STRIVING TOWARDS RESPONSIBLE VIEWING: AN EVALUATION OF DOLPHIN-WATCH ECOTOUR OPERATIONS IN CLEARWATER, FLORIDA

by

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Abstract

In the past decade, marine mammal tourism has increased dramatically in the United States. To promote sustainability of this industry while minimizing harassment, NOAA Fisheries has developed guidelines to encourage appropriate viewing practices among boaters. In Clearwater, Florida, NOAA Fisheries is developing a workshop to train commercial tour operators in responsible marine mammal viewing and effective interpretation. To assist in the development process, I evaluated the dolphin-watch tour operations to determine the operators' compliance with the viewing guidelines, the structure of the interpretation programs of the tours, and dolphin behavior during interactions with tour vessels.

During June 2003, I accompanied the tour vessels and recorded a total of 45 interactions between bottlenose dolphins and operators. During these interactions, operators adhered to all the guidelines approximately 60% of the time. The operators maintained complete compliance with the viewing time limit but failed to end encounters when dolphins exhibited possible disturbance behaviors. Operators frequently approached dolphins within 50 yards and used inappropriate techniques to maneuver around dolphins. Many of the operators presented information about basic dolphin biology, but very few included the MMPA regulations, the NOAA viewing guidelines, or other critical components of an effective interpretation program.

These results indicate a strong need for the ecotour training workshop in Clearwater. In addition to attendance at the workshop, the development of a code of conduct specific to Clearwater operators would address possible cumulative impacts of the industry and promote self-enforcement. A monitoring program is also needed to manage tour operations and examine the long-term effects of ecotourism on the local bottlenose dolphin population.

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Introduction

Tourism is one of the largest and fastest growing industries in the world. Ecotourism, a nature-based form of tourism, contributes greatly to this growth (Hoyt 2001). This relatively new industry in the United States poses potential threats to wildlife from tourist interactions and the disruption of natural processes. The worldwide demand for marine wildlife viewing has grown into a billion-dollar industry. Over 80 countries now offer opportunities to view marine mammals in their natural habitat (Hoyt 2001). These viewing experiences not only support the economy of coastal communities but also provide unique opportunities to educate the public about marine mammal populations. However, many tour operations do not practice responsible viewing of marine mammals or conduct effective interpretation programs. Such operations are not minimizing their impacts on marine mammals or promoting conservation of marine mammals and their environment.

Swim-with interactions

Marine mammal ecotourism includes "swim-with" activities, land-based interactions, and vessel-based interactions (67 FR 4380, January 30, 2002). In the U.S., "swim-with-dolphin" activities occur in various locations in the southeast (mainly in Florida) and throughout the Hawaiian Islands (Spradlin et al. 1999). In the past, programs in the Panhandle and Gulf Coast regions of Florida have often involved food provisioning to facilitate interactions with dolphins. This behavior is detrimental to wild animals and can even harm humans (Samuels et al. 2000, Shane et al. 1993). Similar programs in Hawaii target shallow coves and bays, habitats in which spinner dolphins (*Stenella longirostris*) rest from predators and care for their young (Wursig 1996).

Although “swim-with” programs have increased dramatically in the past few years and are expanding to other U.S. coastal areas, the long-term impacts of these programs are not known (Samuels *et al.* 2000).

Land-based interactions

Land-based interactions have also increased in recent years (67 FR 4380, January 30, 2002). During these programs, tourists closely approach pinnipeds (seals, sea lions, and walruses) on land to observe, and, in some cases, pose for pictures, touch, pet, poke, and/or throw objects to elicit reactions. These actions are known to cause behavioral changes such as increases in disturbance behaviors (Cassini 2001, Boren *et al.* 2001) and significant decreases in time spent resting and nursing (Kovacs and Innes 1990). In the U.S., land-based interactions involve elephant seals, harbor seals, and sea lions in the Southwest, and endangered monk seals in Hawaii (67 FR 4380, January 30, 2002).

Vessel-based interactions

Vessel-based interactions include the use of motorized or non-motorized vessels to interact with wild marine mammals (67 FR 4380, January 30, 2002). These ecotour operations are also growing nationwide and have the potential to negatively impact marine mammals (67 FR 4380, January 30, 2002). For instance, vessel-based viewing operations contribute to the growing boat activity in many coastal habitats that are important for various cetacean (whales, dolphins, and porpoises) species (Spradlin *et al.* 2001). Numerous studies worldwide have clearly demonstrated the effects of boat traffic on the behavior of marine mammals. Cetacean responses include avoidance behaviors such as longer intervals between surfacings, increases in speed, increases in group

cohesion, and changes in movement patterns and direction (Nowacek *et al.* 2001, Blane and Jackson 1994, Janik and Thompson 1996, Cope *et al.* 1999, Latusek 2002). Bottlenose dolphins are known to avoid the use of primary foraging areas during periods of high boat density (Allen and Read 2000). Collisions with boats resulting from increases in boat traffic have also been documented (Wells *et al.* 1997).

In addition to the effects of boat traffic in general, whale and dolphin-watching operations may cause specific disturbances to marine mammals. Scientists have observed differences between the behavior of commercial marine mammal tour boats and other commercial and recreational boats. Tour vessels pursue cetaceans and attempt to stay in their vicinity (Janik and Thompson 1996). These behaviors often result in a significant increase in animal avoidance behaviors (Janik and Thompson 1996) and may lead to disturbance or harassment. Other animal responses include increases in surfacing intervals (Richter *et al.* 2001), increases in avoidance behaviors as vessels approach and/or change direction (Blane and Jackson 1994), alterations in behavior and movement to avoid tour vessels (Cope 2000), and increases in stress related behaviors (leaps, tail-slaps, coughing) during vessel approaches (Berggren 2001).

Legal mandates

The primary legal mandate related to the marine mammal tourism issue is the Marine Mammal Protection Act (MMPA) of 1972. The MMPA, 16 U.S.C. 1361 *et seq.*, is intended to protect all marine mammals in the United States and prohibits the "take" of any marine mammal. Section 3(13) of the MMPA defines "take" as:

> *"to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal."*

Section 3(18)(A) further defines the term “harassment” as:

> “*any act of pursuit, torment, or annoyance which—*
>
> *(1) has the potential to injure a marine mammal or marine mammal stock in the wild, (Level A harassment), or*
>
> *(2) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).”*

In 1991, NOAA Fisheries amended the definition of “take” in the MMPA regulations to include a prohibition on the feeding or attempting to feed a marine mammal (50 CFR 216.3). The amended definition of “take” is as follows:

> *“the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild.”* (50 CFR 216.3)

The prohibition on “taking” applies to all marine mammals within the U.S. jurisdiction. However, there are limited exceptions to the prohibition for permitted “takes” for activities such as scientific research, public display, enhancement of a species or stock, commercial/educational photography, and incidental take in commercial fisheries (16 U.S.C. 1371). Marine mammal ecotour operations are not included in this list of exceptions nor does the MMPA provide for a permit or other authorization process to view or interact with marine mammals in the wild.

According to the MMPA, the term “harassment” can be any act of *pursuit* that has the *potential to disturb behavior* (Level B harassment). Ecotour operations that pursue interactions with marine mammals in the wild risk this form of harassment if they disrupt the animals’ natural behaviors (Spradlin et al. 1999). However, it is often very difficult to define harassment, and operators are often not aware that they are disturbing the animals. Nevertheless, operations that feed wild dolphins to facilitate interactions with tourists are in direct violation of the MMPA.

NOAA Fisheries actions related to marine mammal tourism

In addition to the regulations that specify “take” to include the act of feeding or attempting to feed a wild marine mammal (50 CFR 216.3), NOAA Fisheries has also made special prohibitions for endangered marine mammals with regards to approach distances. According to the regulations, it is illegal to approach within 100 yards (91.4 m) of humpback whales (*Megaptera novaeangliae*) in Hawaii and Alaska or within 500 yards (460 m) of North Atlantic right whales (*Eubalaena glacialis*) (50 CFR 224.103, 66 FR 29502, May 31, 2001). However, there are no distance regulations that pertain to other marine mammal species.

NOAA Fisheries does not support, condone, or approve of any activities that involve closely approaching or interacting with wild marine mammals. This includes all “swim-with” operations and land/vessel-based interactions that move too close to marine mammals and/or behave in a negligent manner (67 FR 4380, January 30, 2002). In 1992, NOAA Fisheries published proposed regulations to provide greater protection to marine mammals by specifying minimum distances and other ways to avoid harassment.

However, NOAA Fisheries withdrew the proposal the following year to review the comments received and consider alternatives (67 FR 4380, January 30, 2002).

NOAA Fisheries recommended viewing guidelines

NOAA Fisheries has developed recommended viewing guidelines to educate the general public and ecotour operators on how to responsibly view marine mammals in the wild without harassing them. Each Regional Office of NOAA Fisheries has constructed specific guidelines for those regions. Some of these guidelines include minimum approach distances for observing animals on land and on board a vessel, limited observation times, specific vessel movements in relation to marine mammals, limited vessel speeds, and a recommendation against swimming with marine mammals (NOAA 2003).

