 29.787’
M	20 37.972’	156 29.798’
N	20 37.970’	156 29.812’
O	20 37.964’	156 29.823’
P	20 37.963’	156 29.835’
Q	20 37.957’	156 29.844’
R	20 37.954’	156 29.853’
S	20 37.954’	156 29.865’
T	20 37.970’	156 29.871’
U	20 38.001’	156 29.869’
V	20 38.039’	156 29.873’
W	20 38.006’	156 29.814’
X	20 38.052’	156 29.849’
Y	20 38.067’	156 29.835’
Z	20 38.094’	156 29.849’

2.2.3 Commercial Use Permits

Permission is required to undertake commercial activities within Molokini Shoal MLCD. The DLNR has issued 41 commercial use permits under the authority of *HAR 13-31-5* to engage in commercial scuba diving, snorkeling, snuba, swimming, and sightseeing tours at the site (Appendix E and Appendix F). The DLNR may also issue permits from time to time to allow activities otherwise prohibited by law within the MLCD such as scientific research or commercial activity the excludes the taking of marine life. Each

applicant is required to obtain a two year permit for a specific vessel costing $50, and the commercial operator must be able to demonstrate active commercial operations within Molokini Shoal MLCD over each 12 month period of the two year permit.

Figure 2.4 No SNUBA Zone



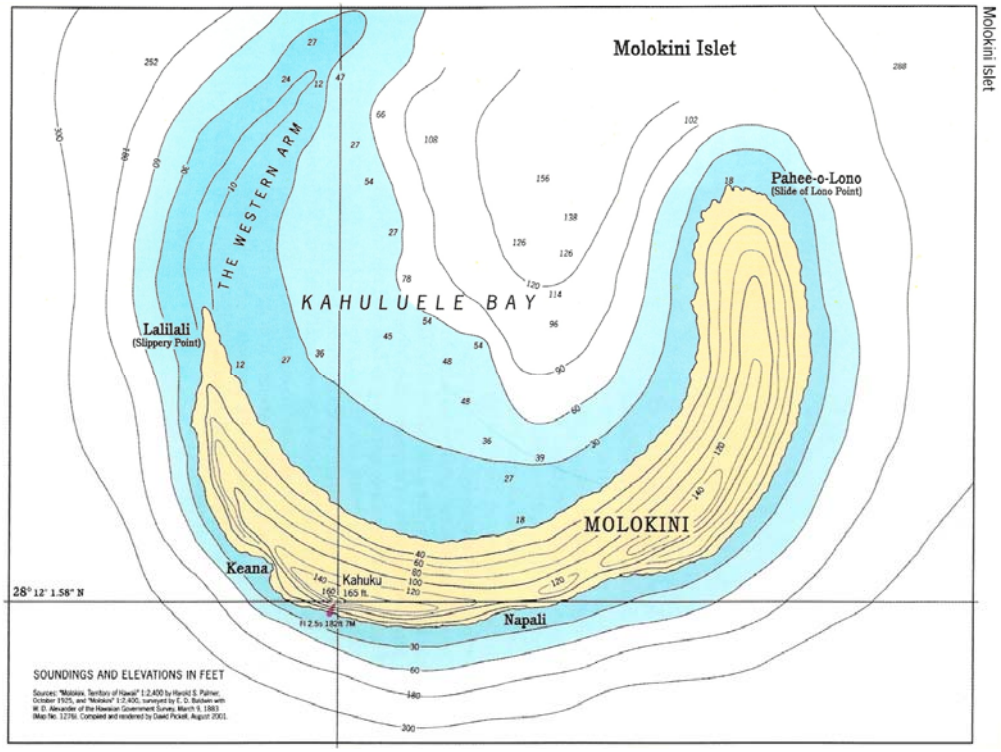
Commercial use permits also contain a number of requirements and provisions that have been introduced over time. Surface air supplied diving (SNUBA) is restricted from areas near the inner crater wall and in waters at least 20 feet deep (Figure 2.4). Permit rules further require that hoses for any surface-supplied air diving be no longer than 10 feet in length. Pre-trip briefings and passenger acknowledgement documents are required for customers visiting the MLCD on commercial tours. These briefings outline prohibitions on fish feeding, taking, injuring or disturbing any living material or non-living habitat, and emphasize that contact with the bottom or shallow water near shore must be avoided. Mandatory use logs are also required for commercial operators to document passenger numbers and activities for each trip to the MLCD. Other requirements of the commercial use permits regulate issues such as vessel transfers or changes, designated vessel captains, and penalties for violating the statutes, rules, and permit regulations.

3.0 ENVIRONMENTAL CONTEXT

3.1 PHYSICAL SETTING

Molokini islet is the southern rim of an extinct volcanic crater and the shallow inner cove is the crater's submerged floor (Figure 3.1). The crater is a volcanic cone that rises 150m from a submarine flank of Haleakala to a summit 49m above sea level. Molokini islet itself is owned by the U.S. Fish and Wildlife Service and managed as a bird sanctuary. The Hawaiian Islands Humpback Whale National Marine Sanctuary also surrounds the MLCD.

Figure 3.1 Molokini Shoal



Molokini crater is about 540m in diameter and was last active nearly 150,000 years ago. Wind blowing from the north-northwest forced a great amount of ash to land along the southern rim, which increased its elevation. Molokini deposits are basanite, a type of basalt with fairly low amounts of silicon and high concentrations of sodium and potassium. Visible

crystals from lava fragments are sparse, but do exist. There is no sand beach at Molokini and the cove area slopes northward from the shoreline of the islet to a depth of approximately 100 feet before dropping off precipitously. The bottom offshore of the islet consists of sand, coral, and basaltic boulders; and a shallow reef that contains a diversity of fish and other marine life extends from the islet's northwestern point. The southern backside of the islet has a steep face that drops to depths of over 200 feet, but small patches of coral are scattered across this area and crevices support fish populations.

3.2 BENTHIC HABITAT

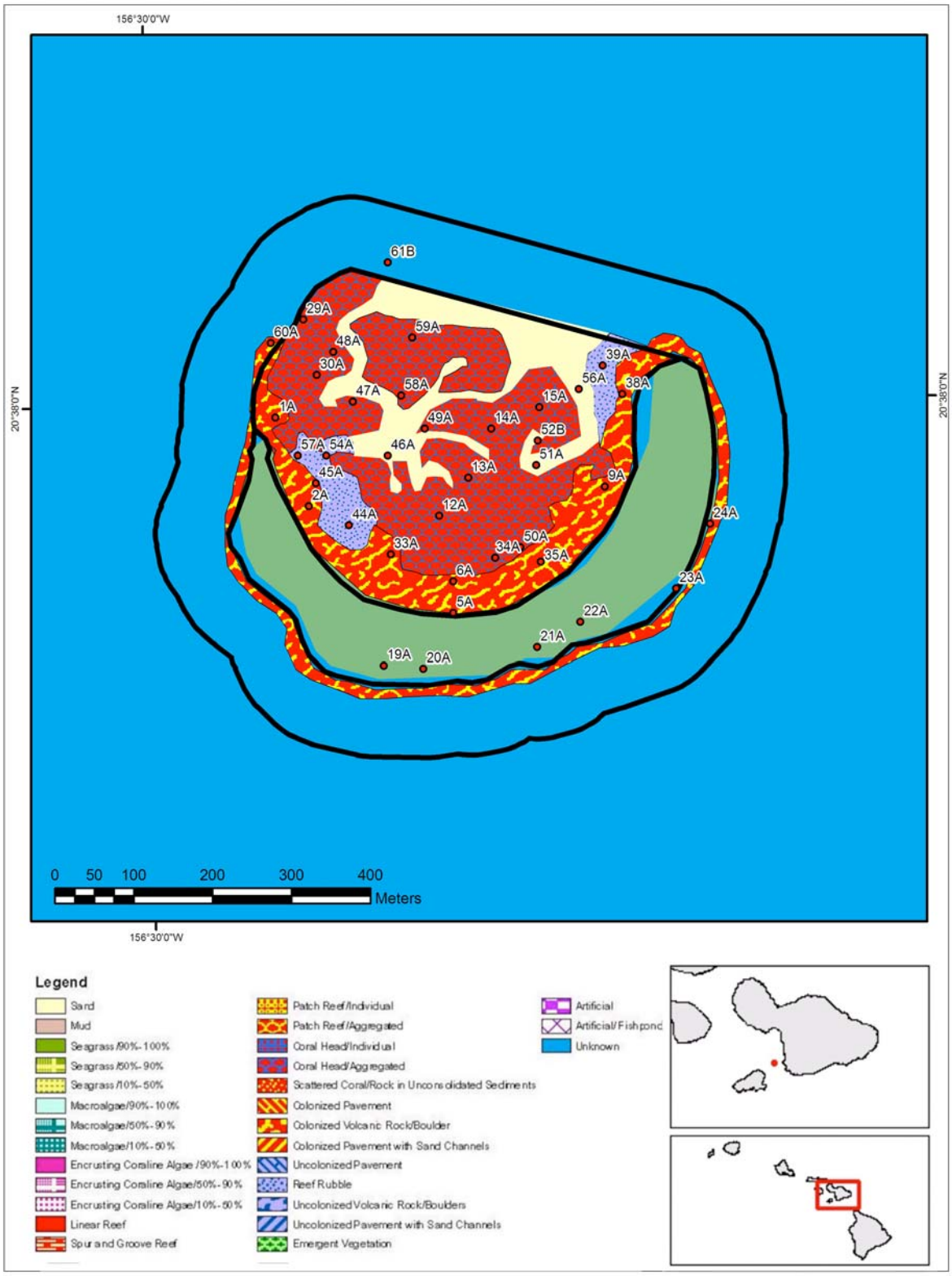
Benthic habitats of Molokini crater provide shelter and food for the diverse community of species that live in the area. The most common substrates are turf algae, sand, and various forms of coral cover in decreasing abundance (Table 3.1 and Figure 3.2).

Table 3.1 Benthic substrate and taxa coverage at Molokini

Substrate Type	Taxon	Coverage
Turf algae	n/a	40.6%
Sand	n/a	28.7%
Coral	*Montipora patula*	9.1%
Coral	*Porites lobata*	7.7%
Coral	*Montipora capitata*	6%
Coral	*Pocillopora meandrina*	4.8%
Coralline algae	n/a	1.2%
Coral	*Porites compressa*	0.3%
Macroinvertebrate	*Clathria sp.*	0.3%
Coral	*Pavona varians*	0.2%

There are approximately 38 species of hard corals and nearly 100 species of algae within this MLCD. The crater offers protection for fragile benthic species and the site is well removed from offshore sediment inflows that frequently disrupt nearshore reef habitats. A combination of offshore location, soil-rock composition of the islet, and strong currents in the Alalakeiki Channel creates an environment capable of sustaining high coral cover.

Figure 3.2 Benthic habitats at Molokini Shoal MLCD



Source: Friedlander et al. (2005)

Coral species present at Molokini include *Montipura patula* (spreading coral) and *Montipura capitata*, which is infamous for its summer spawning activity (Severns & Fiene, 2002). Contributing to the richness of the benthic habitat at Molokini is the regular occurrence of large storms that rearrange benthic environments. In a manner similar to fire clearing land to promote new growth, wave action acts in a comparable way on benthic habitats at Molokini with colonized volcanic rock / boulder surrounding land formation and sand located further from the crater rim. Another unique feature at Molokini is the rare black coral (*Antipathes grandis*) that is endemic to Hawaii and was once common in deeper waters surrounding the islet. This species is now rare, however, as it was harvested extensively for the jewelry trade and only small colonies are now found on the back wall of the MLCD.

3.3 MARINE FISHERIES

Surveys at Molokini MLCD have identified high species diversity, richness, and biomass (Figures 3.3 to 3.5), which varies spatially due to factors such as food and habitat structure (Friedlander et al., 2005). Fish biomass refers to the mass of living biological organisms in an area at a given time, and species richness characterizes the homogeneity of a marine environment. Fish diversity indicates how many different types of fish exist in the area. Sand areas at Molokini contain higher biomass, whereas hard bottom areas possess higher species richness and diversity. Fish tropic structure among habitats was 42% herbivores, 41% predators, and 17% secondary consumers (Table 3.2). Species composition by management regime consisted of dominant species such as surgeon fish, trigger fish, sharks, jacks, and parrot fishes. The most common fish found was the orangespine unicornfish, but bluefin trevally, giant trevally, and the bigeye emperor fish are also widespread. Juvenile white tip reef sharks are frequently seen at Molokini, and abundant plankton along the outer crater wall can attract whale sharks and manta rays.

Table 3.2 Top ten species at Molokini Shoal MLCD

Taxon Name	Common Name	Hawaiian Name	Number (ha^-1 x 1000)	Biomass (t ha^-1)	Frequency	%	Biomass	IRD
Naso lituratus	Orangespine Unicornfish	umaumalei	0.72	0.166	55.26%	9.53	13.49	745.57
Melichthys niger	Black Durgon	humuhumuelelee	0.39	0.164	39.47%	5.13	13.34	526.63
Triaenodon obesus	Whitetip Reef Shark	mano lalakea	0.01	0.286	15.79%	0.17	23.26	367.33
Caranx melampygus	Blue Trevally	omilu	0.04	0.098	34.21	0.58	7.95	271.91
Melichthys vidua	Pinktail Durgon	humuhumuhiukole	0.07	0.033	50	0.97	2.68	133.98
Xanthichthys auromarginatus	Gilded Triggerfish		0.23	0.033	36.84	3.01	2.67	98.36
Acanthurus olivaceus	Orangeband Surgeonfish	naenae	0.09	0.03	39.47	1.23	2.43	96.04
Chlorurus sordidus	Bullethead Parrotfish	uhu	0.09	0.024	34.21	1.23	1.98	67.65
Scarus psittacus	Palenose Parrotfish	uhu	0.54	0.015	42.11	7.13	1.2	50.62
Monotaxis grandoculis	Bigeye Emperor	mu	0.01	0.03	15.79	0.17	2.47	38.98

Source: Friedlander et al. (2005)

1. Index of Relative Dominance (IRD = % freq. x % biomass)

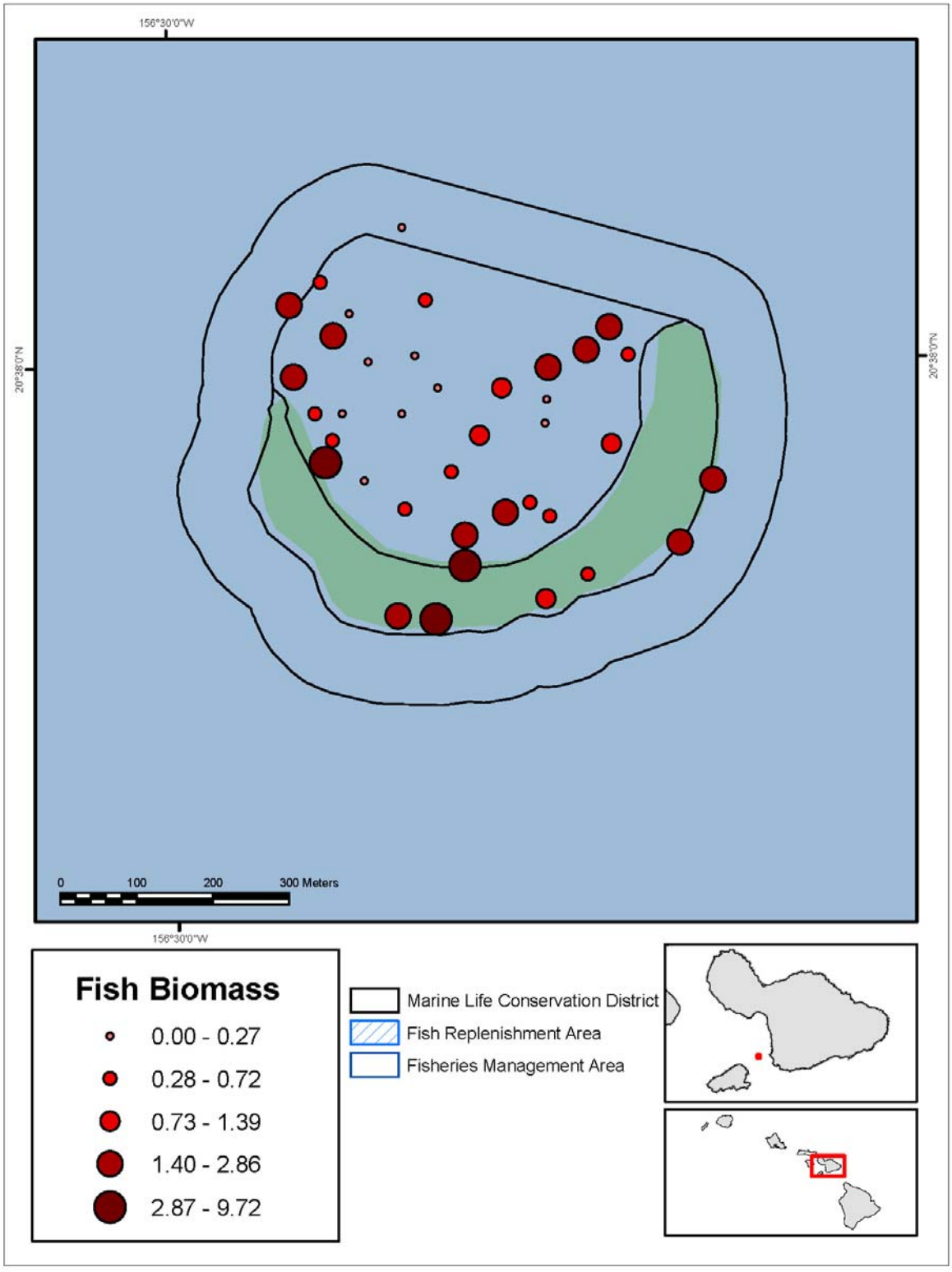
2. No. = numerical density in number of individuals per hectare x 1000

3. Biomass = biomass density in t ha^-1

4. % no. = percentage of total number of individuals within management regime

5. % biomass = percentage of total biomass within the management regime.

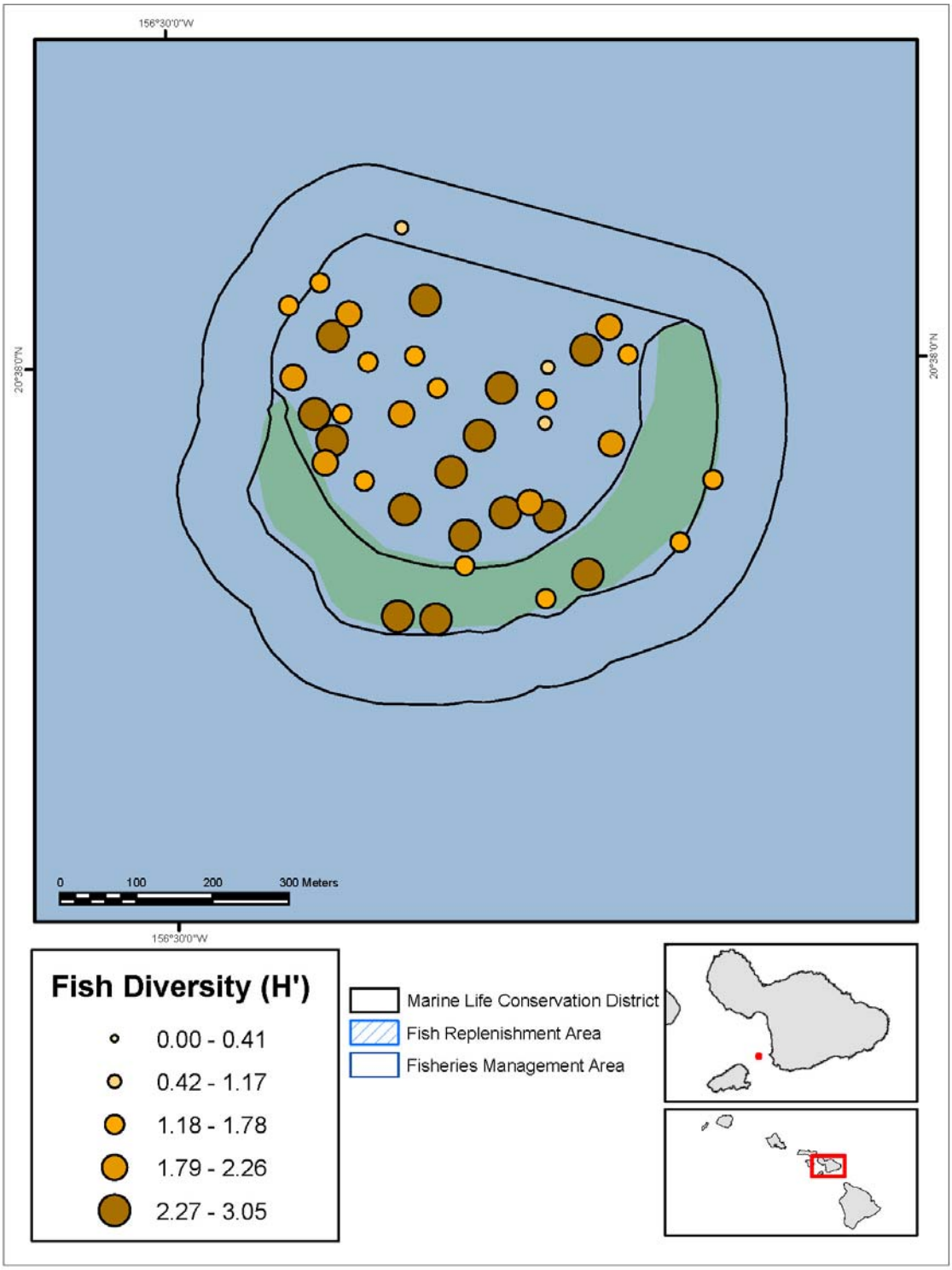
Figure 3.3 Fish biomass at Molokini Shoal MLCD



Source: Friedlander et al. (2005)

Individual transects (N=38) for Molokini Shoal MLCD (classification based on quantiles)

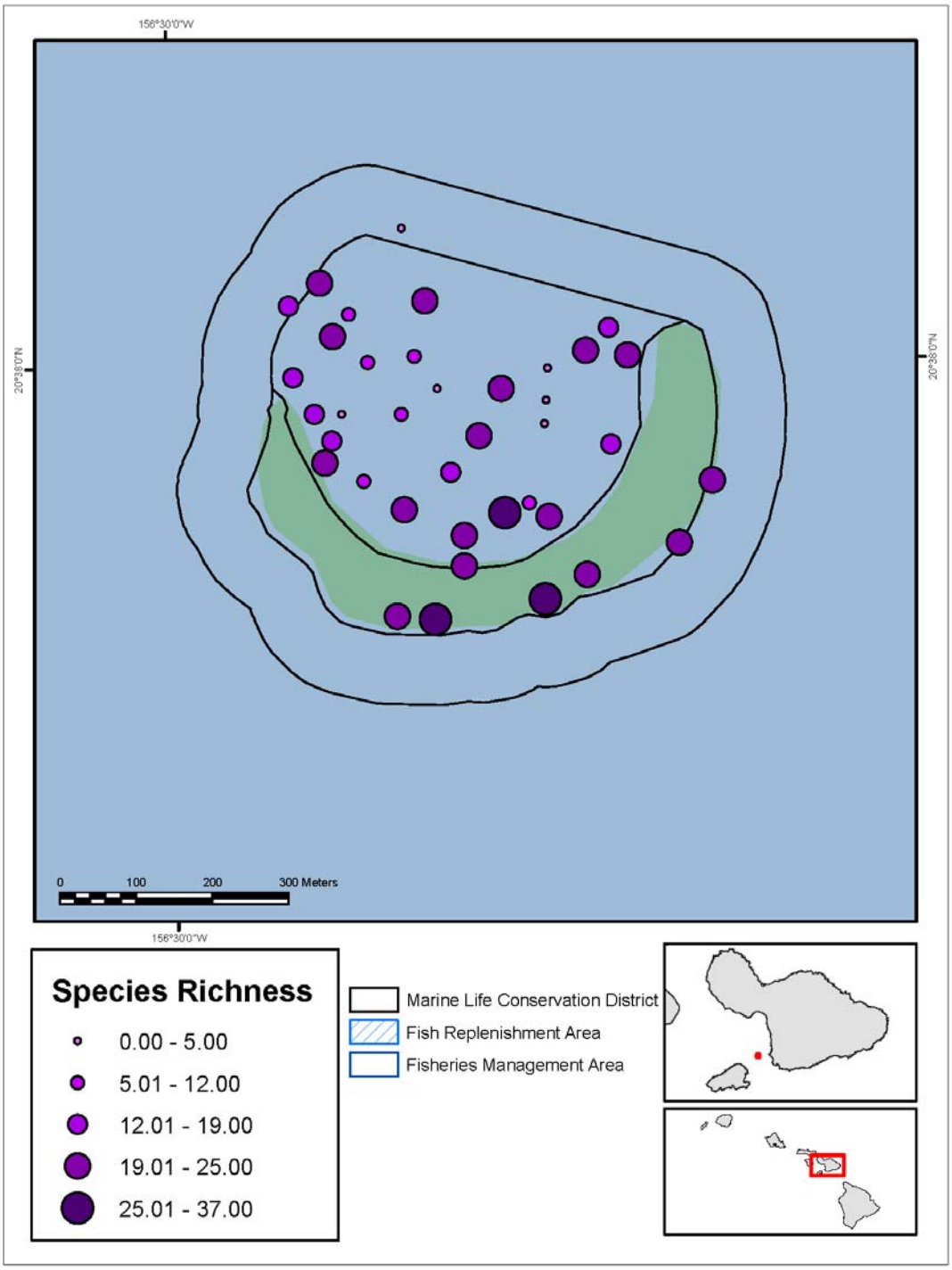
Figure 3.4 Fish diversity at Molokini Shoal MLCD.



Source: Friedlander et al. (2005)

Individual transects (N=38) for Molokini Shoal MLCD (classification based on quantiles)

Figure 3.5 Species richness at Molokini Shoal MLCD



Source: Friedlander et al. (2005)

Individual transects (N=38) for Molokini Shoal MLCD (classification based on quantiles)

3.4 MARINE MAMMALS AND OTHER SPECIES

Marine mammals in Hawaiian waters include monk seals, spinner dolphins, and humpback whales. Molokini MLCD is located near the center of the Hawaiian Islands Humpback Whale National Marine Sanctuary. Humpback whales migrate seasonally to this protected environment to mate, give birth, and nurse their young. The North Pacific humpback population was estimated to be approximately 15,000 in pre-whaling days, and there are now approximately 7,000 humpback whales in the North Pacific. About 5,000 of this North Pacific population migrate to Hawai'i every year. Humpback whales are protected by the *Endangered Species Act* and the *Marine Mammal Protection Act*, as well as Hawai'i state law. Although harvesting is prohibited in U.S. water, potential threats to the humpback whale population include entanglement in fishing gear, ship strikes, harassment, and habitat impacts. The Hawaiian monk seal *(Monachus schauinslandi)* is the most endangered seal in U.S. waters, and only approximately 1,200 individuals remain in the wild with numbers continuing to drop. Threats to this species include food limitations, entanglement, human interactions, mother-pup disturbance, disease, and low genetic diversity. Green sea turtles are also common at Molokini MLCD and are also protected under the federal *Endangered Species Act*. Green sea turtles were placed on the endangered species list as a result of losses related to hunting, by-catch, marine debris, coastal development, and habitat degradation, but population numbers have increased significantly in Hawaiian waters since its listing.

3.5 ENVIRONMENTAL STATUS OF MOLOKINI MLCD

The environmental status of Molokini MLCD is regularly evaluated by DAR as part of a broader marine environmental monitoring program. Overall monitoring objectives in Maui County include conducting quarterly resource fish and biannual invertebrate surveys of 27

sites, conducting quarterly monitoring of 6 algae survey sites, and assisting the Coral Reef Assessment and Monitoring Program (CRAMP) in monitoring 20 sites (DAR, 2006). Results of benthic monitoring and resource fish surveys are particularly noteworthy with respect to the environmental status of Molokini MLCD, which was found to be relatively healthy and productive in spite of substantial recreational use. Results of the most recent five year DAR monitoring effort (2005-2010) in Maui County should be released in early 2011.

3.5.1 Benthic Monitoring

Monitoring sites on Maui were selected on the basis of existing historical data, degree of perceived environmental degradation, level of management protection, and extent of wave exposure. Two reef areas (shallow 1-4m and deep 6-13m) were generally surveyed at each site. Each survey station consists of 10 randomly chosen 10m transects marked by small stainless steel staked endpoints. Digital video and stills, substrate rugosity, sediment samples, and other qualitative data were collected over the study period. Digital imagery was taken perpendicular to the substrate along each transect at a height of 0.5 m. Twenty randomly selected, non-overlapping digital video frames or stills from each transect were used to estimate benthic coverage. PointCount99 and Photogrid 1.0 software were used to tabulate coral and benthic substrate types at each of 50 randomly selected points per image and generate percent coverage data (Figure 3.6).

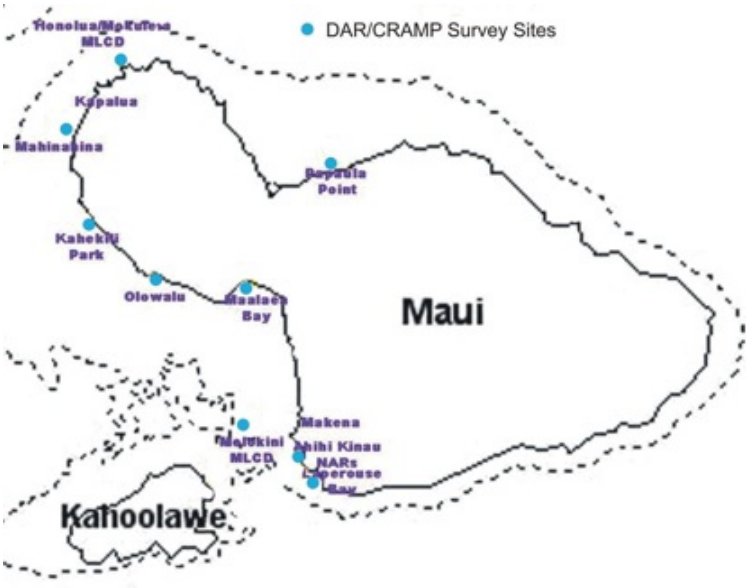
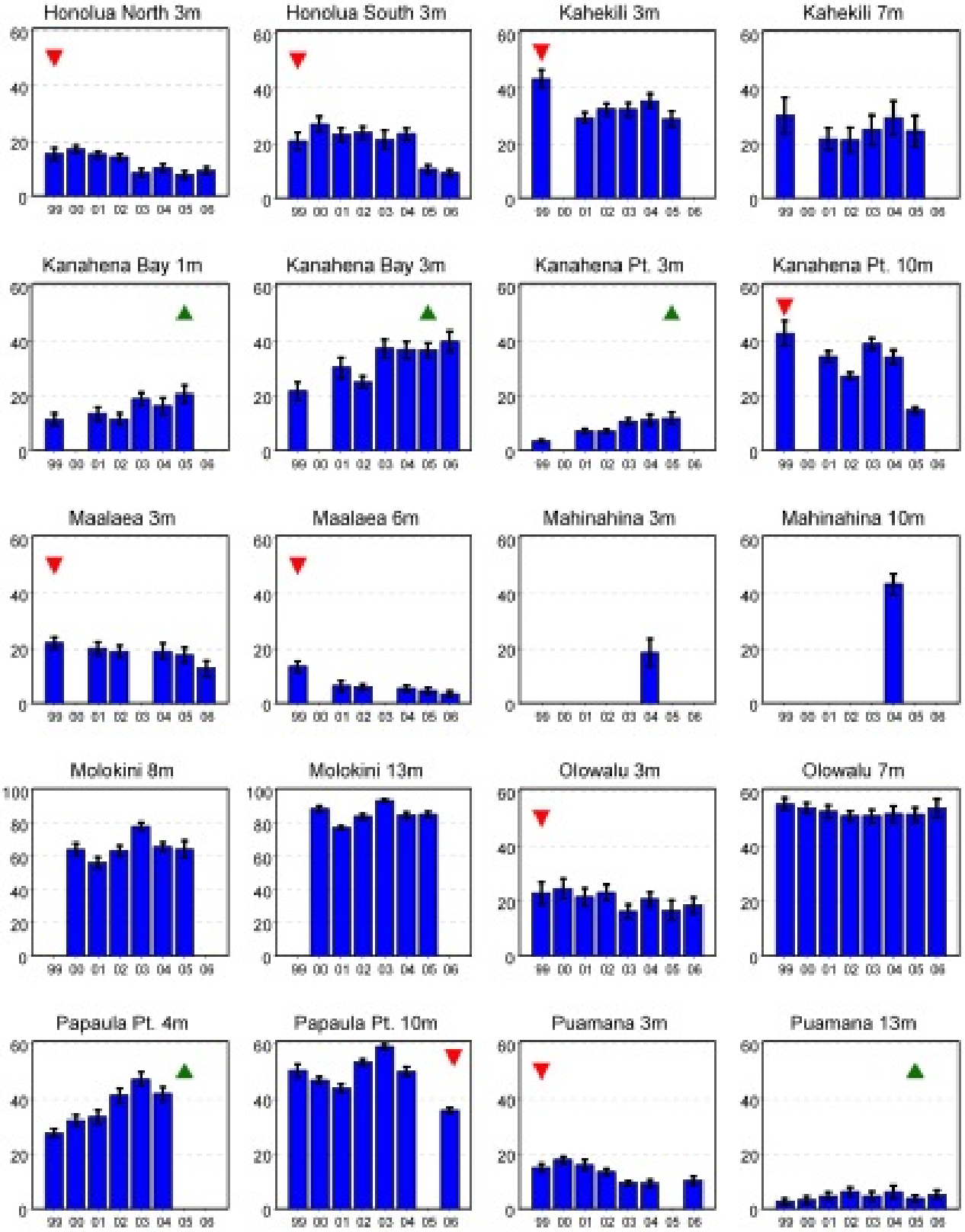


Figure 3.6 Temporal change in percent coral cover at Maui study sites (DAR, 2005)



Coral cover averaged 30.7% ± 5.4 SE for Maui County sites in 1999 and 2000 when benthic surveys were commenced. Coral cover declined to 27.1% ± 5.3 SE at the same sites in 2005-06 surveys. This modest decline masks substantial change at the site level, however, with 14 of the 18 sites experiencing significant change over the monitoring period. Coral cover declined at several west and central Maui sites (e.g., Honolua Bay, Kahekili, Olowalu, Maalaea) where anthropogenic impacts from shoreline development and visitation were greatest. On the other hand, sites that experienced increases in coral cover or sustained high coral cover tend to be more remote or offshore (e.g., Kanahena Bay, Kanahena Point, Molokini).

Blooms of invasive macroalgae likely related to elevated nutrient levels and low herbivore densities were observed at several sites with low or declining coral cover (e.g., Kahekili, Maalaea), but these were rarely observed at more remote sites such as Molokini. Recreational use may also be a potential factor in declining coral cover at some monitoring sites such as Honolua Bay and Kahekili where there are more than 5,000 scuba divers and other visitors per year (Meadows, 2003). However, the report notes the continuing healthy state of reefs at Molokini MLCD, which is one of the most visited marine recreation sites in Hawai'i. This suggests that that presence of a large numbers of scuba divers and snorkelers is not necessarily incompatible with persisting high coral cover. The Molokini monitoring sites and transects are, however, more isolated and deeper (8m and 13m) than those at Kahekili and Honolua Bay, which were much shallower (3m) and more accessible.

In general, dramatic declines of several West Maui reefs were observed in the most recent benthic surveys conducted by DAR, which required urgent management action to reduce land based impacts and enhance reef natural control mechanisms. Reef conditions and coral coverage at Molokini MLCD were, however, an exception to this pattern and appear

to be relatively stable and healthy compared to similar nearshore sites on Maui in spite of significant levels of recreational use at this MLCD.

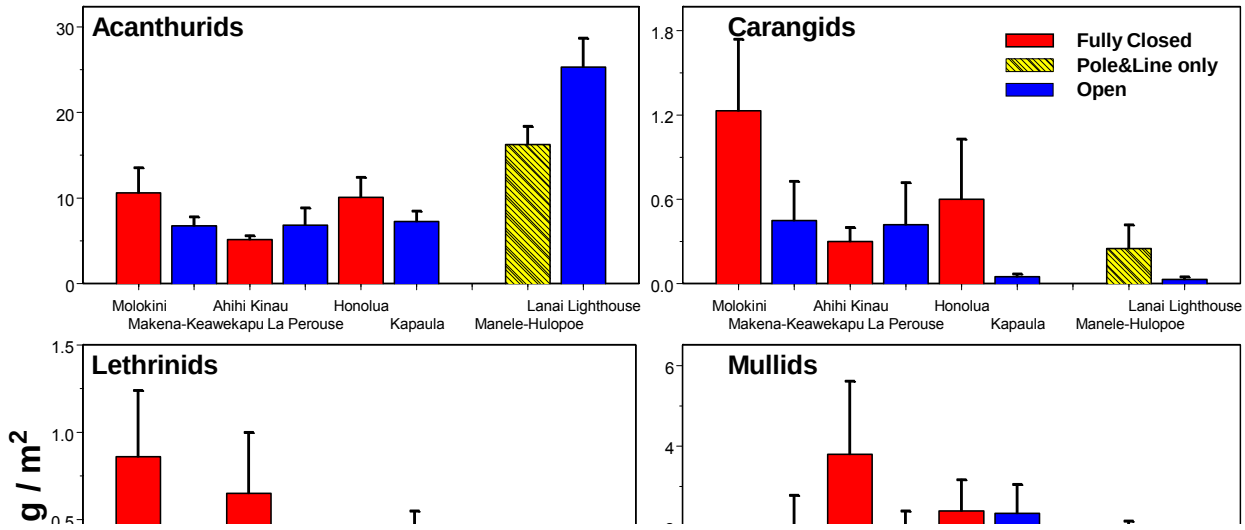
3.5.2 Fish Surveys

Resource fish surveys in Maui County focused on larger species targeted by subsistence, recreation, and commercial fishers. These surveys were conducted at four pairs of sites (total of eight sites) and each site included four or five sub-sites. Study pairs included a reserve where fishing is prohibited / restricted and an adjacent control area with relatively similar reef structure and active fishing. The Maui County study pairs were:

- Ahihi-Kina`u Natural Area Reserve (control at La Perouse Bay);
- Molokini MLCD (controls at Makena and Keawakapu);
- Honolua-Mokule`ia MLCD (control sites adjacent to Honolua); and
- Manele-Hulopo`e MLCD (control area Lighthouse on SW coast of Lāna`ī).