These guidelines are not regulations and, thus, cannot be enforced. They rely on voluntary compliance by the public and ecotour operators. NOAA has partnered with various local and regional environmental organizations to promote the guidelines in each region. In 1997, NOAA Fisheries initiated a nationwide education and outreach program to support the recommended guidelines. The “Protect Dolphins” campaign was formed to address the issues of feeding and harassing dolphins in the Southeast region (67 FR 4380, January 30, 2002). In 1998, NOAA Fisheries extended these efforts by joining the Watchable Wildlife consortium of federal and state agencies and wildlife interest groups to encourage passive wildlife viewing (67 FR 4380, January 30, 2002). Additional education and outreach efforts included the issuance of press releases, the development and distribution of enforcement warning signs, and the organization of workshops and conferences involving local stakeholders (NOAA 2000).

Despite these efforts, noncompliance still exists. For instance, many ecotour operations in Hawaii and Florida advertise swimming with marine mammals. Ecotour operations are also known to promote other activities that contradict the guidelines and have been observed intentionally violating the guidelines to get a better view of the animals and/or to entice them to jump in the wake of the vessel (67 FR 4380, January 30, 2002, Herrington 2002).

Marine mammal tourism in Clearwater, Florida

At the time of writing, commercial tour operations in Clearwater, Florida, consist of five vessel-based companies which target a local population of bottlenose dolphins (*Tursiops truncatus*). Three of the companies conduct dolphin-watching tours in which the goal of each tour is to locate and follow dolphins. These operations guarantee dolphin sightings and conduct hourly tours from 11:00 am to 8:00 pm daily in the summer. The other two companies locate and follow dolphins but also anchor at Compass Island (Figure 1) to allow passengers to go shelling and snorkeling. Therefore, time spent locating and following dolphins is limited to allow more time for passengers to enjoy the island. The length of these tours varies from two to four hours, and three to five trips are conducted daily.

In this area of Florida, vessel-based dolphin-watch operations are known to exhibit a medium to high potential for harassment based on past observations of their interactions with local bottlenose dolphins (Herrington 2002). NOAA Fisheries' officials, in cooperation with the Florida Fish and Wildlife Conservation Commission (FFWCC) and the Clearwater Convention and Visitors Bureau, are developing a "Dolphin Aware" training workshop to inform these operators about responsible wildlife

viewing guidelines, industry best practices, and effective interpretation (Hudon 2002). The workshop will consist of two components—a classroom discussion and a field training session. In the classroom, consultants will explain and facilitate discussions to address how feeding and harassing wild dolphins can harm animals and humans. Laws and regulations for protecting wild dolphins, as well as the recommended marine mammal viewing guidelines, will be presented to operators along with an open-forum discussion on how to implement these best practices into existing tour operations. During the field portion of the workshop, tour operators will have the opportunity to receive immediate feedback while incorporating these best practices, along with new interpretive skills, into their tours (Hudon 2002).

Objectives

My project involved an evaluation of the Clearwater dolphin-watch operations prior to the Dolphin-Aware workshop. My objectives included (1) determining the operators' compliance with the viewing guidelines by observing their interactions with dolphins, (2) evaluating the level of education offered to consumers during these dolphin encounters, (3) observing dolphin behavior during interactions with ecotour operators, and (4) developing a preliminary catalog of bottlenose dolphins in the Clearwater area. I will use the results of my study to provide recommendations for the development and planning of the workshop and to generate support for the development of cetacean-viewing workshops throughout the U.S. and worldwide.

Methods

Tour companies surveyed

During June 2003, an assistant and I accompanied five commercial dolphin-watch tour boats in the Clearwater, Florida area (Figure 1). The vessels consisted of a 40-foot tugboat, two 45-foot pontoon boats, a 73-foot speedboat (with two 900 HP Diesel engines), and a 125-passenger outboard motorboat. Prior to this study, the operators agreed to attend the workshop and allowed my assistant and me to accompany their tours as part of the planning process. To minimize the potential for bias in this study due to our presence on the tours, we told the tour operators that we were studying the behavior of bottlenose dolphins and their interactions with tour vessels in the area. We did not specify any of the details of our study. The operators allowed us to accompany their tours provided there was room onboard and the weather permitted them to conduct tours. To preserve the confidentiality of the five tour companies, I will refer to them as Company A, B, C, D, and E.

Figure 1. Clearwater, Florida.

Field effort

During each trip I recorded the boat name, captain name, number of passengers, total time of the trip, and weather conditions. To document the area covered by the tours, I recorded the position of the vessel every minute using a handheld Garmin eTrex Vista

Global Positioning System (GPS). I converted the positions into shape files using ArcGIS and mapped the tour route for each company.

To determine operator adherence to the MMPA and suggested viewing guidelines, I evaluated the operators' behaviors during interactions between the tour vessels and dolphins.

I defined an interaction as:

(i) an encounter that began when an operator sighted a dolphin and purposefully moved the vessel toward the individual or group; and/or

(ii) an encounter that began when a dolphin approached the vessel.

An interaction ended when the operator moved the vessel away from the individual/group or when the individual/group moved away and the vessel did not follow. During each interaction, the assistant recorded the length of the interaction, the number and type of boats within 100 yards of the individual/group, a field estimate of the total number of dolphins in the group, and the behavior (feeding, traveling, milling, socializing, resting) of the individual/group.

The definitions for the behaviors are as follows:

Feeding = dolphin seen with fish in mouth, diving deeply and rapidly, swirling rapidly near the surface, or seen directly pursuing a fish (Allen and Read 2000)

Traveling = movement in a persistent manner without frequent changes in direction (Shane *et al.* 1986)

Milling = movement with frequent changes in heading in a given area (Shane *et al.* 1986)

Socializing = behaviors such as mating, rubbing, playing, and leaping

Resting = also known as idling, refers to dolphins engaged in slow movements without including components of the other behaviors (Shane *et al.* 1986).

When possible, I photographed the dorsal fin of each dolphin with an SLR camera, 300-mm lens, and color slide film. During each interaction, I attempted to photograph the dorsal fin of every dolphin. I determined the location of dolphins by matching the time of each interaction with the times recorded from the GPS. Using Arc/Info (ESRI Version 8.0.1), I converted these coordinates into shape files and mapped the position of the dolphin interactions for each tour company.

Operator vessel maneuvers

To assess the boat handling techniques of the operators during interactions, I recorded the operators' maneuvering methods after each surfacing of the individual or group of dolphins. The different methods are as follows:

Parallel = vessel moved beside and in the same or opposite direction of dolphins

Head-on = vessel moved towards dolphins by maneuvering directly in front of individual/group

Behind = vessel moved directly behind dolphins

Side-on = vessel moved perpendicular to dolphins

Circling = vessel moved in a circle around the individual/group; also known as corralling

Over = vessel moved directly over individual/group

In addition to these approaches, I also recorded maneuvers such as shifting into neutral, turning the vessel toward or away from the animals, shifting into reverse, and maintaining a constant speed and direction (on course) while dolphins were bowriding or wake jumping.

Distance estimation

To assess the distance between the vessel and the individual/group, I recorded the distance (in yards) of the nearest dolphin at each surfacing. Laser rangefinders are unable to focus on fast moving dolphins or their fluke prints in the water. However, my assistant and I used a laser rangefinder (Bushnell Yardage Pro Compact 800) to practice estimating distances on the water so that our estimates of the distances between dolphins and vessels would be more accurate. At each surfacing, we both agreed upon an estimation of distance. This method of estimating distances requires practice but is an excellent technique for dolphin-watch operators who need a simple and low-cost means of estimating their distances from dolphins.

Dolphin behavior

In addition to recording the distance between the vessel and the individual/group and the subsequent maneuvering method, I also recorded the behavior of the individual/group at each surfacing. These behaviors included possible signs of disturbance (tail slapping and chuffing), direct interactions with the vessel (bowriding and wake jumping), and other behaviors such as remaining on course or changing heading (toward or away from the vessel). These behaviors may not have been a direct response to the vessel's movement; however, they may be associated with particular vessel maneuvers.

Educational programs

I assessed the various aspects of the companies' interpretation programs by recording the educational information presented as part of each tour. Only information presented to the entire vessel was considered part of the formal tour. Therefore, I did not

record commentaries between captain and crew and/or conversations between captain/crew and individual passengers.

Data Analysis

Analysis of operator compliance

I analyzed the operators' behaviors during dolphin interactions based on the NOAA Fisheries guidelines for viewing marine mammals in the Southeast region. The guidelines are as follows:

> *(1) remain a respectful distance from marine mammals—50 yards from dolphins, porpoises, and seals;*
> *(2) time spent observing marine mammals should be limited to ½ hour—leave the vicinity of animals if you see signs of disturbance;*
> *(3) marine mammals should not be encircled or trapped between watercraft, or watercraft and shore—avoid approaching an animal when another vessel is near;*
> *(4) if approached by a marine mammal, put your watercraft's engine in neutral and allow the animal to pass—any vessel movement should be from the rear of the animal; and*
> *(5) never feed or attempt to feed a marine mammal* (NOAA 2003).