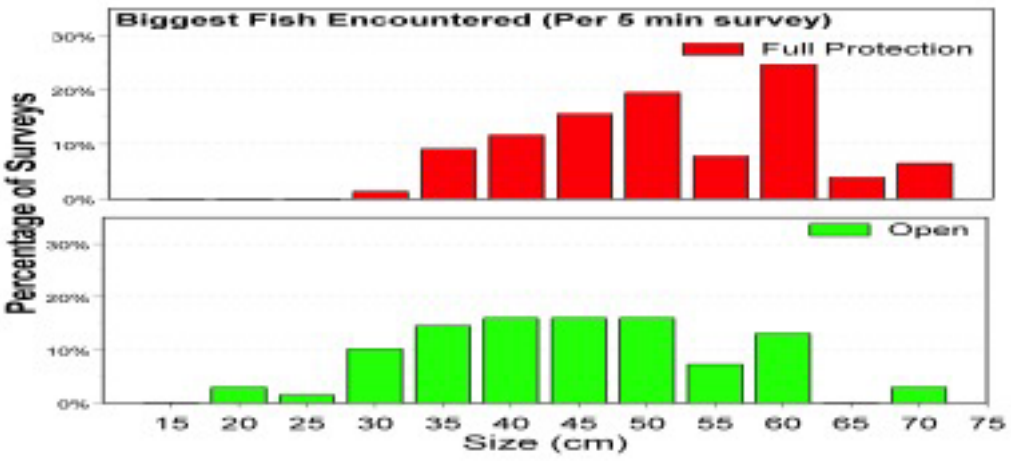
These comparisons in the Maui County were between relatively similar protected areas and controls, but differences in habitat and exposure did exist between the area pairs, particularly between Molokini MLCD and its control (Figure 3.7).

Figure 3.7 Fish surveys at sites in Maui County



Fish survey results generally indicate positive effects associated with closures to fishing. Total food fish biomass in the three fully closed reserves (Honolua-Mokule`ia MLCD, Ahihi-Kina`u Natural Area Reserve, Molokini MLCD) was higher than biomass at the comparable open access controls. There was also greater prevalence of apex predators (carangids and lethrinids) and greater size of target fishes at remote protected sites such as Molokini. The largest fish encountered per survey is a simple metric of fish stock health that has been found useful in other studies (Williams & Walsh, 2006). In surveys of reserve areas such as Molokini, a fish of 60cm or larger was observed 35% of that time. Fish of that size were only seen in 12% of surveys in the open access areas. Observed size distribution trends were also investigated by assessing four relatively common and heavily-targeted fish species: Bluefin Trevally (*Caranx melampygus*), Bluespine Unicornfish (*Naso unicornis*), Bigeye Emperor (*Monotaxis grandoculis*), and Redlip Parrotfish (*Scarus rubroviolaceus*). Reserves such as Molokini were found to contain more and larger fishes of these species than open areas (Figure 3.8).

Figure 3.8 Fish encounters in Maui County (reserve versus open areas)



Stocks of herbivore fish were also depleted at open access locations, and the presence of large schools of Manini (*Acanthurus triostegus*) were only seen in protected sites such as

Molokini or at open sites where fishing is light due to relative inaccessibility and low population densities. Given the growing concern over the spread of invasive algae on Maui, these results suggests that protecting herbivore fish populations at sites such as Molokini can have significant positive implications for reef health.

4.0 FOCUS GROUP RESULTS

A total of 19 Molokini stakeholders participated in three separate focus groups including: commercial operators, government agencies, native Hawaiians, recreation interest groups, and environmental groups. The meetings were conducted on Maui in February 2009 and information gleaned from these sessions was used to inform site objectives, indicators, and future data collection efforts. Meetings were recorded on digital audio, transcribed verbatim, and analyzed using content analysis.

4.1 COMMERCIAL OPERATORS

4.1.1 Perceptions of Current Conditions

Commercial tour operators who participated in the focus groups believed that Molokini is a good example of industry self-regulation that requires little outside intervention and is a model of diverse user groups coming together. They believed that Molokini could be a model for how things could be done elsewhere in the state, but it is important to look at what is working with the experienced operators. These operators cooperate to install and maintain boat moorings, and felt that they are doing a good job because the site is heavily used and coral is perceived to be healthy. Environmental compliance is self-regulated and education is provided to passengers (e.g., should not feed fish, cannot take shells, stay 15 feet off the shelf). Operators believed that Molokini has good visibility, unique topography (especially on the backside of the crater), and parts of the site are suited for adventurous types of people. For others, a trip to Molokini represents their first time in the ocean. Operators considered Molokini one of the more dependable locations where marine life is consistently good with dependable snorkel and scuba dive sites. They considered this site to be iconic to Maui and its proximity to this island is a lure.

Commercial tour operators argued that there has been a significant shift over time with increased safety, better training of staff, and integration of environmental and cultural education. Operators would like this to continue because they believed that education at Molokini translates to other areas. These operators believed that Molokini is a significant educational resource for the public and interactions with the marine environment at this site influence behavior at other locations in Hawai‘i and elsewhere. It was argued that Molokini is not the only place where operators go and educational messages that passengers receive at Molokini translates to other places. An example of this is fish feeding, which is thought to be absent at Molokini and reduced elsewhere because of educational messages by commercial operators. Operators stated that fish feeding did attract fish, but now there is a more balanced and diverse population even though the number of fish has reduced. Commercial operators mentioned that they provide oversight of uneducated people who visit Molokini. In operators' opinions, the site receives fishing pressure at night from poachers, which would also occur in the day if not for the presence of tour boats.

Although there is a perception that every boat traveling to and from Molokini is full of tourists, commercial tour operators noted that they believed many local residents also access this site using tour boats because residents of Hawai‘i have been a significant group in many visitor counts conducted by tour companies. Most operators have some basic data about users and their experiences already, such as demographics, activity groups, and customer satisfaction. According to commercial operators who participated in these focus groups, ocean and geography dictate where certain boats can go and through trial and error, commercial operators have developed a system that they believe works. Private recreational boaters can disrupt this informal system at Molokini because they often

do not have enough information. On a summer day with a south swell, for example, the only place to go is Molokini and it gets crowded. By communicating and working together, tour boats can secure a particular spot, but unexpected changes, especially from private recreational boaters, can upset this system. There might be some misunderstanding between user groups, but it should not be adversarial, and other groups might be surprised at the level of integrity shown by commercial operators. Molokini accommodates many people and takes the pressure off other more sensitive coastal areas, but there is only a small window of opportunity of use from sunrise to one or two o'clock in the afternoon.

Operators identified distinct activity types at Molokini. Scuba divers go to deeper water where the diving is good based on experience. Snorkel boats, on the other hand, typically go to more sheltered areas that are more appropriate for novice recreationists. A few snorkel boats also offer scuba diving and vice versa because it makes sense economically. Most companies work well together regarding safety, and operators work cooperatively if an accident occurs. Passengers have an expectation that their trip will be safe and captains keep people together within set boundaries. People cooperate to make the trip to Molokini as safe and organized as possible.

4.1.2 Concerns and Desired Future Conditions

Commercial tour operators generally agreed with management objectives that support sustainable businesses, create quality user experiences, maintain a stable and healthy environment, and build respect for Hawaiian culture. Significant concerns were, however, expressed over several issues at Molokini. Commercial operators believed that state agency managers need to realize that operators have worked together independently from agencies to manage mooring schedules and other potential conflicts. Operators hoped that

agencies could be a partner to manage these moorings for the benefit of all, including private recreational boaters. Operators would like more cooperation and teamwork on this issue. These operators also expressed that additional moorings would be beneficial. They also would like improved communication between commercial tour operators and private recreational users. Information needs to be provided to the public about moorings and other formal and informal rules to help manage the heavy boat traffic at Molokini.

Operators felt that agencies do not understand that they provide most of the access to Molokini for local residents. It is difficult for locals to access many marine areas and operators thought that agencies should invest in facilities to support existing commercial operations that provide safe access for both locals and visitors. Commercial operators believed that they are part of the community and the industry is cross-cultural and cross-generational. They would like to get more respect from agencies for the benefits that they provide to the local community and state. Commercial operators also believed that the carrying capacity of Molokini is already informally established by harbor slips, infrastructure, and the limited number of permits. Some commercial operators, however, would like to find out more about customer experiences in the future, such as: (a) whether they get educated and are more aware of the environment and stewardship as a result of their trip, (b) if the provider is perceived by users to be knowledgeable of the environment, (c) how Molokini compares to other areas, (d) whether their experience inspires them to change future behavior or take further action, and (e) what made them choose to visit Molokini.

There have been incidents at Molokini and operators believed that the existing situation is overly punitive and driven by state agencies seeking sources of additional revenue. Some of the distrust in this area is hard to separate from problems related to management of

Molokini in general, but operators were concerned that large fines will result in less reporting of incidents. One option expressed was that fines should go back to rehabilitating coral on site and a reasonable restitution should be worked out. This may allow operators to work together to restore the coral because people want the coral back as soon as possible. Revenue from fines or restitution could also fund information provided to local recreational boaters on the rules at Molokini. Operators thought that the goal of fines should be to recover the resource and not generate revenue, and if the mandate is to protect the resource, money and energy should be directed toward this effort.

Operators would also like state agencies to be more forthcoming with their objectives so they can help with issues such as reef monitoring. Operators stated that it would be refreshing to be included in trying to achieve long-term objectives for Molokini, but before doing so, they would want to know what agencies are looking to achieve and why. Operators would also like less bureaucracy and inter-agency conflict among the various managing agencies because they believe this to be counter-productive and puts commercial tour operators in the middle. Finally, concern was expressed by several operators about the poor condition of the harbors and boat ramps, which they believed is inappropriate given the money that commercial tour operations at Molokini generate for local communities and the state as a whole.

4.2 COMMUNITY INTEREST GROUPS

4.2.1 Perceptions of Current Conditions

Participants mentioned that the water at Molokini is crystal clear and feels like an aquarium because the site is isolated from terrestrial and residential run-off. Water depth is also good and attracts large fish and other marine life, and the high diversity of substrate and

topography also make this site unique. Participants cited studies saying that the reef at Molokini is generally healthy and moorings have helped to improve reef health and safety. On the other hand, some participants believed that management has largely fallen to the Maui Reef Fund, which is a consortium that wants more sustainable marine tourism. Some state agencies are involved in this program. This group is attempting to establish a structured management program for the moorings, but there are only nine or 10 operators who contribute out of the 22 to 27 companies that currently have permits to visit the site. Participants believed, however, that management of moorings is working better than most things at Molokini. Native Hawaiians considered Molokini to be the piko (belly button) of a mythic being that runs between Maui and Kahoolawe, connecting the islands. There is no water or humans on the island and although this site was traditionally used for fishing, it is now a tourist spot. Participants have noticed a dramatic drop in fishing around Molokini despite it being so accessible from Maui. Participants discussed the different activities at Molokini and although the site accommodates many snorkelers and scuba divers, they believed that no major conflict occurs between these two main user groups because they are well divided with scuba divers visiting the outer reef and snorkelers remaining inside the crater sheltered from ocean currents and wind. They also mentioned that although there are many people visiting Molokini, this site has moorings and draws people away from other more sensitive sites that have no moorings and can suffer from anchor damage.

4.2.2 Concerns and Desired Future Conditions

Community participants generally agreed with management objectives that focused on maintaining a healthy environment, supporting sustainable businesses, creating quality user experiences, and building respect for Hawaiian culture. Some of these focus group

participants felt that there are not as many fish at Molokini as there used to be and this could be because they have often seen lights of fishing boats around Molokini at night. They have even seen people fishing from jet skis at Molokini. Participants believed that better education of users about the reserve's perimeter, moorings, and why it is a preserve would help minimize fishing related problems. They also believed that although coral cover has increased at Molokini, fish diversity has decreased, suggesting that something strange is happening. They have noticed that fish feeding and its impacts are still occurring, which is difficult to stop completely without monitoring. One participant mentioned that fish feeding is evident because fish now bite and jump out at people, and more aggressive fish species are coming into Molokini on a more regular basis. Participants have noticed that the bird life on the island of Molokini is also changing.

Participants were concerned about management and enforcement at Molokini, especially issues related to size and capacity of boats. Participants also noted that there was no regulation on the size of boats allowed Molokini and that the only regulation involves the size of boat slip, which is why many boats are getting bigger by adding a second level (i.e., two-story boats). Allowing fewer visitors or boats at one time and permitting only smaller boats were supported. Another option raised in the meeting was to specify in the permit process that access would be regulated by time of day, but wind is a factor in the afternoon so boats typically visit in the morning. Participants applauded some commercial operators for setting boundaries and spatially separating use to minimize overcrowding. They also did not advocate any measures that would prohibit tourism at Molokini; they believed that the public needs a place to go and things to do, and Molokini is good for this because it is deep and the reef is largely protected, which minimizes potential environmental damage. One

participant noted that the music being played on the tour boats was distracting, could affect the bird populations, and should be limited with noise restrictions.

During this focus group, several participants believed that the community should be able to access Molokini more easily on their own because most residents avoid the area when use levels are high and the commercial boats occupy most of the moorings. Participants felt that more information on availability and location of public moorings is needed, and any non-commercial moorings should be submerged, color coordinated, maintained, and publicized only to non-commercial users. A locals day (i.e., once per month) was also supported, but weather could make it problematic in terms of equity. If a locals day was to be implemented, a proper public information and education campaign would be needed to raise awareness. Participants discussed that another option to increase resident access would be for tour companies to provide free or heavily discounted rates to local residents as a way to give back to the community.

Participants believed that there should be both a learning component and a cultural context to all tours at Molokini, and this area should be used for educating people about both the environment and Hawaiian culture. Participants believed that the area provides a Disneyland type of experience, and more could be done to inform visitors of its setting, history, and culture. Although respect for Hawaiian cultural practices is hard to reconcile with modern tourism, participants believed that measures could be taken such as showing respect by blowing the pu to let the ancestors know you are coming. Operators and their employees should also be trained in native culture and informed about things such as how to ask for permission and give back. Participants believed that someone should be required

to talk to tour boat crews or do a workshop on native Hawaiian culture that sets acceptable rules and cultural protocols to adhere to that are clear and truthful.

From a managerial perspective, participants expressed a desire for increasing collaboration among operators, agencies, interest groups, and other stakeholders. They believed that there is no communication, management plan, advisory committee, or strategy for what is happening on the islet. They also thought that it would be good if native Hawaiian councils and local families were more involved. Participants also wanted more commitment to research and ongoing monitoring of human use and biological indicators because there is limited data and only educated guesses on such things as the number of people visiting Molokini. Participants felt that any money collected for Molokini should go back to management and not to state general funds. Overall, these meeting participants believed that there is currently little management, planning, or money being used to take care of Molokini, and that protecting this conservation district and trying to run sustainable tourism while keeping the reef healthy is of the utmost importance. They would like to see less people, more fish, smaller vessels, dedicated funding for management, outreach that raises cultural respect and awareness, and more education that builds appreciation of the site as a marine protected area.

5.0 MARINE RECREATION USE & SOCIAL CARRYING CAPACITY

The following analyses and results of the onsite observations and pre-trip / post-trip surveys are presented in several major sections: (a) site observations; (b) personal and trip characteristics (e.g., activity groups, specialization, previous visitation, group size, value orientations, demographics); (c) expectations of and satisfaction with conditions and experiences; (d) social carrying capacity indicators (e.g., encounters, crowding); (e) conflict among activity groups; (f) support and opposition of potential management strategies; and (g) displacement and future visitation. Most data were recoded into major response categories (e.g., agree, disagree; support, oppose) to highlight important findings.

In addition to on-site observations recorded by researchers, a total of 712 pre-trip and 439 matching post-trip surveys were completed by visitors (see Appendix I). The pre-trip response rate (i.e., number of completed surveys compared to refusals) was 95% and post-trip response rate was 79%, which are both extremely high response rates for survey research (Vaske, 2008). Approximately 85% of surveys were completed on large boats and all but four respondents on these boats were snorkelers (99%). The remaining 15% of surveys were completed on smaller boats where all but eight respondents were scuba divers (93%). This means that comparisons of survey responses between individuals on large and small boats would yield results that are basically identical to comparisons between snorkelers and scuba divers, respectively. The discrepancy between numbers of pre-trip and post-trip surveys was a result of unfavorable ocean conditions that cancelled several trips after the pre-trip surveys were already completed by passengers. These sample sizes allow generalizations about the population of Molokini tour visitors at a margin of error of ±3.7% (pre-trip) to ±4.7% (post-trip) 19 times out of 20 (i.e., 95% confidence

level), which is better than the conventional standard accepted in recreation and tourism research (Vaske, 2008). Surveys were also administered in April 2009 to local boating and fishing club members, but only 14 surveys were completed, so it cannot be assumed that this sample is representative of all boating or fishing groups on Maui or the population of Maui residents who fish or own a boat.

5.1 ONSITE OBSERVATIONS

Onsite observation sheets (Appendix H) were used by researchers to record information on 28 trips aboard commercial tour boats. All trips departed harbors or boat ramps between 7:00 AM and 8:15 AM with 80% leaving by 7:30 AM. All trips returned between 11:45 AM and 2:00 PM with 75% returning by 12:30 PM. In total, most trips (75%) also visited a secondary site before or after Molokini such as Turtle Arches / Turtle Town off the coast of Maui. Facilities and services observed on these trips are summarized in Table 5.1.

Table 5.1 Facilities and services observed on tour boats to Molokini

	Percent of trips observed (%)		
	Large Tour Boats	Smaller Tour Boats	Total
On board toilets	100	100	100
Meals offered	100	90	96
Playing music on boat	100	70	89
Barbequing on boat	81	0	50
Handling / showing marine life	19	10	15
Introductory scuba diving / training	0	40	15
Fishing	13	0	8
Snuba offered	2	0	1
Waste dumping overboard	0	0	0
Fish feeding	0	0	0

All boats had onboard toilets and most trips (96%) offered meals to clients. Music was played on most trips (89%), but there was a slight difference between large boats where

music was played on all trips compared to smaller boats where music was played on 70% of trips. Barbequing was common on large boats (81%), but not on smaller boats (0%). Guides handling or showing marine life to clients was observed on 15% of these trips. Introductory scuba diving and training was not observed on any of the large boats, but did occur on 40% of trips with smaller boats. Fishing from tour boats was observed on 13% of trips with large boats, but not on any trips with smaller boats. Dumping waste overboard or feeding fish was not observed on any trips.

Observations of various types of information and education disseminated to passengers are summarized in Table 5.2. Information about safety and equipment was provided on all trips, and education about nature, underwater marine species, coral reefs, proper etiquette and behavior, and problems with touching marine life was provided on over 90% of trips.

Table 5.2 Information and education observed on tour boats to Molokini

	Percent of trips observed (%)		
	Large Tour Boats	Smaller Tour Boats	Total
About safety	100	100	100
About equipment	100	100	100
About nature	94	100	96
About underwater species	94	100	96
About proper etiquette / behavior	94	100	96
About how touching marine life is bad	100	90	96
About coral reefs	94	90	92
About how fish feeding is bad	100	70	88
About history of the area	93	0	56
About how humans impact the environment	81	0	50
About suggestions for how to help	80	0	48
About native Hawaiian culture	60	0	36

Information about problems associated with fish feeding was provided on all trips on large boats, but only 70% of trips on smaller boats. Most trips on large boats provided

information about history of the area (93%), how humans impact the environment (81%), and suggestions for how to help the environment (80%). None of the trips on smaller boats, however, provided information about these topics. Only 36% of trips included information about native Hawaiian culture, with 60% of trips on large boats and no trips on smaller boats including information about this topic.

5.2 PERSONAL AND TRIP CHARACTERISTICS

5.2.1 Activity Groups

Visitors were asked to indicate the one main activity in which they participated at Molokini. Table 5.3 shows that 85% of respondents were snorkeling, 15% were scuba diving, and fewer than 1% participated in snuba. There were differences in groups between large and smaller boats, as all but four respondents on large boats were snorkeling (99%) and all but eight respondents on smaller boats were scuba diving (93%). This means that comparisons of survey responses between individuals on large and small boats would yield results that are almost identical to comparisons between snorkelers and divers, respectively.

Table 5.3 Activity groups at Molokini*

	Large Tour Boats	Smaller Tour Boats	Total
Snorkeling	99	7	85
Scuba diving	0	93	15
Snuba	< 1	0	< 1

***cell entries are percentages (%). $\chi^2(2, N = 691) = 491.38$, $p < .001$, $V = .94$.

These differences in activities between large and smaller boats were statistically significant ($\chi^2(2, N = 691) = 491.38$, $p < .001$, $V = .94$) and when a *p*-value associated with any of the statistical tests (i.e., χ^2, *F*) presented in this report is $p < .05$, a statistically significant

relationship or difference was observed between the independent (e.g., boat size) and dependent (e.g., activity groups) variables. The relationship between boat size and activity groups in Table 5.3 was significant at $p < .001$. In addition to these tests of statistical significance, effect sizes (e.g., Cramer's *V*, eta η) were used to compare the strength of these relationships or differences. In general, a value of .10 for effect size statistics can typically be considered a "minimal" (Vaske, 2008) or "weak" (Cohen, 1988) relationship or difference, .30 is considered "typical," and .50 or greater is a "substantial" relationship or difference. These rules of thumb (i.e., .10 = minimal, .30 = typical, .50 = substantial) apply to most effect sizes reported here. Larger effect sizes imply stronger relationships or differences. The Cramer's *V* effect size in Table 3 was $V = .94$ which implies an extremely "large" or "substantial" difference in activity groups between large and smaller boats.

5.2.2 Degree of Specialization.

Respondents were asked if their trip to Molokini was the first time that they have ever participated in snorkeling or scuba diving (Table 5.4). In total, 70% of respondents had participated in this main activity before and 30% were trying the activity for the first time at Molokini. There were significant differences between snorkelers and scuba divers ($\chi^2(1, N = 680) = 19.76$, $p < .001$, $\phi = .16$).

Table 5.4 Previous activity participation*

	Snorkeling (Large Tour Boats)	Scuba Diving (Smaller Tour Boats)	Total
First time ever participating in this activity	32	12	30
Previously participated in this activity	68	88	70

*cell entries are percentages (%).$\chi^2(1, N = 680) = 19.76$, $p < .001$, $\phi = .16$.

A more rigorous measure of involvement and experience in an activity involves the concept of specialization. Recreation specialization is a concept for grouping recreationists into subgroups based on “a continuum of behavior from the general to the particular, reflected by equipment and skills used in the sport and activity setting preferences” (Bryan, 1977, p. 175). At one end of the continuum are novices or infrequent participants who do not consider the activity to be a central life interest or show strong preferences for equipment and technique. The other end includes more avid participants who are committed to the activity and use more sophisticated methods. Recreationists are thought to progress to higher stages along this continuum, reflected by increasing skill and commitment (Needham, Sprouse, & Grimm, 2009; Scott & Shafer, 2001). Grouping recreationists is important because they are heterogeneous and often exhibit different preferences, behaviors, and attitudes based on their specialization. For example, research has shown that more specialized recreationists tend to be more supportive of restrictive management strategies, prefer more educational and interpretive information, and are more sensitive to crowding and use levels (Manning, 1999; Needham & Rollins, 2009; Scott & Shafer, 2001).

Specialization is a multidimensional concept consisting of behavioral, cognitive, and affective dimensions. Behavioral indicators include past participation experience and equipment investment. Cognitive indicators include skill and knowledge. Indicators of affective attachment and commitment include enduring involvement and centrality to lifestyle (Needham, Vaske, Donnelly, & Manfredo, 2007). Tables 5.5 and 5.6 show the multiple dimensions and variables used for measuring specialization of Molokini visitors in their main activity – snorkeling or scuba diving. These variables are consistent with those used in previous studies (e.g., Barro & Manfredo, 1996; Needham et al., 2007).

Measurement reliability of variables measuring these dimensions was examined using Cronbach alpha (α) reliability coefficients, which ranges from 0 (no reliability) to 1 (perfect reliability). An alpha coefficient of ≥ 0.65 is considered by most researchers to be acceptable and indicates that multiple items are measuring the same broad concept or dimension, and justifies combining individual survey variables into composite indices representing these dimensions (Cortina, 1993; Nunnally & Bernstein, 1994; Vaske, 2008).

Alpha values in Table 5.5 and Table 5.6 were .90 (snorkelers) to .91 (divers) for the "centrality to lifestyle" affective dimension, .84 (divers) to .85 (snorkelers) for the "skill level" cognitive dimension, and .67 (snorkelers) to .69 (divers) for the "past experience" behavioral dimension. These results indicate that the survey variables for each reliably measured their respective dimension. Deletion of any variable from its dimension did not improve reliability of any dimensions for both snorkelers and scuba divers. Reliability of the overall specialization scale was extremely high for both snorkelers (α = .91) and scuba divers (α = .93), which justified combining variables into mean composite indices for their respective dimensions.

Comparing information in Tables 5.5 and 5.6 shows that, on average, snorkelers slightly disagreed with most of the statements measuring centrality, skill, and experience in snorkeling. Conversely, scuba divers, on average, slightly agreed with most of these variables. Compared to scuba divers, snorkelers also rated their skill level lower and participated in few places, fewer times in the past year, and for a slightly less proportion of their lives. These findings suggest that snorkelers may be less specialized than scuba divers at Molokini.

Table 5.5 Reliability analyses of variables measuring specialization in snorkeling

Dimensions and variables	Mean	Std. dev.	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Centrality to lifestyle (affective dimension) [1]					.90
If I stopped participating in this activity, an important part of my life would be missing	-0.37	1.06	.74	.88	
I would rather participate in this activity than do most anything else	-0.48	0.95	.77	.87	
Participation in this activity is a large part of my life	-0.66	0.94	.79	.86	
Most recreation activities do not interest me as much as this activity	-0.44	0.92	.69	.89	
This activity is becoming a more important part of my life each year	-0.44	0.94	.74	.87	
Skill level (cognitive dimension)					.85
Given skills I have developed in this activity, it is important that I continue to participate [1]	-0.27	0.98	.66	.77	
I feel that I am more skilled in this activity than most other people [1]	-0.66	1.03	.71	.76	
Testing my skills in this activity is very important to me [1]	-0.49	1.00	.62	.79	
I am becoming more skilled in this activity each year [1]	-0.28	1.06	.70	.76	
I would rate my skill level in this activity as … [2]	1.98	1.03	.40	.82	
Experience (behavioral dimension)					.67
I try to participate in this activity as often as possible [1]	-0.16	1.07	.56	.54	
I am spending more time participating in this activity each year [1]	-0.39	1.03	.44	.61	
Number of other places ever participated in this activity [3]	4.98	11.07	.41	.62	
Number of times participated in this activity in past 12 months [3]	1.11	3.61	.32	.66	
Proportion of life participating in this activity [4]	16.30	21.80	.39	.64	
Overall specialization index					.91

[1] Variables measured on 5-point recoded scales of -2 "strongly disagree" to +2 "strongly agree."

[2] Variable measured on 5-point scale of: 1 "beginner" to 5 "expert."

[3] Variable measured on open-ended (i.e., write number of places or times).

[4] Calculated as: (number of years snorkeling * 100) = proportion of life spent snorkeling (% of life).

Table 5.6 Reliability analyses of variables measuring specialization in scuba diving

Dimensions and variables	Mean	Std. dev.	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Centrality to lifestyle (affective dimension) [1]					.91
If I stopped participating in this activity, an important part of my life would be missing	0.56	1.08	.77	.88	
I would rather participate in this activity than do most anything else	0.01	1.13	.84	.87	
Participation in this activity is a large part of my life	0.08	1.13	.84	.87	
Most recreation activities do not interest me as much as this activity	-0.02	1.02	.65	.91	
This activity is becoming a more important part of my life each year	0.46	1.03	.73	.89	
Skill level (cognitive dimension)					.84
Given skills I have developed in this activity, it is important that I continue to participate [1]	0.70	0.98	.76	.78	
I feel that I am more skilled in this activity than most other people [1]	-0.32	1.13	.58	.83	
Testing my skills in this activity is very important to me [1]	0.41	0.99	.62	.81	
I am becoming more skilled in this activity each year [1]	0.61	0.96	.71	.79	
I would rate my skill level in this activity as … [2]	2.61	1.07	.57	.83	
Experience (behavioral dimension)					.69
I try to participate in this activity as often as possible [1]	0.58	1.01	.44	.60	
I am spending more time participating in this activity each year [1]	0.39	1.00	.52	.58	
Number of other places ever participated in this activity [3]	13.78	26.89	.51	.55	
Number of times participated in this activity in past 12 months [3]	5.92	9.97	.57	.52	
Proportion of life participating in this activity [4]	17.67	18.26	.14	.66	
Overall specialization index					.93

[1] Variables measured on 5-point recoded scales of -2 "strongly disagree" to +2 "strongly agree."

[2] Variable measured on 5-point scale of: 1 "beginner" to 5 "expert."

[3] Variable measured on open-ended (i.e., write number of places or times).

[4] Calculated as: (number of years scuba diving * 100) = proportion of life spent scuba diving (%).

Having demonstrated reliability of variables measuring snorkeling and scuba diving specialization, K-means cluster analysis was then performed on mean composite indices to

group respondents into smaller homogenous subgroups based on their specialization. Cluster analysis classifies individuals into groups based on patterns of responses across multiple survey variables or factors (Hair & Black, 2000). A series of two to five group cluster analyses showed that a three group solution provided the best fit for the data. To validate this solution, data were randomly sorted and a cluster analysis was conducted after each of four random sorts. These additional analyses supported the solution identifying three distinct groups of individuals, labeled as "casual participants" (cluster 1), "intermediate participants" (cluster 2) and "veteran participants" (cluster 3).

Table 5.7 Specialization groups at Molokini*

	Snorkeling (Large Tour Boats)	Scuba Diving (Smaller Tour Boats)	Total
Casual participants	36	11	32
Intermediate participants	56	47	54
Veteran participants	9	42	14

*cell entries are percentages (%). $\chi^2(2, N = 682) = 71.52, p < .001, V = .36$.

Respondents were compared in terms of their responses to the original specialization variables. Casual participants reported the lowest mean scores on all variables measuring centrality, skill, and experience; veterans had the highest scores. Intermediate respondent scores fell in between these two groups. This pattern among casual, intermediate, and veteran participants is consistent with a continuum of specialization, as originally hypothesized by Bryan (1977) and supported in more recent research (see Manning, 1999; Needham & Rollins, 2009; Scott & Shafer, 2001 for reviews). Both four and five group cluster solutions showed this same pattern, but sample sizes in some groups were so small that they would severely constrain further statistical analysis (e.g., *n* = 29 in four group

solution, n = 19 in five group solution). The largest percentage of visitors at Molokini were classified in the intermediate group (cluster 2 = 54%) followed by casual participants (cluster 1 = 32%; Table 5.7). The fewest users were classified as veterans (cluster 3 = 14%). There were, however, differences in specialization between snorkelers (i.e., passengers on large boats) and scuba divers (i.e., those on smaller boats), $\chi^2(2, N = 682) = 71.52$, $p < .001$, $V = .36$. Although the largest proportion of both snorkelers (56%) and scuba divers (47%) was classified in the intermediate group, only 9% of snorkelers were veterans in this activity compared to 42% of scuba divers who were veterans in scuba diving. This confirms that snorkelers were less specialized than scuba divers at Molokini.

5.2.3 Previous Visitation

Approximately 81% of survey respondents were first-time visitors to Molokini with the remaining 19% having visited Molokini previously (Table 5.8). There was, however, a significant difference between large and smaller boats, $\chi^2(1, N = 708) = 33.18$, $p < .001$, $\phi = .23$. Over 41% of visitors surveyed on the smaller dive boats had been to Molokini before compared to just 15% repeat visitors on the larger snorkel boats.

Table 5.8 Previous visitation to Molokini*

	Large Tour Boats	Smaller Tour Boats	Total
Never been to Molokini before	85	59	81
Been to Molokini before	15	41	19

*cell entries are percentages (%). $\chi^2(1, N = 708) = 33.18$, $p < .001$, $\phi = .23$.

Among respondents who had been to Molokini, 57% had visited only once before, 23% had visited two or three times, 10% had been four or five times, and 10% had visited six or more times (Table 5.9). Repeat visitors on the smaller dive boats had visited Molokini

significantly more often than those on the larger snorkel boats. Over 34% of repeat visitors on smaller boats, for example, had been to Molokini four or more times before, whereas only 13% of repeat visitors on the large snorkel boats had visited this many times. These differences were statistically significant, $\chi^2(3, N = 124) = 12.96$ $p = .005$, $V = .33$.

Table 5.9 Number of previous visits to Molokini*

	Large Tour Boats	Smaller Tour Boats	Total
1 previous visit	66	37	57
2-3 previous visits	21	29	23
4-5 previous visits	8	12	10
6 or more previous visits	5	22	10

*cell entries are percentages (%).$\chi^2(3, N = 124) = 12.96$, $p = .005$, $V = .33$.

5.2.4 Group Size

Surveys asked respondents about group size on their trip to Molokini. The average group size was 3.44 people, but average group size was significantly higher on large snorkel boats ($M = 3.61$ people) than smaller dive boats ($M = 2.45$), $t = 6.27$, $p < .001$, $r_{pb} = .15$ (Table 5.10). In total, the highest proportions of respondents were visiting in groups of two (36%) or four (20%) people. Another 18% were in groups of five or more people and 14% visited on their own. The largest number of visitors on large boats were in groups of two (38%) or four (20%), whereas visitors on smaller dive boats tended to be on their own (33%) or accompanied by only one other person.

Table 5.10 Visitor group size at Molokini[1]

	Large Tour Boats	Smaller Tour Boats	Total
1 person	10	33	14
2 people	38	25	36
3 people	12	16	12
4 people	20	19	20
5 or more people	19	8	18
Mean (average number of people) [2]	3.61	2.45	3.44

[1] cell entries are percentages (%).$\chi^2(4, N = 680) = 39.49, p < .001, V = .26$.
[2] cell entries are mean (average) number of people. $t = 6.27, p < .001, r_{pb} = .15$.

5.2.5 Environmental Value Orientations.

The public can also be grouped according to their value orientations toward general objects or natural resources (Bright, Manfredo, & Fulton, 2000; Vaske & Needham, 2007). Value orientations refer to general classes of objects and are revealed through the pattern, direction, and intensity of basic beliefs (Fulton, Manfredo, & Lipscomb, 1996; Vaske & Donnelly, 1999). Value orientations toward wildlife, for example, have been reliably measured by asking individuals how strongly they identify with biocentric or protectionist belief statements (e.g., “wildlife should have equal rights as humans”) and utilitarian or use beliefs about wildlife (e.g., “wildlife should be used by humans to add to the quality of human life;” Bright et al., 2000; Fulton et al., 1996). In most studies, these basic beliefs have reliably and consistently factored into value orientation continuums such as the biocentric-anthropocentric continuum for broader environmental value orientations (Steel, List, & Shindler, 1994; Vaske & Donnelly, 1999) and the protection-use continuum for value orientations related to more specific objects (e.g., wildlife, forests, coral reefs; Bright et al., 2000; Fulton et al., 1996; Needham, 2010; Vaske & Needham, 2007). An anthropocentric

or use orientation reflects human centered or utilitarian views of the non-human world (Eckersley, 1992). This approach assumes that providing for human use and benefit is the primary goal of natural resource allocation and management regardless of whether uses are for commodity, aesthetic, or physical benefits. Natural resources are viewed as materials to be used by humans and there is little recognition that non-human aspects of nature are valuable in their own right or for their own sake (Scherer & Attig, 1983). A use orientation emphasizes the instrumental value of natural resources for humans rather than any inherent worth of these resources (Vaske, Donnelly, Williams, & Jonker, 2001).