Feeding or attempting to feed marine mammals is a direct violation of the MMPA (50 CFR 216.3).

Signs of disturbance in guideline (2) include the following dolphin behaviors: rapid changes in direction or swimming speed; erratic swimming patterns; escape tactics such as prolonged diving, underwater exhalation, underwater course changes, or rapid swimming at the surface; tail slapping or lateral tail swishing at the surface; or female attempting to shield a calf with her body or by her movements. The guidelines suggest cautiously moving away from animals if any of these behaviors are observed (NOAA 2003).

According to a NOAA Fisheries enforcement official, enticing dolphins to jump in the wake of the tour vessel is not considered harassment if the operator does not change speed or heading while passing parallel to dolphins from a minimum distance of 50 yards (G. Freselli, Southeast Office, St. Petersburg, Florida, personal communication). Therefore, I only considered these maneuvers as a violation of the guidelines if the operators passed by within 50 yards of the dolphins and/or changed direction or speed while dolphins were jumping in the wake of the vessel.

To determine compliance with NOAA guidelines, I analyzed data from the interactions in terms of appropriate viewing time, approach distance, approach maneuvers, and operator response to disturbance behaviors. I assessed operator compliance with each guideline separately to compare compliance within and among tour companies. Each operator behavior during an interaction was classified as appropriate (in compliance with the guidelines) or inappropriate (not in compliance). From these binary response variables, I calculated the proportion of appropriate behaviors for each guideline per tour company. I then estimated the variance and standard error of each proportion and calculated 95% confidence intervals (Ramsey and Schafer 2002).

In terms of the viewing guideline, I assigned a “0” to those interactions lasting more than 30 minutes and a “1” to interactions that did not exceed the time limit. I calculated the proportion and confidence intervals of interactions that were within the 30-minute guideline.

To calculate proportions of compliance with the approach distance guideline of 50 yards, I assigned a “1” to all vessel maneuvers greater than 50 yards from dolphins and a “0” to maneuvers within 50 yards. I did not include maneuvers in which operators stayed

50 yards on course and dolphins approached the vessel to bowride or wake jump or those instances in which the vessel was in neutral. I only included instances in which operators actively approached dolphins during interactions.

The proportions of appropriate approach maneuvers (assigned a "1") included behind, parallel, neutral, and on course methods when passing parallel to dolphins. All other methods such as head-on, side-on, and over were considered inappropriate ("0"). I calculated separate proportions for those instances in which vessels were within 50 yards of dolphins. Appropriate maneuvers included neutral or on course methods which allowed dolphins to pass by the vessel. All other maneuver methods were considered inappropriate within 50 yards of dolphins.

I calculated the proportion of appropriate operator behaviors when dolphins exhibited possible signs of disturbance such as chuffing and tailslapping. I assigned a "1" to instances in which operators ended an interaction when dolphins exhibited disturbance behaviors and a "0" when operators continued the interaction.

After calculating proportions of compliance with each separate guideline, I determined overall compliance for each tour company by calculating the proportions of operator behaviors that adhered to all the guidelines. In terms of approach distance and maneuvers, I analyzed each vessel maneuvering technique with respect to the distance from the dolphins. Appropriate maneuver methods included those in which operators approached from behind or parallel at a distance of at least 50 yards, maneuvered into neutral when dolphins were within 50 yards, and remained on course (same speed and direction) when dolphins were bowriding and/or wake jumping. Appropriate behaviors

also included instances in which operators limited their interactions to 30 minutes and ended interactions when dolphins exhibited possible disturbance behaviors.

After calculating proportions and 95% confidence intervals for each tour company, I presented the confidence intervals for each guideline and overall compliance as graphs. I then compared the overlap of confidence intervals among tour companies and assessed operator compliance with each guideline separately to determine possible differences among tour companies. I also combined the proportions of all tour companies and graphed the 95% confidence intervals for appropriate viewing time, approach distance, approach maneuver methods, maneuvers within 50 yards, response to dolphin disturbance behaviors, and overall compliance of Clearwater operators.

Photo-identification analysis

I used a grading scale to select fins for photo-identification analysis, based on photographic quality of the image and the distinctiveness of the fin. The quality criteria included focus and clarity, angle of the fin to the photographer, and visibility of the fin. I excluded images that did not capture the entire trailing edge of the fin or were at an oblique angle. I also excluded out of focus images and those in which there were no distinguishing features. Only those images of relatively good photographic quality and at least one distinctive feature were used for analysis.

Using a 15X loupe eyepiece, I identified all individual dolphins within each interaction and assigned an identification number to each dolphin before placing it in a catalog. I compared each fin to all the others and verified the matches with another researcher before adding the new fins to the catalog.

I then selected fins with exceptional photographic quality and distinctive features and matched these fins with those taken by Duke University researchers during the summer of 1996 in Clearwater to determine possible long-term residence of bottlenose dolphins in the Clearwater area. Two other researchers verified each match.

Analysis of dolphin behavior

I calculated the proportions of group behaviors during interactions and the average group size of dolphins. I used minimum estimates of group size when exact numbers could not be determined.

To analyze possible associations between dolphin behavior and operator maneuvers, I grouped dolphin behaviors into the following categories: positive (dolphin moved toward vessel or approached vessel to bowride or wake jump), negative (dolphin moved away from vessel or exhibited possible disturbance behaviors), and neutral (dolphin remained on course or group moved toward and away from vessel). I calculated the proportion of each behavior category for all appropriate and inappropriate maneuver methods. I tested for equality of the proportions of negative and positive behaviors. To test for an association of dolphin behavior and maneuver method, I performed a Pearson's chi-squared test using positive/negative behaviors and appropriate/ inappropriate maneuver methods.

I analyzed the possible disturbance based on the type of behavior, the previous operator maneuver method, the distance from the tour vessel, and the presence of calves. I calculated the proportion of disturbance behaviors exhibited when a calf was present and compared the interaction scenarios of the different disturbance behaviors.

Analysis of educational programs

I developed a grading scale to determine the educational aspect of the tours. The scale ranged from 0 to 8 with 0 being the lowest level of education and 8 being the highest level. I reviewed the educational information presented aboard each trip and assigned one point for each of the following criterion:

(i) tour presented accurate information about basic dolphin biology (scientific name, size, diet, behavior, etc.)

(ii) tour had a trained naturalist onboard to present the educational information

(iii) tour included information about the MMPA

(iv) tour stated that swimming with dolphins in the wild is discouraged and could harm the animals and humans

(v) tour stated that it is illegal to feed dolphins in the wild

(vi) tour discussed the recommended viewing guidelines

(vii) tour presented information about activism and suggested specific ways in which the passengers can promote marine conservation in their daily lives

(viii) tour provided reference materials for the passengers (Protect Dolphins pamphlets, NMFS Southeast Region Marine Mammal Viewing Guidelines pamphlets, etc.)

I based these criteria on suggestions from studies on marine mammal interpretation programs and surveys of tourists' expectations and needs on marine mammal tours (Garrison 2003, Orams 2000, Russell 2001, Luck 2003). Educational programs that did not incorporate any of these criteria were given a rating of 0. I calculated an education score for each dolphin-watch trip and then found an average education score for each tour company. I used a Kruskal-Wallis Rank Sum test to determine whether the education levels differed among tour companies.

I used S-Plus Professional Release 2 for all statistical tests and evaluated significance levels at $\alpha = 0.05$.

Results

Field effort

I collected data from a total of 23 trips. Because the surveys were opportunistic, the number of trips per tour company varied from three to six. For all the tour companies combined, I observed a total of 45 interactions between tour vessels and dolphins. Approximately ten interactions were recorded for each of the three primarily dolphin-watching companies (A, B, and C). Eight interactions were observed from Company D while five interactions were observed from Company E.

Table 1. Summary of trip data

Tour Company	**A**	**B**	**C**	**D**	**E**
Number of trips	5	6	5	4	3
Average trip time (min)	81.43	64.00	71.79	118.87	100.77
Average number of passengers	16.80	39.67	21.00	13.50	20.33
Number of interactions	10	11	11	8	5

The operators had a 100% success rate of locating dolphins during this study period. Company A, B, and C had similar tour routes; these companies operated mostly in the Clearwater Pass and Gulf of Mexico areas (Figure 2). Company E did not enter Clearwater Pass but remained north of Compass Island. Company D, on the other hand, operated mostly south of Compass Island and near the Indian Rocks Beach area.

Dolphin interactions varied throughout the Clearwater area, but most interactions were west of Clearwater Pass along the shoreline (Figure 2). The number of interaction points on the map is greater than 45 because the GPS recorded the position of the vessel

every minute. Therefore, interaction points on the map indicate the location of dolphins every minute during the interactions with tour vessels.

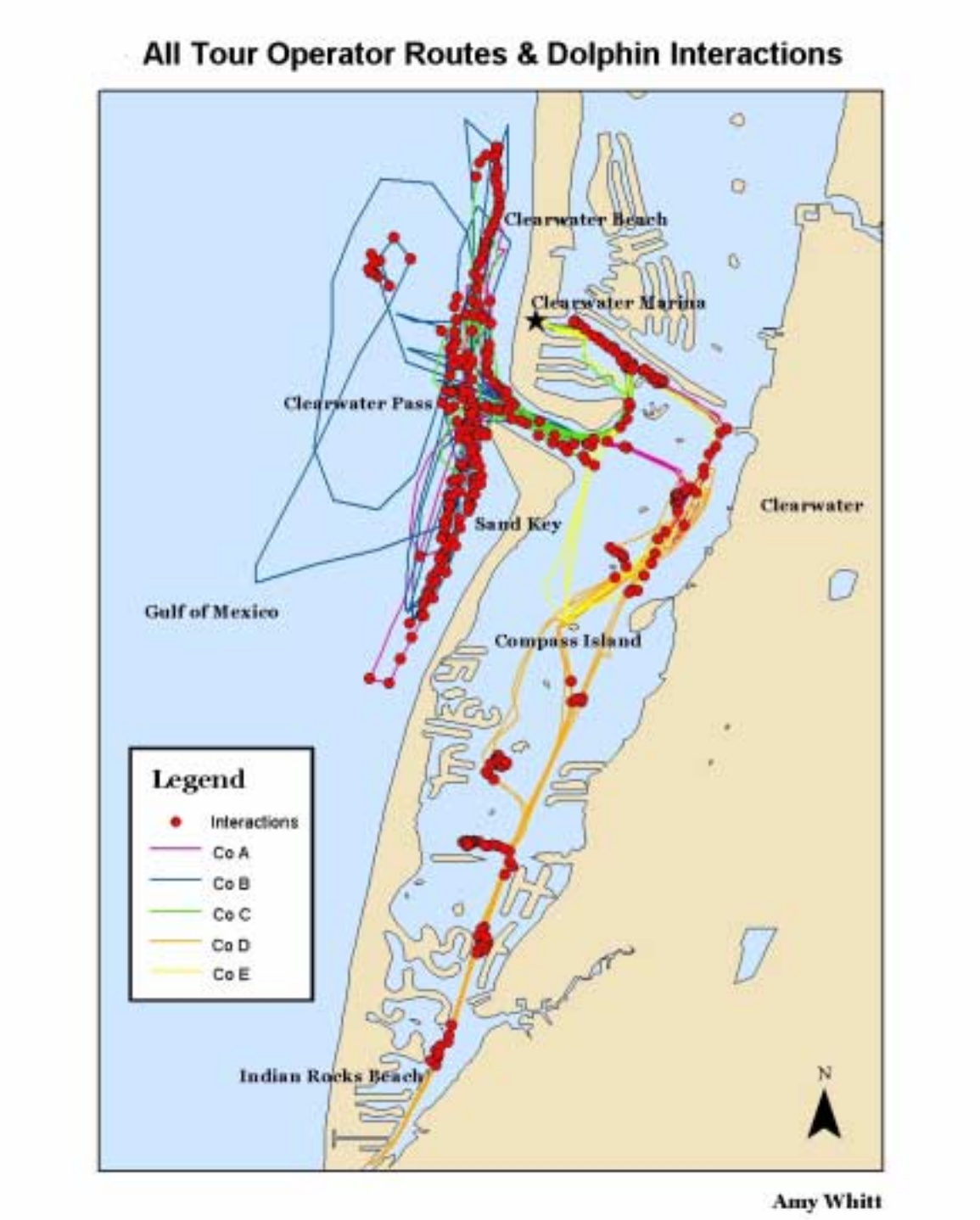

Figure 2. Operator routes and dolphin interactions per tour company.

To determine the level of boat traffic in the Clearwater area, I calculated the total number of watercraft within 100 yards of dolphin interactions (Appendix B, Table 1). Boats in the area included inboard/outboard motorboats and some sailboats ("other" category in Figure 3). The number of these vessels during a single interaction ranged from 1 to 11. A total of 22 jet skis (33% of total boats) passed within 100 yards, and most of them approached and passed within 50 yards of dolphins. I observed a maximum of four jet skis during a single interaction. Other dolphin-watch boats comprised approximately 15% of the total watercraft vessels within 100 yards of interactions.

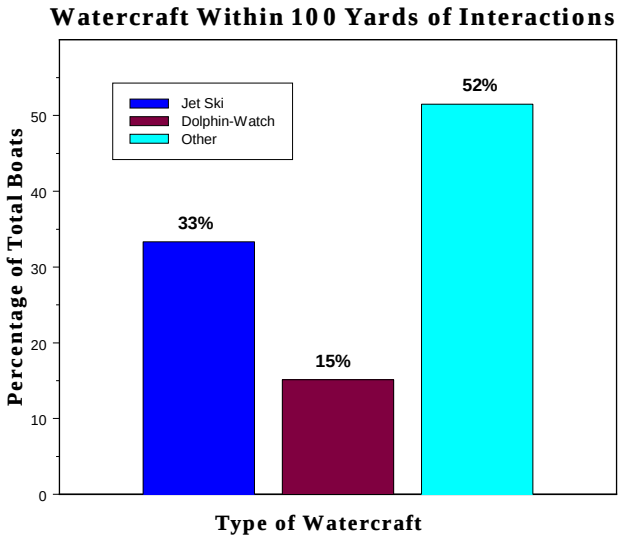

Figure 3. Proportion of watercraft vessels within 100 yards of interactions.

Operator compliance with guidelines

All operators exhibited complete compliance with the viewing limit guideline. None of the interactions exceeded the 30-minute limit, and the average interaction times for each company ranged from approximately 7 to 12 minutes (Figure 4, Appendix B,

Table 2). The longest recorded interaction was 26 minutes, but most interactions were between 2 and 10 minutes.

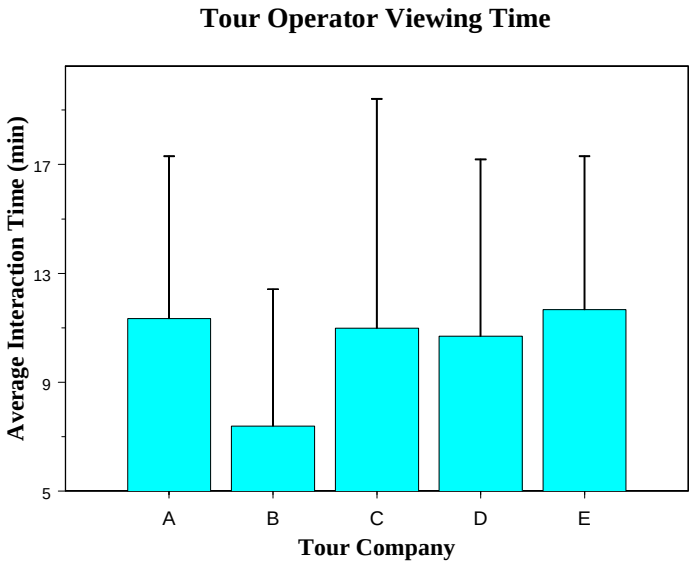

Figure 4. Average interaction times per tour company.

None of the operators complied with the disturbance guideline. Dolphins displayed disturbance behaviors on ten occasions, but none of the operators ended the interactions or left the vicinity of the animals (Appendix B, Table 3).

Approach distance compliance varied from 39% (Company A) to 78% (Company B) (Figure 5, Appendix B, Table 4). Company A operators approached dolphins within 50 yards most (61%) of the time. The majority of these approaches were between 20 and 40 yards when operators moved parallel to dolphins to entice wake jumping. 54% of Company C's approaches were also within 20-40 yards; however, these approaches were mostly from behind.

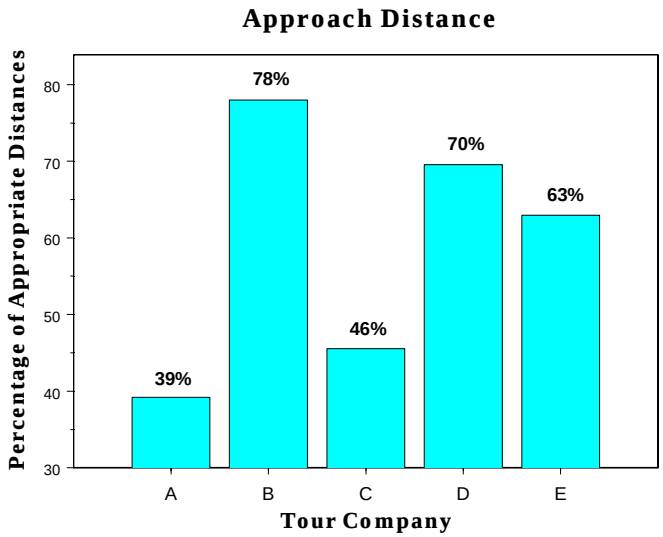

Figure 5. Proportion of appropriate approach distances per tour company.

As demonstrated in Figure 6, compliance of Companies A and C differed from Companies B, D, and E when considering the recommended approach distance.