A biocentric or protectionist value orientation is a more nature centered approach. The value of ecosystems, species, and natural resources is elevated to a more prominent level (Eckersley, 1992). Human needs and desires are still important, but are viewed within a larger perspective. This approach assumes that environmental and natural resource objects have instrumental and inherent worth, and that human uses and benefits are not always the most important uses of these resources. In a natural resource management context, these inherent values are to be respected and preserved even if they conflict with human centered values (Thompson & Barton, 1994; Vaske et al., 2001). Biocentric or protectionist orientations and anthropocentric or use orientations are not mutually exclusive; they can be arrayed along a continuum with biocentric or protectionist orientations at one end and anthropocentric or use orientations at the other end; the midpoint represents a mix of these two extremes (Vaske & Donnelly, 1999). Users arranged along this value orientation continuum can then be grouped into more meaningful homogeneous subgroups (Bright et al., 2000; Vaske & Needham, 2007). These value orientations are important because they can predict higher order cognitions such as

attitudes, behavioral intentions, and actual behavior toward natural resources (Fulton et al., 1996; Vaske & Donnelly, 1999). Individuals with biocentric or protectionist value orientations, for example, may be less inclined to engage in depreciative behavior such as feeding fish or handling or standing on coral.

Broad environmental value orientations of Molokini visitors were measured using variables from the popular New Environmental Paradigm scale (Dunlap & Van Liere, 1978) and its more recent version, the Revised New Ecological Paradigm scale (Dunlap, Van Liere, Mertig, & Jones, 2000). These variables are shown in Table 5.11.

Table 5.11 Reliability analyses of environmental value orientations

Orientations and variables*	Mean	Std. dev.	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Anthropocentric orientation					.83
Humans have the right to modify the natural environment to suit their needs	-0.83	1.10	.62	.79	
Humans were meant to rule over the rest of nature	-0.91	1.15	.67	.78	
The so-called "ecological crisis" facing humankind has been greatly exaggerated	-0.81	1.05	.65	.78	
The balance of nature is strong enough to cope with impacts of industrial nations	-0.83	1.01	.67	.77	
Biocentric orientation					.86
The earth is like a spaceship with very limited room and resources	0.58	1.12	.55	.86	
We are approaching the limit of the number of people the earth can support	0.37	1.08	.65	.83	
The balance of nature is very delicate and easily upset	0.75	1.01	.71	.82	
When humans interfere with nature, it often produces disastrous consequences	0.78	0.98	.70	.83	
Plants and animals have as much right as humans to exist	0.92	1.04	.61	.84	
Humans are severely abusing the environment	0.85	0.98	.70	.83	
Overall value orientation index					.85

*variables measured on 5-point recoded scales of -2 "strongly disagree" to +2 "strongly agree"

Ancillary analyses showed that responses to each of these variables and their reliability did not differ between large snorkel boats and smaller dive boats, so responses in Table 5.11 were aggregated across all respondents. On average, respondents agreed with the biocentric variables and disagreed with the anthropocentric variables. For example, respondents agreed most strongly with the belief statement that "plants and animals have as much right as humans to exist" and disagreed most strongly with the statement that "humans were meant to rule over the rest of nature." The alpha reliability coefficients were .83 for the anthropocentric orientation and .86 for the biocentric orientation, suggesting that variables for each reliably measured their respective orientation. Deletion of any variable from its respective orientation did not improve reliability. Reliability of the final environmental value orientation scale was high at .85.

K-means cluster analysis was then performed on these variables to group respondents. A series of two to six group cluster analyses showed that a two group solution provided the best fit for the data. To validate this solution, data were randomly sorted and a cluster analysis was conducted after each of four random sorts. These additional analyses supported the solution identifying two distinct groups of individuals, labeled as weak biocentric orientation (cluster 1) and strong biocentric orientation (cluster 2). These groups were compared in terms of their responses to the original value orientation belief statements. Respondents with a weak biocentric orientation (cluster 1) reported slight agreement with all of the biocentric variables and slight disagreement with all anthropocentric variables. Those with a strong biocentric orientation (cluster 2) had strong agreement on all of the biocentric variables and strong disagreement on all anthropocentric variables. Molokini visitors were relatively evenly split between the weak (48%) and strong

biocentric groups (52%). There were no significant differences in environmental value orientations between recreationists on large snorkel boats and those on smaller dive boats, $\chi^2(1, N = 675) = 2.13$, $p = .144$, $V = .06$. Taken together, these results show that basically all Molokini visitors have biocentric (i.e., nature oriented) values toward the broader environment; there were no discernable or obvious groups at this site with mixed orientations or only anthropocentric orientations toward the environment.

Recent research has also measured value orientations toward coral reefs in recreation and tourism settings (Needham, 2010). This is especially important for an area such as Molokini that is characterized by coral reefs and high levels of visitation. An individual's value orientation toward coral reefs was constructed from five survey variables designed to measure protectionist basic beliefs and five variables measuring use-related beliefs. These variables are shown in Table 5.12 and have demonstrated high reliability and validity in recent research (Needham, 2010). Ancillary analyses showed that responses to each of these variables and their reliability did not differ between large snorkel boats and smaller dive boats, so responses were aggregated across all respondents. On average, respondents agreed with the protectionist variables and disagreed with the use-related variables. For example, respondents agreed most strongly with the statement that "it is important to take care of coral reef areas for future generations" and disagreed most strongly with the statement that "coral reef areas exist primarily to be used by humans." Alpha reliability coefficients were .95 for the use-related orientation and .84 for the protectionist orientation, suggesting that variables for each reliably measured their respective orientation. Deletion of any variable from its respective orientation did not

improve reliability, and reliability of the final scale measuring value orientations toward coral reefs was high at .85.

Table 5.12 Reliability analyses of value orientations toward coral reefs

Orientations and variables*	Mean	Std. dev.	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Use orientation toward reefs					.95
Humans should manage coral reef areas so that only humans benefit	-1.23	1.05	.82	.94	
The needs of humans are more important than coral reef areas	-1.17	1.07	.84	.94	
The primary value of coral reef areas is to provide benefits for humans	-1.31	0.99	.90	.93	
Recreational use of coral reef areas is more important than protecting the species that live there	-1.38	0.95	.89	.93	
Coral reef areas exist primarily to be used by humans	-1.39	0.95	.85	.94	
Protectionist orientation toward reefs					.84
Coral reef areas should be protected for their own sake rather than to simply meet the needs of humans	0.77	1.43	.48	.83	
Coral reef areas should have rights similar to the rights of humans	0.42	1.27	.55	.80	
Recreational use of coral reef areas should not be allowed if it damages these areas	1.00	1.07	.72	.75	
It is important to take care of coral reef areas for future generations	1.39	0.88	.72	.76	
Coral reef areas have value whether humans are present or not	1.36	0.92	.68	.76	
Overall value orientation index					.85

*****variables measured on 5-point recoded scales of -2 "strongly disagree" to +2 "strongly agree"

K-means cluster analysis was then performed on these variables to group respondents. A series of two to six group cluster analyses showed that a two group solution provided the best fit for the data. To validate this solution, data were randomly sorted and a cluster analysis was conducted after each of four random sorts. These additional analyses

supported the solution identifying two distinct groups of individuals, labeled as weak protectionist orientation (cluster 1) and strong protectionist orientation (cluster 2).

These groups were compared in terms of their responses to the original value orientation belief statements. Respondents with a weak protectionist orientation (cluster 1) reported slight agreement with all of the protectionist variables and slight disagreement with all use-related variables. Those with a strong protectionist orientation (cluster 2) had strong agreement on all of the protectionist variables and strong disagreement on all use-related variables. Molokini visitors were relatively evenly split between the weak (44%) and strong protectionist groups (56%). There was a significant difference in value orientations toward coral reefs between recreationists on large snorkel boats and those on smaller dive boats, $\chi^2(1, N = 681) = 5.23$, $p = .022$, $\phi = .09$ (Table 5.13). Those on smaller dive boats were slightly more likely to hold stronger protectionist value orientations toward coral reefs (66%) compared to those on larger snorkel boats (54%). Taken together, these results show that basically all Molokini visitors have protectionist (i.e., nature oriented) values toward coral reefs; there were no discernable or obvious groups at this site with mixed orientations or only use-related orientations toward coral reefs.

Table 5.13 Value orientations toward coral reefs for large and smaller boats*

	Large Tour Boats	Smaller Tour Boats	Total
Weak protection	46	34	44
Strong protection	54	66	56

*cell entries are percentages (%). $\chi^2(1, N = 681) = 5.23$, $p = .022$, $\phi = .09$.

These orientations toward reefs mirrored those of orientations toward the broader environment. Molokini visitors were classified into groups with varying magnitudes of

protectionist or biocentric value orientations and there were no obvious groups possessing only anthropocentric or use-related orientations. In fact, 71% of respondents were classified in the related groups, with 65% in the weak biocentric group (i.e., environment) also being in the weak protectionist group (i.e., coral reefs), and 76% in the strong biocentric group also being in the strong protectionist group. The variables measuring value orientations toward coral reefs were asked in both the pre-trip and post-trip surveys in an effort to examine whether the single day trip to Molokini had any effect on changing passengers' value orientations (Tables 5.14 and 5.15).

Table 5.14 Differences in value orientations (pre-trip / post-trip on large boats)

	Mean agreement*			
	Pre-trip	Post-trip	Paired *t*-value	*p*-value
Use orientation toward reefs				
Humans should manage coral reef areas so that only humans benefit	-1.28	-1.37	1.67	.096
The needs of humans are more important than coral reef areas	-1.21	-1.18	0.47	.637
The primary value of coral reef areas is to provide benefits for humans	-1.35	-1.34	0.25	.802
Recreational use of coral reefs is more important than protecting species that live there	-1.40	-1.38	0.41	.679
Coral reef areas exist primarily to be used by humans	-1.43	-1.39	0.68	.496
Protectionist orientation toward reefs				
Coral reef should be protected for their own sake rather than to meet the needs of humans	0.82	0.85	0.23	.818
Coral reef areas should have rights similar to the rights of humans	0.37	0.40	0.31	.757
Recreational use of coral reef areas should not be allowed if it damages these areas	1.04	0.90	1.78	.076
It is important to take care of coral reef areas for future generations	1.41	1.39	0.32	.749
Coral reef areas have value whether humans are present or not	1.36	1.35	0.19	.849

*variables measured on 5-point recoded scales of -2 "strongly disagree" to +2 "strongly agree"

In total, 19 of 20 paired comparisons across both large and small boats showed no significant ($p > .05$) changes between the pre-trip and post-trip responses to the variables measuring value orientations toward reefs. These findings show that the trip to Molokini had no immediate change on visitor value orientations toward coral reefs; visitors were not more appreciative of coral reefs and more environmentally oriented immediately after their trip to Molokini than they were before going on the trip.

Table 5.15 Differences in value orientations (pre-trip / post-trip on smaller boats)

	Mean agreement*			
	Pre-trip	Post-trip	Paired *t*-value	*p*-value
Use orientation toward reefs				
Humans should manage coral reef areas so that only humans benefit	-1.37	-1.49	1.31	.192
The needs of humans are more important than coral reef areas	-1.35	-1.30	0.71	.478
The primary value of coral reef areas is to provide benefits for humans	-1.48	-1.43	0.67	.503
Recreational use of coral reefs is more important than protecting species that live there	-1.56	-1.19	3.26	.002
Coral reef areas exist primarily to be used by humans	-1.55	-1.33	1.95	.054
Protectionist orientation toward reefs				
Coral reef should be protected for their own sake rather than to meet the needs of humans	0.94	0.78	0.84	.405
Coral reef areas should have rights similar to the rights of humans	0.60	0.43	1.28	.203
Recreational use of coral reef areas should not be allowed if it damages these areas	1.01	0.76	1.81	.073
It is important to take care of coral reef areas for future generations	1.47	1.46	0.10	.918
Coral reef areas have value whether humans are present or not	1.51	1.52	0.10	.923

*variables measured on 5-point recoded scales of -2 "strongly disagree" to +2 "strongly agree"

5.2.6 Socio-Demographic Characteristics.

In total, 48% of Molokini visitors were male and 52% were female (Table 5.16). There was, however, a difference between large snorkel boats and smaller dive boats, with far more males (61%) than females (39%) on the smaller boats and slightly more females (55%) than males (45%) on the larger boats, $\chi^2(1, N = 679) = 8.87$, $p = .003$, $\phi = .12$.

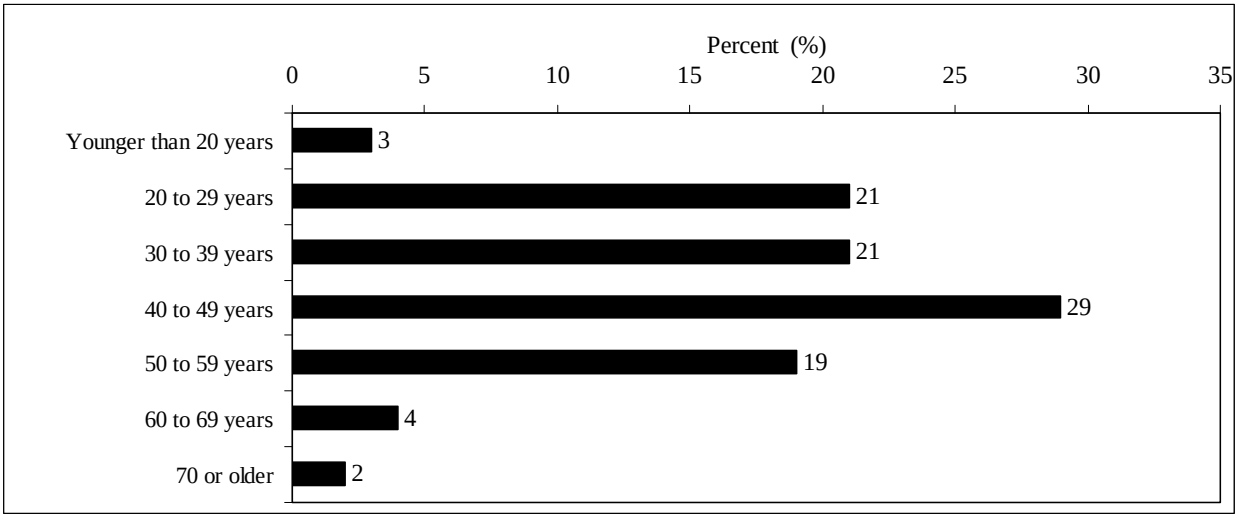
Table 5.16 Proportion of males and females visiting Molokini*

	Large Tour Boats	Smaller Tour Boats	Total
Female	55	39	52
Male	45	61	48

*cell entries are percentages (%).$\chi^2(1, N = 679) = 8.87$, $p = .003$, $\phi = .12$.

Approximately 45% of Molokini visitors were younger than 40 years of age with the largest proportion (29%) of individuals surveyed between the ages of 40 and 49 (Figure 5.1). In total, 24% of respondents were under 30 years old, 21% were 30-39 years old, 29% were 40 to 49 years old, 19% were 50 to 59, and 6% were 60 or older.

Figure 5.1 Age of Molokini visitors*



*average age = 40.9 years.

The average (i.e., mean) age of respondents was 41 years old. The proportion of users under 20 years of age might be underestimated in this study because human subjects / regulatory compliance protocols required that no individuals under the age of 18 years old be surveyed in this project. There was no difference in mean age between visitors on large snorkel boats versus smaller dive boats, $t = 1.32$, $p = .187$, $r_{pb} = .05$.

Almost all respondents **did not** live on Maui (97%). Only 3% resided on Maui and 1% had a second home on the island. A slightly higher percentage of those on smaller dive boats lived on Maui (5%) compared to recreationists on larger snorkel boats (2%), but this difference was not statistically significant, $\chi^2(2, N = 401) = 4.42$, $p = .110$, $V = .11$. More than 79% of Molokini visitors who were surveyed resided in the United States, 15% lived in Canada, and 6% resided elsewhere. The largest proportion of these residents of the United States lived in the western states of California, Washington, and Oregon. Only 4% of all survey respondents lived in Hawai'i.

5.3 EXPECTATIONS AND EXPERIENCES

5.3.1 Overall Satisfaction.

Respondents were asked in the post-trip surveys, “overall how dissatisfied or satisfied are you with your experience at Molokini today?” Overall satisfaction was extremely high, as 95% were satisfied and almost no respondents (2%) were dissatisfied (Figure 5.2). The post-trip surveys also asked "is Molokini the best attraction that you have visited in Maui?" Figure 5.3 shows that the majority (58%) of passengers considered Molokini to be the highlight of their trip to Maui and the best attraction. Finally, respondents were asked whether they would rate their visit to Molokini better than they expected, exactly what they expected, or worse than they expected.

Figure 5.2 Overall respondent satisfaction with their visit to Molokini

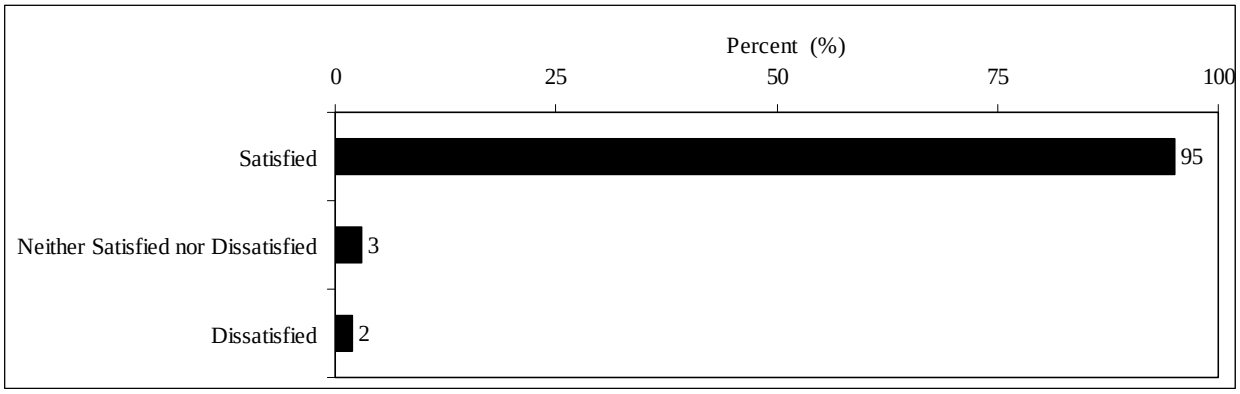


Figure 5.3 Extent that visitors consider Molokini to be the best attraction in Maui

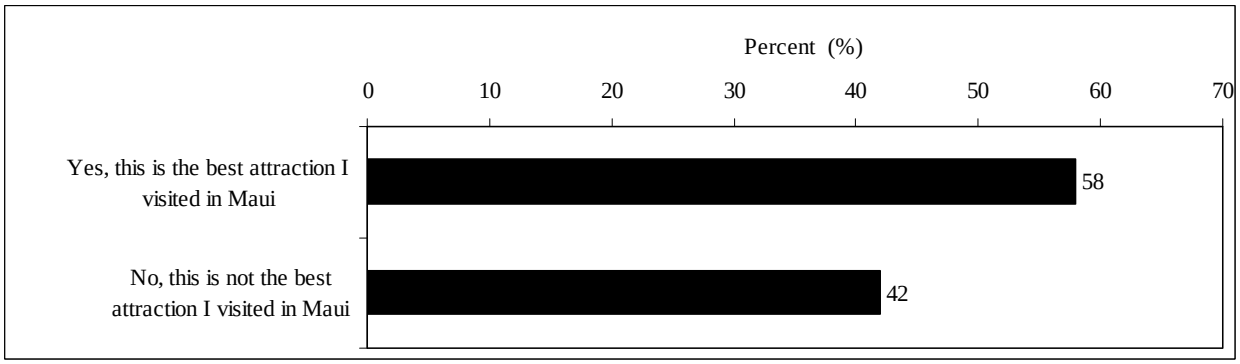
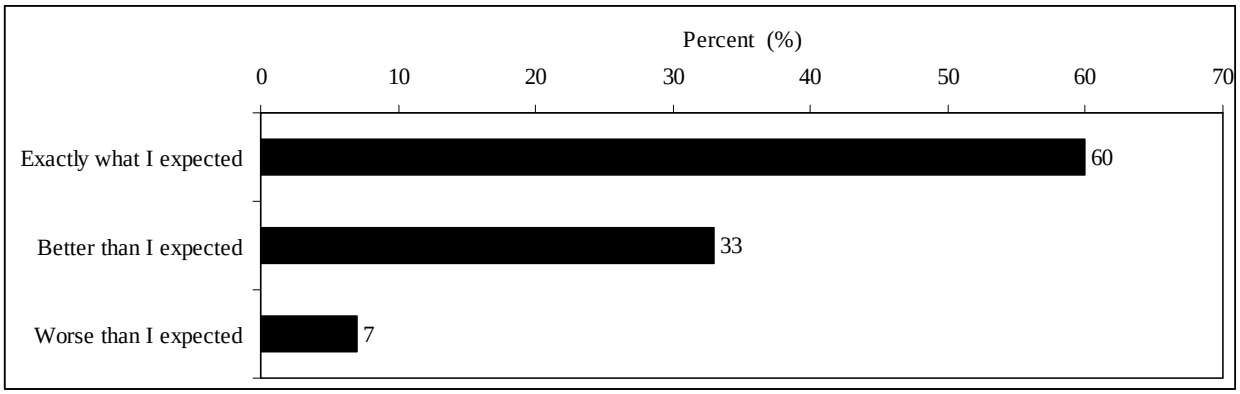


Figure 5.4 Overall respondent expectations for their trip to Molokini



The largest proportion of visitors considered Molokini to be exactly what they expected (60%) and approximately one-third of users believed that it was better than they expected (33%). Few respondents (7%) thought that Molokini was worse than they expected (Figure 5.4). There were no differences in responses to any of these questions between visitors on large snorkel boats and those on the smaller dive boats, $\chi^2(1, 2; N = 405, 416) = 3.75$ to 4.07, $p = .053$ to .131, $\phi = .10$; $t = 0.16$, $p = .874$, $r_{pb} = .01$). Overall, these results show that most visitors found their trip to Molokini to be exactly as expected, they were satisfied and it met their expectations, and it was a highlight of their trip to Maui.

5.3.2 *Expectations and Experiences with Specific Characteristics.*

Although almost all respondents were satisfied with their overall visit to Molokini, this does not mean that they were satisfied with every aspect of their experience or conditions at the site. In fact, uniformly high levels of overall satisfaction almost always occur in recreation and tourism research, and this measure is of limited usefulness for managers (Manning, 1999; Needham & Rollins, 2009). Hendee's (1974) "multiple satisfactions" approach suggests that recreation and tourism resources offer individuals the opportunity for a range of experiences, which give rise to various human satisfactions. In other words, an individual's satisfaction with an activity or experience is complex and they may evaluate several aspects of the setting and experience (e.g., resource, social, managerial). Satisfaction is based on multiple factors that differ from person to person rather than any single global evaluation. Research has also demonstrated that although recreationists and tourists may be satisfied with a particular aspect of the setting or their experience, it may not be important to them that the characteristic is actually provided or available in the setting (Manning, 1999). For example, users may be satisfied with information provided

about regulations at an area, but feel that educational information is not an important characteristic of good recreation / tourism experiences in the setting. To investigate these issues, this study first measured respondent expectations about 55 different aspects of their upcoming trip to Molokini in pre-trip surveys (e.g., scenery, environmental attributes, activities, learning, safety, staff, equipment). Post-trip surveys then measured how satisfied respondents were with the same 55 attributes that they actually experienced.

Figure 5.5 shows that 42 of the 55 attributes were important to over 80% of respondents. The largest proportions of visitors agreed that they expected good customer service from staff on the tour boats, as over 99% expected that the staff would be helpful, and over 95% of visitors agreed that they expected staff to be friendly and professional, practice good safety behavior, and look out for safety of their customers. The second most important attribute that visitors expected was to have fun and almost all visitors also expected their trip to be well organized and the tour boat to be good (98%). Visitors least expected to get scared (28%) and take risks (41%), feed fish (32%), escape crowds of people (52%), and experience calm and warm ocean conditions (56%). For 41 of these 55 attributes, there were no differences between visitors on large snorkel boats and smaller dive boats in the percent who agreed that they expected these attributes on their trip to Molokini (Table 5.17). There were, however, some differences in importance based on boat size. The largest differences involved what visitors expected to learn on their trip, as visitors on the smaller dive boats were significantly less likely to expect to learn about nature, underwater species, coral, history of the area, and Hawaiian culture. Only 49% of visitors on smaller boats, for example, expected to learn about native Hawaiian culture, compared to 75% of those on large boats expecting to learn about this topic.

Figure 5.5 Pre-trip expectations for trips to Molokini

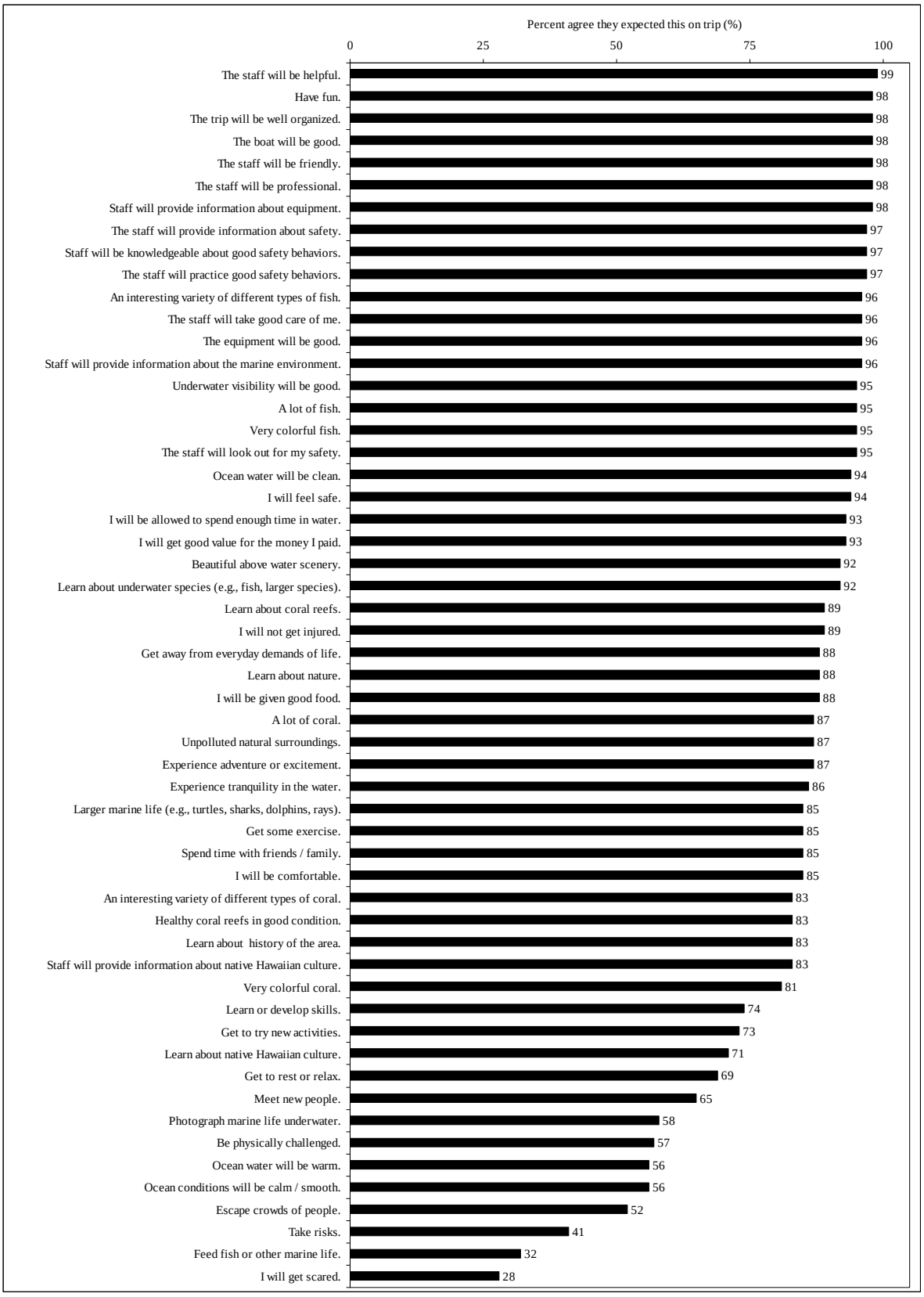


Table 5.17 Differences in pre-trip expectations between large and small tour boats

	Percent Agree They Expected (%)				
	Large Tour Boats	Smaller Tour Boats	χ^2 - value	*p* - value	ϕ
Ocean water will be clean.	94	96	1.42	.233	.04
Underwater visibility will be good.	94	97	1.95	.162	.05
Ocean water will be warm.	56	59	0.47	.495	.03
Ocean conditions will be calm / smooth.	57	49	2.52	.113	.06
Beautiful above water scenery.	**93**	**85**	**6.71**	**.010**	**.11**
A lot of fish.	95	95	0.16	.693	.02
An interesting variety of different types of fish.	96	96	0.03	.873	.01
Very colorful fish.	96	94	0.27	.601	.02
Larger marine life (e.g., turtles, dolphins, rays).	84	89	1.92	.166	.05
A lot of coral.	88	85	0.51	.476	.03
An interesting variety of different types of coral.	83	83	0.01	.991	.00
Very colorful coral.	81	80	0.02	.876	.01
Healthy coral reefs in good condition.	82	88	2.33	.127	.06
Unpolluted natural surroundings.	86	90	1.02	.312	.04
Have fun.	98	97	0.07	.791	.01
Get to try new activities.	**75**	**63**	**5.92**	**.015**	**.12**
Learn or develop skills.	73	76	0.33	.569	.02
Get some exercise.	85	83	0.25	.615	.02
Be physically challenged.	58	52	1.32	.251	.04
Experience adventure or excitement.	87	87	0.01	.947	.00
Take risks.	41	36	1.09	.297	.04
Get to rest or relax.	**71**	**61**	**4.07**	**.044**	**.08**
Get away from the everyday demands of life.	88	87	0.09	.769	.01
Experience tranquility in the water.	86	83	0.66	.418	.03
Escape crowds of people.	**50**	**61**	**4.56**	**.033**	**.08**
Meet new people.	65	68	0.54	.465	.03
Get to spend time with friends / family.	**87**	**75**	**9.70**	**.002**	**.13**
Feed fish or other marine life.	**34**	**18**	**12.03**	**.001**	**.13**
Photograph marine life underwater.	**61**	**42**	**12.53**	**< .001**	**.14**
Learn about nature.	**90**	**80**	**6.19**	**.009**	**.11**
Learn about underwater marine species.	**94**	**83**	**10.86**	**.001**	**.14**
Learn about coral reefs.	**91**	**77**	**14.40**	**< .001**	**.16**
Learn about the history of the area.	**87**	**65**	**26.16**	**< .001**	**.21**
Learn about native Hawaiian culture.	**75**	**49**	**28.38**	**< .001**	**.21**
I will feel safe.	94	94	0.04	.838	.01
I will *not* get injured.	88	91	0.53	.466	.03
I will get scared.	29	24	0.78	.323	.04
I will be comfortable.	84	87	0.48	.488	.03
The staff will take good care of me.	96	98	1.89	.169	.05
The staff will look out for my safety.	95	95	0.01	.994	.00
The staff will provide information about safety.	97	96	0.19	.664	.02
Staff will be knowledgeable of good safety behaviors.	97	95	1.22	.270	.05
The staff will practice good safety behaviors.	97	97	0.02	.902	.01
The trip will be well organized.	98	99	1.13	.287	.04
The equipment will be good.	96	97	0.25	.615	.02
The boat will be good.	98	98	0.06	.805	.01
I will be given good food.	**97**	**74**	**20.18**	**< .001**	**.19**
The staff will be friendly.	98	100	2.64	.104	.06
The staff will be helpful.	98	100	1.88	.170	.05
The staff will be professional.	98	100	2.07	.150	.06
The staff will provide information about equipment.	98	99	1.12	.290	.04
Staff will provide information on marine environment.	96	95	0.06	.811	.01
Staff will provide info on native Hawaiian culture.	**85**	**71**	**10.96**	**.001**	**.13**
I will be allowed to spend enough time in the water.	94	91	1.13	.288	.04
I will get good value for the money I paid.	93	92	0.17	.683	.02

***** significant items bolded

Visitors on smaller boats were also less likely to agree that they expected to see beautiful above water scenery, try new activities, rest and relax, spend time with friends or family, feed fish, photograph marine life underwater, get good food, and receive information from staff on native Hawaiian culture. On the other hand, visitors on smaller boats were more likely to expect chances for escaping crowds of people on their trip to Molokini.

Figure 5.6 shows that over 80% of visitors experienced and were satisfied with 33 of the 55 attributes. The largest proportions of visitors were satisfied with the customer service from staff on the tour boats, as over 95% experienced the staff being helpful, friendly, and professional and providing information about safety and equipment. Almost all visitors were also satisfied with the organization of the trip and the boats and equipment. Only 7% of visitors fed fish, 15% were scared, and 32% took risks. About 58% were able to escape crowds of people, 42% experienced learning about native Hawaiian culture, and 63% learned about the history of the area on their trip to Molokini. For 41 of these 55 attributes, there were no differences between visitors on large snorkel boats and smaller dive boats in the percent who agreed that they experienced these attributes on their trip to Molokini. There were, however, some differences based on boat size (Table 5.18). The largest differences involved the amount that visitors learned on their trip. Visitors on the smaller dive boats were significantly less likely to learn about nature, coral reefs, history of the area, and Hawaiian culture. Visitors on smaller dive boats were also less likely to experience calm ocean conditions, try new activities, rest and relax, photograph marine life underwater, and spend time with friends or family. On the other hand, visitors on smaller dive boats were significantly more likely to meet new people, be physically challenged, and see a lot of fish, a variety of different types of fish, and different types of coral.