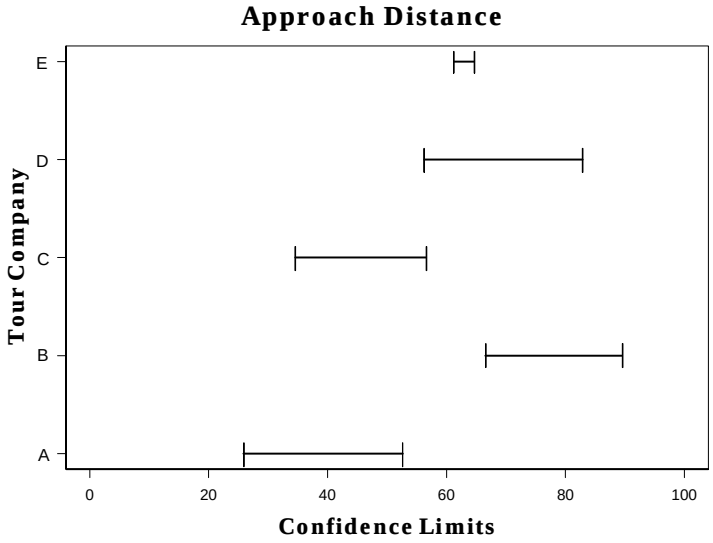

Figure 6. 95% confidence intervals of appropriate approach distances per tour company.

Compliance with appropriate maneuver methods was fairly high and ranged from 63% (Company C) to 88% (Company E) (Figure 7, Appendix B, Table 5). Although Company C operators often approached dolphins from behind, they also frequently maneuvered side-on to the animals. In contrast, Company E operators mostly approached from behind or shifted into neutral to allow dolphins to approach or pass by the vessel. Inappropriate maneuvers of the other companies also included side-on maneuvers.

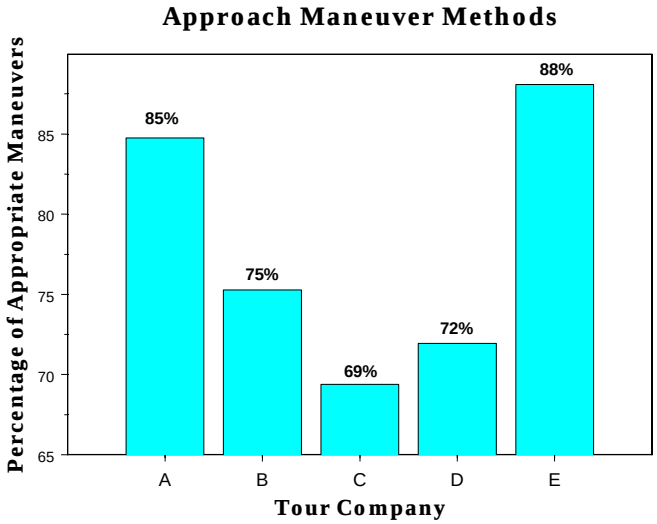

Figure 7. Proportion of appropriate approach maneuvers per tour company.

The overlap of confidence intervals suggests inconclusive evidence for the difference in compliance among Companies B, C, D (Figure 8, Appendix B, Table 4). Overlap of the proportion estimates of Companies A and E also suggests inconclusive differences in compliance. However, there is strong evidence to conclude that the proportions of compliance differ between Companies B, C, D and Companies A and E.

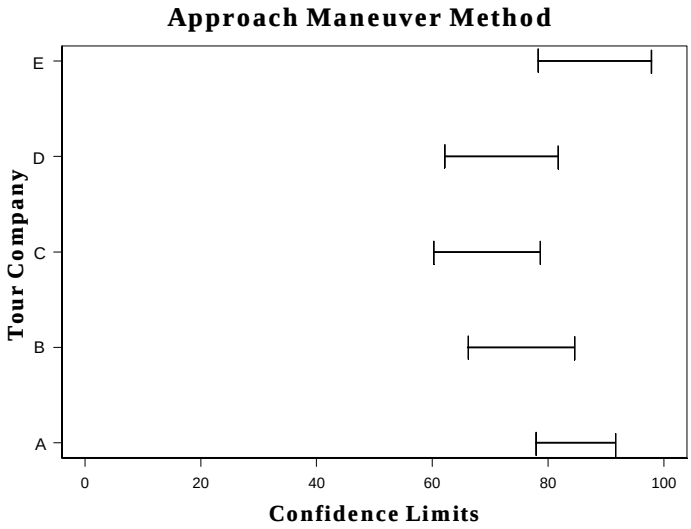

Figure 8. 95% confidence intervals of appropriate approach maneuvers per tour company.

Compliance with appropriate maneuvers within 50 yards of dolphins varied the most among individual tour companies. The proportion of appropriate maneuvers ranged from 25% (Company C) to 79% (Company A) (Figure 9, Appendix B, Table 6). Company C operators often maneuvered behind or parallel to dolphins within 50 yards. Inappropriate maneuvers among the other companies also consisted of parallel approaches within 20-50 yards of dolphins.

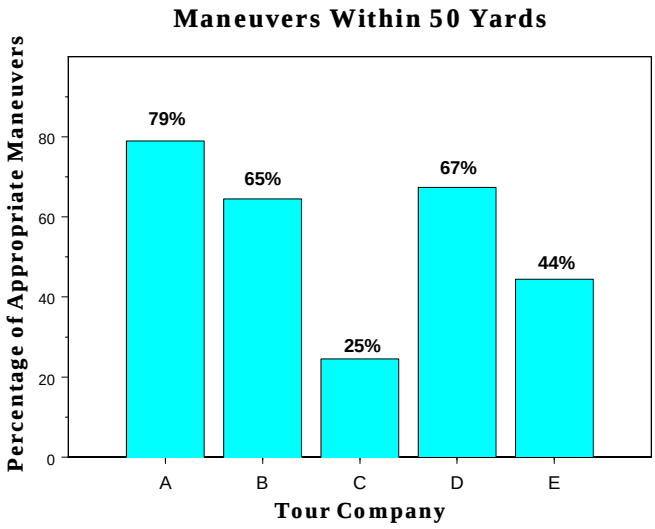

Figure 9. Proportion of appropriate maneuvers within 50 yards per tour company.

As noted in Figure 10, the compliance of Company C differed significantly from Companies A, B, and D.

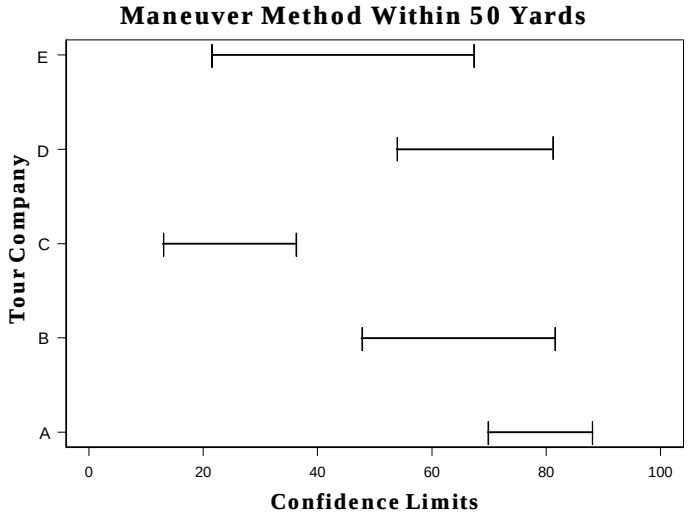

Figure 10. 95% confidence intervals of appropriate maneuvers within 50 yards per tour company.

To determine overall guideline compliance per tour company, I analyzed each interaction based on appropriate viewing time, approach distance, approach maneuver methods, maneuver methods within 50 yards, and response to dolphin disturbance behaviors. The proportions of compliance behaviors are summarized in Figure 11. Among the tour companies, the company with the lowest proportion of compliance behaviors was Company C, which adhered to the guidelines only 38% of the time (Appendix B, Table 7). As noted above, Company C had a low proportion of compliance with approach distance, approach maneuvers, and maneuvers within 50 yards of dolphins when compared to the other companies. The relatively low proportion of overall compliance for Company C can be attributed to frequent parallel and behind maneuvers within 50 yards of dolphins and failure to end interactions when dolphins exhibited disturbance behaviors.

Compliance of the other companies was much higher and ranged from 60% (Company D) to 73% (Company B). Company D's compliance was relatively high and consistent among approach distance, approach maneuvers, and maneuvers within 50 yards (Figures 5, 7, and 9). Although operators from Company E (64%) frequently approached dolphins from behind or shifted into neutral, they often maneuvered within 50 yards. Company A operators (66%) frequently complied with the approach maneuvers guideline and shifted into neutral when within 50 yards of dolphin. However, to entice wake jumping, operators often moved parallel to dolphins within the 50-yard limit. In addition to maneuvering within the appropriate distance, Company A operators failed to end interactions after observing disturbance behaviors on several occasions. Company B had the highest proportion of compliance behaviors (73%). Although

operators typically maneuvered parallel to entice wake jumping, they often remained 50 yards from dolphins.