Figure 5.6 Respondent post-trip experiences with attributes of the trip to Molokini

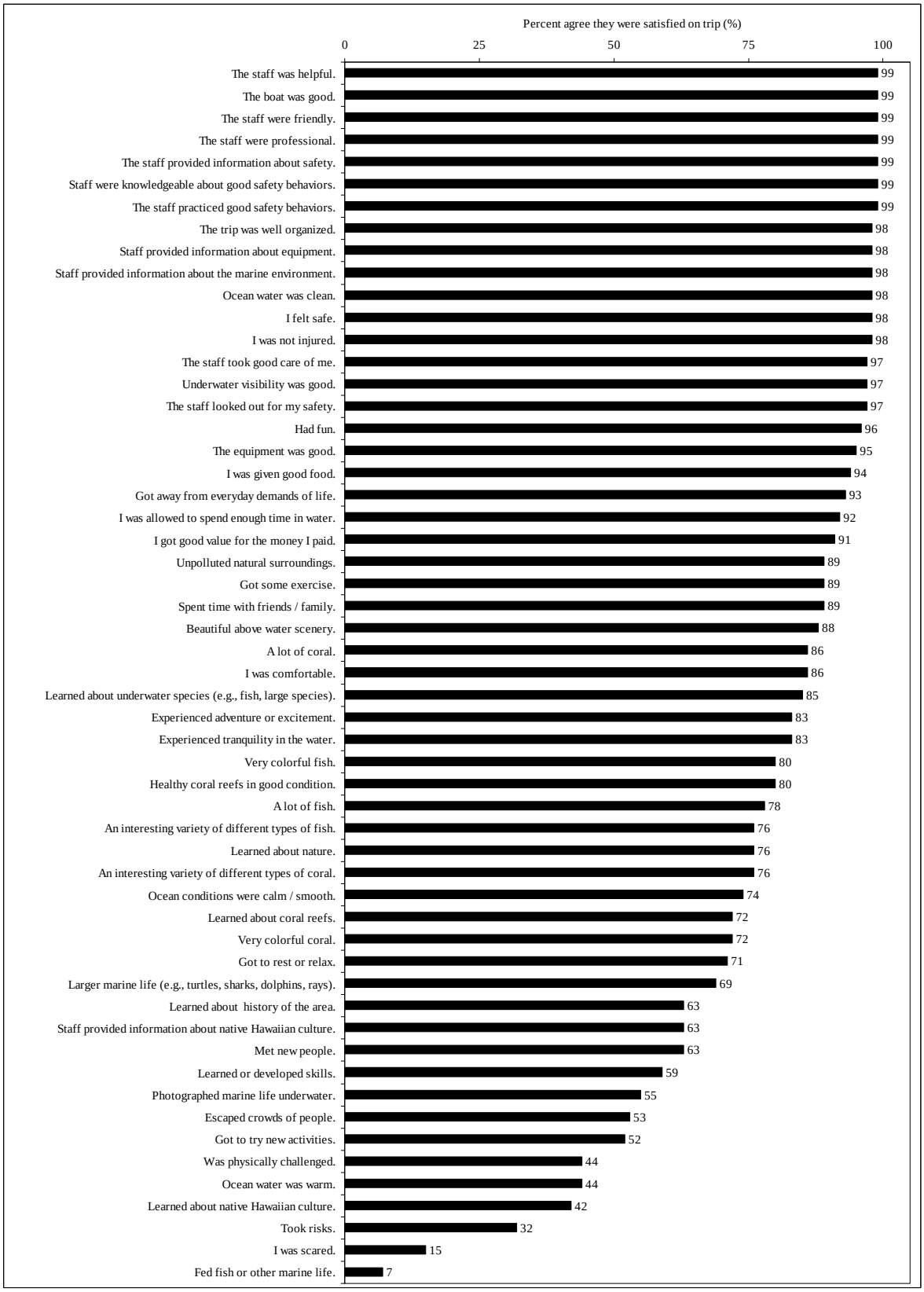


Table 5.18 Differences in post-trip experiences between large and small tour boats*

	Percent Agree They Experienced (%)				
	Large Tour Boats	Smaller Tour Boats	X^2 - value	*p* - value	ϕ
Ocean water was clean.	98	96	1.77	.183	.07
Underwater visibility was good.	98	96	0.74	.389	.04
Ocean water was warm.	42	48	0.84	.347	.05
Ocean conditions were calm / smooth.	**79**	**61**	**11.63**	**.001**	**.17**
Beautiful above water scenery.	88	88	0.01	.936	.00
A lot of fish.	**75**	**85**	**5.13**	**.024**	**.11**
An interesting variety of fish.	**73**	**87**	**10.41**	**.001**	**.15**
Very colorful fish.	78	85	2.63	.105	.08
Larger marine life (e.g., turtles, dolphins, rays).	69	65	0.64	.423	.04
A lot of coral.	85	90	1.94	.164	.07
An interesting variety of coral.	**78**	**88**	**5.27**	**.022**	**.11**
Very colorful coral.	72	71	0.11	.746	.02
Healthy coral reefs in good condition.	81	78	0.29	.590	.03
Unpolluted natural surroundings.	90	85	1.51	.219	.06
Had fun.	96	99	3.47	.062	.08
Got to try new activities.	**58**	**35**	**15.59**	**< .001**	**.19**
Learned or developed skills.	60	58	0.09	.760	.02
Got some exercise.	89	89	0.02	.903	.01
Was physically challenged.	**40**	**55**	**7.14**	**.008**	**.13**
Experienced adventure or excitement.	81	87	2.19	.139	.07
Took risks.	32	28	0.53	.465	.04
Got to rest or relax.	**76**	**57**	**12.69**	**< .001**	**.18**
Got away from the everyday demands of life.	94	92	0.37	.541	.03
Experienced tranquility in the water.	83	82	0.02	.896	.01
Escaped crowds of people.	51	61	3.11	.078	.09
Met new people.	**59**	**75**	**7.89**	**.005**	**.14**
Got to spend time with friends / family.	**93**	**77**	**18.61**	**< .001**	**.23**
Fed fish or other marine life.	6	10	1.26	.262	.06
Photographed marine life underwater.	**59**	**41**	**10.18**	**.001**	**.16**
Learned about nature.	**80**	**64**	**10.07**	**.002**	**.16**
Learned about underwater marine species.	86	81	1.24	.265	.06
Learned about coral reefs.	**75**	**63**	**4.80**	**.029**	**.11**
Learned about the history of the area.	**73**	**33**	**48.99**	**< .001**	**.35**
Learned about native Hawaiian culture.	**51**	**11**	**58.01**	**< .001**	**.35**
I felt safe.	98	99	0.72	.398	.04
I did *not* get injured.	97	99	1.38	.240	.05
I was scared.	15	17	0.23	.629	.02
I was comfortable.	87	83	0.78	.376	.04
The staff took good care of me.	97	100	3.66	.056	.09
The staff looked out for my safety.	97	98	0.68	.411	.04
The staff provided information about safety.	98	100	1.64	.200	.06
Staff were knowledgeable of good safety.	99	100	0.98	.322	.05
The staff practiced good safety behaviors.	99	99	0.01	.982	.00
The trip was well organized.	99	99	0.06	.811	.01
The equipment was good.	94	97	1.41	.235	.06
The boat was good.	99	97	2.89	.089	.09
I was given good food.	93	97	2.28	.131	.07
The staff were friendly.	98	100	1.96	.162	.07
The staff were helpful.	98	100	1.97	.161	.07
The staff were professional.	99	99	0.05	.816	.01
The staff told information about equipment.	98	98	0.01	.971	.00
Staff provided information on marine environment.	96	93	0.92	.337	.05
Staff provided info on native Hawaiian culture.	**72**	**33**	**48.63**	**< .001**	**.35**
I was allowed enough time in the water.	91	94	0.90	.342	.05
I got good value for the money I paid.	90	92	0.42	.517	.03

***** significant items bolded

The post-trip surveys contained an additional 12 questions about information and education that were not included in the pre-trip surveys. Table 5.19 shows that over 80% of Molokini visitors learned on their trip that feeding and touching marine life could harm these species.

Table 5.19 Post-trip educational experiences on large and small tour boats

	Percent Agree They Experienced (%)					
	Large Tour Boats	Smaller Tour Boats	Total	χ^2 - value	*p* - value	ϕ
I learned that feeding marine life (fish, turtles) could harm them.	89	64	83	29.08	< .001	.28
I learned that I could harm marine life (fish, coral, turtles) by touching them.	85	75	83	5.29	.021	.12
I learned information that increased my awareness of the marine environment.	81	67	78	8.64	.003	.15
I learned that it is my responsibility to help protect the marine environment.	76	62	72	6.76	.009	.13
I learned that my behaviors can cause problems in the marine environment.	71	53	67	11.00	.001	.17
I learned about impacts that humans have on the marine environment.	68	48	63	13.22	< .001	.18
I learned how I can do more to help the marine environment.	68	42	62	21.11	< .001	.23
I learned information that expanded my world view.	61	47	58	6.00	.014	.12
I learned that I should be responsible for helping to teach others about the marine environment.	61	43	57	10.32	.001	.16
I learned how I can contribute (e.g., donate, volunteer) to help improve the marine environment.	64	29	56	38.93	< .001	.31
I learned about how my daily actions affect the marine environment.	58	38	53	12.62	< .001	.18
I learned information that increased my awareness of native Hawaiian culture.	53	13	43	53.17	< .001	.34

Over 70% increased their overall awareness of the marine environment and learned that it is their responsibility to help protect these areas. Over 60% of visitors also learned that their behaviors cause problems in the marine environment, humans impact these areas, and they can do more to help the marine environment. More than half of visitors (i.e., 53% to 58%) learned things that expanded their world view, influenced them to be more

responsible for teaching others about marine areas, directed them on how to contribute (e.g., donate, volunteer) to help the marine environment, and showed them how their daily actions affect these areas. The fewer visitors (43%) learned information that increased their awareness of native Hawaiian culture. Visitors on the larger snorkel boats were significantly more likely than those on the smaller dive boats to experience all 12 of these learning opportunities, $\chi^2(1; N = 412 \text{ to } 413) = 5.29 \text{ to } 53.17$, $p = .021 \text{ to } < .001, \phi = .12 \text{ to } .34$. Over 64% of visitors on the large snorkel boats, for example, learned how they can contribute to help improve the marine environment, whereas only 29% of those on the smaller dive boats were informed and learned about this issue on their Molokini trip.

One approach for visualizing relationships between expectations (i.e., importance of attributes) and experiences (i.e., satisfaction with attributes) is **importance – performance (I-P) matrices**. Importance or expectations are represented as averages on the vertical axis and average performance or experiences (i.e., satisfaction) are measured on the horizontal axis. When combined, these axes intersect and produce a matrix of four quadrants (Figure 5.7) that can be interpreted as “concentrate here” (high importance or expectation, low satisfaction or poor experiences), “keep up the good work” (high importance or expectation and high satisfaction or good experiences), “low priority” (low importance or expectation and low satisfaction or poor experiences), and “possible overkill” (low importance or expectation, high satisfaction or good experiences). This matrix provides managers with an easily understandable picture of the status of services, facilities, and conditions as perceived by users, and reveals conditions that may or may not need attention (Bruyere, Rodriguez, & Vaske, 2002; Vaske, Beaman, Stanley, & Grenier, 1996).

Figure 5.7 Generic importance-performance matrix

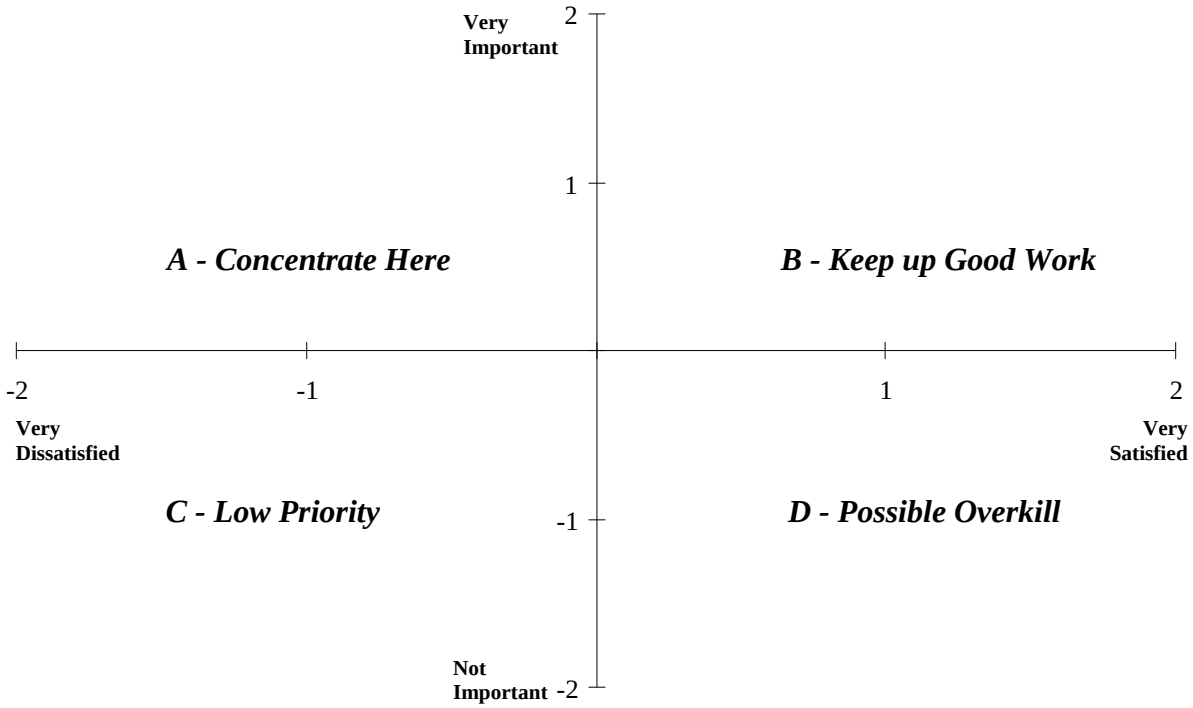
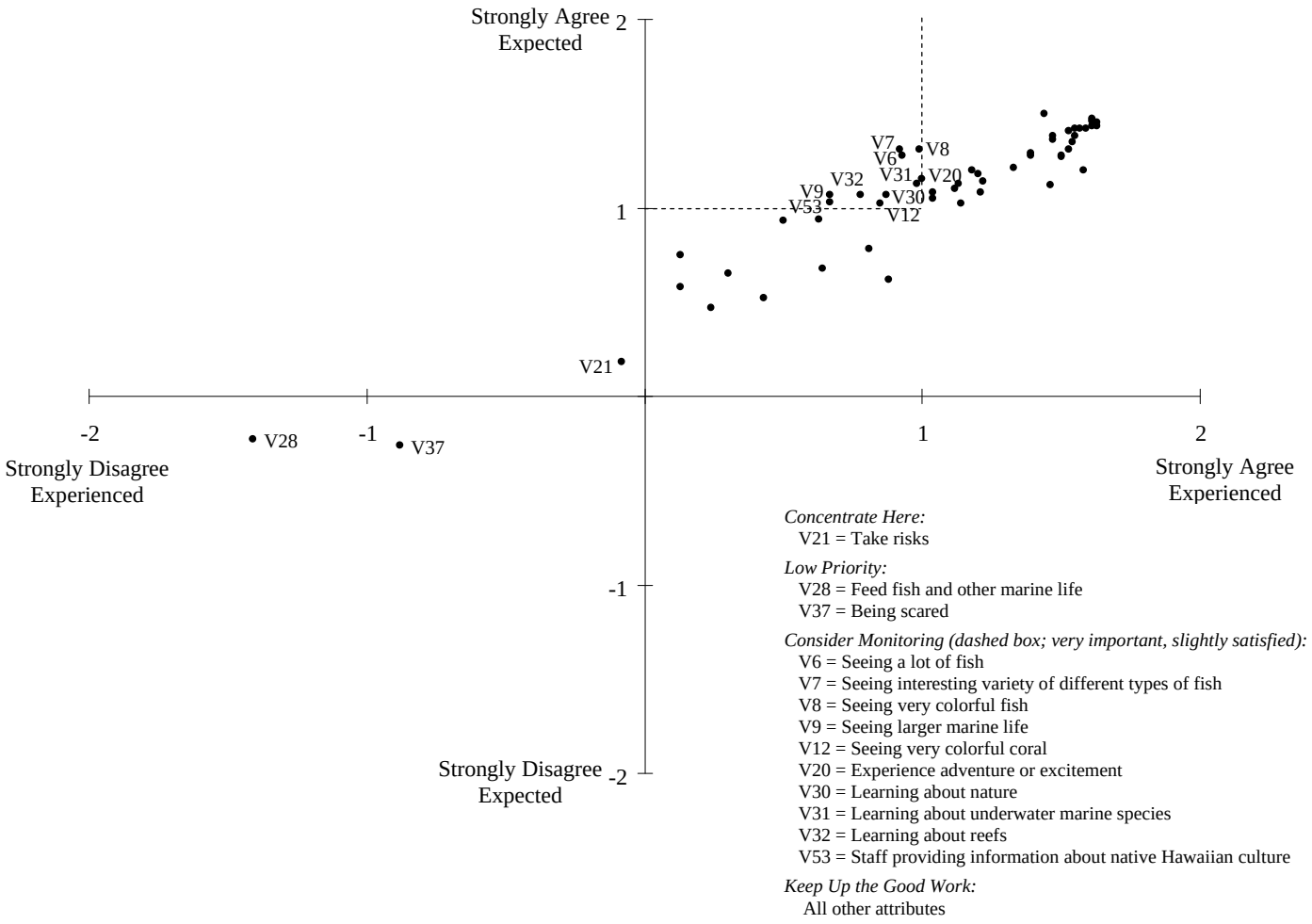


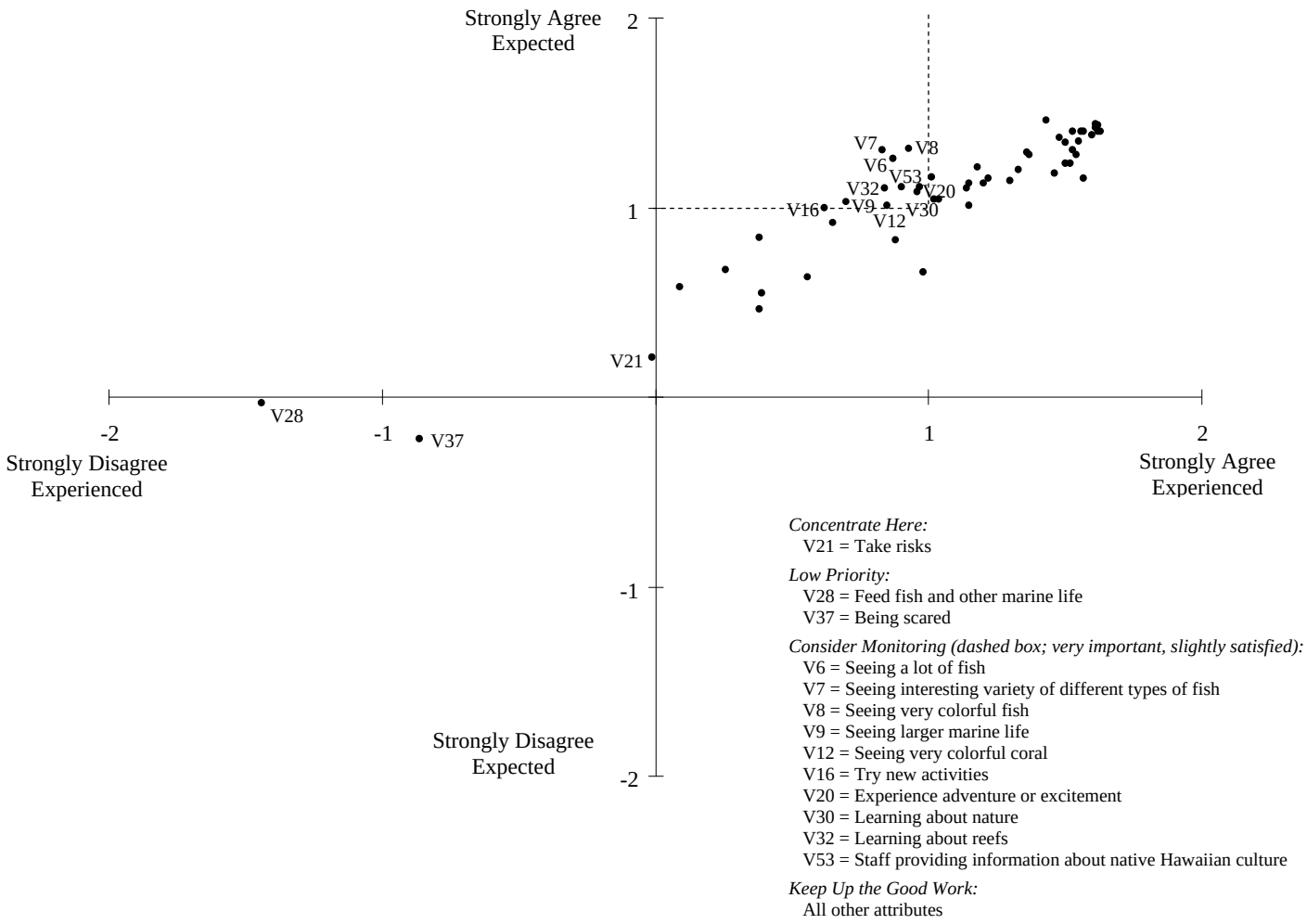
Figure 5.8 displays I-P matrices for all Molokini visitors who completed both pre-trip (i.e., expectations) and post-trip surveys (i.e., experiences / satisfaction). Almost all attributes were in the "keep up the good work" quadrant, indicating that Molokini visitors thought that managers and operators are doing a good job. There was only one attribute in the "concentrate here" quadrant where passengers were expecting to take some risks, but did not experience these risks. Although this may be an issue for a few risk-seeking passengers, the fact that customers did not experience risk events should be considered a good thing for operators and managers. The two attributes in the "low priority" quadrant, fish feeding and being scared, should also not concern managers and operators because the fact that most visitors did not feed fish or experience being scared is a good thing in terms of environmental conservation and client safety.

Figure 5.8 Molokini importance - performance matrix (all respondents)



Managers and operators should, however, consider monitoring attributes in the dashed box, as visitors strongly expected to encounter these on their trip, but only slightly agreed that they actually experienced these attributes. Issues such as seeing a large number and variety of fish, viewing large marine life and colorful coral, and learning about nature, reefs, and underwater species were all extremely important to most visitors, but they were not as satisfied with their experiences. These results are almost identical to those on the large snorkel boats (Figure 5.9).

Figure 5.9 Molokini importance - performance matrix (larger boat respondents)



The I-P matrix for the smaller dive boats, however, was quite different from the larger snorkel boats (Figure 5.10). The small boat I-P matrix shows although most attributes were still in the "keep up the good work" quadrant, there were several in the "concentrate here" quadrant. Most importantly, passengers were expecting to photograph marine life underwater and learn about history of the area and native Hawaiian culture, but most were dissatisfied that they did not experience these on their trip. Managers and operators should also consider monitoring attributes such as seeing larger marine life and colorful coral, and

learning about nature, coral reefs, and underwater marine species because visitors on the smaller dive boats strongly expected to encounter these on their trip, but only slightly agreed that they actually experienced these on their trip. Again, the two attributes in the "low priority" quadrant, fish feeding and being scared, should not concern managers and operators because most visitors not feeding fish or being scared is a good thing in terms of environmental conservation and client safety, respectively.

Figure 5.10 Molokini importance - performance matrix (smaller boat respondents)

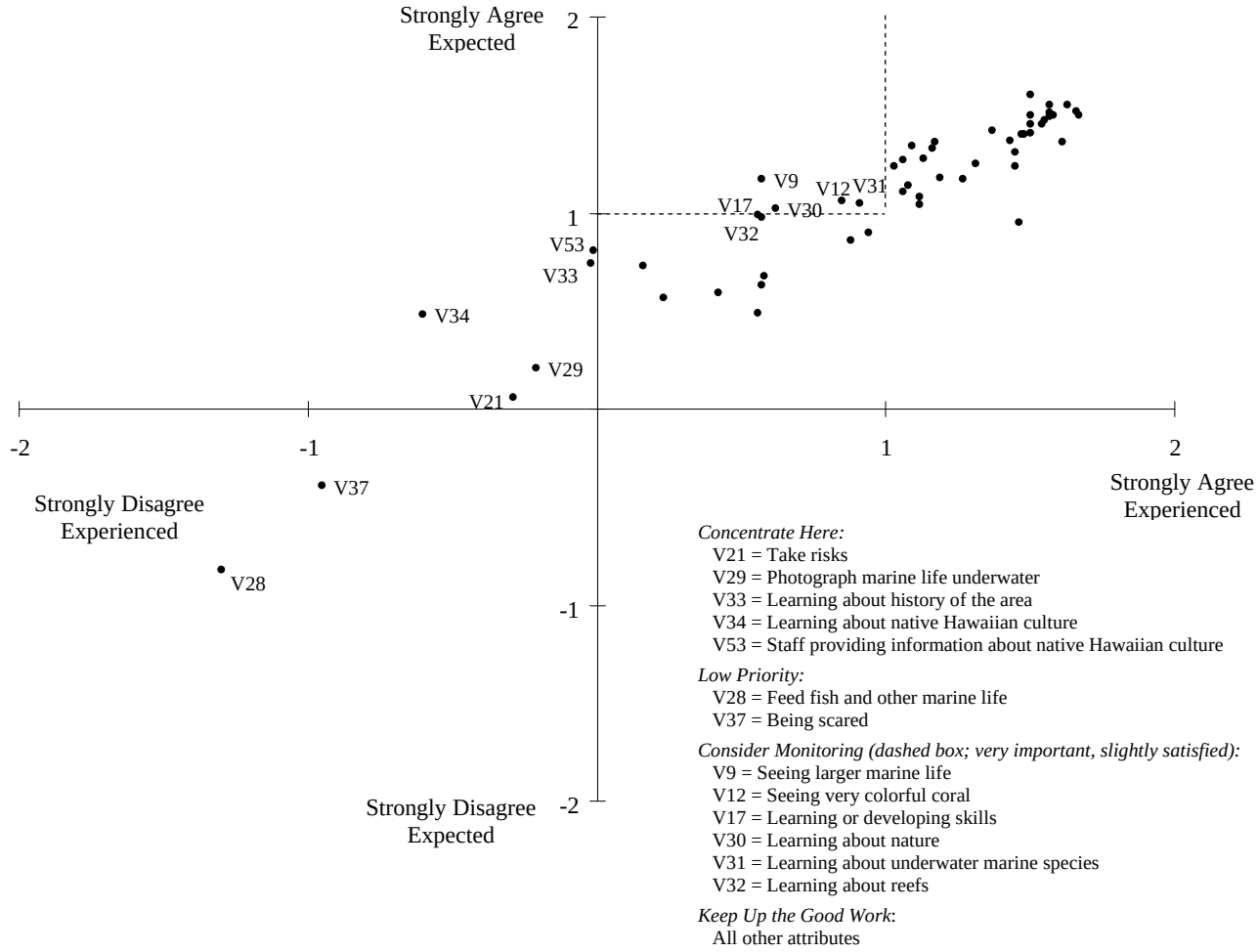


Table 5.20 Relationships between pre-trip expectations and post-trip experiences

	Mean agreement (-2 = strongly disagree, +2 = strongly agree)			
	Pre-trip Expectation	Post-trip Experience	Paired *t*-value	*p* - value
Clean ocean water	1.27	1.50	6.25	< .001
Good underwater visibility	1.31	1.53	5.84	< .001
Warm ocean water	0.58	0.13	7.41	< .001
Calm / smooth ocean conditions	0.62	0.88	4.66	< .001
Beautiful above water scenery	1.20	1.18	0.56	.578
A lot of fish	1.28	0.93	7.56	< .001
An interesting variety of different types of fish	1.31	0.92	8.55	< .001
Very colorful fish	1.31	0.99	7.47	< .001
Larger marine life (e.g., turtles, dolphins, rays)	1.07	0.67	6.19	< .001
A lot of coral	1.14	1.22	1.86	.064
An interesting variety of different types of coral	1.05	1.04	0.27	.791
Very colorful coral	1.02	0.85	3.56	< .001
Healthy coral reefs in good condition	1.08	1.04	1.12	.264
Unpolluted natural surroundings	1.18	1.20	0.37	.715
Have fun	1.50	1.44	1.71	.087
Try new activities	0.93	0.50	8.76	< .001
Learn or develop skills	0.94	0.63	6.94	< .001
Get some exercise	1.10	1.12	0.46	.643
Be physically challenged	0.65	0.30	6.64	< .001
Experience adventure or excitement	1.15	1.00	3.86	< .001
Take risks	0.18	-0.08	4.68	< .001
Rest or relax	0.78	0.81	0.46	.645
Get away from the everyday demands of life	1.21	1.33	3.20	.001
Experience tranquility in the water	1.13	1.13	0.01	.999
Escape crowds of people	0.52	0.43	1.61	.109
Meet new people	0.68	0.64	1.02	.309
Spend time with friends / family	1.08	1.21	3.14	.002
Feed fish or other marine life	-0.23	-1.41	16.48	< .001
Photograph marine life underwater	0.47	0.24	3.52	< .001
Learn about nature	1.07	0.87	4.62	< .001
Learn about underwater marine species	1.13	0.98	3.85	< .001
Learn about coral reefs	1.07	0.78	6.79	< .001
Learn about history of the area	0.94	0.59	6.95	< .001
Learn about native Hawaiian culture	0.75	0.13	11.50	< .001
Feel safe	1.28	1.50	6.35	< .001
Not get injured	1.20	1.58	8.37	< .001
Be scared	-0.26	-0.88	8.69	< .001
Be comfortable	1.02	1.14	2.46	.014
Staff taking good care of me	1.35	1.54	5.92	< .001
Staff looking out for my safety	1.38	1.55	5.05	< .001
Staff providing information about safety	1.42	1.59	5.66	< .001
Staff knowledgeable of good safety behaviors	1.43	1.61	5.83	< .001
Staff practicing good safety behaviors	1.46	1.61	4.91	< .001
Well organized trip	1.41	1.53	4.12	< .001
Good equipment	1.38	1.47	2.62	.009
Good boat	1.42	1.55	4.26	< .001
Be given good food	1.12	1.46	7.89	< .001
Friendly staff	1.43	1.63	6.43	< .001
Helpful staff	1.45	1.63	5.93	< .001
Professional staff	1.47	1.61	4.78	< .001
Staff providing information about equipment	1.42	1.57	4.75	< .001
Staff providing information on marine environment	1.36	1.47	3.11	.002
Staff providing information on native Hawaiian culture	1.03	0.67	6.61	< .001
Allowed to spend enough time in the water	1.28	1.39	2.50	.013
Get good value for the money paid	1.29	1.39	2.44	.015

Paired sample *t*-tests statistically compared respondents' pre-trip expectations with their post-trip experiences to determine if experiences met, exceeded, or did not meet expectations. Table 5.20 shows attributes that met or exceeded expectations mainly included those related to: boat staff and equipment, trip organization and food, perceived safety, spending time with friends or family and meeting new people, experiencing tranquility and escaping crowds, time in the water, water cleanliness and visibility, scenery, coral conditions, having fun, and value for money. Attributes that did not meet expectations involved educational information and opportunities for learning (e.g., marine life, coral, nature, history, native Hawaiian culture), trying new activities, taking risks and being adventurous / challenged, and seeing many different fish and other species. This pattern of results did not substantively differ between large snorkel boats and small dive boats.

5.4 SOCIAL CARRYING CAPACITY INDICATORS

The concepts of reported encounters, norms, and perceived crowding have received considerable attention in the recreation and tourism literature because they can be used to estimate standards of quality for social carrying capacity indicators, and examine the extent that these standards are being met or exceeded at a particular location (see Manning, 1999, 2007 for reviews). **Reported encounters** describe a subjective count of the number of other people or other objects that an individual remembers observing in a setting. **Perceived crowding** refers to a subjective and negative evaluation that this reported number of encounters with people or other objects observed in an area is too many. Understanding reported encounters and perceived crowding, however, may not reveal maximum acceptable or tolerable use levels or an understanding of how use should be managed and monitored. Norms offer a theoretical and applied approach for helping to

address these issues. **Norms** are standards that individuals use for evaluating activities, environments, or management strategies as good or bad, better or worse; they help to clarify what people believe conditions or behavior should or should not be. Research suggests that when recreationists perceived a setting to be crowded and over its social capacity, they likely encountered more than their norm for what they believe should be acceptable conditions or impacts in the setting (e.g., use levels; Vaske & Donnelly, 2002).

5.4.1 Reported Encounters and Observed Counts

Previous research has typically measured reported encounters in recreation and tourism areas by asking respondents to estimate how many other people (or other objects of interest) they saw or encountered during their trip to a particular site (Vaske & Donnelly, 2002). Responses are typically recorded in either: (a) an open ended format (i.e., fill in the blank) where respondents write a number corresponding to how many they encountered, or (b) a close ended format where respondents circle one number from a series of numbers provided on a survey that corresponds to how many they encountered (e.g., 5, 10, 20, 40 people). This project measured encounters in the post-trip surveys using the open ended format where respondents were asked "approximately how many of each of the following did you see at Molokini today" and were asked to write numbers for "people on this boat," "people in the water," "people in total at Molokini," and "boats at Molokini."

Recent studies, however, have shown that it is unrealistic to expect respondents to provide an accurate single number that represents exactly how many people (or other objects of interest) they encountered or what would be acceptable or unacceptable (see Manning, 2007 for a review). This is especially relevant in frontcountry settings or other areas such as Molokini where use levels are typically quite high. It may be difficult, for example, for

respondents to count hundreds of people in the water or visualize what hundreds of people or many boats would look like. Researchers have, therefore, started using image capture technology (ICT) to measure perceptions of conditions such as encounters and use levels. ICT involves using computer software to manipulate and create visuals, which provide a more realistic and cognitively easier assessment of impacts because they allow users to visualize site conditions. Respondents evaluate several photographs depicting conditions (e.g., use levels) varied from low to high. The post-trip surveys also used visuals in addition to the open ended format for measuring reported encounters, norms, and other social carrying capacity related indicators.

Most studies measure encounters and norms of a single dimension, which is typically the number of people encountered and whether it is acceptable or unacceptable to encounter this number at any one time. Characteristics at Molokini, however, make this approach potentially unrealistic and imprecise. Ability to clearly distinguish and count people is constrained because many visitors are snorkeling or scuba diving underwater and line of sight is impeded by waves and other boats. Given that use levels at Molokini are directly linked to both the number of boats and size of boats, these two dimensions were measured in surveys with 12 color photographs representing scenarios of boat encounters (Figure 5.11). Number of boats was depicted with four levels: 6, 12, 26, and 42 boats, while size of boats was depicted using three levels: 100% small boats, 100% large boats, and 50% small and 50% large boats. This represents a full factorial design (i.e., 4^1 levels for number of boats * 3^1 proportions of boat size = 12 encounter scenarios) which is described in Table 5.21 and the associated photographs in Figure 5.11.

Figure 5.11 Photographs used for measuring encounters and norms with boats

A.

B.

C.

D.

E.

F.

G.

H.

I.

J.

K.

L.

Table 5.21 Full factorial design for photographs depicting encounter scenarios[1,2]

Photograph / Scenario	Number of Boats	Size of Boats
1	12 boats	50% small, 50% large
2	12 boats	100% small
3	6 boats	100% small
4	42 boats	100% large
5	26 boats	100% large
6	26 boats	50% small, 50% large
7	12 boats	100% large
8	6 boats	50% small, 50% large
9	6 boats	100% large
10	42 boats	50% small, 50% large
11	26 boats	100% small
12	42 boats	100% small

[1] number of boats" factor had four levels: 6, 12, 26, 42 boats.
[2] size of boat factor had three levels: 100% small, 100% large, 50% small and 50% large.

Photographs containing 26 boats were created using Adobe Photoshop software by placing actual GPS coordinates of all current mooring sites at Molokini on the background image and then placing boats on these coordinates. This background image shows Molokini from an aerial perspective at a 25 degree angle above sea level. Although visitors on boats view Molokini from sea level, this aerial perspective was necessary to depict boats on the moorings because line of sight would be impeded and many boats would be positioned behind each other and not visible if a lower perspective had been used. For images depicting 42 boats, boats were added in spaces between those in the original 26 boat picture in locations where additional moorings could possibly be placed. Photographs of six and 12 boats were created by randomly removing boats from the 26 boat image, and ensuring that boats remained on mooring locations.

Size of boat was manipulated by using actual photographs of both large and small boats taken at Molokini from the same or similar vantage point used in the background image and

then populating each photograph with these boats. To ensure that large boats could be readily distinguished from small boats, the large boats were increased by 50% in size. Although this has the potential to slightly inflate the importance of the boat size dimension and influence evaluations of large boats, it was necessary to ensure that respondents were able to clearly distinguish between small and large boats. Slightly altering characteristics of people or objects in photographs and the perspective of background images is common practice for cueing respondents to indicator impacts and improving accuracy of evaluations. Research has also shown that these types of minor alterations typically do not substantively change evaluations (e.g., Inglis, Johnson, & Ponte, 1999; Manning, Lawson, Newman, Laven, & Valliere, 2002). The visual approaches used in this study are virtually identical to those used in numerous studies that have rigorously tested validity and reliability of visual methods for measuring evaluations of indicator conditions (see Freimund, Vaske, Donnelly, & Miller, 2002; Hall & Roggenbuck, 2002; Manning & Freimund, 2004 for reviews). To measure reported encounters, respondents were asked "which one photograph most accurately represents what you saw at Molokini today?"

Respondents reported encountering an average of approximately 62 other people on their boat, but not surprisingly, this differed dramatically by boat size with respondents encountering an average of 78 people on large boats and 17 people on smaller boats (Table 5.22). These average encounters reported by visitors were relatively accurate because they were similar to use levels counted on these boats by the trained researchers (64 people per boat, 96 on large boats, 14 on smaller boats). The largest proportion of visitors (41%) encountered 100 or more people on large boats, whereas most visitors (93%) encountered fewer than 25 people on smaller boats.

Table 5.22 Reported encounters with number of people at Molokini

	Percent Saw at Molokini (%)					
	Large Tour Boats	Smaller Tour Boats	Total	χ^2 or *t* value	*p* - value	*V* or r_{pb}
Encounters with people *on their boat*				275.09	< .001	.82
1 to 24 people	8	93	30			
25 to 49 people	10	6	9			
50 to 74 people	31	1	23			
75 to 99 people	10	0	8			
100 or more people	41	0	31			
Mean (average number of people) [1]	77.72	16.79	62.25	25.82	< .001	.63
Encounters with people *in the water*				129.14	< .001	.62
1 to 24 people	2	52	14			
25 to 49 people	16	15	15			
50 to 74 people	22	14	20			
75 to 99 people	11	3	9			
100 to 124 people	25	12	22			
125 to 149 people	5	0	4			
150 to 199 people	7	1	6			
200 or more people	12	3	10			
Mean (average number of people) [2]	98.13	41.62	84.24	9.43	< .001	.39
Encounters with people *in total at Molokini*				87.62	< .001	.52
1 to 49 people	2	37	11			
50 to 99 people	16	24	18			
100 to 149 people	27	26	27			
150 to 199 people	14	2	11			
200 to 249 people	21	6	17			
250 to 299 people	7	2	6			
300 or more people	14	4	11			
Mean (average number of people) [3]	176.66	82.24	152.99	8.33	< .001	.33

[1] Cell entries are mean (average) number of people on boats reported by respondents using the open-ended format. Mean number on boats observed by researchers: 64.15 people (on large boats: 95.56, on small boats: 13.90)

[2] Cell entries are mean (average) number of people in the water reported by respondents using the open-ended format. Mean number in water observed by researchers: 161.79 people (from large boats: 208.79, from small boats: 96.00)

[3] Cell entries are mean (average) number of people in total reported by respondents using the open-ended format. Mean number in total observed by researchers: 326.13 people (from large boats: 327.29, from small boats: 324.50)

Respondents reported seeing an average of 84 people in the water during their trip to Molokini, with visitors on large boats seeing more people in the water (*M* = 98 people) than what visitors on smaller boats saw in the water (*M* = 42 people; Table 5.22). Over 58% of users on large boats, for example, encountered between 50 and 125 people in the water, whereas the majority of users on smaller boats encountered only 25 or fewer people in the

water. These results are predictable because the number of people visible in the water is directly related to boat size, with passengers remaining quite close to their boats when snorkeling or scuba diving. It is likely that respondents simply counted the number of people they saw or encountered in the water immediately surrounding the boat on which they were traveling and did not count users who were on other boats moored in different areas within the Molokini crater. In other words, visitors counted the number of people they saw in the water near their boat and underestimated the total number of other people in the water at Molokini. This was supported by the trained researchers who estimated the total number of people in the water on each trip and recorded that the average number of people in the water was almost double (*M* = 162) what was reported by visitors.