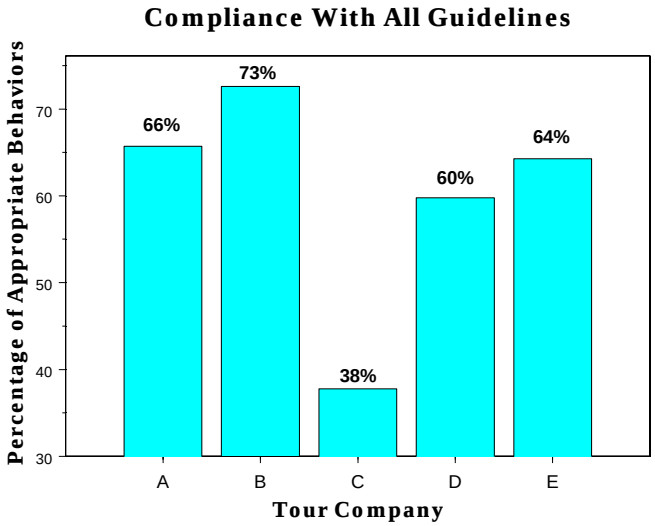

Figure 11. Proportion of compliance with all guidelines per tour company.

In Figure 12, there is convincing evidence that Company C's compliance differed from the other companies.

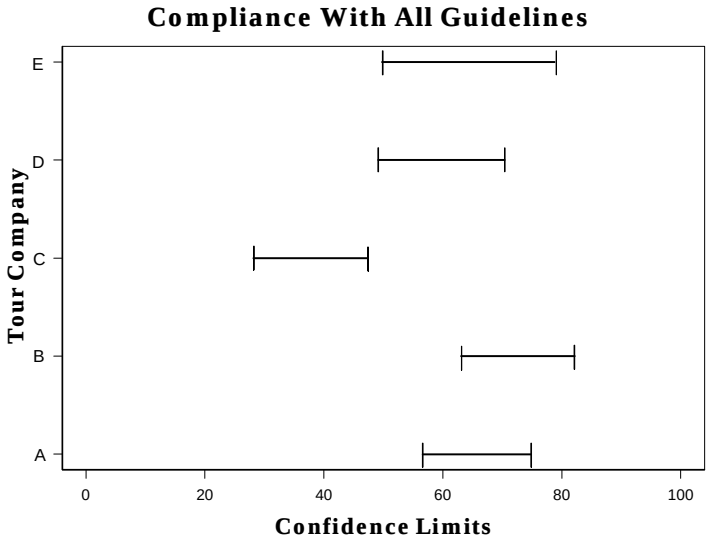

Figure 12. 95% confidence intervals for compliance with all guidelines per tour company.

When analyzing compliance among all operators, I found that compliance varied among the different guidelines (Figure 13, Appendix B, Table 8). The operators maintained 100% compliance with the viewing time limit but failed to end encounters when dolphins exhibited possible disturbance behaviors. Approximately 60% of the operators' behaviors adhered to the guidelines for approach distance and maneuvers within 50 yards. Operators complied with the approach maneuver guideline 77% of the time. Clearwater operators adhered to all the guidelines approximately 60% of the time.

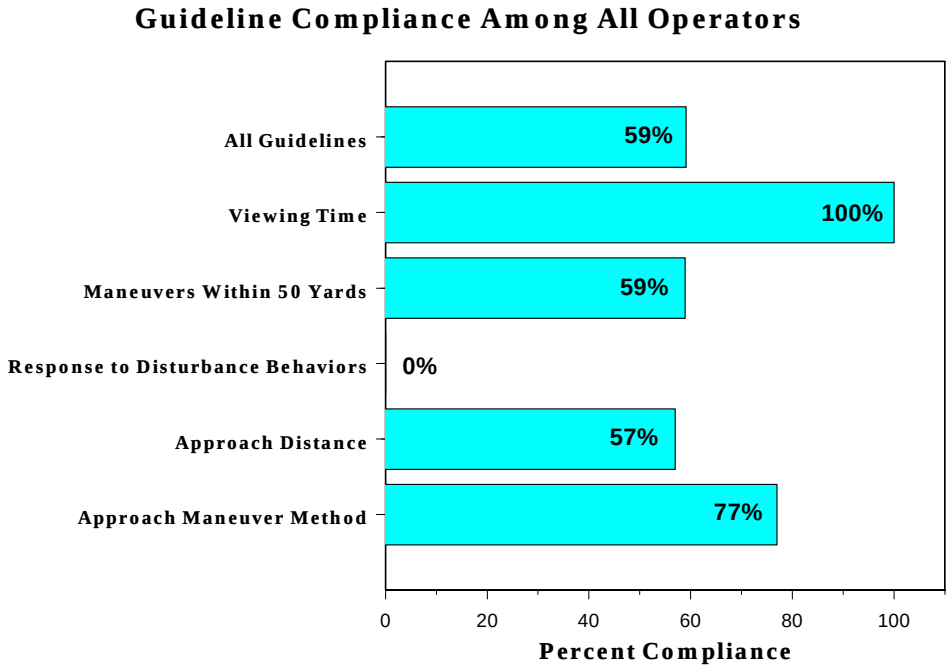

Figure 13. Proportions of operator compliance per guideline.

Photo-identification

During the study period, I photographed 211 dolphins. Ninety-eight of these images were not of acceptable photographic quality, and 25 were of dolphins that did not have any distinctive features. Therefore, only 88 of the photographed images met the criteria and were used in the analysis. In these images, I identified 33 individual

dolphins, and 14 of these were photographed during more than one interaction. I photographed several dolphins on two different days while on different tour vessels. One dolphin was photographed four separate times during the month of June.

Five of the 33 dolphins were positively matched to the Duke University Clearwater catalog. Two of these five identifications show additional nicks and notches that formed over the intervening seven-year period, since they were photographed in the Clearwater area in July 1996. I intend to add my useful images to the 1996 catalog for use in future studies of Clearwater dolphins.

Dolphin behavior

The average group size was 4.5 dolphins (SD = 2.96) and ranged from one to twelve animals. Approximately 27% of the interactions included a calf in the group. Frequently observed behaviors included milling (46%) and traveling (41%). Socializing and feeding behaviors were observed less frequently (2% and 10% respectively) while none of the groups were seen resting during interactions with tour vessels.

Most potential disturbance behaviors were observed after parallel, behind, and neutral maneuvers while the majority of positive behaviors followed parallel and on course maneuvers. The proportion of negative behaviors was significantly higher than the proportion of positive behaviors ($z = 2.69$, one-sided $p = 0.004$). There was no significant association between dolphin behavior and maneuver method ($X^2 = 2.58$, two-sided $p = 0.139$).

I observed ten possible signs of disturbance during dolphin interactions with all tour companies except Company D. Chuffing constituted 50% of disturbance behaviors while tailslapping accounted for the other half. Operator maneuvers prior to the

behaviors included neutral, head-on, parallel, side-on, and behind. The distance from the dolphins ranged from 20 to 100 yards during these interactions. Fifty percent of the disturbance behaviors were observed within 50 yards of the dolphins. Calves were present during 80% of the tailslapping incidences and 60% of the chuffing incidences.

Educational programs

The average education scores of the tours were extremely low and ranged from 1.0 to 1.75 (Figure 14). The levels did not significantly differ among tour companies (Kruskal-Wallis, $X^2 = 4.0$, two-sided $p = 0.406$). Many of the operators presented information about basic dolphin biology, but very few included the MMPA regulations, the NOAA viewing guidelines, or other critical components of an effective interpretation program. None of the operators were consistent in the information presented during each tour.

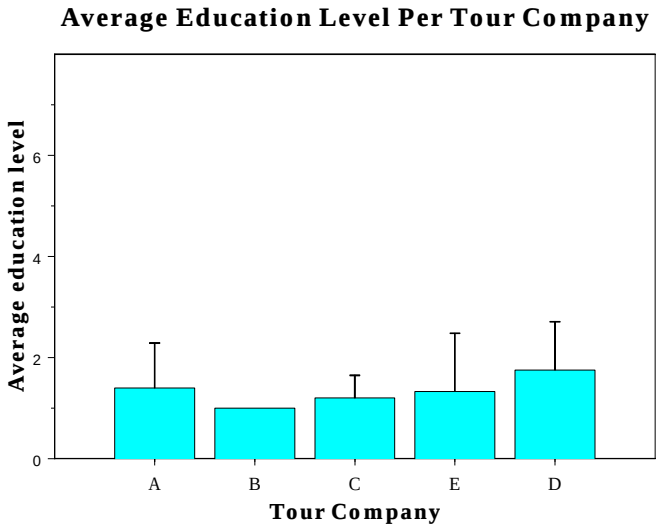

Figure 14. Average education scores per tour company.

Discussion

Dolphin-watch operations

From my observations onboard dolphin-watch vessels, I believe that Clearwater operators would benefit greatly from the "Dolphin-Aware" workshop. The tour companies did not fully adhere to the recommended viewing guidelines, and compliance with individual guidelines varied among companies. Operators maintained complete compliance with the viewing time limit but never ended interactions when dolphins exhibited possible disturbance behaviors. Operators frequently used appropriate maneuvers to approach dolphins but often approached within the 50-yard limit. During these instances, they did not consistently change maneuver methods to abide by the guidelines.