On average, respondents reported seeing approximately 153 people at Molokini, and again, visitors on large boats reported more encounters (*M* = 177 people) than those on smaller boats (*M* = 82 people). The largest proportions of visitors on large boats reported seeing 100 to 149 (27%) or 200 to 249 (21%) people on their trip to Molokini, whereas the most visitors on smaller boats (37%) reported seeing fewer than 50 people at Molokini. These findings also seem to be related to the size of boat on which respondents were traveling. Respondents simply counted the number of people they saw on their boat, in the water immediately surrounding their boat, and perhaps on and near boats moored immediately next to the boat on which they were traveling. These reported encounters are underestimates and not likely to be accurate counts of total use across all areas at Molokini. In fact, the actual use levels estimated by the trained researchers showed that the average number of users at any one time at Molokini was 326 people, which is more than double the number reported by visitors.

These encounters in the water and in total at Molokini reported by visitors should be treated with extreme caution and are inappropriate to use as estimates of total use at Molokini because ability to clearly distinguish and count people in the water and on other boats is severely constrained. Most visitors are snorkeling or scuba diving underwater and line of sight is impeded by waves and boats. The average use levels recorded by trained researchers (e.g., 162 people in total in the water, 326 people in total at Molokini) are likely to be more accurate than those reported by users, but should still be treated with caution because it is extremely challenging for any individual or team of individuals to perfectly count total use at this large site where people are scattered on other boats and barely visible in the water at various locations within the crater.

Given the challenges associated with measuring human encounters in a marine context and the direct linkage between use levels and the number and size of boats at Molokini, estimating encounters and use levels by multiplying the average number of boats observed by the average capacity or occupancy of these boats was considered a more accurate metric. Using an open-ended (i.e., fill in a number) approach, survey respondents on both large and smaller boats reported seeing between 6 and 7 boats at Molokini, with 62% seeing 6 or fewer boats (Table 5.23). Results using the photographic approach were similar; although survey respondents reported seeing slightly more boats (8 to 9 on average) and 63% reported seeing 6 or fewer boats. Similar to reported encounters with other people, however, visitors underestimated the actual number of boats present at Molokini. Trained researchers counted an average of 12 boats at any one time, and this higher number is not surprising because boats often block the line of sight to other vessels at Molokini, which makes taking accurate counts challenging for average visitors.

Table 5.23 Reported encounters with number of boats at Molokini*

	Percent Saw at Molokini (%)					
	Large Tour Boats	Smaller Tour Boats	Total	χ^2 or *t* value	*p* - value	*V* or r_{pb}
Open-ended format (fill-in-the-blank)				4.40	.136	.09
1 boat	1	3	1			
2 boats	1	2	1			
3 boats	11	14	12			
4 boats	17	6	14			
5 boats	21	15	19			
6 boats	17	11	15			
7 boats	6	9	7			
8 boats	8	13	10			
9 boats	1	0	1			
10 boats	11	13	12			
11 or more boats	7	15	9			
Mean (average number of boats) [1]	6.43	7.05	6.58	1.35	.180	.07
Photograph format (select one photo.)				7.39	.060	.14
6 or less boats	66	53	63			
12 boats	33	44	36			
26 boats	1	3	1			
42 or more boats	0	1	0			
Mean (average number of boats)	8.26	9.25	8.49	2.19	.059	.11

* Cell entries are mean (average) number of boats.
Mean number of boats observed by researchers: 11.63 boats (from large boats: 12.07, from small boats: 11.10)

Researcher counts of both the number of boats observed and occupancy of these boats can be used to calculate a crude estimate of total visitation at Molokini. For example, researchers found an average of 12 boats at Molokini based on 28 separate visits to Molokini during high use and lower use periods, and counted an average of 96 people on large boats and 14 people on small boats. Assuming 6 large boats and 6 smaller boats (50/50 split), the number of people at Molokini on any one day or time is approximately ([6 large boats * 96 people per boat] + [6 small boats * 14 people per boat]) = 660 people. Multiplying this over a 365 day period (i.e., one year) provides an estimate of over 240,000 people visiting Molokini per year. This estimate should be treated with caution because it does not account for boats that make multiple trips each day, differences in the proportion

of large and small boats present on any given day or at a specific time, constraints such as economic factors affecting tourism visitation, or weather that may prevent boats from visiting Molokini on one or more days. For example, if 75% of the boats visiting Molokini were large boats and at least one of these boats was making a second trip each day, the estimate would be ([9 large boats * 96 people per boat] + [1 large boat extra trip * 96 people] + [3 small boats * 14 people per boat]) = 1002 people per day and approximately 365,000 people per year. Commercial operators are now required to submit daily passenger numbers to the DAR and it will be interesting to compare these estimates to actual passenger counts at Molokini.

5.4.2 Normative Acceptance of Maximum Encounters

Understanding reported encounters does not reveal maximum acceptable use levels or an understanding of how use should be managed and monitored. Norms offers a conceptual and applied basis to help address these issues (i.e., standards that individuals use for evaluating activities, environments, or management strategies as good or bad, or what should or should not be). This project used two well-established methods for measuring visitor norms regarding encounters and use levels. First, respondents were asked to write numbers that represented the maximum number of people on their boat, people in the water, people in total, and boats they would accept encountering / seeing at any one time at Molokini. Results from this open-ended measure of respondent encounter norms showed that they would accept encountering, on average (i.e., mean), a maximum of approximately 63 people on their boat, 102 people in the water, 160 people in total, and 7 boats at one time at Molokini (Table 5.24). The majority of respondents (i.e., median) would accept encountering a maximum of 6 boats, 50 people on their boat, 80 people in the water, and

100 people in total at Molokini. Not surprisingly, respondents on large boats would accept encountering substantially more people on their boat, in the water, and in total than visitors on smaller boats would accept encountering. There was no statistical difference between respondents on large and smaller boats with respect to the maximum number of boats that they would accept seeing at Molokini.

Table 5.24 Maximum normative acceptance of people and boats at Molokini

	Maximum acceptance at Molokini (%) *					
	Large Tour Boats	Smaller Tour Boats	Total	*t* - value	*p* - value	r_{pb}
Maximum number of people on this boat	78.13	18.79	63.11	22.41	< .001	.61
Maximum number of people in the water	116.93	51.05	101.74	6.16	< .001	.28
Maximum number of people in total	183.18	89.12	159.97	6.56	< .001	.27
Maximum number of boats	6.96	8.21	7.26	1.63	.104	.09

* cell entries are means (averages).

Given that the ability to distinguish and count people at Molokini is constrained because most visitors are snorkeling or scuba diving underwater and line of sight is impeded by waves and other boats, boat number and boat size are considered to be more appropriate dimensions for determining encounter norms at this site. It was first necessary to determine the extent that each dimension (i.e., number of boats, size of boats) represented in the images previously discussed influenced respondent encounter norms. A 4x3x2 three-way analysis of variance (ANOVA) was used to examine: (a) individual main effects of the number of boats in the photographs, size of boats in these images, and size of boat on which visitors were surveyed; and (b) interaction effects among these three dimensions on encounter norms (Table 5.25). Both the number and size of boats in the photographs significantly influenced encounter norms (F = 50.52 to 1425.37, p < .001) and the interaction between these two dimensions was also statistically significant (F = 8.50, p <

.001). The size of boat on which respondents were surveyed, however, did not significantly influence norms (F = 0.35, p = .554) and interactions between the size of boat that respondents were on and the other dimensions (i.e., number of boats, boat size) were also not statistically significant (F = 0.26 to 1.82, p = .163 to .956).

Table 5.25 Three-way ANOVA of dimensions potentially effecting encounter norms[1]

	df	SS	MS	*F*-value	*p*-value	Partial Eta squared (η^2)
Number of boats [2]	3	16174.41	5391.47	1425.37	< .001	.49
Size of boats [3]	2	382.17	191.08	50.52	< .001	.02
Respondent boat size [4]	1	1.32	1.32	0.35	.554	.00
Number x Size interaction	6	192.89	32.15	8.50	< .001	.01
Number x Respondent boat size interaction	3	3.67	1.22	0.32	.809	.00
Size x Respondent boat size interaction	2	13.75	6.87	1.82	.163	.00
Number x Size x Respondent boat size interaction	6	5.85	0.98	0.26	.956	.00

[1] Model Adjusted R^2 = .571.

[2] Number of boats: 6, 12, 26, 42 boats.

[3] Size of boats: 100% small, 50% small / 50% large, 100% large.

[4] Size of boat carrying respondents (e.g., small: < 50 ft., < 50 passengers; large: $\geq$ 65 ft., $\geq$ 100 passengers).

Given that size of boat on which respondents were surveyed was not important and did not influence normative evaluations, this factor was removed from further analysis and a final 4x3 two-way ANOVA examined main effects of number of boats and size of boats on encounter norms, and interaction effects of these two dimensions on these norms (Table 5.26). Both the number of boats and size of these boats still influenced encounter norms (F = 57.65 to 1991.53, p < .001) and the interaction between these two dimensions also remained significant (F = 10.59, p < .001).

Table 5.26 Two-way ANOVA for number and size of boats[1]

	df	SS	MS	*F*-value	*p*-value	Partial Eta squared (η^2)
Number of boats [2]	3	22457.63	7485.88	1991.53	< .001	.57
Size of boats [3]	2	433.36	216.68	57.65	< .001	.03
Number x Size interaction	6	238.79	39.80	10.59	< .001	.01

[1] model adjusted R^2 = .573.

[2] number of boats: 6, 12, 26, 42 boats.

[3] size of boats: 100% small, 50% small / 50% large, 100% large.

The number of boats had by far the strongest influence on norms, as the partial eta squared of .57 indicated that 57% of the variance in normative evaluations can be attributed to this dimension. The size of boats depicted in the images was much less important, explaining only 3% of the variance in norms (partial η^2 = .03). The interaction of boat size and number of boats, although statistically significant, explained only 1% of the variance in norms (partial η^2 = .01). Taken together, these results show that: (a) both the number of boats and size of boats were significant dimensions of encounter norms at Molokini, but number of boats was a far more important dimension than size of these boats; and (b) the size of boats on which respondents were surveyed did not influence their normative evaluations. Respondents, on average, considered a greater numbers of boats and larger boats to be less acceptable than fewer and smaller boats. The photograph containing 42 large boats was rated as the most unacceptable scenario, whereas the image of six small boats was considered most acceptable (Table 5.27). Six boats of any size and 12 boats that are all small or split evenly between small and large were considered by visitors to be acceptable at Molokini. All other scenarios were unacceptable for this site (e.g., 12 large boats, 26 or 42 boats of any size).

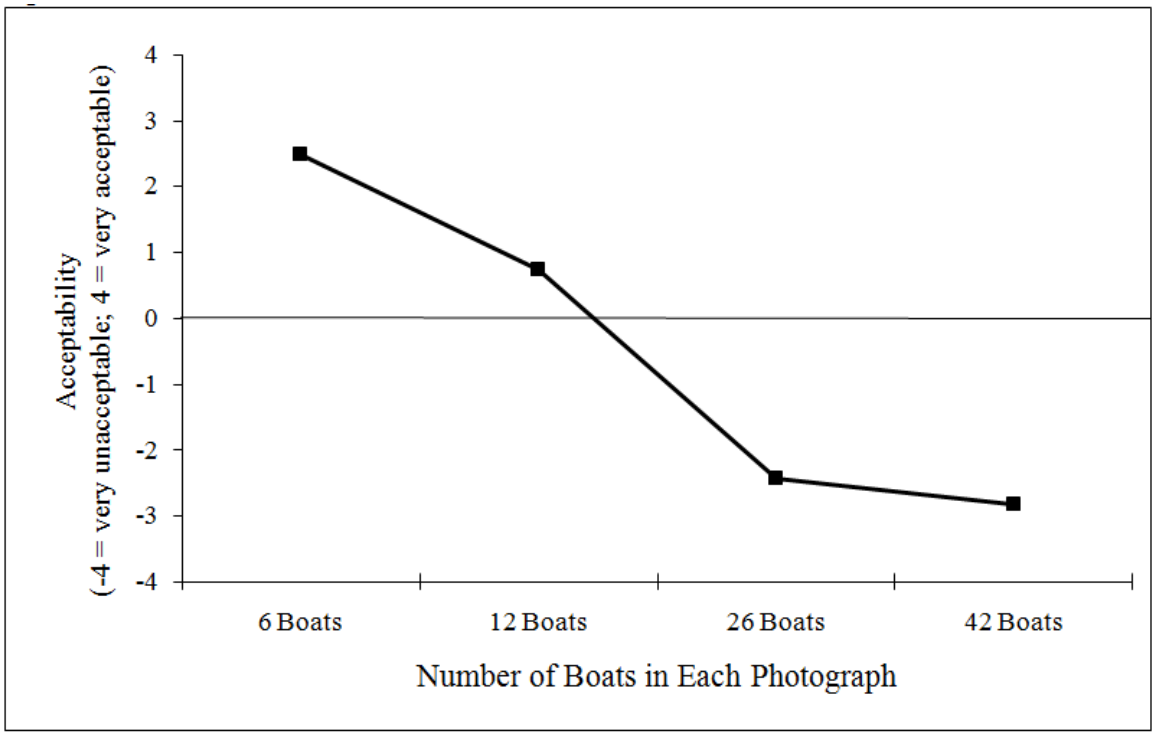
Table 5.27 Mean acceptability norms for number and size of boats*

	Proportion of large and small boats			
Number of boats	100% small	50% Small, 50% Large	100% Large	Estimated total
6 boats	2.62	2.44	2.39	2.48
12 boats	1.32	1.13	-0.21	0.74
26 boats	-2.24	-2.27	-2.78	-2.43
42 boats	-2.56	-2.79	-3.11	-2.82
Estimated total	-0.21	-0.37	-0.93	

***** cell entries are means on 9-point recoded scales of -4 "very unacceptable" to +4 "very acceptable."

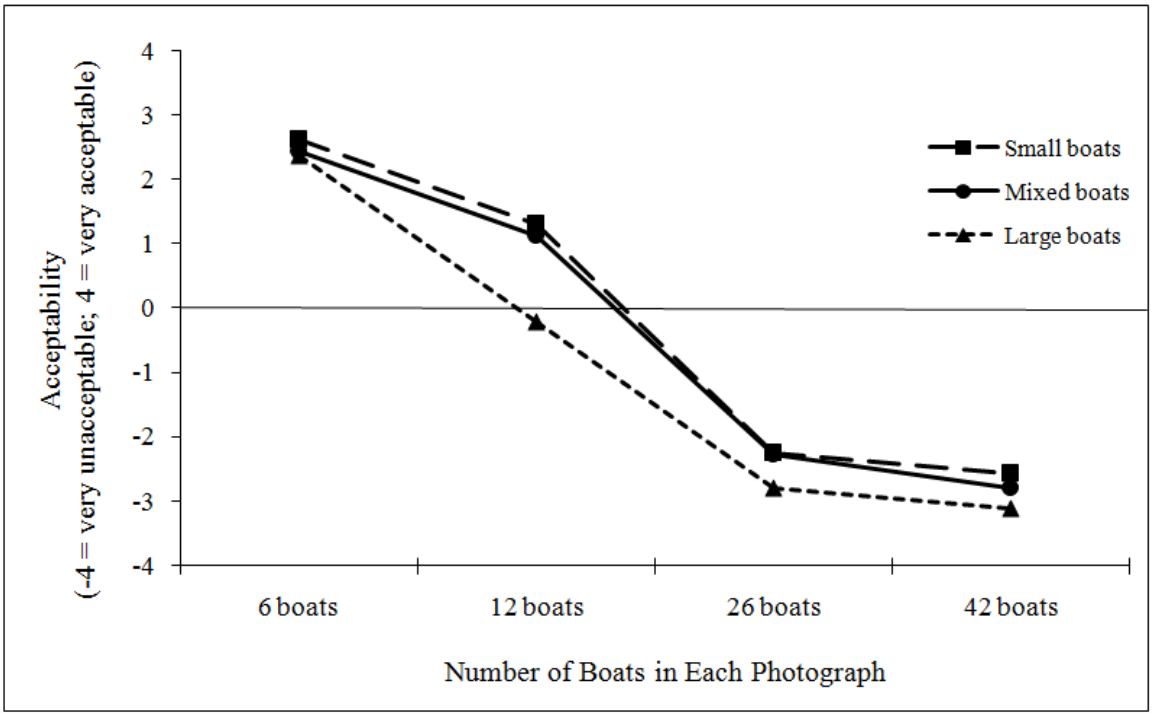
These results can also be depicted using norm curves for each dimension and indicate that the minimum acceptable condition or point where the norm curve crossed the neutral point was 15.27 boats (Figure 5.12). This suggests that any number of boats over 15 at Molokini would generally be unacceptable to the majority of people visiting this site, and this number could also potentially represent a possible standard of quality for this indicator.

Figure 5.12 Norm curve for acceptability of boat numbers at Molokini



This number (15.27 boats) is much higher than the average maximum number of acceptable boats (7.26) revealed using the open-ended approach, but past research suggests that normative evaluations based on the visual techniques tend to be more accurate because these provide more realistic assessments of impacts and conditions for respondents to evaluate. Norm curves for the number of each size of boat varied (Figure 5.13). Minimum acceptable conditions were 17.19 boats when all boats were small, 16.64 when evenly split between small and large boats, and 11.51 when all boats were large.

Figure 5.13 Norm curves for number of boats by size of boat



These minimum acceptable numbers of boats can be combined with observed counts of the average boat occupancy to calculate a crude estimate of social carrying capacities associated with use levels at Molokini. Researchers counted an average of 96 people on large boats and 14 people on small boats, and passengers reported a minimum acceptable

number of boats was 17.19 when all were small, 16.64 when they were evenly split between small and large boats, and 11.51 when all boats were large. An estimated capacity at Molokini could be (17.19 boats * 14 people per boat) = 241 people at one time if all boats were small. If half of the boats were small and half were large (i.e., even split), the capacity would be ([8.32 large boats * 96 people per boat] + [8.32 small boats * 14 people per boat]) = 915 people at one time. If all boats were large, the maximum acceptable capacity would be approximately (11.51 boats * 96 people per boat) = 1105 total people at Molokini at one time. Research suggests that standards of quality such as these must be monitored to ensure that acceptable use levels are not violated and conditions and experiences are not deteriorating (Manning, 2007).

5.4.3 Perceived Crowding.

Survey respondents were also asked to report whether the number of people that they encountered at Molokini on their trip reduced their enjoyment, had no effect on their enjoyment, or increased / enhanced their enjoyment. Table 5.28 shows that encounters with other people at Molokini had no effect on 77% of visitors, reduced the enjoyment for 17% of visitors, and increased the enjoyment of 6% of respondents. There were no differences between visitors on large snorkel boats and those on smaller dive boats, $\chi^2(2, N = 413) = 5.74$, $p = .057$, $V = .11$. These findings are not surprising because most visitors in recreation and tourism settings report that occasional events occurring on their trip seldom influence their overall satisfaction. In other words, overall satisfaction of recreationists and tourists is almost always high irrespective of some specific events that may occur during their experience (see Manning, 1999; Needham & Rollins, 2009 for reviews).

Table 5.28 Effect of encounters with people at Molokini on overall satisfaction*

	Large Tour Boats	Smaller Tour Boats	Total
Encounters with people had no effect on enjoyment	75	86	77
Encounters with people reduced enjoyment	19	10	17
Encounters with people increased enjoyment	6	4	6

* cell entries are percentages (%).$\chi^2(2, N = 413) = 5.74$, $p = .057$, $V = .11$.

A more appropriate measure of the effects of use levels and encounters on experiences of recreationists and tourists is perceived crowding. **Perceived crowding** is a subjective negative evaluation that the number of people or other objects encountered in a setting is too many (Manning, 1999, 2007; Vaske & Donnelly, 2002). Post-trip surveys in this study asked Molokini visitors to report the extent that they felt crowded by the number of people on their boat, people in the water, people in total at Molokini, and boats at Molokini. Consistent with almost all research on crowding, responses were measured on the rigorously tested 9-point perceived crowding scale of 1 “not at all crowded” to 9 “extremely crowded,” and were recoded to 0 "not crowded" (i.e., 1 and 2 on scale) and 1 "crowded" (3 to 9; Shelby, Vaske, & Heberlein, 1989; Vaske & Donnelly, 2002; Vaske & Shelby, 2008).

Table 5.29 shows that over two-thirds of respondents felt crowded at Molokini with 67% feeling crowded by the number of boats and number of people on their boat, 70% crowded by the number of people in the water, and 73% feeling crowded by the number of people in total at Molokini during their visit. Compared to survey respondents on smaller dive boats, individuals on larger snorkel boats felt slightly more crowded by the number of people on their boat and by people in the water, $\chi^2 = 7.71$ to 14.31, $p = .006$ to $< .001$, $V = .14$ to .19.

Table 5.29 Visitor perceived crowding at Molokini*

	Percent Feel Crowded (%)					
	Large Tour Boats	Smaller Tour Boats	Total	χ^2 - value	*p* - value	ϕ
Felt crowded by number of people on their boat	70	55	67	7.71	.006	.14
Felt crowded by number of people in the water	74	54	70	14.31	< .001	.19
Felt crowded by number of people in total	74	68	73	1.16	.282	.05
Felt crowded by number of boats	65	71	67	1.03	.311	.05

***** cell entries are percentages for 3 – 9 on original scale (%).

There were no differences between people on larger and smaller boats in their perceptions of crowding associated with the total number of people or boats at Molokini ($p > .05$). Shelby et al. (1989) and Vaske and Shelby (2008) explained that at levels where 65% to 80% of recreationists feel crowded, perceived crowding at the site should be characterized as "more than capacity" or "overcapacity." This suggests a problem with overuse and the need for immediate management action to improve and preserve experiences at the site. Without management action, sites characterized by these levels of perceived crowding are likely destined to become "sacrifice areas" of high-density use where quality of the natural environment and visitor experiences may be severely compromised (Shelby et al., 1989). Implementation of management strategies must be followed by continuous monitoring and periodic empirical research.

5.4.4 Relationships among Encounters, Norms, and Crowding.

To estimate whether potential social carrying capacity problems exist at a recreation site, it is important to examine relationships among encounters, norms, and crowding. In particular, it is important to determine what proportion of users encountered more people than they would tolerate at a site (i.e., their norm). Research has shown that when

recreationists encounter more people than they feel are acceptable (i.e., norm), they feel more crowded compared to those who encounter less than they would accept. If many users are encountering more people than they feel is acceptable, management may need to do more to address social capacity related issues (e.g., quota, zoning). Table 5.30 shows relationships among encounters, norms, and crowding at Molokini. The majority of respondents reported encountering more people on their boat, in the water, and in total than their normative tolerances.

Table 5.30 Relationships among user encounters, norms, and crowding at Molokini

	Reported encounters compared to norm [1]		Mean crowding [2]				
	% Fewer encounters	% More encounters	Fewer than norm	More than norm	*t*-value	*p*-value	Effect size (r_{pb})
All respondents combined							
Number of people on their boat	41	59	2.60	4.23	8.15	< .001	.41
Number of people in the water	49	51	3.08	4.71	7.06	< .001	.38
Number of people in total	43	57	3.22	4.82	6.72	< .001	.36
Number of boats (open-ended)	42	58	2.80	4.55	8.02	< .001	.40
Number of boats (photographs)	91	9	3.50	6.32	7.20	< .001	.39
Respondents only on large boats							
Number of people on their boat	40	60	2.64	4.39	7.45	< .001	.43
Number of people in the water	48	52	3.34	4.85	5.66	< .001	.35
Number of people in total	41	59	3.26	4.65	5.11	< .001	.32
Number of boats (open-ended)	38	62	2.67	4.29	6.77	< .001	.39
Number of boats (photographs)	94	6	3.34	6.14	5.37	< .001	.34
Respondents only on small boats							
Number of people on their boat	48	52	2.51	3.67	2.97	.004	.31
Number of people in the water	54	46	2.35	4.21	4.15	< .001	.45
Number of people in total	51	49	3.11	5.46	4.54	< .001	.48
Number of boats (open-ended)	52	48	3.10	5.53	5.12	< .001	.51
Number of boats (photographs)	83	17	4.05	6.46	3.61	< .001	.39

[1] Percent of users who encountered either fewer than or more than their norm (minimum acceptable condition).

[2] Mean perceived crowding based on a 9-point scale from 1 "not at all crowded" to 9 "extremely crowded."

Approximately 57% of users encountered more people in total at Molokini than they would accept seeing at this site. These results support findings related to perceived crowding and

suggest that human use levels (i.e., numbers of people) are currently a problem at Molokini and this site is operating over capacity. This pattern was evident on large boats, but slightly more people on smaller boats encountered fewer people than their maximum tolerances. Crowding scores were significantly higher for users reporting more encounters than their norm, which is consistent with past research (e.g., Vaske & Donnelly, 2002).

A majority of respondents (58%) also reported encountering more boats at Molokini than they would tolerate at this site using the open-ended approach. The photographic approach provided a different result with only 6% to 17% of users encountering more boats than their normative tolerance. Given that the photographic approach arguably provides more realistic and accurate assessments of use levels, this suggests that although the number of people visiting Molokini may be problematic, the number of boats visiting the site may be less of a concern. However, over 65% of respondents still felt crowded by the number of boats at Molokini, which suggests that managers may still need to address the number of boats at site. Again, crowding was significantly higher for users reporting more encounters than their norm, which is consistent with past studies (e.g., Vaske & Donnelly, 2002).

Finally, information in Table 5.31 outlines relationships among user norms and crowding, and researcher observed counts at Molokini. Similar to relationships between user encounters and their norms, researchers counted more people on the boat, in the water, and in total at Molokini than users would tolerate at this site. This implies that there were more people actually present at Molokini than users would tolerate and use levels counted on boats were higher than 83% of respondent maximum tolerance norms for the site. These results support earlier findings suggesting that human use levels (i.e., numbers of people) are currently a problem at Molokini and this site is operating over its capacity.

Table 5.31 Relationships among norms, crowding, and researcher observations

	Researcher observation compared to norm [1]		Mean crowding [2]				
	% Lower than observed	% Higher than observed	Lower than norm	Higher than norm	*t*-value	*p*-value	Effect size (r_{pb})
All respondents combined							
Number of people on their boat	40	60	2.62	4.20	7.92	< .001	.39
Number of people in the water	18	82	3.28	4.08	2.70	.008	.14
Number of people in total	17	83	3.46	4.37	3.03	.003	.15
Number of boats (open-ended)	16	84	3.00	4.03	3.67	< .001	.17
Number of boats (photographs)	75	25	3.47	4.61	3.75	< .001	.23
Respondents only on large boats							
Number of people on their boat	32	68	2.58	4.27	6.67	< .001	.39
Number of people in the water	17	83	3.79	4.24	1.27	.210	.08
Number of people in total	19	81	3.55	4.27	2.24	.028	.13
Number of boats (open-ended)	12	88	2.82	3.81	2.82	.008	.16
Number of boats (photographs)	76	24	3.33	4.13	2.26	.027	.17
Respondents only on small boats							
Number of people on their boat	63	37	2.68	3.84	2.88	.005	.30
Number of people in the water	24	76	2.26	3.57	2.78	.008	.26
Number of people in total	13	87	3.10	4.67	1.82	.073	.21
Number of boats (open-ended)	28	72	3.22	4.83	3.19	.002	.30
Number of boats (photographs)	69	31	3.92	5.70	3.18	.002	.35

[1] percent of users whose norm was less than or higher than what researchers actually observed.

[2] mean perceived crowding based on a 9-point scale from 1 "not at all crowded" to 9 "extremely crowded."

Researchers also counted more boats at Molokini than users suggested they would tolerate at the site using the open-ended approach. The photographic approach, however, showed the opposite result with researcher boat counts being lower than the maximum tolerance for a majority of users. Again, if photographic techniques are considered to be more accurate, this suggests that although the number of people visiting Molokini is problematic, the number of boats at this site may be less of a concern. More than 65% of respondents felt crowded by the number of boats at Molokini, however, and this suggests that managers should still consider managing the number of boats visiting the site.

5.5 RECREATION CONFLICT AND DEPRECIATIVE BEHAVIOR

5.5.1 Conflict with Activity Groups.

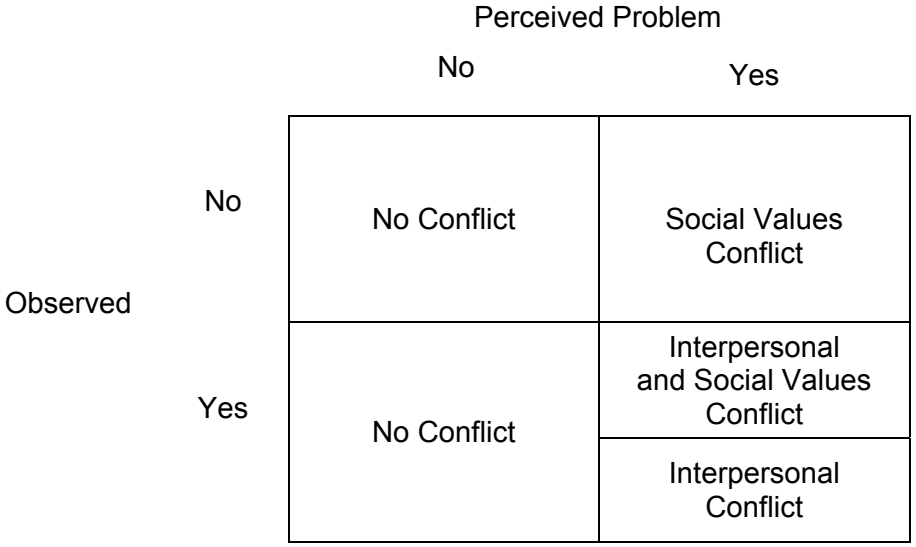
Like encounters and crowding, conflict is another indicator of social carrying capacity in recreation and tourism settings. Empirical research has revealed several different types of conflict that can occur between people participating in similar or different types of outdoor recreation (see Graefe & Thapa, 2004; Manning, 1999 for reviews). *One-way* or *asymmetrical conflict* occurs when one activity group experiences conflict with or dislikes another group, but not vice versa. A study of snowmobilers and cross-country skiers, for example, showed that skiers disliked encounters with snowmobilers, but snowmobilers were not in conflict with skiers (Vaske, Needham, & Cline Jr., 2007). *Two-way conflict* occurs when there is resentment or dislike in both directions (e.g., skiers in conflict with snowboarders, snowboarders in conflict with skiers; Vaske, Carothers, Donnelly, & Baird, 2000). Conflict between users engaged in different activities (e.g., windsurfers versus surfers) is known as *out-group conflict*, whereas conflict between participants in the same activity (e.g., surfers versus other surfers) is *in-group conflict* (Manning, 1999).

Most recreation and tourism studies have examined *interpersonal* or *goal interference conflict* where the actual physical presence or behavior of an individual or group interferes with goals, expectations, or behavior of another individual or group (Vaske et al., 2007). A snorkeler, for example, may experience interpersonal conflict if he or she collides with a surfer. Recent research has also introduced and explored the concept of *social values conflict* (Vaske et al., 2007). Social values conflict occurs between groups who do not share similar opinions, norms, or values about an activity. Unlike interpersonal conflict, social values conflict is defined as conflict that can occur even when there is no direct physical

contact or interaction among groups (Vaske et al., 2007). For example, although encounters with horseback riders / stock users may be rare in recreation settings such as parks and wilderness areas, recreationists may philosophically disagree about the appropriateness of such animals in these settings. A study of wildlife viewers and hunters showed that viewers did not witness many hunters or hunting behaviors (e.g., hearing shots fired) in a backcountry area because management regulations and rugged terrain and topography separated the two groups (Vaske, Donnelly, Wittmann, & Laidlaw, 1995). Regardless, viewers still reported conflict with hunters simply because of a divergence in values regarding the appropriateness of hunting in the area.

To differentiate social values and interpersonal conflict, studies have operationalized conflict by combining responses from two sets of questions asked in surveys of recreationists (Vaske et al., 1995, 2007). Individuals indicated how frequently conflict events happened to them during their visit (e.g., rude behavior, passing too closely). Responses were coded as “observed” or “not observed.” Then, users evaluated if they perceived each event to be a problem. Combining the occurrence of observation variables with the corresponding perceived problem variables produces a conflict typology (Figure 5.14). Individuals who observed or did not observe a given event, but did not perceive it to be a problem were considered to have experienced no social values or interpersonal conflict. Those who never saw a given event, but believed that a problem existed were considered to be expressing a social values conflict. Users who saw a given event and believed that it caused a problem were judged to be indicating either interpersonal conflict or a combination of both interpersonal and social values conflict (Vaske et al., 2007).

Figure 5.14 Conflict evaluation typology



Understanding the extent and type of conflict is important for managing recreation and tourism settings because some management strategies may be effective for addressing one type of conflict, but not others. When conflict stems from interpersonal conflict, for example, spatial zoning or temporal segregation of incompatible groups may be effective. When the source of conflict is a difference in social values, user information or education may be needed (Graefe & Thapa, 2004; Vaske et al., 2007). Managers need to understand the basis of user concerns and type of conflict to develop strategies for managing conflict.

Respondents in this study were first asked in the post-trip survey how frequently they had observed four different conflict situations / events for the two main groups at Molokini: snorkelers who were surveyed on large boats, and scuba divers who were surveyed on smaller boats. Respondents were asked how frequently they had observed each of these groups being rude or discourteous, being too close, not looking where they were going, and bumping into people. Responses for these situations / events were measured on 4-point scales of “never,” “once or twice,” “sometimes,” and “many times.” For analysis purposes

and consistent with past research, responses were recoded as “observed” (i.e., at least once) or “did not observe” the event (i.e., never saw event).

Table 5.32 displays that the most commonly reported conflict events observed by users at Molokini were snorkelers being too close, not looking where they were going, and bumping into people. Over 70% of snorkelers observed these behaviors by other snorkelers, whereas fewer than 26% of scuba divers observed these behaviors by snorkelers. Over 30% of scuba divers reported observing other scuba divers being too close, not looking where they were going, and bumping into people, whereas fewer than 5% of snorkelers observed these scuba diver behaviors. These findings are evidence of more in-group conflict than out-group conflict at Molokini because snorkelers reported more conflict events with other snorkelers than scuba divers, and scuba divers reported more conflict events with other divers than snorkelers. These findings are also evidence of one-way or asymmetric conflict, as scuba divers reported conflict events with snorkelers (23% to 26%), whereas snorkelers reported almost no conflict events with scuba divers (2% to 4%).

Table 5.32 Observed conflict behavior at Molokini

	Percent Observed (%)				
	Snorkelers (Large Boats)	Scuba Divers (Smaller Boats)	χ^2 - value	*p* - value	ϕ
Snorkelers					
Being rude or discourteous	21	7	11.02	.001	.16
Being too close	74	23	77.63	< .001	.44
Not looking where they are going	73	26	64.69	< .001	.40
Bumping into people	75	24	79.09	< .001	.45
Scuba divers					
Being rude or discourteous	2	5	1.91	.167	.07
Being too close	4	32	50.24	< .001	.39
Not looking where they are going	4	34	55.83	< .001	.41
Bumping into people	3	35	63.75	< .001	.44

Users were then asked if they believed that each of these conflict events (e.g., too close, bumping into people) for each activity group was a problem at Molokini. Responses were coded on 4-point scales of "not at all a problem" to "extreme problem." For analysis purposes and consistent with past research, variables were recoded as "no problem" or "problem." Table 5.33 shows that that the most problematic events at Molokini were snorkelers being too close, not looking where they were going, and bumping into people.

Table 5.33 Perceived problem behavior at Molokini

	Percent Think a Problem (%)				
	Snorkelers (Large Boats)	Scuba Divers (Smaller Boats)	χ^2 - value	*p* - value	ϕ
Snorkelers					
Being rude or discourteous	19	17	0.10	.757	.02
Being too close	53	25	23.68	< .001	.24
Not looking where they are going	52	26	20.29	< .001	.22
Bumping into people	56	25	27.54	< .001	.26
Scuba divers					
Being rude or discourteous	11	17	2.11	.146	.08
Being too close	13	26	8.41	.004	.15
Not looking where they are going	12	29	13.74	< .001	.20
Bumping into people	12	26	9.50	.002	.16

Over 50% of snorkelers believed that these snorkeler behaviors were problematic at Molokini, whereas fewer than 26% of scuba divers believed that these snorkeler behaviors were a problem. Over 25% of scuba divers thought that scuba divers being too close, not looking where they were going, and bumping into people were problematic at Molokini, whereas fewer than 13% of snorkelers thought that these scuba diver behaviors were a problem. Again, these findings are evidence of more in-group conflict than out-group conflict at Molokini. These findings also show one-way or asymmetric conflict, as scuba divers reported more conflict events with snorkelers, whereas snorkelers reported fewer conflict events with divers.

Similar to previous research, combining the frequency of occurrence (observed, not observed) variables with the corresponding perceived problem (no problem, problem) variables for each respondent produced conflict typologies with three possible attributes for each activity group: no conflict, interpersonal conflict, and social values conflict. In other words, this analysis strategy resulted in four situations / events common to both activity groups where respondents were described as having no conflict, interpersonal conflict, or social values conflict. Separate K-Means cluster analyses were conducted on the four variables for each activity group to obtain an overall view of the total proportion of respondents in each activity experiencing each type of conflict (Table 5.34). Cluster analyses were performed for 2, 3, and 4 group solutions for each activity, and the 3-group solution provided the best fit. Data were also randomly sorted four times and cluster analyses were conducted after each sort. These analyses supported a three group solution.