The overall level of compliance as a group was approximately 60%; however, operator compliance was highly variable. One company exhibited a low proportion of overall compliance, while other companies had higher proportions of compliance with most of the guidelines. The proportions of appropriate behaviors of tour companies also varied among the individual guidelines. Although there was relatively high compliance with the approach maneuver guideline, compliance with approach distance and maneuvers within 50 yards greatly varied among tour companies.

Operators can easily maneuver around dolphins and should not have trouble following the guidelines for approach maneuvers and maneuvers within 50 yards. The distance guideline, on the other hand, is difficult to judge at sea. This may result in unintentional violations. However, this guideline is particularly important in minimizing harassment since close proximity may provide the greatest risk of disturbance (Orams

2000). Controlled experiments have tested the relevance of distance guidelines for killer whales in Johnstone Strait, British Columbia. The results of these studies indicate that levels of disturbance increase when the guideline distance is shortened (Williams *et al* 2002). Although the distance estimations in this study may not have been exact, captains and skippers can improve their estimations by using a rangefinder to target objects in the water. Practice with this device and feedback during the training workshop will improve operators' abilities to estimate distances from dolphins.

Clearwater operators maneuver close to dolphins to satisfy participant expectations, but they do not seem to be aware that many participants value education above proximity to marine mammals (Orams 2000). A survey of wildlife tourists in the United States found that visitor satisfaction is linked to their knowledge about local wildlife (Garrison 2003). Therefore, ecotour operations that incorporate an educational program would increase visitor satisfaction.

Clearwater operators are lacking this component of their tours. During this study, none of the companies offered structured interpretation programs as a part of the tours. Based on my 8-point scale, the highest average education level was less than 2 points. Most of the tours included information about basic dolphin biology (size, food, weight), but this information was not consistent among the tours or companies. A few operators mentioned the MMPA, but only one tour included information about the viewing guidelines. In addition, none of the companies had formal naturalists or interpreters onboard their vessels. The captain and/or crew presented information during the tours but did not provide questionnaires to participants. Without feedback from participants,

the companies are unlikely to improve their operations to provide greater participant satisfaction.

Cumulative impacts

Several potential cumulative impacts of dolphin-watch operations have been identified in this study. The results of the photo-identification analysis suggest that a relatively small population of bottlenose dolphins resides in the Clearwater area during the summer months. Because photographs from the tour vessels were opportunistic, I was unable to photograph all of the dolphins encountered during the tours. The actual population size is undoubtedly much greater than the 33 individuals identified in this study.

Because several individual dolphins were sighted over a seven-year period, there may be evidence of a long-term resident population. According to my results, the operators followed a minimum of 14 dolphins more than one time during the total 45 interactions. Three of the tour companies search for dolphins in the same locations and follow a similar route. During the summer months, Clearwater operators conduct tours from 11:00 am to sunset. Therefore, dolphins in the area are possibly accompanied by at least one dolphin-watch vessel during most of the daylight hours. I documented several occasions when more than one dolphin-watch vessel interacted with the same group of dolphins. The cumulative impacts of these factors are not known but should be taken into account when determining appropriate dolphin-watch behaviors.

The level of boat traffic is also a concern in this area. Although several boats passed within 100 yards of dolphin interactions, jet skis accounted for 33% of the total boat traffic and often approached dolphins. The number of jet skis in the area has grown

recently with the increase in jet ski rental companies along the beaches. Jet ski operators are either ignorant of the viewing guidelines or refuse to abide by them. During interactions when dolphins jumped in the wake of the tour vessels, jet ski operators often joined in this activity and rode within a few yards of the dolphins. Due to their behavior, jet ski operators may pose a real threat to dolphins during the tourist season. Indirect threats of general boat traffic, including dolphin-watch vessels, may include increases in ambient noise levels that could potentially affect the daily lives of local dolphin populations (Evans 1996).

Dolphin behavior

During interactions, dolphins were usually milling (46%) or traveling (41%). These behaviors are not uncommon after interactions with boats (Lusseau 2003) or in the absence of boats. I observed dolphin behavior from dolphin-watch vessels so I could not assess the behavioral state of the dolphins before or after the interactions. However, the behavioral responses during the interactions varied. There was a significantly greater proportion of negative behaviors such as movement away from the vessel or disturbance behaviors when compared to positive behaviors. However, neither negative nor positive behaviors were associated with operator maneuver method.

The large proportion of negative behaviors may be attributed to group composition since the majority of disturbance behaviors and movement away from vessels were observed when a calf was present. Other studies have found an increase in similar negative behaviors when vessels interact with adult-calf pairs or lone individuals (Evans *et al.* 1994).

Vessel type may also affect the number of negative or positive behaviors. For instance, harbor porpoises in the Shetland Islands often respond positively to sailboats and small ferries but exhibit negative behaviors in the presence of speed boats and large ferries (Evans *et al*. 1994). Although I did not include vessel type as a part of this study, the different dolphin-watch vessels may influence certain behaviors. Other factors such as vessel speed or location of the interaction may also play a role. In fact, the large combined proportion of positive and neutral behaviors may be attributed to possible habituation of the summer residents. Resident sperm whales off Kaikoura, New Zealand, and are more tolerant to whale-watch activities than transients (Gordon *et al*. 1992). In addition, resident killer whales in Johnstone Strait and the Puget Sound often ignore or approach boats (Phillips and Baird 1993).

Future research

Future studies should investigate the population size and structure of the local population of bottlenose dolphins. My results suggest that a resident population exists in Clearwater during the summer months. However, the distribution and movement patterns of these dolphins throughout the year are unknown. These studies would provide valuable insight into habitat preference, especially foraging and resting areas. Allen and Read (2000) found that bottlenose dolphins decreased use of primary foraging habitats during periods of high vessel traffic in two areas near Clearwater. Dolphins in Clearwater may also shift habitat preferences in response to high vessel densities, especially during the summer. This information is critical in determining long-term ecological impacts of dolphin-watch operations and may have future management implications.

Future research programs should also focus on short-term impacts of ecotour operations. Studies should include experimental approaches in which researchers assess the behavior of dolphins before, during, and after interactions with vessels. Because marine mammal behavior and response to vessels vary by species and location, certain operator maneuvers may induce more positive or negative behaviors in this particular population of bottlenose dolphins. Controlled experimental approaches can account for vessel speed, maneuver methods, distance, and other parameters that may influence dolphin behavior. These studies can test for different dolphin behaviors to various types of vessels such as sailboats, speedboats, and outboard motor boats. Particular types of vessels may minimize impacts of ecotour operations.

To evaluate the effectiveness of educational programs, a survey study needs to be implemented after the operators incorporate these programs into their tours. Surveys should include questions about dolphin biology and behavior, the MMPA, and the viewing guidelines. Distribution of surveys before and after the ecotours will allow researchers to assess the amount of information learned during the tour. Surveys should also evaluate participant expectations of tours and demographic information so that operators can tailor their educational materials and narratives to their audiences.

I also recommend a research project to evaluate the success of the "Dolphin-Aware" workshop. Researchers can observe operator interactions with dolphins before and after completion of the training workshop to determine changes or improvements in operator compliance. An assessment of the interpretation programs should also be incorporated into this project. Researchers could also assess the effectiveness of the

interpretation programs by observing the content of the programs and surveying participants to determine any gain in knowledge.

Recommendations for Dolphin-Aware workshop

Code of conduct

Based on my observations of dolphin-watch operations, I recommend the establishment of an ecotourism association for Clearwater operators. The formation of operator associations worldwide has initiated the collaboration of ecotour operators, scientists, and government officials. These organizations promote sustainability of the industry through self-monitoring and assist in conservation of all marine species. The Whale Watch Operators Association (WWOA) in the Pacific Northwest strives to protect local species of marine mammals. This group of operators has developed their own code of conduct, a set of guidelines that outlines appropriate maneuvers around specific marine mammal species and ways to navigate when more than one vessel is present. The code also requires naturalists/biologists on all ecotour vessels (WWOA 2004).

Operators in other areas have also joined together to develop their own set of guidelines. Whale-watch operators in Western Scotland frequently adhere to a code produced by a tour operators' association but do not follow the UK government guidelines (Parsons and Woods-Ballard 2003). Their preference for local, operator-produced codes promotes bottom-up management in which operators are actively involved in monitoring and managing the ecotourism industry. Operators in Newfoundland also adhere to a voluntary code of conduct and consider the code valuable for business (Corbelli 2003).

The development of a Clearwater Operators Association (COA) would join together all dolphin-watch operators in the area and promote self-monitoring and enforcement. During the workshop, government officials and researchers can work with the operators to develop a code of conduct specifically for the Clearwater area. This code of conduct would include additional guidelines that may help to minimize the potential for harassment in this area. For instance, the cumulative impact of multiple operators viewing the same group of animals could be minimized if the operators agree to limit the number of tour vessels near a group of animals. Operators may also choose to alter the times or locations of their tours to limit the number of dolphin-watch vessels in certain areas or times when overall boat traffic is high.