Table 5.34 Amount of activity conflict at Molokini*

	Snorkelers (on Large Boats)		Scuba Divers (on Smaller Boats)	
	Other Snorkelers	Scuba Divers	Other Scuba Divers	Snorkelers
No Conflict	44	89	70	75
Interpersonal Conflict	44	11	26	16
Social Values Conflict	12	0	4	9

* cell entries are percentages (%).

The first cluster of individuals did not express any conflict (i.e., no conflict). Cluster 2 individuals indicated interpersonal / goal interference conflict and cluster 3 expressed social values conflict. Table 5.34 shows that over 75% of scuba divers did not experience conflict with other divers and almost 90% of snorkelers did not experience conflict with scuba divers at Molokini. On the other hand, a majority of snorkelers (56%) and many scuba

divers (30%) experienced conflict with other snorkelers, with almost all of this conflict being interpersonal or face-to-face conflict. Taken together, these analyses revealed relatively low conflict with scuba divers, but high conflict with snorkelers and most of this conflict was in-group interpersonal conflict with other snorkelers.

5.5.2 Depreciative Behavior Toward Coral Reefs and Marine Life

The post-trip surveys asked respondents if they had seen snorkelers or scuba divers harassing marine life (e.g., fish, turtles), feeding fish, or bumping, handling, or standing on coral at Molokini. Table 5.35 shows that only 18% of respondents saw snorkelers chase or harass marine life, and fewer than 10% saw any of these other behaviors at Molokini.

Table 5.35 Depreciative behavior toward reefs and marine life at Molokini*

	Large Tour Boats	Smaller Tour Boats	Total	χ^2 - value	*p* - value	ϕ
Recreationists						
Saw snorkelers chase or harass marine life	21	11	18	5.62	.018	.11
Saw snorkelers feed fish	7	10	8	0.98	.323	.05
Saw snorkelers bump, handle, or stand on coral	7	12	8	2.84	.092	.09
Saw scuba divers bump, handle, or stand on coral	2	23	7	41.22	< .001	.35
Saw scuba divers chase or harass marine life	3	8	4	4.02	.045	.11
Saw scuba divers feed fish	1	3	2	1.10	.295	.06
Tour boat staff						
Think it is appropriate for staff to handle marine life	31	36	33	0.53	.466	.04
Saw staff handle / touch marine life at another site	13	9	13	1.09	.297	.05
Saw staff handle / touch marine life at Molokini	7	7	8	0.01	.990	.00

*cell entries are percentages (%)

There were, however, some important differences between recreationists on large snorkel boats and those on smaller dive boats. More people on larger boats saw snorkelers chase

or harass marine life (21%) and substantially more users on smaller dive boats saw scuba divers bump, handle, or stand on corals (23%). Regardless, relatively few users observed any of these depreciative behaviors at Molokini. Respondents were also asked if they saw tour boat staff engaging in some of these depreciative behaviors. Table 5.35 shows that 13% of respondents saw boat staff handle or touch marine life at secondary sites (e.g., Turtle Arches / Turtle Town) and 8% witnessed staff handling marine life at Molokini. Approximately one-third of people on both the large snorkel boats (31%) and smaller dive boats (36%) believed that it is appropriate for tour boat staff to handle or touch marine life during the tours.

5.6 SUPPORT FOR MANAGEMENT STRATEGIES

5.6.1 Support and Opposition of Potential Management Strategies

Studies have highlighted the importance and need for understanding user support and opposition toward management strategies designed to mitigate negative effects of coastal recreation in Hawai'i (e.g., Cesar & van Beukering, 2004; Friedlander et al., 2005; Needham & Szuster, in press). There are two general approaches for managing recreation use. **Direct management** strategies act directly on user behavior leaving little or no freedom of choice (Manning, 1999). **Indirect management** strategies attempt to influence decision factors on which users base their behavior (Manning, 1999). To illustrate, direct management practices aimed at reducing litter in a beach environment could include a regulation prohibiting this behavior and then enforcing the regulation with fines or other sanctions. An indirect action could be an education program designed to inform users of undesirable ecological and aesthetic impacts of litter, and encourage them to avoid littering.

Post-trip surveys asked Molokini visitors the extent that they supported or opposed 14 possible indirect and direct management strategies for this site in the future (Table 5.36).

Table 5.36 Support for potential management strategies at Molokini

Potential Management Strategies	Percent Support (%)			χ^2 - value	*p* - value	ϕ
	Large Tour Boats	Smaller Tour Boats	Total			
Do not allow people to feed fish at Molokini	82	84	83	0.18	.675	.02
Limit number of boats allowed per day at Molokini	82	70	79	5.87	.015	.13
Do more to inform passengers about marine environment	74	78	75	0.55	.459	.04
Limit number of people allowed per day at Molokini	75	65	73	3.52	.061	.10
Do more to inform passengers about appropriate behavior	66	71	67	1.00	.318	.05
Restrict size of boats allowed at Molokini	66	65	66	0.01	.782	.01
Do more to inform passengers about native Hawaiian culture	68	54	64	5.29	.021	.12
Improve maintenance / upkeep of harbor / ramp facilities	49	49	49	0.01	.950	.00
Designate some boat moorings for only non-commercial use	42	38	41	0.62	.431	.04
Put different recreation activities in different areas (zoning)	36	37	36	0.08	.780	.01
Do not allow music to be played on boats while at Molokini	24	47	30	16.47	< .001	.21
Do not allow barbequing on boats while at Molokini	20	43	25	18.61	< .001	.23
Do not allow introductory dive training at Molokini	19	36	23	9.99	.002	.17
Close Molokini to all recreation / tourism activities	9	10	9	0.02	.889	.01

The largest proportion of respondents supported prohibition of fish feeding at Molokini (83%). Over two-thirds of visitors also supported restricting use levels at Molokini by limiting the number of boats allowed per day (79%), number of people allowed per day (73%), and

restricting the size of boats allowed (66%). This high level of support for such direct restrictive actions on use levels and visitation is rare in recreation and tourism research (Manning, 1999, 2007). Over two-thirds of visitors also supported increasing interpretation and education by doing more to inform passengers about the marine environment (75%), appropriate behavior (67%), and native Hawaiian culture (64%). Approximately half of respondents supported improving maintenance and upkeep of harbor and boat ramp facilities, 41% supported designating some boat moorings solely for non-commercial use, and 36% supported spatially zoning activities at Molokini. Fewer than 30% of visitors supported prohibiting music, barbequing, and introductory dive training on boats, although users on smaller dive boats were significantly more supportive of these strategies. Fewer than 10% of users supported closing Molokini.

5.6.2 Opinions about Boat Moorings and Conservation Status

Respondents were informed on the last page of the post-trip surveys that there are currently 26 boat moorings at Molokini, and were asked about their opinion of this number of moorings at this site. Table 5.37 shows that 66% of respondents believed that this number of moorings is too many and that there should be fewer moorings at Molokini.

Table 5.37 Opinions about boat moorings at Molokini*

	Large Tour Boats	Smaller Tour Boats	Total
There are too many boat moorings at Molokini	65	66	66
The number of boat moorings at Molokini is about right	33	33	33
There are not enough boat moorings at Molokini	2	1	2

*cell entries are percentages. $\chi^2(2, N = 388) = 0.46$, $p = .796$, $V = .03$.

Approximately 33% of users believed that this number of boat moorings was about right, and only 2% thought that this was not enough and that there should be more moorings at the site. There were no differences in opinions about boat moorings between visitors on large snorkel boats and smaller dive boats, $\chi^2(2, N = 388) = 0.46$, $p = .796$, $V = .03$.

Post-trip surveys also asked respondents"is Molokini a marine conservation reserve / district?" Table 5.38 shows that 74% of respondents knew that Molokini was a marine life conservation district, 26% were unsure, and only 1% said that it was not a conservation district. There were no differences in knowledge of Molokini's conservation status between visitors on large snorkel boats and those on smaller dive boats.

Table 5.38 Knowledge of conservation status*

	Large Tour Boats	Smaller Tour Boats	Total
Yes, Molokini is a marine life conservation district	76	67	74
Unsure	24	32	26
No, Molokini is not a marine life conservation district	1	1	1

*cell entries are percentages. $\chi^2(2, N = 389) = 2.60$, $p = .272$, $V = .08$.

5.7 FUTURE VISITATION, DISPLACEMENT, AND PRODUCT SHIFT

Recreationists and tourists may cope with negative experiences such as crowding and conflict by choosing to visit alternative locations or return to the same location at different times. **Temporal displacement** involves shifting the time of visitation. For example, some users may visit during weekdays or off-peak time periods if an area is mostly crowded on weekends and during peak seasons. Users may also choose to visit a different location. This **spatial displacement** can involve shifts in use to other areas within the same

recreation area (i.e., intrasite displacement) or to completely different settings (i.e., intersite displacement). If a user encounters more people than expected or experiences conflict events, he or she might not change their location or time of visitation, but rather change their definition of the experience. This is known as **product shift.** For example, a wilderness area may be reevaluated as a semi-primitive area by individuals because they encounter conflict and crowding inconsistent with their initial expectation of a wilderness area (Hall & Shelby, 2000; Manning, 1999; Shelby, Bregenzer, & Johnson, 1988). This project measured four different future visit and coping behaviors with responses measured on 5-point scales from "very unlikely" to "very likely" (Table 5.39).

Table 5.39 Future visitation at Molokini

	Percent Likely (%)					
	Large Tour Boats	Smaller Tour Boats	Total	χ^2 - value	*p* - value	ϕ
I would come back to Molokini	82	85	82	0.46	.497	.03
I would come back to Molokini, but recognize that this area offers a different type of experience than I first believed	43	45	44	0.15	.700	.02
I would not come back to Molokini because I have been here and do not need to come back again	16	14	16	0.47	.493	.03
I would not come back to Molokini because I can have better experiences at other coral reef areas on Maui	11	10	11	0.01	.948	.00

Approximately 82% of visitors would come back to Molokini, 44% would come back, but with a different expectation about the type of experiences offered at the site, 16% would not come back because they do not need to visit twice, and 11% would not come back because they believe that they can have better experiences elsewhere. There were no statistically significant differences among visitors on large snorkel boats and those on smaller boats catering primarily to scuba divers.

REFERENCES

Barker, N. H. L., & Roberts, C. M. (2004). Scuba diver behavior and the management of diving impacts on coral reefs. *Biological Conservation, 120*, 481-489.

Barro, S. C., & Manfredo, M. J. (1996). Constraints, psychological investment, and hunting participation: Development and testing of a model. *Human Dimensions of Wildlife, 1*(3), 42-61.

Bright, A. D., Manfredo, M. J., & Fulton, D. C. (2000). Segmenting the public: An application of value orientations to wildlife planning in Colorado. *Wildlife Society Bulletin*, *28*, 218-226.

Bruyere, B. L., Rodriguez, D. A., & Vaske, J. J. (2002). Enhancing importance – performance analysis through segmentation. *Journal of Travel and Tourism Marketing, 12*, 81-95.

Bryan, H. (1977). Leisure value systems and recreational specialization: The case of trout fishermen. *Journal of Leisure Research, 9*, 174-187.

Cesar, H. S. J., & van Beukering, P. J. H. (2004). Economic valuation of the coral reefs of Hawai'i. *Pacific Science, 58*, 231-242.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum.

Cole, D. (1992). Modeling wilderness campsites: Factors that influence amount of impact. *Environmental Management, 16*, 255-264.

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*, 98-104.

Davidson, K., Hamnett, M., & Minato, C. (2003). *Economic value of Hawaii's nearshore reefs*. Honolulu: Social Science Research Institute, U. of Hawai`i.

Division of Aquatic Resources. (2006). *Final Project Report*. Main Hawaiian Islands Coral Reef Assessment and Monitoring Program. Honolulu, Department of Land and Natural Resources. 49 p.

Dinsdale, E. A., & Harriott, V. J. (2004). Assessing anchor damage on coral reefs: A case study in selection of environmental indicators. *Environmental Management, 33*, 126-139.

Dunlap, R. E., & Van Liere, K. D. (1978). The new environmental paradigm. *Journal of Environmental Education*, *9*(4), 10-19.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G., Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues, 56*(3), 425-442.

Eckersley, R. (1992). *Environmentalism and political theory: Toward an ecocentric approach*. Albany, NY: State University of New York Press.

Farrell, T. A., & Marion, J. L. (2002). The protected area visitor impact management (PAVIM) framework: A simplified process for making management decisions. *Journal of Sustainable Tourism, 10*, 31-51.

Friedlander, A. M., Aeby, G., Brown, E., Clark, A., Coles, S., Dollar, S., et al. (2005). The state of coral reef ecosystems of the main Hawaiian Islands. In J. Waddell (Ed.), *The state of coral reef ecosystems in the United States and Pacific Freely Associated States* (pp. 222-269). Silver Spring, MD: NOAA/NCCOS Center for Coastal Monitoring & Assessment Biogeography Team.

Freimund, W., Vaske, J., Donnelly, M., & Miller, T. (2002). Using video surveys to access dispersed backcountry visitors' norms. *Leisure Sciences, 24*, 349–362

Fulton, D. C., Manfredo, M. J., & Lipscomb, J. (1996). Wildlife value orientations: A conceptual and measurement approach. *Human Dimensions of Wildlife*, *1*(2), 24-47.

Graefe, A. E., & Thapa, B. (2004). Conflict in natural resource recreation. In M. J. Manfredo, J. J. Vaske, B. L. Bruyere, D. R. Field, & P. J. Brown (Eds.), *Society and natural resources: A summary of knowledge* (pp. 209- 224). Jefferson, MO: Modern Litho.

Graefe, A. R., Kuss, F. R., & Vaske, J. J. (1990). *Visitor impact management: The planning framework*. Washington, D.C.: National Parks & Conservation Association.

Hair, J. F., & Black, W. C. (2000). Cluster analysis. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding more multivariate statistics* (pp. 147-206). Washington, D.C.: American Psychological Association.

Hall, T., & Roggenbuck, J. (2002). Response format effects in questions about norms: Implications for the reliability and validity of the normative approach. *Leisure Sciences, 24*, 325–338.

Hall, T. E., & Shelby, B. (2000). Temporal and spatial displacement: Evidence from a high use reservoir and alternate sites. *Journal of Leisure Research, 32*, 435-456.

Hawai`i Department of Business, Economic Development, and Tourism (DBEDT) (2002). *State of Hawai`i data book 2002: A statistical abstract*. Honolulu: DBEDT Research and Economic Analysis Division, Statistics and Data Support Branch.

Hawkins, J., Roberts, C., Vant Hof, T., De Meyer, K., Tratalos, J., & Aldam, C. (1999). Effects of scuba diving on Caribbean coral and fish communities. *Conservation Biology, 12*, 888-897.

Hendee, J. C. (1974). A multiple-satisfaction approach to game management. *Wildlife Society Bulletin, 2*, 104-113.

Inglis, G., Johnson, V., & Ponte, F. (1999). Crowding norms in marine settings: A case study of snorkeling on the Great Barrier Reef. *Environmental Management, 24*, 369-381.

Kay, A. M., & Liddle, M. J. (1989). Impacts of human trampling in different zones of a coral reef flat. *Environmental Management, 13*, 509-520.

Liddle, M. J., & Kay, A. M. (1986). Resistance, survival, and recovery of trampled corals on the Great Barrier Reef. *Biological Conservation, 87*, 1-18.

Lynch, T. P., Wilkinson, E., Melling, L., Hamilton, R., Macready, A., & Feary, S. (2004). Conflict and impacts of divers and anglers in a marine park. *Environmental Management, 33,* 196-211.

Manning, R. E. (1999). *Studies in outdoor recreation: Search and research for satisfaction.* Corvallis: Oregon State University Press.

Manning, R. E. (2001). Visitor experience and resource protection: A framework for managing the carrying capacity of national parks. *Journal of Park & Recreation Administration, 19,* 93-108.

Manning, R. E. (2004). Recreation planning frameworks. In M. J. Manfredo, J. J. Vaske, B. L. Bruyere, D. R. Field, & P. J. Brown (Eds), *Society and natural resources: A summary of knowledge* (pp. 83-92). Jefferson, MO: Modern Litho.

Manning, R. E. (2007). *Parks and carrying capacity: Commons without tragedy*. Washington, D.C.: Island Press.

Manning, R., & Freimund, W. (2004). Use of visual research methods to measure standards of quality for parks and outdoor recreation. *Journal of Leisure Research, 36*(4), 557-579.

Manning, R., Lawson, S. R., Newman, P., Laven, D., & Valliere, W. (2002). Methodological issues in measuring crowding-related norms in outdoor recreation. *Leisure Sciences, 24*, 339-348.

Markrich, M. (2004). *The Hawai'i boat industry 2003 – A survey and economic description*. DBa/Marich Research. http://hawaii.gov/dbedt/czm/maczac/pdf/tour_boat_industry_27.pdf.

McCool, S., & Cole, D. (1997). Experiencing limits of acceptable change: Some thoughts after a decade of implementation. In USDA Forest Service, *Proceedings – Limits of acceptable change and related planning processes: Progress and future directions* (pp. 72-78).Washington DC: US Government Printing Office.

Molokini erupted about 230,00 years ago. (2001, February 8). Retrieved from http://hvo.wr.usgs.gov/volcanowatch/2001/01_02_08.html

Needham, M. D., & Rollins, R. B. (2005). Interest group standards for recreation and tourism impacts at ski areas in the summer. *Tourism Management, 26*, 1-13.

Needham, M. D., Rollins, R. B., & Vaske, J. J. (2005). Skill level and normative evaluations among summer recreationists at alpine ski areas. *Leisure / Loisir: Journal of the Canadian Association for Leisure Studies, 29*, 71-94.

Needham, M. D., Rollins, R. B., & Wood, C. J. B. (2004). Site-specific encounters, norms and crowding of summer visitors at alpine ski areas. *International Journal of Tourism Research, 6*, 421-437.

Needham, M. D., & Rollins, R. (2009). Social science, conservation, and protected areas theory. In P. Dearden & R. Rollins (Eds.), *Parks and protected areas in Canada: Planning and management (3rd Edition)* (pp. 135-168). Don Mills, ON: Oxford University Press.

Needham, M. D., Sprouse, L. J., & Grimm, K. E. (2009). Testing a self-classification measure of recreation specialization among anglers. *Human Dimensions of Wildlife, 14*(6), 448-455.

Needham, M. D., & Szuster, B. W. (In Press). Situational influences on normative evaluations of coastal tourism and recreation management strategies in Hawaii. *Tourism Management*.

Needham, M. D., Vaske, J. J., Donnelly, M. P., & Manfredo, M. J. (2007). Hunting specialization and its relationship to participation in response to chronic wasting disease. *Journal of Leisure Research, 39*, 413-437.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory*. New York, NY: McGraw-Hill.

Orams, M. (1999). *Marine tourism: Development, impacts, and management*. London: Routledge.

QMark Research and Polling (2005). *Noneconomic value of Hawaii's coral reef: Results from telephone survey and focus groups*. Honolulu: Social Science Research Institute, U. of Hawai`i.

Rodgers, K. S., & Cox, E. F. (2003). The effects of trampling on Hawaiian corals along a gradient of human use. *Biological Conservation, 112*, 383-389.

Scherer, D., & Attig, T. (1983). *Ethics and the environment*. Englewood Cliffs, NJ: Prentice Hall.

Schleyer, M. H., & Tomalin, B. J. (2000). Damage on South African coral reefs and an assessment of sustainable diving capacity using a fisheries approach. *Bulletin of Marine Science, 67*, 1025-1042.

Scott, D., & Shafer, C. S. (2001). Recreational specialization: A critical look at the construct. *Journal of Leisure Research, 33*, 319-343.

Severns, M., & Fiene, P. (2002). *The Pocket guide to Molokini*. Waipahu, HI: Island Heritage Publishing.

Shelby, B., Bregenzer, N. S., & Johnson, R. (1988). Displacement and product shift: Empirical evidence from Oregon rivers. *Journal of Leisure Research, 20,* 274-288.

Shelby, B., & Heberlein, T. A. (1986). *Carrying capacity in recreation settings*. Corvallis: Oregon State University Press.

Shelby, B., & Shindler, B. (1992). Interest group standards for ecological impacts at wilderness campsites. *Leisure Sciences, 14*, 17-27.

Shelby, B., Stankey, G., & Shindler, B. (1992). The role of standards in wilderness management. In USDA Forest Service, *Defining wilderness quality: The role of standards in wilderness management* (pp. 1-5). Washington DC: US Government Printing Office.

Shelby, B., Vaske, J. J., & Heberlein, T.A. (1989). Comparative analysis of crowding in multiple locations: Results from fifteen years of research. *Leisure Sciences, 11,* 269-291.

Stankey, G. H., Cole, D. N., Lucas, R. C., Peterson, M. E., Frissell, S., & Washburne, R. F. (1985). *The Limits of Acceptable Change (LAC) System for wilderness planning*. USDA Forest Service General Technical Report INT-176. Utah: Intermountain Forest & Range Station.

Steel, B. S., List, P., & Shindler, B. (1994). Conflicting values about federal forests: A comparison of national and Oregon publics. *Society and Natural Resources, 7*(2), 137-153.

Swenson, C. (2006). *Offshore islet restoration committee*. Retrieved from http://www.hawaiioirc.org/OIRC-ISLETS-Maui/OIRC-ISLETS-Maui-Molokini.htm

Thompson, S. C. G., & Barton, M. A. (1994). Ecocentric and anthropocentric attitudes toward the environment. *Journal of Environmental Psychology, 14,* 149-158.

Tratalos, J., & Austin, T. (2001). Impacts of recreational SCUBA diving on coral communities of the Caribbean island of Grand Cayman. *Biological Conservation, 102*, 67-75.

Van Beukering, P. J. H., & Cesar, H. S. J. (2004). Ecological economic modeling of coral reefs: Evaluating tourist overuse at Hanauma bay and algae blooms at the Kihei coast, Hawai'i. *Pacific Science, 58*, 243-260.

Vaske, J. J. (2008). *Survey research and analysis: Applications in parks, recreation and human dimensions*. State College, PA: Venture Publishing.

Vaske, J. J., Beaman, J., Stanley, R., & Grenier, M. (1996). Importance performance and segmentation: Where do we go from here? *Journal of Travel and Tourism Marketing, 5*, 225-240.

Vaske, J. J., Carothers, P., Donnelly, M. P., & Baird, B. (2000). Recreation conflict among skiers and snowboarders. *Leisure Sciences, 22*, 297-313.

Vaske, J. J., & Donnelly, M. P. (1999). A value-attitude-behavior model predicting wildland voting intentions. *Society and Natural Resources*, *12*, 523-537.

Vaske, J. J., & Donnelly, M. P. (2002). Generalizing the encounter-norm-crowding relationship. *Leisure Sciences, 24,* 255-270.

Vaske, J. J., Donnelly, M. P., Williams, D. R., & Jonker, S. (2001). Demographic influences on environmental value orientations and normative beliefs about national forest management. *Society and Natural Resources*, *14*, 761-776.

Vaske, J. J., Donnelly, M. P., Wittmann, K., & Laidlaw, S. (1995). Interpersonal versus social values conflict. *Leisure Sciences, 17*, 205-222.

Vaske, J. J., & Needham, M. D. (2007). Segmenting public beliefs about conflict with coyotes in an urban recreation setting. *Journal of Park and Recreation Administration, 25*(4), 79-98.

Vaske, J. J., Needham, M. D., & Cline Jr., R. C. (2007). Clarifying interpersonal and social values conflict among recreationists. *Journal of Leisure Research, 39*, 182-195.

Vaske, J. J., & Shelby, L. B. (2008). Crowding as a descriptive indicator and an evaluative standard: Results from 30 years of research. *Leisure Sciences, 30*, 111-126.

Williams, I. D., & Walsh, W. J. (2006). Effects of rotational closure on coral reef fishes in Waikiki-Diamond Head Fishery Management Area, Oahu, Hawaii. Marine Ecology-Progress Series 310: 139-149.

APPENDIX A

HAWAII REVISED STATUTES

CHAPTER 190

HRS Chapter 190 - Marine Life Conservation Program

Haw. Rev. Stat. § 190-1 : Hawaii Statutes - Section 190-1
Conservation area; administration.

All marine waters of the State are hereby constituted a marine life conservation area to be administered by the department of land and natural resources subject to this chapter and any other applicable laws not inconsistent herewith or with any rules adopted pursuant hereto. No person shall fish for or take any fish, crustacean, mollusk, live coral, algae or other marine life, or take or alter any rock, coral, sand or other geological feature within any conservation district established pursuant to this chapter except in accordance with section 190-4 and rules adopted by the department pursuant hereto. [L 1955, c 192, §2; RL 1955, §21-131; am L Sp 1959 2d, c 1, §22; am L 1961, c 132, §2; HRS §190-1; am L 1981, c 16, §1]

Haw. Rev. Stat. § 190-1.5 : Hawaii Statutes - Section 190-1.5: State marine waters.

As used in this chapter, state marine waters shall be defined as extending from the upper reaches of the wash of the waves on shore seaward to the limit of the State's police power and management authority, including the United States territorial sea, notwithstanding any law to the contrary. [L 1990, c 126, §4]

Haw. Rev. Stat. § 190-2 : Hawaii Statutes - Section 190-2: Establishment and modifications of conservation district.

The department of land and natural resources may establish and from time to time modify the limits of one or more conservation districts in each county and may, if it deems necessary, declare all waters within any county a conservation district. [L 1955, c 192, §5; RL 1955, §21-134; am L Sp 1959 2d, c 1, §22; am L 1961, c 132, §2; HRS §190-2]

Haw. Rev. Stat. § 190-3 : Hawaii Statutes - Section 190-3: Rules.

The department of land and natural resources pursuant to chapter 91, shall adopt rules governing the taking or conservation of fish, crustacean, mollusk, live coral, algae, or other marine life as it determines will further the state policy of conserving, supplementing and increasing the State's marine resources. The rules may prohibit activities that may disturb, degrade, or alter the marine environment, establish open and closed seasons, designate areas in which all or any one or more of certain species of fish or marine life may not be taken, prescribe and limit the methods of fishing, including the type and mesh and other description of nets, traps, and appliances, and otherwise regulate the fishing and taking of marine life either generally throughout the State or in specified districts or areas. The rules shall upon taking effect supersede any state laws inconsistent therewith. [L 1955, c 192, §6; RL 1955, §21-135; am L Sp 1959 2d, c 1, §22; am L 1961, c 132, §2; HRS §190-3; am L 1981, c 16, §2]

Haw. Rev. Stat. § 190-4 : Hawaii Statutes - Section 190-4: Permits.

The department of land and natural resources may, in any conservation district, prohibit the taking of marine life or the engaging in activities prohibited by this chapter and rules adopted thereunder, except by permit issued by it for scientific, education, or other public purposes on

such terms and conditions deemed necessary to minimize any adverse effect within the conservation district. The department may revoke any permit for any infraction of the terms and conditions of the permit. Any person whose permit has been revoked shall not be eligible to apply for another permit until the expiration of one year from the date of revocation. [L 1955, c 192, §7; RL 1955, §21-136; am L Sp 1959 2d, c 1, §22; am L 1961, c 132, §2; HRS §190-4; am L 1981, c 16, §3]

Haw. Rev. Stat. § 190-4.5 : Hawaii Statutes - Section 190-4.5: Anchoring, boating, and mooring in marine life conservation districts; rules.

(a) The department shall, pursuant to chapter 91, adopt rules for the regulation of anchoring and mooring in each marine life conservation district established under this chapter.
(b) Within its jurisdiction over ocean recreational boating and coastal activities, the department shall adopt rules pursuant to chapter 91 for the regulation of boating in each marine life conservation district established under this chapter. [L 1988, c 381, §1; am L 1991, c 183, §1]

Haw. Rev. Stat. § 190-5 : Hawaii Statutes - Section 190-5: Penalty.

(a) Any person violating this chapter, any rule adopted pursuant thereto, or the terms and conditions of any permit issued under section 190-4, shall be guilty of a petty misdemeanor and punished as provided in subsections (b) and (c).
(b) The punishment, in addition to any other penalties, shall be a fine of not less than:

(1) $250 for a first offense;

(2) $500 for a second offense; and

(3) $1,000 for a third or subsequent offense.

(c) The fines specified in this section shall not be suspended or waived. [L 1955, c 192, §8; RL 1955, §21-137; HRS §190-5; am L 1981, c 16, §4; am L 1999, c 195, §9]

General administrative penalties, see §187A-12.5.

APPENDIX B

POLICY FOR COMMERCIAL ACTIVITIES ON STATE OWNED AND MANAGED LANDS AND WATERS DEPARTMENT OF LAND AND NATURAL RESOURCES

Policy for Commercial Activities on State Owned and Managed Lands and Waters Department of Land and Natural Resources

RECOMMENDATIONS APPROVED ON 1/30/98:

1) The Board accepted the final report of *Findings and Recommendations* from the Department's Commercial Use Task Force, and acknowledged the fine work of the Task Force in establishing the basis for the Department's commercial use policies.

2) The Board adopted the following commercial activity policies and directed the Department to develop appropriate standards and processing mechanisms to implement these policies as needed with the following caveats:

- This should be done in a timely but transparent manner to assure that all affected constituencies are aware and participate where appropriate;
- It should not unreasonably affect outstanding permits, licenses, and existing memoranda of understanding;
- The diversity of resources managed by the Department will require different implementation approaches;
- The current funding constraints will delay some actions needed for full implementation of these policies; and
- All relevant commercial activity proposals brought forward for Board approval will have considered these commercial activity policies.

POLICY # 1:

The Department, when considering commercial activity proposals or management actions on state owned lands and waters, will use the following hierarchy of priorities:

a. The Natural or Cultural Resource - The highest priority should go to the conservation of the resource. Only if an activity can be done in a way that does not **unduly damage** the resource, should it be allowed.

b. The General Public - If use or activity by the public can be done without undue damage to the resource, it should be the next priority.

c. Commercial Activities - Commercial activities should be considered only if their impacts do not impinge on the resource, #a above, or use by the general public, #b, above.

If public and commercial activities are occurring, and resource impacts indicate that restrictions or controls need to be imposed, these should first be levied on commercial operators. The general public is the last group to have restrictions and controls imposed on them.

POLICY # 2:

The principles of *Limits of Acceptable Change* should be used to monitor and manage intensities of use.

POLICY #3:

Any new permits for commercial activity should have explicit conditions to allow DLNR ability to change levels or terminate certain activities based upon stated limits of acceptable change. This will insure that managing agencies have timely opportunities to remedy any problems that occur as a result of that permit.

POLICY #4:

The ***Managing Agency*** has the lead responsibility to coordinate an applicant's activity application. The Managing Agency is responsible to inform other appropriate agencies and solicit comments much in the way present CDUA applications are handled by the Lands Division. Any environmental documentation (e.g. environmental impact statements and/or assessments) needed to process any commercial activity will be the responsibility of the applicant.

POLICY #5:

The ***Managing Agency*** can issue activity permits for routine activities and not for profit organizations without Board approval. Memoranda of understanding can be established for not for profit organizations to cover a range of activities. Very significant activities and/or those requesting multiple years should go to the Board for approval.

POLICY #6:

Reasonable fees for commercial users should be assessed based either on a percentage of gross revenues, per user, or expected impacts of their activity. While any group conducting an activity should be encouraged to also perform work that improves the resource, or mitigates their presence, there should be no guaranteed waiver of all fees for service of this kind. Not for profit groups that charge fees only to cover administrative costs can be exempted from fees.

POLICY #7:

The Department will compile a list of eligible sites for commercial activity. The list will also note the intensity of commercial activity that will be permitted. The list will be periodically reviewed and updated.

Definitions:

Activity - A pursuit that does not involve the changing or alteration of land or water areas, or existing structures on those land or water areas. In general, activities are those things that take place on the resources in a passive way, do not involve any resource extraction, or do not require the imposition of change on the resource.

Commercial Activity - The collection by a party or their agent of any fee, charge, or other compensation shall make the activity commercial except when such fee, charge, or other compensation is for the sale of literature allowed under Chapter 13-7-7, HAR. Nonprofit status of any group or organization under Internal Revenue or Postal Laws or regulations does not in itself determine whether an event or activity arranged or managed by such a group or organization is noncommercial. Not for profit groups that charge only a nominal fee for administrative costs that utilize a public facility or resource at a frequency and/or magnitude that does not significantly contribute to the degradation of the facility and/or resource will be considered non-commercial.

Ecotourism - Travel to Hawaii's natural, cultural and historic attractions to experience and study Hawaii's unique environment, heritage and culture in a manner which is ecologically responsible and sustainable, and sustains the wellbeing of local communities.

Limits of Acceptable Change - A concept of assessing impacts to the resource. Under this concept, descriptors are established indicating what level of change or impact is tolerable, or what level it takes to trigger some kind of remedial action. If a resource is unduly impacted, restrictions are imposed, regardless of the number of users.

Managing Agency - The Managing Agency is that lead Division or office that has jurisdictional responsibility for the urea being considered for an activity. If a proposed activity takes place on more than one jurisdiction, the division or office having the greatest area of resource will be considered as the Managing Agency.

Undue Damage or Impact - Includes excessive damage, or those impacts which cannot be economically remedied, given a managing agency's resources.

Use - If a proposed action will involve a change or construction, this is considered a use.

APPENDIX C

HAWAIʻI ADMINISTRATIVE RULES TITLE 13, CHAPTER 31

HAWAII ADMINISTRATIVE RULES

TITLE 13

DEPARTMENT OF LAND AND NATURAL RESOURCES

SUBTITLE 4 FISHERIES

PART 1 MARINE LIFE CONSERVATION DISTRICTS

CHAPTER 31

MOLOKINI SHOAL MARINE LIFE CONSERVATlON DISTRICT, MAUI

§13-31-1 Definitions
§13-31-2 Boundaries
§13-31-3 Prohibited activities
§13-31-4 Allowed activities
§13-31-5 Exceptions; permits
§13-31-6 Penalty

Historical note: Chapter 31 of title 13 is based substantially upon regulation 42 of the division of fish and game, department of land and natural resources, State of Hawaii. [Eff. 7/8/77; R May 26, 1981]

§13-31-1 Definitions. As used in this chapter unless otherwise provided:

"Trolling means trailing a line attached to either a baited hook or artificial lure from a boat moving faster than slow-no-wake speed;

"Slow-no-wake" means as slow as possible without losing steerage way and so as to make the least possible wake. This would almost always mean speeds of less than five miles per hour;

"Demonstrate" as is used in section 13-31-5(3) means proof such as in any combination of documents including but not limited to copies of commercial licenses, excise tax reports, brochures, affidavits, etc. The burden of proof lies with the applicant.

"Active commercial vessel operation" as used in section 13-31-5(3) means use no less than two times every quarter over four quarters (12 months) and greater than eight times per year [Eff and comp SEP 16 1995) (Auth: HRS §l90-3) (Imp: §§190-3, 190-4.5)

§13-31-2 Boundaries. The Molokini shoal marine life conservation district shall include subzones A and B of that portion of the submerged lands and overlying waters surrounding Molokini islet, county of Maui, as follows:

(1) Subzone A is defined as that portion of submerged lands and overlying waters within the crater, beginning at a point at the highwater mark of Lalilali Point, then along the highwater mark of the northorn shoreline eastward until Pahee O Lono Point, then west along a straight line to the end of the submerged ridge (shoal) extending from Lalilali Point, then along the top of the shoal back to the point of beginning; and

(2) Subzone 3 is defined as that portion of submerged lands and overlying waters outside the crater, encircling the islet out to 100 yards, seaward of the point of beginning at the highwater mark of Lalilali Point then eastward along the highwater mark of the southern shoreline of the islet to Pahee O Lono Point, then west along a straight line from Pahee O Lono Point to the end of the shoal extending from Lalilali Point, then along the top of the shoal back to the point of beginning.

Subzone areas A and B are illustrated in "Map of Molokini Shoal Marine Life Conservation District, Maui 1/18/1981" attached at the end of this chapter. [Eff: 5/26/1981; am, ren, and comp SEP 16 1995] (Auth: HRS §190-3) (Imp: HRS §§190-1, 190-2, 190-3)

§13-31-3 Prohibited activities. No person shall engage in the following activities in the Molokini shoal marine life conservation district:

(1) Fish for, catch, take, injure, kill, possess, or remove any finfish, crustacean, mollusk including sea shell and opihi, live coral, algae or limu, or other marine life, or eggs thereof except as provided for in section 13-31-4(1);

(2) Have or possess in the water, any spear, trap net, crowbar, or any other device that may be used for the taking or altering of marine life, geological feature, or specimen;

(3) Take, alter, deface, destroy, possess, or remove any sand coral, rock, or other geological feature, or specimen;

(4) Feed or deliberately introduce any food material, substance, or attractant, directly to or in the vicinity of any aquatic organism, by any means for any purpose except as provided in section 13-31-4(1);
(5) Moor boats for commercial activities except as provided for in section 13-31-5; or
(6) Anchor a boat when a day use mooring system and management plan is established by this department. [Eff: 5/26/1961; am, ren, and comp SEP 16 1995] (Auth: §§190-3, 190-4.5) (Imp HRS §§190-1, 190-3, 190-4.5)

§13-31-4 Allowed activities. A person may
(1) Fish for, catch, take, possess, or remove any finfish by trolling in subzone B only;
(2) Possess in the water, any knife and any shark billy, bang stick, powerhead, or carbon dioxide (C02) injector for the sole purpose of personal safety. [EFf 5/26/1981; am, ren, and comp SEP 16 1995] (Auth: HRS §§190-3, 190-4.5) (Imp: HRS §§190-1, 190-3, 190-4.5)

§13-31-5 Exceptions; permits. The department may issue permits to engage in activities otherwise prohibited by law and section 13-31-3, under such terms and conditions it deems necessary to carry out the purpose of chapter 190, Hawaii Revised Statutes:
(1) To take for scientific, propagation, or other purposes in conformance with chapter 190 and section 187A-6, Hawaii Revised Statutes, any form of marine life or eggs thereof otherwise prohibited by law;
(2) Except as provided in chapter 13-257, subchapter 4, to engage in commercial activity, excluding the taking of marine life, with a marine life conservation district use permit. Each boat shall be required to obtain a separate permit. An applicant for this permit shall pay a non-refundable permit fee of $50 valid for a two-year duration. Prior to its expiration, the permittee may apply for reissuance. Unless the permit is reissued, it shall automatically expire on the expiration date. The permittee shall indemnify, defend, and hold harmless the State of Hawaii, its successors, assigns, officers, employees, contractors, and agents from and against any

loss, liability, claim or demand for property damage, personal injury and death arising from any act or omission related to this permit;

(3) An application for this permit shall be accepted only from a commercial operator who can demonstrate active commercial vessel operation within the Molokini shoal marine life conservation district within the twelve-month period immediately prior to the effective date of these rules, and possesses a commercial vessel use permit for the use of state boating facilities issued in accordance with section 13-231-57, or a commercial vessel registration issued in accordance with section 13-256-4. No application for a permit shall be accepted after ninety days of the effective date of these rules;

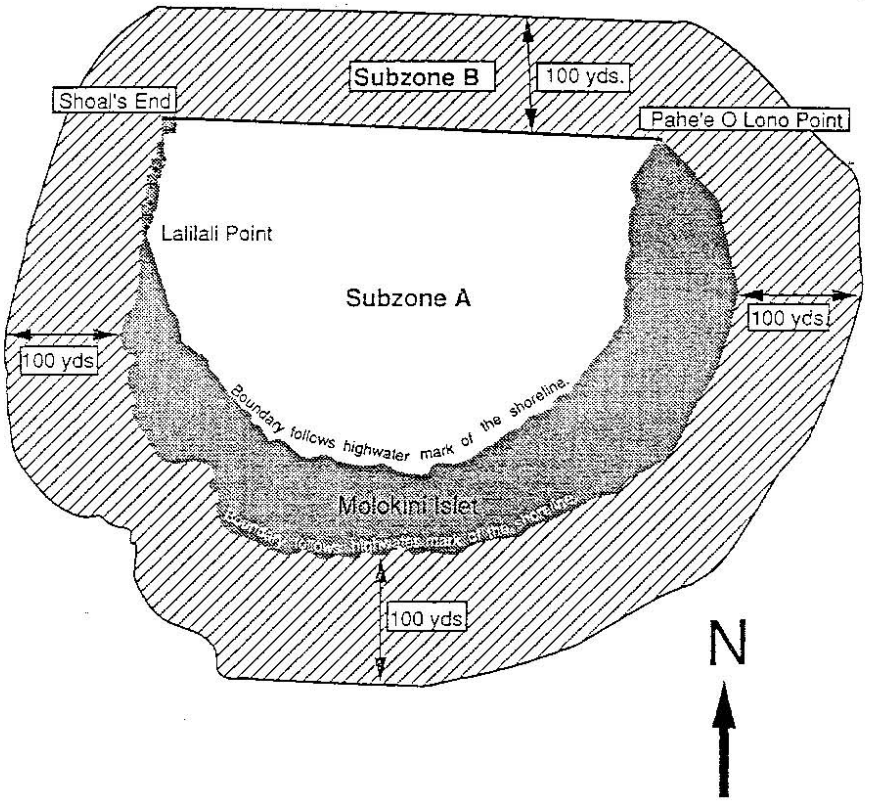
(4) The permit shall be incorporated as an addendum to the commercial vessel use permit for the use of state boatinq facilities issued in accordance with section 13-231-57, or a commercial vessel registration issued in accordance with section 13-256-4;

(5) The permit shall be non-transferrable, except as providad by section 13-231-62; and

(6) The board may revoke any permit for any infraction of the terms and conditions of the permit, and a person whose permit is revoked shall not be eligible to renew a permit until the expiration of one year from the date of revocation. [Eff: 5/26/1981; am 3/2/1987; am, ren, and comp SEP 16 1995] (Auth: §§187A-6, 190-3, 190-4.5) (Imp: HRS §§187A-6, 190-4)

§13-31-6 Penalty. A person violating the provisions of this chapter or the terms and conditions of any permit issued as provided by this chapter, shall be punished as provided by law. [Eff: 5/26/1981; am, ren, and comp SEP 16 1995] (Auth: HRS §§190-3, 190-4.5) (Imp: HRS §190-5)

Map of Molokini Shoal Marine Life Conservation District, Maui 1-18-94



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APPENDIX D

DAY USE MOORING RULES

(HAR SECTION 13, CHAPTER 257)

Subchapter 4, Day Use Mooring Area, Molokini Shoal Marine Life Conservation District

§13-257-51 Molokini island day use mooring area. The boundary of the Molokini island day use mooring area is contiguous with the boundary of Subzone A of the Molokini shoal marine life conservation district, as described in section 13-31-2, and as shown on Exhibit "DM-10", dated March 3, 1994, located at the end of this subchapter and described as follows:

Beginning at a point at the high water mark at Pahe'e 0 Lono Point; then in a straight line to the end of the shoal at the northwest point of Molokini island; then in a counter-clockwise direction along the shoreline of Molokini island to the point of beginning. [Eff SEP 16 1995) (Auth: HRS §§200-2, 200-3, 200-4, 200-10) (Imp: HRS §200-10)

S13-257-52 Commercial use restrictions. (a) No vessel shall use a day use mooring for commercial purposes unless the owner has been issued a marine life conservation district use permit by the department pursuant to section 13-31-5, as evidenced by its inclusion as an addendum to a commercial vessel use permit for the use of state boating facilities issued in accordance with section 13-231-57, or a commercial vessel registration issued in accordance with section 13-256-4 for that vessel.

(b) Mooring zone "A" is designated for use by commercial vessels carrying twelve or more passengers. Mooring zone "B" is designated for use by commercial vessels carrying less than twelve passengers. The use of any one particular mooring shall be on a first-come, first-served basis. Mooring zones "A" and "B" as shown on exhibit "DM-10" located at the end of this subchapter are generalized locations intended to reflect current mooring practices and are subject to revision, pending development of a final mooring plan prior to installation of permanent moorings.

(c) The department may authorize the owner of a commercial vessel not having a marine life conservation district use permit occasional or infrequent use of the day use moorings, not to exceed eight times a year, when application is made and approved not less than seven days in advance of the date of intended use. [Eff SEP 16 1995) (Auth: HRS §§200-2, 200-3, 200-4, 200-10) (Imp: HRS §200-10)

§13-257-53 Commercial day use mooring permit fee. The commercial day use mooring permit fee for a commercial Molokini day use mooring shall be the greater of $100 per month or two per cent of gross receipts, provided that this fee shall be waived for commercial operators who are presently paying commercial vessel user fees for the use of state boating facilities in accordance with section 13-234-5. This fee shall be in addition to the commercial use permit fee required under section 13-31-5. [Eff SEP 16 1995] (Auth: HRS §§200-2, 200-3, 200-4, 200-10) (Imp: HRS §200-10)

§13-257-54 Recreational vessel use of Molkini day use moorings. Mooring zone "C" is designated for primary use by recreational vessels, and is shown on exhibit "DM-10" located at the end of this subchapter. Recreational vessels may also use vacant moorings located in zones "A" and "B" except during the period from 8:30 a.m. to 11:30 a.m. [Eff SEP 16 1995] (Auth: HRS §§200-2, 200-3, 200-4, 200-10) (Imp: HRS §200-10)

§13-257-55 Speed Restrictions. No vessel shall operate at a speed in excess of "slow-no wake" within the Subzone A, as defined in section 13-257-51 and shown on exhibit "DM-10". [Eff SEP 16 1995] (Auth: HRS §§200-2, 200-3, 200-4, 200-10) (Imp: HRS §200-10)

§13-257-56 Anchoring restrictions. (a) Anchoring is prohibited within the Molokini island day use mooring area, provided that anchoring is permitted within the designated area at locations of sand, rock, or rubble bottom types where no live corals exist until such time as new day use moorings are installed.

(b) Anchoring is prohibited within Subzone B of the Molokini shoal marine life conservation district. [Eff SEP 19 1995] (Auth: HRS §§200-2, 200-3, 200-4, 200-10) (Imp: HRS §200-10)

§13-257-57 to §13-257-60 (Reserved)

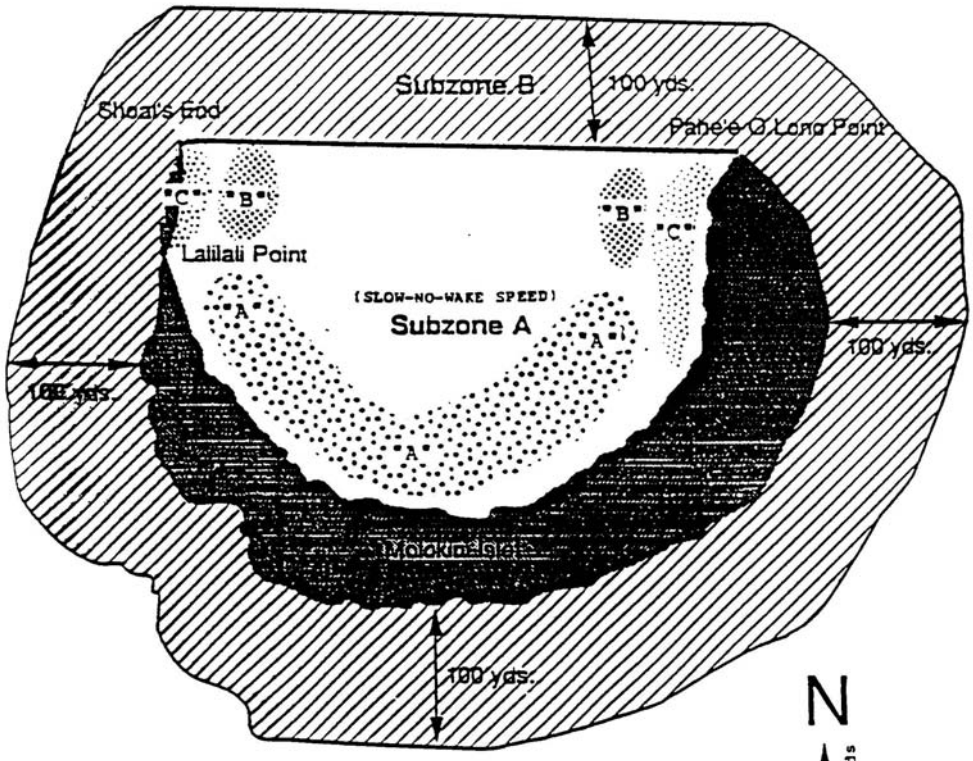
STATE OF HAWAII
MOLOKINI ISLAND DAY USE MOORING AREA
being a portion of the
MOLOKINI SHOAL MARINE LIFE CONSERVATION DISTRICT
EXHIBIT "DM-10"
DECEMBER 16, 1994

ALL DAY USE MOORINGS ON A "FIRST-COME, FIRST-SERVED BASIS".

1. Zone "A" is designated for use by commercial vessels carrying twelve or more passengers.

2. Zone "B" is designated for use by commercial vessels carrying less than twelve passengers.

3. Zone "C" is designated for primary use by recreational vessels. Recreational vessels may also use vacant moorings located in Zone "A" and "B", except from 8:30am to 11:30am.



Note: Exact locations of moorings will be determined at time of permanent installation.

APPENDIX E

MOLOKINI SHOAL MLCD COMMERCIAL USE PERMITS

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

MARINE LIFE CONSERVATION DISTRICT USE PERMIT FOR: COMMERCIAL ACTIVITIES IN THE MOLOKINI SHOAL MARINE LIFE CONSERVATION DISTRICT

Under the authority of Title 13, Chapter 31, Section 5, Hawaii Administrative Rules (HAR), and all other applicable laws, the Board of Land and Natural Resources hereby grants a Marine Life Conservation District Use Permit to:

APPLICANT NAME _____

BUSINESS NAME _____

MAILING ADDRESS _____

PHONE NO. _____

PROPOSED ACTIVITIES:

_____

VESSEL NAME, AND HA. NO. OR VESSEL DOCUMENT NO.

_____

VESSEL LENGTH:_____VESSEL TYPE:_____ PASSENGER CAPACITY:_____

(U.S. Coast Guard Passenger Certification attached? ☐)

This permit allows only snorkel, SCUBA and surface-supplied air diving, swim, and sight-see commercial activities, within the Molokini Shoal Marine Life Conservation District (MLCD) in furtherance of the purpose of Chapter 190, Hawaii Revised Statutes (HRS), under the terms and conditions listed below:

1. The permittee shall comply with all applicable provisions of the Department of Land and Natural Resources (Department) HAR, Chapter 13-31, and other applicable laws not exempted by this permit.

2. This permit does not authorize the primary permittee or any designated assistant to engage in any other activity that violates any other State, Federal or County law, regulation or ordinance.

3. Under the authority of HRS Chapter 190 and all other applicable laws, the permittee may be liable for damages to natural resources caused by the permittee in the Molokini Shoal MLCD.

4. Under the authority of HRS Chapter 190 and all other applicable laws, the permittee may be held liable for the actions of all persons entering Molokini Shoal MLCD under the authority of this permit.

5. Discretion shall be used to avoid conflict with divers, swimmers, recreational and commercial vessel operators, and others while conducting commercial activities.

6. The vessel covered by this permit shall be equipped with both a continuously recording Global Positioning System (GPS) plotting unit and a depth recorder. The GPS unit must be installed no later than May 15, 2010. The depth recorder unit must be installed no later than July 15, 2011. Once installed, both the GPS plotting unit and depth recorder must be turned on and GPS track data must be recorded at all times while the vessel is within the Molokini Shoal MLCD.

7. Should the vessel covered under this permit impact any submerged land or natural resource within the Molokini MLCD, the vessel operator shall immediately record the location of impact. The permittee shall notify the Division of Aquatic Resources Maui office (243-5294, or 294-4280 after hours) and the Division of Conservation and Resource Enforcement (873-3990) immediately after any such impact, and provide the number of this permit and the GPS coordinates of the impact site (phone or voice mail messages are acceptable notification). Any recorded GPS track data must be preserved for Department inspection, and shall not be cleared without Department authorization. Notification received pursuant to this paragraph or information obtained by the exploitation of such notification shall not be used against the informant in any criminal case, except in a prosecution for perjury, for giving a false statement, or for failing to comply with the requirements of this condition.

8. The permittee shall notify the Division of Aquatic Resources Maui office (243-5294, or 294-4280 after hours) and the Division of Conservation and Resource Enforcement (873-3990) prior to conducting any salvage activity within the Molokini Shoal MLCD, except that salvage and vessel rescue operations may be commenced immediately prior to notification if necessary to protect the safety of human lives or natural resources. The permittee may be held liable for damages to natural resources resulting from salvage activities.

9. It is prohibited to conduct any vessel repairs within the Molokini Shoal MLCD, except to the extent necessary to protect the immediate safety of human lives or natural resources within the MLCD. A permittee or agent of the permittee found conducting vessel repairs or maintenance (including, but not limited to, vessel or hull cleaning, engine maintenance, fixture repair, etc.) must demonstrate that such conduct was necessary to protect the safety of human lives or natural resources within the MLCD. The permittee may be held liable for damages to natural resources from repair or maintenance activities.

10. The following conditions apply to the commercial activities authorized by this permit for the Molokini Shoal MLCD:

    a. Non-certified SCUBA diving which is not part of a SCUBA certification course is not allowed within the Molokini Shoal MLCD.

    b. SCUBA diving conducted as part of a Basic Open Water SCUBA certification course requires at least one certified SCUBA instructor for every three student divers, Certified divers, not including the SCUBA instructor and any certified dive master assistant, will be considered student divers when joining a Basic Open Water certification dive group.

    c. Certified SCUBA diving where all divers are Basic Open Water certified shall be conducted with at least one certified dive master for every seven certified divers.

    d. Surface-supplied air diving shall be conducted using air lines no longer than ten feet and in waters no less than twenty feet deep, and shall be conducted only outside of the boundaries indicated on Attachment A ("Prohibited Areas for Surface-Supplied Air Diving"). Surface-supplied air diving is not considered SCUBA diving and is not subject to the instructor-to-diver ratio provisions of this condition.

11. In addition to the activities prohibited in HAR Chapter 13-31, the following activities shall be prohibited within the Molokini Shoal MLCD: active barbecuing; and any activity that may result in

the discharge of water pollutants or waste, including, but not limited to, the cleaning of snorkel and dive gear. "Water pollutants" include dredged spoil, solid refuse, incinerator residue, sewage, garbage, sludge, munitions, chemical waste, biological materials, radioactive materials, excessive heat, wrecked or discarded equipment, rock, sand, soil, sediment, cellar dirt and industrial, municipal, and agricultural waste. "Waste" includes sewage, industrial and agricultural matter, and all other liquid, gaseous, or solid substance, including radioactive substances, whether treated or not, which may pollute or tend to pollute the waters of this state.

12. It is prohibited to possess any fishing gear in subzone A, except for trolling gear either stowed out of sight, or stowed without any terminal tackle attached to any fishing line. Every crewmember on vessels engaged in fishing activities must have a valid Commercial Marine License, as required by HAR Section 13-74-20 and HRS Section 189-2. It is prohibited to possess any fish food or material used for the purpose of fish feeding while conducting commercial activities within the Molokini Shoal MLCD.

13. The permittee must ensure that all crewmembers entering the Molokini Shoal MLCD under the authority of this permit have been fully informed of the permit terms and conditions prior to entry into the Molokini Shoal MLCD. Prior to each commercial trip to the MLCD, **the permittee must ensure that all passengers have been fully informed of the rules, prohibited activities and other instructions contained in Attachment B ("Pre-Trip Passenger Briefing and Acknowledgement"). The permittee shall obtain the signature of each passenger acknowledging their receipt of the information on Attachment B, and shall allow inspections of the signed copies of Attachment B at the Department's request.**

14. The permittee shall provide to the Division of Aquatic Resources a monthly report of the number of commercial trips taken each day to the Molokini Shoal MLCD, and the number of passengers taken each day. This report shall be made using copies of Attachment C ("Mandatory Molokini Use Log") available at www.hawaii.gov/dlnr/dar, and must be a true and correct statement of such information. The report shall be due to the Division of Aquatic Resources on or before the twentieth day of the following month in which the trips were taken. Passenger count information, if it is confidential business information whose release would cause substantive competitive harm, is exempt from disclosure under the State Uniform Information Practices Act.

15. This permit shall be in effect for a two year period, from 12/15/09 to 12/14/11 for the activities as specified.

16. This permit shall be valid for use with a vessel with a certified passenger capacity of no more than _____ passengers. The permittee must provide to the Division of Aquatic Resources a copy of the Coast Guard certification on passenger capacity for any vessel covered under this permit.

17. Only Designated Vessel Captains may operate any vessel covered under this permit, including emergency and permanent transfers. Designated Vessel Captains must certify below that they have at least five trips' worth of prior experience at the Molokini Shoal MLCD. Every such trip must have been taken aboard the vessel covered under this permit, or aboard a vessel of similar size, propulsion, and passenger capacity.

18. This permit shall be non-transferable, except as provided by HAR Section 13-231-62.

19. The permittee shall notify the Division of Aquatic Resources Maui office (243-5294, or 294-4280 after hours) of any emergency, temporary transfer of this permit to another vessel within twenty-four hours of the transfer (voice messages are acceptable notification). Within seventy-two hours of the transfer, the permittee shall also submit via fax (243-5833) a completed copy of Attachment

D ("Vessel Transfer or Change Form"). If approved, a temporary transfer shall be valid for no more than one month. Vessels covered under a temporary transfer may carry no more passengers per trip to Molokini than the Coast Guard passenger capacity certification of the original vessel. The permittee shall submit via fax an additional Vessel Transfer or Change Form within seventy-two hours after the resumed use of the original vessel under this permit.

20. The permittee shall obtain approval from the Division of Aquatic Resources prior to any permanent transfer of vessel operated under this permit. Any approved new vessel shall have a certified passenger capacity of no more than the capacity stated on this permit. The permittee shall submit a completed copy of Attachment D ("Vessel Transfer or Change Form") thirty days prior to the expected permanent transfer, to allow sufficient time for review and processing.

21. As of March 15, 2010, any vessel covered under this permit, including emergency or permanent transfers, must display a double-sided white marine boat flag with the permit number prominently labeled in black lettering on both sides. The marine flag shall be no smaller than twelve inches by eighteen inches and lettering must be at least five inches tall. The marine flag must be prominently displayed at all times while within the Molokini Shoal MLCD.

22. The permittee shall notify the Division of Aquatic Resources Maui office (243-5294) of any change to the Molokini Shoal Marine Life Conservation District Use Permit, contact information, or Designated Vessel Captain. Notice shall be given within seven days of any such change by submitting a completed copy of Attachment D ("Vessel Transfer or Change Form").

23. Unless the permit is reissued, it shall automatically expire on the expiration date. In order to be considered for reissuance, this permit must be received by the Division of Aquatic Resources Maui Office, 130 Mahalani St., Wailuku, HI 96793, prior to its expiration.

24. The permittee must comply with all other Department requirements for commercial vessels, including a commercial vessel use permit for the use of state boating facilities issued in accordance with HAR section 13-231-57, or a commercial vessel registration issued in accordance with HAR section 13-256-4.

25. The permittee shall fully cooperate with any Department official, employee, authorized agent, or contractor's request relating to the conservation, protection, management, or study of the MLCD and its resources.

26. Permit terms and conditions shall be treated as severable from all other terms and conditions contained in this or any other ancillary permit. In the event that any provision of this permit or other ancillary permit is found or declared to be invalid or unenforceable, such invalidity or unenforceability shall not affect the validity or enforceability of the remaining terms or conditions of this permit.

27. The Board of Land and Natural Resources may revoke or suspend any permit for any infraction of the terms and conditions of this permit. A person whose permit is revoked shall not be eligible to renew a permit until the expiration of one year from the date of revocation.

28. This permit shall not be reissued if the permittee is not in compliance with the terms and conditions of this permit or any other permit issued to the permittee by the Department of Land and Natural Resources.

29. This permit does not in any way make the Board of Land and Natural Resources of the State of Hawaii or its employees liable for any claims of personal injury or property damage which may

occur while the permittees are engaged in activities authorized under this permit; further, the permittees agree to hold the State harmless against any claims of personal injury, death, property damage, or business loss resulting from their activities.

I certify that I understand the conditions of this Permit and the Penalty of Chapter 13-31, Hawaii Administrative Rules, which is attached hereto for reference. If I am signing as a Designated Vessel Captain, I additionally certify that I have at least five trips of prior experience to Molokini Shoal MLCD aboard the vessel covered under this permit, or aboard a vessel of similar size, propulsion, and passenger capacity.

APPLICANT:

Signature:

Print:

DESIGNATED VESSEL CAPTAIN(S):

Signature:

Print:

Signature:

Print:

Signature:

Print:

Signature:

Print:

APPROVED:

Laura H. Thielen, Chairperson
Board of Land and Natural Resources

cc: DOCARE
DOBOR
DAR-Maui
USFWS
USCG-Maui

APPENDIX F

MOLOKINI SHOAL MLCD COMMERCIAL USE

PERMIT HOLDERS

MOLOKINI SHOAL MLCD COMMERCIAL PERMIT HOLDERS

Permit #	Business Name	Vessel Name	Vessel Type	Vessel Length	PAX
1	3090, Inc.	Alii Nui	Catamaran	54	?
2	Aquatic Charters of Maui, Inc.	Xian	Mono	26	6
3	Catamaran Express, Inc.	Ocean Voyager	Mono	?	?
4	Challenger Waterskiing Kihei,	Cloud IX	Mono	27	24
5	Clark Enterprises, Inc.	Paragon II	Catamaran	47	49
6	De Rensis Associates, Inc.	Kanaloa	Mono	30	24
7	De Rensis Associates, Inc.	Pineapple	Mono	30	24
8	Dive Shop Water Sports, Inc.	Seafire II	Mono	28	22
9	Excellence Charters, Inc.	Aqua Adventure	Mono	50	49
10	Hawaiian Charters, Inc	Hokua	Catamaran	40	?
11	Idle Wild Charters	Frogman II	Catamaran	?	?
12	Kahikolu, Ltd.	Quicksilver	Catamaran	55	149
13	Kihei Boat Co., Inc.	Sea Spirit	Mono	36	15
14	Kihei Ramp #6 Corp.	Ala Kai II	Mono	32	24
15	Kihei SCUBA Services, Inc.	Seadiver II	Mono	est. 33	14
16	Lahaina Divers	Dominion	Mono	46	49
17	Lahaina Divers	Dauntless	Mono	50	48
18	Leilani Corporation	Ocean Odyssey	Catamaran	65	149
19	Lin Wa Cruises, Inc.	Island Princess	Mono	65	149
20	Maalaea Sportfishing, Inc.	Leilani	Mono	50	49
21	Maalaaea Kai Enterprises	Lani Kai	Catamaran	52.5	72
22	Maka Kai Charters, Inc.	Trilogy II	Catamaran	?	?
23	Maka Kai Charters, Inc.	Ocean Intrigue	Catamaran	65?	137?
24	Makena Boat Partners	Kai Kanani II	Catamaran	46	45?
25	Makena Coast Charters, Inc.	Makena Mele	Mono	35	6
26	Marine Charters, Inc.	Pride of Maui	Catamaran	65	149
27	Maui Classic Charters	Four Winds II	Catamaran	55	49
28	Maui Classic Charters	Maui Magic	Catamaran	54	70
29	Maui Diamond Sea Sports	Maui Diamond II	Mono	38	24
30	Maui Snorkel Charters, Inc.	Kai ‘Anela	Mono	32	24
31	Maui-Molokai Sea Cruises, Inc.	Prince Kuhio	Mono	92	149
32	Mike Severns Diving	Pilikai	Mono	32	13
33	Molokini Divers, Inc.	Whats the Scoop	Mono	33	20
34	No Ka Oi IV Charters, Inc.	Maka Koa	Mono	48	42
35	Sea Sport Cruises, Inc.	Ocean Spirit	Catamaran	65	149
36	Seabird Cruises	Maui Nui Explorer	Mono	39	25
37	Southshore Charters, Inc.	Mahana Nai’a	Catamaran	59	68
38	Sundance Scuba Charters, Inc.	Sundance II	Mono	23	6
39	Underwater Habitat, Inc.	Pro Diver	Mono	34	16
40	Watersport Charters, Inc.	Kilikina	Mono	32.5	19
41	Yuki Gutsu Seafoods, Inc.	Trilogy V	Catamaran	55	65

APPENDIX G

STANDARDIZED OBSERVATION CHECKLIST

FIELD RESEARCH DATA INFORMATION

Researcher Name _____

Day of Week & Date _____

Harbor _____

Company Name & Boat Name _____

Departure Time (From Harbor) _____

Arrival Time (At Harbor) _____

Number of People on Boat

- Number of Snorkelers _____
- Number of Divers _____
- Number of Snuba _____
- Number Not Doing These Activities _____
- Total Number on Boat _____

Molokini

- Number of Boats at Molokini _____
- Number of People Visible in Water at Molokini _____
- Total Number of People at Molokini _____

Secondary Site Name: _____

- Number of Boats at Secondary Site _____
- Number of People Visible in Water at Secondary Site _____
- Total Number of People at Secondary Size _____

Facilities / Behavior			Information / Education		
On Board Toilets	Yes ❒	No ❒	About Nature	Yes ❒	No ❒
Waste Dumping Overboard	Yes ❒	No ❒	About Underwater Species	Yes ❒	No ❒
Fish Feeding	Yes ❒	No ❒	About Coral Reefs	Yes ❒	No ❒
Meals Offered	Yes ❒	No ❒	About History of the Area	Yes ❒	No ❒
Intro Diving / Training	Yes ❒	No ❒	About Native Hawaiian Culture	Yes ❒	No ❒
Snuba	Yes ❒	No ❒	About Proper Etiquette / Behavior	Yes ❒	No ❒
Handle Marine Life (Showing)	Yes ❒	No ❒	About Safety	Yes ❒	No ❒
Barbequing on Boat	Yes ❒	No ❒	About Equipment	Yes ❒	No ❒
Playing Music on Boat	Yes ❒	No ❒	How Humans Impact Environment	Yes ❒	No ❒
Fishing	Yes ❒	No ❒	Touching Marine Life is Bad	Yes ❒	No ❒
			Fish Feeding is Bad	Yes ❒	No ❒
			Suggestions for How to Help	Yes ❒	No ❒

Response Rate (i.e., Completes, Denials)

Acceptance (i.e., Completed Surveys)

- Pre-Trip Survey _____
- Post-Trip Survey _____
- Total _____

Denial (i.e., Refused)

- Pre-Trip Survey _____
- Post-Trip Survey _____
- Total _____

APPENDIX H

SURVEY INSTRUMENTS

APPENDIX I

UNCOLLAPSED PERCENTAGES

Recreationists' Pre-Trip Expectations for Molokini

The University of Hawaii, Oregon State University, and Hawaii Division of Aquatic Resources are conducting this survey early in your trip to Molokini to learn about your expectations for this trip. Your input is important and will assist managers. Participation is voluntary and answers are anonymous. ***Please answer all questions and return to the researcher.***

1. ***Before today***, had you ever been to Molokini before? **(check *ONE*)**
   - ☐ No
   - ☐ Yes → if yes, how many previous trips have you made to Molokini in your life? **(write number)** _____ trip(s)

2. ***INCLUDING YOURSELF***, how many people are accompanying you on this trip to Molokini ***today***? _____ person(s)

3. What is the ***ONE main activity*** that you plan to participate in at Molokini ***today***? **(check *ONE*)**
   - ☐ Snorkeling
   - ☐ Scuba Diving
   - ☐ Snuba
   - ☐ None of these activities → skip to question 10 on next page

4. Is this the first time that you will have ever participated in this one main activity? **(check *ONE*)** ☐ No ☐ Yes

5. How would you rate your skill level in this one main activity? **(check *ONE*)**
   ☐ Beginner ☐ Novice ☐ Intermediate ☐ Advanced ☐ Expert

6. ***Not including Molokini***, how many other places have you participated in this activity? **(write number)** _____ place(s)

7. About how many years in your life have you been participating in this activity? **(write number)** _____ year(s)

8. About how many times have you participated in this activity in the past 12 months? **(write number)** _____ time(s)

9. To what extent do you disagree or agree with each of the following statements related to your involvement in this activity? **(circle one number for *EACH* statement)**

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
If I stopped participating in this activity, an important part of my life would be missing.	1	2	3	4	5
I would rather participate in this activity than do most anything else.	1	2	3	4	5
Participation in this activity is a large part of my life.	1	2	3	4	5
Most recreation activities do not interest me as much as this activity.	1	2	3	4	5
This activity is becoming a more important part of my life each year.	1	2	3	4	5
Given the skills I have developed over the years in this activity, it is important that I continue to participate.	1	2	3	4	5
I feel that I am more skilled in this activity than most other people.	1	2	3	4	5
Testing my skills in this activity is very important to me.	1	2	3	4	5
I am becoming more skilled in this activity each year.	1	2	3	4	5
I try to participate in this activity as often as possible.	1	2	3	4	5
I am spending more time participating in this activity each year.	1	2	3	4	5

10. To what extent do you disagree or agree with each of the following statements about ***ocean conditions you expect*** to experience on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that the …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… ocean water will be clean.	1	2	3	4	5
… underwater visibility will be good.	1	2	3	4	5
… ocean water will be warm.	1	2	3	4	5
… ocean conditions will be calm / smooth.	1	2	3	4	5

11. To what extent do you disagree or agree with each of the following statements about ***what you expect to see*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that I will see …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… beautiful above water scenery.	1	2	3	4	5
… a lot of fish.	1	2	3	4	5
… an interesting variety of different types of fish.	1	2	3	4	5
… very colorful fish.	1	2	3	4	5
… larger marine life (for example: turtles, sharks, dolphins, rays).	1	2	3	4	5
… a lot of coral.	1	2	3	4	5
… an interesting variety of different types of coral.	1	2	3	4	5
… very colorful coral.	1	2	3	4	5
… healthy coral reefs in good condition.	1	2	3	4	5
… unpolluted natural surroundings.	1	2	3	4	5

12. To what extent do you disagree or agree with each of the following statements about ***what you expect your experiences will be*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that I will …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… have fun.	1	2	3	4	5
… get to try new activities.	1	2	3	4	5
… learn or develop skills.	1	2	3	4	5
… get some exercise.	1	2	3	4	5
… be physically challenged.	1	2	3	4	5
… experience adventure or excitement.	1	2	3	4	5
… take risks.	1	2	3	4	5
… get to rest or relax.	1	2	3	4	5
… get away from the everyday demands of life.	1	2	3	4	5
… experience tranquility in the water.	1	2	3	4	5
… escape crowds of people.	1	2	3	4	5
… meet new people.	1	2	3	4	5
… get to spend time with friends / family.	1	2	3	4	5
… feed fish or other marine life.	1	2	3	4	5
… photograph marine life underwater.	1	2	3	4	5

13. To what extent do you disagree or agree with each of the following statements about ***what you expect to learn*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that I will <u>learn</u> …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… about nature.	1	2	3	4	5
… about underwater marine species (for example: fish, larger marine life).	1	2	3	4	5
… about coral reefs.	1	2	3	4	5
… about the history of the area.	1	2	3	4	5
… about native Hawaiian culture.	1	2	3	4	5

14. To what extent do you disagree or agree with each of the following statements about ***how safe you expect to be*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… I will feel safe.	1	2	3	4	5
… I will *not* get injured.	1	2	3	4	5
… I will get scared.	1	2	3	4	5
… I will be comfortable.	1	2	3	4	5
… the staff will take good care of me.	1	2	3	4	5
… the staff will look out for my safety.	1	2	3	4	5
… the staff will provide information about safety.	1	2	3	4	5
… the staff will be knowledgeable about good safety behaviors.	1	2	3	4	5
… the staff will practice good safety behaviors.	1	2	3	4	5

15. To what extent do you disagree or agree with each of the following statements about ***services you expect*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… the trip will be well organized.	1	2	3	4	5
… the equipment will be good.	1	2	3	4	5
… the boat will be good.	1	2	3	4	5
… I will be given good food.	1	2	3	4	5
… the staff will be friendly.	1	2	3	4	5
… the staff will be helpful.	1	2	3	4	5
… the staff will be professional.	1	2	3	4	5
… the staff will provide information about equipment.	1	2	3	4	5
… the staff will provide information about the marine environment.	1	2	3	4	5
… the staff will provide information about native Hawaiian culture.	1	2	3	4	5
… I will be allowed to spend enough time in the water.	1	2	3	4	5
… I will get good value for the money I paid to go to Molokini.	1	2	3	4	5

16. To what extent do you disagree or agree with each of the following statements? **(circle one number for *EACH* statement)**

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Humans should manage coral reef areas so that *only* humans benefit.	1	2	3	4	5
The needs of humans are more important than coral reef areas.	1	2	3	4	5
The primary value of coral reef areas is to provide benefits for humans.	1	2	3	4	5
Recreational use of coral reef areas is more important than protecting the species that live there.	1	2	3	4	5
Coral reef areas exist primarily to be used by humans.	1	2	3	4	5
Coral reef areas should be protected for their own sake rather than to simply meet the needs of humans.	1	2	3	4	5
Coral reef areas should have rights similar to the rights of humans.	1	2	3	4	5
Recreational use of coral reef areas should not be allowed if it damages these areas.	1	2	3	4	5
It is important to take care of coral reef areas for future generations.	1	2	3	4	5
Coral reef areas have value whether humans are present or not.	1	2	3	4	5

17. Listed below are statements about relationships between humans and the environment. To what extent do you disagree or agree with each of the following statements? **(circle one number for *EACH* statement)**

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Humans have the right to modify the natural environment to suit their needs.	1	2	3	4	5
Humans were meant to rule over the rest of nature.	1	2	3	4	5
The so-called "ecological crisis" facing humankind has been greatly exaggerated.	1	2	3	4	5
The balance of nature is strong enough to cope with impacts of modern industrial nations.	1	2	3	4	5
The earth is like a spaceship with very limited room and resources.	1	2	3	4	5
We are approaching the limit of the number of people the earth can support.	1	2	3	4	5
The balance of nature is very delicate and easily upset.	1	2	3	4	5
When humans interfere with nature, it often produces disastrous consequences.	1	2	3	4	5
Plants and animals have as much right as humans to exist.	1	2	3	4	5
Humans are severely abusing the environment.	1	2	3	4	5

18. Are you: **(check *ONE*)** ☐ Male ☐ Female

19. What is your age? **(write age)** _____ years old

Thank you, your input is important! ***<u>Please return this survey to the researcher</u>***.

RESEARCHER COMPLETES THIS SECTION:

Day & Date: _____ Time: _____ Harbor: _____

Boat: _____ # on Boat: _____

Recreationists' Post-Trip Experiences at Molokini

Please Complete this Survey and Return it to the Researcher

Participation is Voluntary and Responses are Anonymous

Thank You for Your Participation

A Study Conducted Cooperatively by:

University of Hawai'i Mānoa

Hawai'i DAR Division of Aquatic Resources

OSU Oregon State University

Now, we are conducting this follow-up survey later in your trip to learn about your experiences and opinions about how Molokini should be managed. Your input is important and will assist managers. ***Please answer <u>all</u> questions and return to the researcher.***

1. What is the ***<u>ONE</u> main activity*** that you participated in at Molokini ***today***? **(check *ONE*)**

   ☐ Snorkeling ☐ Snuba
   ☐ Scuba Diving ☐ None of these activities → skip to question 3 below

2. Which ***<u>ONE</u>*** of the following best describes your involvement in this activity? **(check *ONE*)**

   ☐ This is an enjoyable but infrequent activity that is incidental to my other outdoor interests and I am not highly skilled in this activity.

   ☐ This activity is important to me but is only one of the outdoor activities in which I participate. My participation in this activity is inconsistent and I consider myself to be moderately skilled in this activity.

   ☐ This is my primary outdoor activity, I consider myself to be highly skilled in this activity, and I participate in this activity every available chance I get.

3. Overall, how dissatisfied or satisfied are you with your experience at Molokini today? **(check *ONE*)**

   ☐ Very Dissatisfied ☐ Dissatisfied ☐ Neither ☐ Satisfied ☐ Very Satisfied

4. Is Molokini the best attraction that you have visited in Maui? **(check *ONE*)** ☐ No ☐ Yes

5. How would you rate your visit to Molokini today? **(check *ONE*)**

   ☐ Better than I expected ☐ Exactly what I expected ☐ Worse than I expected

6. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***ocean conditions*** you experienced on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini, the …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… ocean water was clean.	1	2	3	4	5
… underwater visibility was good.	1	2	3	4	5
… ocean water was warm.	1	2	3	4	5
… ocean conditions were calm / smooth.	1	2	3	4	5

7. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***what you saw*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini, I <u>saw</u> …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… beautiful above water scenery.	1	2	3	4	5
… a lot of fish.	1	2	3	4	5
… an interesting variety of different types of fish.	1	2	3	4	5
… very colorful fish.	1	2	3	4	5
… larger marine life (for example: turtles, sharks, dolphins, rays).	1	2	3	4	5
… a lot of coral.	1	2	3	4	5
… an interesting variety of different types of coral.	1	2	3	4	5
… very colorful coral.	1	2	3	4	5
… healthy coral reefs in good condition.	1	2	3	4	5
… unpolluted natural surroundings.	1	2	3	4	5

8. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***your experiences*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini, I …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… had fun.	1	2	3	4	5
… tried new activities.	1	2	3	4	5
… learned or developed skills.	1	2	3	4	5
… got some exercise.	1	2	3	4	5
… was physically challenged.	1	2	3	4	5
… experienced adventure or excitement.	1	2	3	4	5
… took risks.	1	2	3	4	5
… rested or relaxed.	1	2	3	4	5
… got away from the everyday demands of life.	1	2	3	4	5
… experienced tranquility in the water.	1	2	3	4	5
… escaped crowds of people.	1	2	3	4	5
… met new people.	1	2	3	4	5
… spent time with friends / family.	1	2	3	4	5
… fed fish or other marine life.	1	2	3	4	5
… photographed marine life underwater.	1	2	3	4	5

9. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***what you learned*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini, I learned …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… about nature.	1	2	3	4	5
… about underwater marine species (for example: fish, larger marine life).	1	2	3	4	5
… about coral reefs.	1	2	3	4	5
… about the history of the area.	1	2	3	4	5
… about native Hawaiian culture.	1	2	3	4	5
… information that increased my awareness of native Hawaiian culture.	1	2	3	4	5
… information that increased my awareness of the marine environment.	1	2	3	4	5
… information that expanded my world view.	1	2	3	4	5
… about impacts that humans have on the marine environment.	1	2	3	4	5
… about how my daily actions affect the marine environment.	1	2	3	4	5
… that my behaviors can cause problems in the marine environment.	1	2	3	4	5
… that I could harm marine life (fish, coral, turtles) by touching them.	1	2	3	4	5
… that feeding marine life (fish, turtles) could harm them.	1	2	3	4	5
… how I can do more to help the marine environment.	1	2	3	4	5
… that it is my responsibility to help protect the marine environment.	1	2	3	4	5
… how I can contribute (for example: donate, volunteer) to help improve the marine environment.	1	2	3	4	5
… that I should be responsible for helping to teach others about the marine environment.	1	2	3	4	5

10. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***your safety*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… I felt safe.	1	2	3	4	5
… I did *not* get injured.	1	2	3	4	5
… I was scared.	1	2	3	4	5
… I was comfortable.	1	2	3	4	5
… the staff took good care of me.	1	2	3	4	5
… the staff looked out for my safety.	1	2	3	4	5
… the staff provided information about safety.	1	2	3	4	5
… the staff were knowledgeable about good safety behaviors.	1	2	3	4	5
… the staff practiced good safety behaviors.	1	2	3	4	5

11. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***services*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… the trip was well organized.	1	2	3	4	5
… the equipment was good.	1	2	3	4	5
… the boat was good.	1	2	3	4	5
… I was given good food.	1	2	3	4	5
… the staff was friendly.	1	2	3	4	5
… the staff was helpful.	1	2	3	4	5
… the staff was professional.	1	2	3	4	5
… the staff provided information about equipment.	1	2	3	4	5
… the staff provided information about the marine environment.	1	2	3	4	5
… the staff provided information about native Hawaiian culture.	1	2	3	4	5
… I was allowed to spend enough time in the water.	1	2	3	4	5
… I got good value for the money I paid to go to Molokini.	1	2	3	4	5

12. Approximately how many of ***EACH*** of the following did you see at Molokini ***today***? **(write numbers for *EACH* item)**

I saw approximately:
_____ people on this boat
_____ people in the water
_____ people in total at Molokini
_____ boats at Molokini

13. To what extent did you feel crowded by each of the following at Molokini ***today***? **(circle one number for *EACH* item)**

	Not at all Crowded		Slightly Crowded		Moderately Crowded			Extremely Crowded	
Number of people on this boat.	1	2	3	4	5	6	7	8	9
Number of people in the water.	1	2	3	4	5	6	7	8	9
Number of people in total at Molokini.	1	2	3	4	5	6	7	8	9
Number of boats at Molokini.	1	2	3	4	5	6	7	8	9

14. How did the number of people you saw at Molokini today affect your enjoyment? **(check *ONE*)**

☐ Reduced My Enjoyment ☐ Had No Effect on My Enjoyment ☐ Increased My Enjoyment

15. What is the ***MAXIMUM*** number of ***EACH*** of the following that you would accept seeing at any one time at Molokini? **(write numbers for *EACH* item)**

It is OK to see a maximum of:

_____ people on this boat
_____ people in the water
_____ people in total at Molokini
_____ boats at Molokini

16. On this trip or any of your trips to Molokini, how often ***have you seen the following at Molokini***? **(circle a number for *EACH*)**

	Never	Once or Twice	Sometimes	Many Times
Snorkelers being rude or discourteous.	0	1	2	3
Snorkelers being too close.	0	1	2	3
Snorkelers not looking where they are going.	0	1	2	3
Snorkelers bumping into people.	0	1	2	3
Snorkelers chasing or harassing marine life such as fish and turtles.	0	1	2	3
Snorkelers feeding fish.	0	1	2	3
Snorkelers bumping, handling, or standing on coral.	0	1	2	3
Scuba divers being rude or discourteous.	0	1	2	3
Scuba divers being too close.	0	1	2	3
Scuba divers not looking where they are going.	0	1	2	3
Scuba divers bumping into people.	0	1	2	3
Scuba divers chasing or harassing marine life such as fish and turtles.	0	1	2	3
Scuba divers feeding fish.	0	1	2	3
Scuba divers bumping, handling, or standing on coral.	0	1	2	3

17. To what extent do you feel that each of the following is a ***problem at Molokini***? **(circle one number for *EACH statement*)**

	Not a Problem	Slight Problem	Moderate Problem	Extreme Problem
Snorkelers being rude or discourteous.	0	1	2	3
Snorkelers being too close.	0	1	2	3
Snorkelers not looking where they are going.	0	1	2	3
Snorkelers bumping into people.	0	1	2	3
Snorkelers chasing or harassing marine life such as fish and turtles.	0	1	2	3
Snorkelers feeding fish.	0	1	2	3
Snorkelers bumping, handling, or standing on coral.	0	1	2	3
Scuba divers being rude or discourteous.	0	1	2	3
Scuba divers being too close.	0	1	2	3
Scuba divers not looking where they are going.	0	1	2	3
Scuba divers bumping into people.	0	1	2	3
Scuba divers chasing or harassing marine life such as fish and turtles.	0	1	2	3
Scuba divers feeding fish.	0	1	2	3
Scuba divers bumping, handling, or standing on coral.	0	1	2	3

A.

B.

C.

D.

E.

F.

G.

H.

I.

J.

K.

L.

18. The previous page shows 12 photographs. ***None of these images are the same***. We are interested in how much boat activity you would accept seeing at Molokini. Please rate your acceptance of ***EACH*** photograph **(circle one number for *EACH* photo)**

	Very Unacceptable		Unacceptable		Neither	Acceptable		Very Acceptable	
Photograph A	1	2	3	4	5	6	7	8	9
Photograph B	1	2	3	4	5	6	7	8	9
Photograph C	1	2	3	4	5	6	7	8	9
Photograph D	1	2	3	4	5	6	7	8	9
Photograph E	1	2	3	4	5	6	7	8	9
Photograph F	1	2	3	4	5	6	7	8	9
Photograph G	1	2	3	4	5	6	7	8	9
Photograph H	1	2	3	4	5	6	7	8	9
Photograph I	1	2	3	4	5	6	7	8	9
Photograph J	1	2	3	4	5	6	7	8	9
Photograph K	1	2	3	4	5	6	7	8	9
Photograph L	1	2	3	4	5	6	7	8	9

19. Which ***ONE*** photograph on the previous page most accurately represents what you saw at Molokini today? **(check only *ONE*)**

☐ Photo A ☐ Photo B ☐ Photo C ☐ Photo D ☐ Photo E ☐ Photo F ☐ Photo G ☐ Photo H ☐ Photo I ☐ Photo J ☐ Photo K ☐ Photo L

20. Occasionally, marine life such as coral, octopus, or fish is handled or touched by staff to show passengers. Did you see staff handling or touching marine life ***at Molokini*** on this trip? **(check *ONE*)**

☐ No ☐ Yes

21. Did you see staff handling or touching marine life ***at any other sites*** on this trip? **(check *ONE*)** ☐ No ☐ Yes

22. Do you feel that it is appropriate for staff to handle or touch marine life? **(check *ONE*)** ☐ No ☐ Yes

23. To what extent do you oppose or support each of the following for Molokini? **(circle one number for *EACH* strategy)**

	Strongly Oppose	Oppose	Neither	Support	Strongly Support
Do more to inform passengers about appropriate behavior.	1	2	3	4	5
Do more to inform passengers about the marine environment.	1	2	3	4	5
Do more to inform passengers about native Hawaiian culture.	1	2	3	4	5
Improve maintenance or upkeep of the harbor / boat ramp facilities.	1	2	3	4	5
Put different recreation activities in different areas at Molokini (zoning).	1	2	3	4	5
Limit the number of people allowed per day at Molokini.	1	2	3	4	5
Limit the number of boats allowed per day at Molokini.	1	2	3	4	5
Restrict the size of boats allowed at Molokini.	1	2	3	4	5
Designate some boat moorings at Molokini for only non-commercial use.	1	2	3	4	5
Do not allow barbequing on boats while at Molokini.	1	2	3	4	5
Do not allow music to be played on boats while at Molokini.	1	2	3	4	5
Do not allow introductory dive training at Molokini.	1	2	3	4	5
Do not allow people to feed fish at Molokini.	1	2	3	4	5
Close Molokini to all recreation / tourism activities.	1	2	3	4	5

24. There are 26 boat moorings at Molokini. What is your opinion about this number of moorings at Molokini? **(check *ONE*)**

☐ This is not enough – there should be moorings for more than 26 boats at one time.
☐ This is about right – moorings for 26 boats at one time seems about right.
☐ This is too many – there should be fewer moorings than 26 boats at one time.

25. Is Molokini a marine conservation reserve / district? **(check *ONE*)** ☐ No ☐ Yes ☐ Unsure

26. ***Assuming you could be on Maui again in the future***, how likely would do the following? **(circle one number for *EACH*)**

	Very Unlikely	Unlikely	Neither	Likely	Very Likely
I would come back to Molokini.	1	2	3	4	5
I would come back to Molokini, but recognize that this area offers a different type of experience than I first believed.	1	2	3	4	5
I would not come back to Molokini because I have been here and do not need to come back again.	1	2	3	4	5
I would not come back to Molokini because I can have better experiences at other coral reef areas on Maui.	1	2	3	4	5

27. To what extent do you disagree or agree with each of the following statements? **(circle one number for *EACH* statement)**

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Humans should manage coral reef areas so that *only* humans benefit.	1	2	3	4	5
The needs of humans are more important than coral reef areas.	1	2	3	4	5
The primary value of coral reef areas is to provide benefits for humans.	1	2	3	4	5
Recreational use of coral reef areas is more important than protecting the species that live there.	1	2	3	4	5
Coral reef areas exist primarily to be used by humans.	1	2	3	4	5
Coral reef areas should be protected for their own sake rather than to simply meet the needs of humans.	1	2	3	4	5
Coral reef areas should have rights similar to the rights of humans.	1	2	3	4	5
Recreational use of coral reef areas should not be allowed if it damages these areas.	1	2	3	4	5
It is important to take care of coral reef areas for future generations.	1	2	3	4	5
Coral reef areas have value whether humans are present or not.	1	2	3	4	5

28. Are you: **(check *ONE*)** ☐ Male ☐ Female

29. What is your age? **(write age)** _____ years old

30. Do you live on Maui? **(check *ONE*)**

☐ No, I do not live on Maui.
☐ I have a second home on Maui and spend part of the year here.
☐ Yes, my primary residence is on Maui and I spend most of the year here.

31. Where do you live? **(write responses)** State / Province _____ Country _____

Thank you, your input is important! ***Please return this survey to the researcher***.

RESEARCHER COMPLETES THIS SECTION:

Day & Date: _____ Time: _____ Harbor: _____ Second Site: _____
Boat: _____ # on Boat: _____ # in Water: _____ # Boats: _____

UNCOLLAPSED PERCENTAGES

Recreationists' Pre-Trip Expectations for Molokini

The University of Hawaii, Oregon State University, and Hawaii Division of Aquatic Resources are conducting this survey early in your trip to Molokini to learn about your expectations for this trip. Your input is important and will assist managers. Participation is voluntary and answers are anonymous. ***Please answer all questions and return to the researcher.***

1. ***Before today***, had you ever been to Molokini before? **(check *ONE*)**
   81 No
   19 Yes → if yes, how many previous trips have you made to Molokini in your life? **(write number)** see report trip(s)

2. ***INCLUDING YOURSELF***, how many people are accompanying you on this trip to Molokini ***today***? see report person(s)

3. What is the ***ONE main activity*** that you plan to participate in at Molokini ***today***? **(check *ONE*)**
   83 Snorkeling 1 Snuba
   14 Scuba Diving 2 None of these activities → skip to question 10 on next page

4. Is this the first time that you will have ever participated in this one main activity? **(check *ONE*)** 70 No 30 Yes

5. How would you rate your skill level in this one main activity? **(check *ONE*)**
   39 Beginner 26 Novice 26 Intermediate 7 Advanced 2 Expert

6. ***Not including Molokini***, how many other places have you participated in this activity? **(write number)** see report place(s)

7. About how many years in your life have you been participating in this activity? **(write number)** see report year(s)

8. About how many times have you participated in this activity in the past 12 months? **(write number)** see report time(s)

9. To what extent do you disagree or agree with each of the following statements related to your involvement in this activity? **(circle one number for *EACH* statement)**

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
If I stopped participating in this activity, an important part of my life would be missing.	16	22	36	20	5
I would rather participate in this activity than do most anything else.	16	28	40	12	3
Participation in this activity is a large part of my life.	19	34	34	11	3
Most recreation activities do not interest me as much as this activity.	12	34	38	15	2
This activity is becoming a more important part of my life each year.	15	26	40	18	3
Given the skills I have developed over the years in this activity, it is important that I continue to participate.	13	20	38	26	3
I feel that I am more skilled in this activity than most other people.	25	29	32	12	2
Testing my skills in this activity is very important to me.	17	26	36	18	3
I am becoming more skilled in this activity each year.	15	20	35	26	4
I try to participate in this activity as often as possible.	13	20	32	31	5
I am spending more time participating in this activity each year.	16	23	39	19	4

10. To what extent do you disagree or agree with each of the following statements about ***ocean conditions you expect*** to experience on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that the …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… ocean water will be clean.	0	1	5	61	33
… underwater visibility will be good.	0	1	5	60	35
… ocean water will be warm.	1	12	31	45	11
… ocean conditions will be calm / smooth.	1	10	33	44	12

11. To what extent do you disagree or agree with each of the following statements about ***what you expect to see*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that I will see …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… beautiful above water scenery.	0	1	7	63	29
… a lot of fish.	0	1	5	62	33
… an interesting variety of different types of fish.	0	0	4	62	34
… very colorful fish.	0	0	4	62	34
… larger marine life (for example: turtles, sharks, dolphins, rays).	0	2	13	60	24
… a lot of coral.	0	2	11	60	28
… an interesting variety of different types of coral.	0	2	15	60	23
… very colorful coral.	0	2	18	59	22
… healthy coral reefs in good condition.	0	2	15	58	26
… unpolluted natural surroundings.	0	1	12	57	30

12. To what extent do you disagree or agree with each of the following statements about ***what you expect your experiences will be*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that I will …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… have fun.	0	0	2	48	50
… get to try new activities.	1	5	22	44	29
… learn or develop skills.	0	4	22	51	22
… get some exercise.	0	3	12	60	25
… be physically challenged.	1	8	34	41	16
… experience adventure or excitement.	0	2	11	59	28
… take risks.	4	20	36	30	11
… get to rest or relax.	2	6	23	53	16
… get away from the everyday demands of life.	1	1	10	55	33
… experience tranquility in the water.	1	2	11	59	27
… escape crowds of people.	2	12	34	38	14
… meet new people.	2	6	27	51	14
… get to spend time with friends / family.	2	3	9	50	35
… feed fish or other marine life.	18	22	29	21	11
… photograph marine life underwater.	6	13	24	36	21

13. To what extent do you disagree or agree with each of the following statements about ***what you expect to learn*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that I will learn …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… about nature.	0	2	10	69	19
… about underwater marine species (for example: fish, larger marine life).	1	1	7	71	22
… about coral reefs.	1	1	10	68	20
… about the history of the area.	1	3	13	65	18
… about native Hawaiian culture.	1	6	22	56	15

14. To what extent do you disagree or agree with each of the following statements about ***how safe you expect to be*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… I will feel safe.	0	1	6	63	31
… I will *not* get injured.	1	2	9	57	32
… I will get scared.	12	31	29	21	7
… I will be comfortable.	1	3	11	65	20
… the staff will take good care of me.	0	0	4	59	37
… the staff will look out for my safety.	0	0	5	55	41
… the staff will provide information about safety.	0	0	3	54	43
… the staff will be knowledgeable about good safety behaviors.	0	0	3	52	45
… the staff will practice good safety behaviors.	0	0	3	51	47

15. To what extent do you disagree or agree with each of the following statements about ***services you expect*** on this trip to Molokini? **(circle one number for *EACH* statement)**

On this trip to Molokini, I expect that …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… the trip will be well organized.	0	0	2	56	42
… the equipment will be good.	0	0	3	56	40
… the boat will be good.	0	0	2	54	43
… I will be given good food.	0	1	10	57	31
… the staff will be friendly.	0	0	2	55	43
… the staff will be helpful.	0	0	2	55	44
… the staff will be professional.	0	0	2	52	46
… the staff will provide information about equipment.	0	0	2	55	43
… the staff will provide information about the marine environment.	0	0	4	56	40
… the staff will provide information about native Hawaiian culture.	1	4	13	53	30
… I will be allowed to spend enough time in the water.	0	1	6	59	34
… I will get good value for the money I paid to go to Molokini.	1	1	6	56	36

16. To what extent do you disagree or agree with each of the following statements? **(circle one number for *EACH* statement)**

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Humans should manage coral reef areas so that *only* humans benefit.	53	30	7	7	3
The needs of humans are more important than coral reef areas.	51	29	10	7	3
The primary value of coral reef areas is to provide benefits for humans.	57	27	7	7	2
Recreational use of coral reef areas is more important than protecting the species that live there.	59	28	5	5	2
Coral reef areas exist primarily to be used by humans.	61	27	6	5	2
Coral reef areas should be protected for their own sake rather than to simply meet the needs of humans.	14	8	7	28	43
Coral reef areas should have rights similar to the rights of humans.	10	13	25	27	24
Recreational use of coral reef areas should not be allowed if it damages these areas.	4	7	12	40	37
It is important to take care of coral reef areas for future generations.	3	2	4	35	56
Coral reef areas have value whether humans are present or not.	3	2	5	35	55

17. Listed below are statements about relationships between humans and the environment. To what extent do you disagree or agree with each of the following statements? **(circle one number for *EACH* statement)**

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Humans have the right to modify the natural environment to suit their needs.	34	34	19	11	3
Humans were meant to rule over the rest of nature.	40	27	19	10	4
The so-called "ecological crisis" facing humankind has been greatly exaggerated.	30	35	23	8	3
The balance of nature is strong enough to cope with impacts of modern industrial nations.	28	39	22	8	2
The earth is like a spaceship with very limited room and resources.	6	11	23	39	21
We are approaching the limit of the number of people the earth can support.	5	14	36	28	17
The balance of nature is very delicate and easily upset.	4	8	22	44	23
When humans interfere with nature, it often produces disastrous consequences.	3	7	22	45	23
Plants and animals have as much right as humans to exist.	3	6	19	37	34
Humans are severely abusing the environment.	2	7	24	40	28

18. Are you: **(check *ONE*)** 48 Male 52 Female

19. What is your age? **(write age)** see report years old

Thank you, your input is important! ***Please return this survey to the researcher***.

RESEARCHER COMPLETES THIS SECTION:

Day & Date: _____ Time: _____ Harbor: _____

Boat: _____ # on Boat: _____

Recreationists' Post-Trip Experiences at Molokini

Please Complete this Survey and Return it to the Researcher

Participation is Voluntary and Responses are Anonymous

Thank You for Your Participation

A Study Conducted Cooperatively by:

University of Hawai'i Mānoa

Hawai'i DAR Division of Aquatic Resources

OSU Oregon State University

Now, we are conducting this follow-up survey later in your trip to learn about your experiences and opinions about how Molokini should be managed. Your input is important and will assist managers. ***Please answer <u>all</u> questions and return to the researcher.***

1. What is the ***<u>ONE</u> main activity*** that you participated in at Molokini ***today***? **(check *ONE*)**

   75 Snorkeling 1 Snuba
   22 Scuba Diving 2 None of these activities → skip to question 3 below

2. Which ***<u>ONE</u>*** of the following best describes your involvement in this activity? **(check *ONE*)**

   57 This is an enjoyable but infrequent activity that is incidental to my other outdoor interests and I am not highly skilled in this activity.

   38 This activity is important to me but is only one of the outdoor activities in which I participate. My participation in this activity is inconsistent and I consider myself to be moderately skilled in this activity.

   6 This is my primary outdoor activity, I consider myself to be highly skilled in this activity, and I participate in this activity every available chance I get.

3. Overall, how dissatisfied or satisfied are you with your experience at Molokini today? **(check *ONE*)**

   1 Very Dissatisfied 1 Dissatisfied 3 Neither 47 Satisfied 48 Very Satisfied

4. Is Molokini the best attraction that you have visited in Maui? **(check *ONE*)** 42 No 58 Yes

5. How would you rate your visit to Molokini today? **(check *ONE*)**

   33 Better than I expected 60 Exactly what I expected 7 Worse than I expected

6. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***ocean conditions*** you experienced on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini, the …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… ocean water was clean.	0	1	1	44	54
… underwater visibility was good.	1	0	2	41	57
… ocean water was warm.	5	29	23	35	8
… ocean conditions were calm / smooth.	2	11	13	46	28

7. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***what you saw*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini, I <u>saw</u> …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… beautiful above water scenery.	1	1	10	56	32
… a lot of fish.	1	8	14	53	24
… an interesting variety of different types of fish.	1	7	16	53	24
… very colorful fish.	1	5	15	55	25
… larger marine life (for example: turtles, sharks, dolphins, rays).	6	17	9	42	26
… a lot of coral.	0	4	9	47	40
… an interesting variety of different types of coral.	0	4	15	53	28
… very colorful coral.	0	7	21	51	21
… healthy coral reefs in good condition.	0	2	18	56	25
… unpolluted natural surroundings.	0	1	10	57	32

8. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***your experiences*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini, I …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… had fun.	0	1	3	48	48
… tried new activities.	4	15	28	31	22
… learned or developed skills.	3	10	28	41	19
… got some exercise.	0	3	8	63	26
… was physically challenged.	3	19	35	33	11
… experienced adventure or excitement.	1	4	13	61	22
… took risks.	10	28	30	23	9
… rested or relaxed.	1	5	23	55	17
… got away from the everyday demands of life.	0	1	5	52	41
… experienced tranquility in the water.	1	3	14	49	34
… escaped crowds of people.	4	17	25	38	15
… met new people.	2	9	26	50	13
… spent time with friends / family.	2	3	6	49	40
… fed fish or other marine life.	65	20	8	5	3
… photographed marine life underwater.	20	14	11	31	24

9. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***what you learned*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini, I learned …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… about nature.	1	4	19	56	17
… about underwater marine species (for example: fish, larger marine life).	1	3	11	66	18
… about coral reefs.	1	7	20	57	15
… about the history of the area.	2	12	22	51	12
… about native Hawaiian culture.	7	21	31	34	7
… information that increased my awareness of native Hawaiian culture.	7	20	31	36	7
… information that increased my awareness of the marine environment.	2	4	16	64	14
… information that expanded my world view.	3	11	28	45	13
… about impacts that humans have on the marine environment.	3	8	26	50	14
… about how my daily actions affect the marine environment.	4	12	31	43	11
… that my behaviors can cause problems in the marine environment.	2	10	21	52	14
… that I could harm marine life (fish, coral, turtles) by touching them.	2	4	12	58	25
… that feeding marine life (fish, turtles) could harm them.	1	4	12	56	27
… how I can do more to help the marine environment.	3	11	25	47	15
… that it is my responsibility to help protect the marine environment.	3	6	19	52	20
… how I can contribute (for example: donate, volunteer) to help improve the marine environment.	3	12	29	42	14
… that I should be responsible for helping to teach others about the marine environment.	3	12	28	42	15

10. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***your safety*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… I felt safe.	0	1	1	46	52
… I did *not* get injured.	1	0	1	35	63
… I was scared.	38	33	14	10	6
… I was comfortable.	2	4	9	50	36
… the staff took good care of me.	0	0	2	40	57
… the staff looked out for my safety.	0	0	3	39	58
… the staff provided information about safety.	0	0	1	38	61
… the staff were knowledgeable about good safety behaviors.	0	0	1	38	62
… the staff practiced good safety behaviors.	0	0	1	37	62

11. To what extent do you disagree or agree with each of the following statements about your satisfaction with ***services*** on this trip at Molokini? **(circle one number for *EACH* statement)**

On this trip at Molokini …	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
… the trip was well organized.	0	0	1	44	55
… the equipment was good.	0	1	5	42	53
… the boat was good.	0	0	1	44	55
… I was given good food.	0	1	5	43	51
… the staff was friendly.	0	0	1	34	64
… the staff was helpful.	0	0	1	35	64
… the staff was professional.	0	0	1	36	63
… the staff provided information about equipment.	0	0	2	40	59
… the staff provided information about the marine environment.	0	1	4	43	52
… the staff provided information about native Hawaiian culture.	5	13	20	36	27
… I was allowed to spend enough time in the water.	0	3	5	42	50
… I got good value for the money I paid to go to Molokini.	0	2	8	40	51

12. Approximately how many of ***EACH*** of the following did you see at Molokini ***today***? **(write numbers for *EACH* item)**

I saw approximately:

see report	people on this boat
see report	people in the water
see report	people in total at Molokini
see report	boats at Molokini

13. To what extent did you feel crowded by each of the following at Molokini ***today***? **(circle one number for *EACH* item)**

	Not at all Crowded		Slightly Crowded		Moderately Crowded		Extremely Crowded		
Number of people on this boat.	20	14	21	13	8	15	8	1	0
Number of people in the water.	16	15	17	16	11	10	11	5	1
Number of people in total at Molokini.	15	13	17	16	11	10	13	4	2
Number of boats at Molokini.	15	18	18	14	11	11	8	5	1

14. How did the number of people you saw at Molokini today affect your enjoyment? **(check *ONE*)**

17 Reduced My Enjoyment 77 Had No Effect on My Enjoyment 6 Increased My Enjoyment

15. What is the ***MAXIMUM*** number of ***EACH*** of the following that you would accept seeing at any one time at Molokini? **(write numbers for *EACH* item)**

It is OK to see a maximum of:

see report people on this boat
see report people in the water
see report people in total at Molokini
see report boats at Molokini

16. On this trip or any of your trips to Molokini, how often ***have you seen the following at Molokini***? **(circle a number for *EACH*)**

	Never	Once or Twice	Sometimes	Many Times
Snorkelers being rude or discourteous.	82	11	5	2
Snorkelers being too close.	38	29	23	11
Snorkelers not looking where they are going.	39	28	23	10
Snorkelers bumping into people.	37	27	26	10
Snorkelers chasing or harassing marine life such as fish and turtles.	82	10	7	1
Snorkelers feeding fish.	93	5	2	1
Snorkelers bumping, handling, or standing on coral.	92	5	2	1
Scuba divers being rude or discourteous.	97	2	1	0
Scuba divers being too close.	90	6	4	1
Scuba divers not looking where they are going.	89	7	3	1
Scuba divers bumping into people.	90	7	3	1
Scuba divers chasing or harassing marine life such as fish and turtles.	96	3	2	0
Scuba divers feeding fish.	98	1	1	1
Scuba divers bumping, handling, or standing on coral.	93	5	1	1

17. To what extent do you feel that each of the following is a ***problem at Molokini***? **(circle one number for *EACH statement*)**

	Not a Problem	Slight Problem	Moderate Problem	Extreme Problem
Snorkelers being rude or discourteous.	81	10	6	3
Snorkelers being too close.	53	30	12	5
Snorkelers not looking where they are going.	54	29	13	5
Snorkelers bumping into people.	51	31	14	4
Snorkelers chasing or harassing marine life such as fish and turtles.	76	13	5	7
Snorkelers feeding fish.	83	7	4	6
Snorkelers bumping, handling, or standing on coral.	81	8	4	7
Scuba divers being rude or discourteous.	87	7	3	4
Scuba divers being too close.	84	9	4	4
Scuba divers not looking where they are going.	84	8	5	3
Scuba divers bumping into people.	85	8	5	3
Scuba divers chasing or harassing marine life such as fish and turtles.	85	6	4	6
Scuba divers feeding fish.	87	5	2	6
Scuba divers bumping, handling, or standing on coral.	85	7	2	6

A.

B.

C.

D.

E.

F.

G.

H.

I.

J.

K.

L.

18. The previous page shows 12 photographs. ***None of these images are the same***. We are interested in how much boat activity you would accept seeing at Molokini. Please rate your acceptance of ***EACH*** photograph **(circle one number for *EACH* photo)**

	Very Unacceptable		Unacceptable		Neither	Acceptable		Very Acceptable	
Photograph A	4	2	4	7	11	32	15	12	13
Photograph B	4	2	5	5	10	27	18	15	15
Photograph C	3	1	0	1	3	10	13	28	40
Photograph D	66	12	10	5	2	1	1	1	2
Photograph E	52	17	13	7	5	2	1	2	2
Photograph F	38	19	15	13	7	3	2	2	2
Photograph G	9	9	9	18	14	22	7	7	5
Photograph H	3	2	0	2	3	13	16	23	38
Photograph I	5	1	1	2	4	11	15	27	35
Photograph J	57	17	9	4	4	1	2	3	2
Photograph K	35	20	15	15	6	3	4	1	1
Photograph L	47	18	13	10	4	2	3	1	2

19. Which ***ONE*** photograph on the previous page most accurately represents what you saw at Molokini today? **(check only *ONE*)**

26 Photo A	15 Photo C	1 Photo E	7 Photo G	23 Photo I	0 Photo K
3 Photo B	0 Photo D	1 Photo F	25 Photo H	0 Photo J	0 Photo L

20. Occasionally, marine life such as coral, octopus, or fish is handled or touched by staff to show passengers. Did you see staff handling or touching marine life ***at Molokini*** on this trip? **(check *ONE*)**

92 No 8 Yes

21. Did you see staff handling or touching marine life ***at any other sites*** on this trip? **(check *ONE*)** 88 No 12 Yes

22. Do you feel that it is appropriate for staff to handle or touch marine life? **(check *ONE*)** 67 No 33 Yes

23. To what extent do you oppose or support each of the following for Molokini? **(circle one number for *EACH* strategy)**

	Strongly Oppose	Oppose	Neither	Support	Strongly Support
Do more to inform passengers about appropriate behavior.	2	3	29	45	22
Do more to inform passengers about the marine environment.	1	2	22	49	26
Do more to inform passengers about native Hawaiian culture.	1	4	31	48	16
Improve maintenance or upkeep of the harbor / boat ramp facilities.	2	4	45	39	10
Put different recreation activities in different areas at Molokini (zoning).	5	16	43	28	8
Limit the number of people allowed per day at Molokini.	1	4	22	55	17
Limit the number of boats allowed per day at Molokini.	1	3	17	55	25
Restrict the size of boats allowed at Molokini.	2	3	29	48	18
Designate some boat moorings at Molokini for only non-commercial use.	3	8	48	32	9
Do not allow barbequing on boats while at Molokini.	8	22	45	17	8
Do not allow music to be played on boats while at Molokini.	11	21	39	21	9
Do not allow introductory dive training at Molokini.	12	25	39	16	7
Do not allow people to feed fish at Molokini.	3	2	12	27	56
Close Molokini to all recreation / tourism activities.	45	29	17	6	3

24. There are 26 boat moorings at Molokini. What is your opinion about this number of moorings at Molokini? **(check *ONE*)**

2 This is not enough – there should be moorings for more than 26 boats at one time.

33 This is about right – moorings for 26 boats at one time seems about right.

66 This is too many – there should be fewer moorings than 26 boats at one time.

25. Is Molokini a marine conservation reserve / district? **(check *ONE*)** 1 No 74 Yes 26 Unsure

26. ***Assuming you could be on Maui again in the future***, how likely would do the following? **(circle one number for *EACH*)**

	Very Unlikely	Unlikely	Neither	Likely	Very Likely
I would come back to Molokini.	3	7	8	50	33
I would come back to Molokini, but recognize that this area offers a different type of experience than I first believed.	3	11	42	33	11
I would not come back to Molokini because I have been here and do not need to come back again.	29	35	19	12	4
I would not come back to Molokini because I can have better experiences at other coral reef areas on Maui.	31	33	26	7	4

27. To what extent do you disagree or agree with each of the following statements? **(circle one number for *EACH* statement)**

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Humans should manage coral reef areas so that *only* humans benefit.	57	31	8	3	2
The needs of humans are more important than coral reef areas.	52	28	12	6	2
The primary value of coral reef areas is to provide benefits for humans.	57	29	8	4	2
Recreational use of coral reef areas is more important than protecting the species that live there.	56	29	10	4	2
Coral reef areas exist primarily to be used by humans.	58	30	7	3	2
Coral reef areas should be protected for their own sake rather than to simply meet the needs of humans.	12	8	7	32	42
Coral reef areas should have rights similar to the rights of humans.	10	16	24	26	24
Recreational use of coral reef areas should not be allowed if it damages these areas.	6	8	14	42	30
It is important to take care of coral reef areas for future generations.	2	1	5	36	56
Coral reef areas have value whether humans are present or not.	3	1	7	32	57

28. Are you: **(check *ONE*)** 48 Male 52 Female

29. What is your age? **(write age)** see report years old

30. Do you live on Maui? **(check *ONE*)**

97 No, I do not live on Maui.

1 I have a second home on Maui and spend part of the year here.

3 Yes, my primary residence is on Maui and I spend most of the year here.

31. Where do you live? **(write responses)** State / Province see report Country see report

Thank you, your input is important! ***Please return this survey to the researcher***.

RESEARCHER COMPLETES THIS SECTION:

Day & Date: _____ Time: _____ Harbor: _____ Second Site: _____

Boat: _____ # on Boat: _____ # in Water: _____ # Boats: _____