Interpretation program

The workshop should include an interpretation session in which the operators (or designated captains/crew members) learn how to effectively incorporate a structured educational program into their tours. This should include information on dolphin biology, behavior, conservation issues, the MMPA, the viewing guidelines, and other local marine issues. It should also include the distribution of materials such as the "Protect Dolphins" brochure, the Marine Mammal Viewing Guidelines pamphlet, and a list of opportunities in which participants can actively get involved in conservation issues.

Forestell (1992) and Orams (1993) have developed general models for effective interpretation programs. These models can provide the basis for educational programs onboard dolphin-watch vessels in Clearwater. Based on these models, I recommend the following structure as a possible approach for Clearwater educational programs:

1) Pre-contact phase—time between leaving the marina and the first dolphin interaction. Operators should not bombard participants with information. Instead, they should motivate tourists to ask questions and give information in short doses. Information should be limited to general descriptions of dolphins so that participants know how to locate dorsal fins. Operators should also orient participants with respect to the boat and certain landmarks and include ways to protect the environment during the trip. For instance, operators can show participants where to recycle their soda cans and where to place cigarette butts so that they do not throw any trash overboard.

2) Contact phase—time during an interaction. Information provided during this portion of the trip should be relevant to what the participants are actually observing. Operators should describe how to distinguish individual animals by the nicks and notches along the trailing edge of the dorsal fin. Operators can also provide interesting information about the size, weight, and daily activities of bottlenose dolphins in the area and describe any behaviors that they observe during the interaction. This is also the perfect time to include information about the MMPA and viewing guidelines to justify the reasons for the operator's cautious movement around the animals. (Note: Participants should be aware of the guidelines and the operator's approach methods before boarding the vessel so that their expectations of the tour are realistic).

3) Post-contact phase—time from the last interaction to docking at the marina. This is probably the most important stage because it allows participants to link their new knowledge of marine mammals and conservation issues to specific ways in which they can change their behaviors to help protect the environment. Operators should answer questions, discuss current marine mammal research, provide reference materials (NOAA recommended viewing guidelines pamphlet, Protect the Dolphins pamphlet, etc.), and suggest concrete opportunities to act (signing petitions, joining environmental organizations, contributing to local research programs, or purchasing environmentally friendly products).

4) Evaluation—feedback and assessment stage. Operators should give follow-up surveys or questionnaires to participants to assess the effectiveness of the educational program and evaluate their expectations and satisfaction with the tour. Participants should be given the option to fill out the questionnaires directly after the tour or at their convenience.

This structure can easily be incorporated into the dolphin-watch tours and would greatly improve the educational programs. Because tour companies may not afford to hire naturalist, the workshop can train captains/crew to conduct these educational programs.

Long-term monitoring program

To ensure the sustainability of the ecotourism industry in Clearwater, I recommend the development of a long-term monitoring program. This program will involve the monitoring of operator compliance and the local dolphin population. The training workshop and formation of a code of conduct should increase operator compliance and promote self-enforcement. However, management of dolphin-watching also depends on careful monitoring from non-industry personnel. Several programs worldwide allow volunteers or researchers to monitor dolphin-watch activities. The Dolphin Space Program (DSP) uses an anonymous system to monitor dolphin-watch tours in the Moray Firth, Scotland (WDCS 2003). Anonymous volunteers participate on trips led by operators who have agreed to the DSP code of conduct. After the tour, the volunteers complete a questionnaire based on the operators' compliance with the code. This program has been successful in addressing issues regarding compliance with code of conduct (WDCS 2003).

The Lifewatch Boater Awareness Program in Vancouver, British Columbia uses a different monitoring approach. Volunteers of the program actively intercept boaters who harass marine mammals and fail to comply with the guidelines. They also provide information about whale-watch guidelines and regulations to boaters on the water and through local aquariums/marinas (Hamilton 2003).

In Cape Cod, Massachusetts, researchers and operators work together to monitor humpback whales and whale-watch activities (Whale Center of New England 2004). Onboard ecotour vessels, researchers and volunteers collect behavioral and population data on local humpback whales. They also lead the tour educational programs and monitor operator interactions with whales.

I recommend a combination of these programs to monitor Clearwater operations and the local dolphin population. Researchers from the Eckerd College Dolphin Project may be interested in collecting photo-identification on Clearwater dolphins and could assist in the educational programs of the tours. Volunteers from the Clearwater Marine Aquarium and other local organizations may also serve as ecotour guides and monitor dolphin-watch operations. A long-term monitoring program in Clearwater should also consist of educational outreach activities to target all boaters in the area and distribute information about the viewing guidelines and regulations.

Workshop Attendance

All captains and crew for each tour company should be required to attend the workshop in order for the tour company to receive any of the incentive benefits. This will ensure that all ecotour operators receive the same training and are well educated in appropriate marine mammal viewing techniques. In addition, the workshop should be

conducted yearly to educate new captains/crew and to discuss the latest regulations and/or guidelines for viewing marine mammals. I also strongly recommend attendance of jet ski rental operators so that they can learn about the viewing guidelines and distribute this information to their patrons.

Policy alternatives to marine mammal tourism

Certification/permit program

Throughout the world, government agencies regulate marine mammal tourism by allocating certifications or permits to operators who complete training courses or abide by certain regulations or guidelines. Tour operators in New Zealand and Australia operate under a permitting system. The number of permits and type of restrictions are site-specific. For instance, the permit systems for dolphin-watch operators in the Bay of Islands, New Zealand restrict the number of tour vessels and the frequency of operations. Operators that are allocated a permit must also abide by the regulation of no more than three vessels within 300 meters of dolphins (Constantine et al. 2004). A similar permit system in Port Phillip Bay, Australia restricts the number of swim-with operations (Scarpaci et al. 2003).

Although certifications and permits are not required under federal regulations in the U.S., these programs may be necessary in the future due to the rapid growth of the industry. Until these programs are required through government regulations, volunteer certification programs are possible management alternatives. Operator training workshops are potential avenues for the development of certification programs. The Dolphin Aware workshop includes a certification process that will provide incentives for

operator participation (Hudon 2003). Upon completion of the workshop, operators will receive a "dolphin-friendly tour operator" logo to display on their vessels and booths at the marina. Promotional materials targeting tourists and locals will advertise the certification program and market the "dolphin-friendly" logo. This will attract customers and provide economic benefits to the operators. Additional certification benefits will include an unlimited supply of outreach materials that operators can distribute to their participants (Hudon 2003). To ensure continued best practices of tour operations, an annual certification renewal system could require operators to attend a training workshop annually and be subject to periodic inspections/assessments.

Certification/permit programs provide incentives for operators to adhere to industry regulations and guidelines. They also provide potential economic benefits by attracting customers that desire tours from responsible operations. Certifications also help to standardize the industry criteria and allow for site-specific differences.

Improved guidelines/regulations

In 2000, the Marine Mammal Commission (MMC) sponsored a literature review to obtain information about human interactions with marine mammals in the wild. After reviewing the report, the MMC concluded there was enough scientific evidence to state that "any efforts to interact intentionally with dolphins in the wild are likely to result in at least Level B harassment" and the possible death or injury of the person and/or animal (Samuels *et al.* 2000). Therefore, the MMC recommended to NOAA Fisheries that swimming or attempting to swim with marine mammals constitutes a taking and should be prohibited (MMC 2000).

In response to this statement and others from researchers, wildlife protection groups, and private citizens, NOAA Fisheries has decided that a new proposed rule is needed to prevent harassment from human activities directed at wild marine mammals (67 FR 4380, January 30, 2002). This ruling would be relevant to marine mammal ecotour operators as well as any recreational or commercial vessels. NOAA Fisheries is requesting comments on the types of regulations that would be appropriate and offers several options for consideration. These options include the following:

(i) *codifying the current NOAA Fisheries Regional guidelines as regulations which would provide for enforcement of these provisions and penalties for violations,*

(ii) *codifying the current guidelines with improvements to more clearly address specific activities of concern and then codifying them as enforceable regulations,*

(iii) *establishing minimum approach rules similar to the rules for humpback whales in Hawaii and Alaska and the North Atlantic right whales to accommodate a reasonable level of wildlife viewing opportunity while minimizing harassment,*

(iv) *and amending the definition of "take" and/or "harassment" to include the prohibition of specific activities such as swimming with, touching, posing with, or otherwise acting on or with a marine mammal in the wild* (67 FR 4380, January 30, 2002).

The proposed ruling includes the necessary changes to ensure the long-term management of marine mammal tourism throughout the U.S. In addition, more research

programs are needed to assess the impacts of ecotour operations in specific areas. Collaboration among researchers, government officials, and operators is also needed to develop regional codes of conduct that will help to minimize harassment and promote operator compliance with guidelines and regulations.

Conclusion

The dolphin-watch tours in Clearwater not only support the local economy but also provide unique opportunities to educate the public about appropriate viewing techniques to minimize negative impacts and conserve marine mammal populations. The "Dolphin Aware" workshop is a perfect opportunity for operators to learn how to minimize their impacts on the local dolphin population and to foster a conservation ethic in the community. Through the development of a Clearwater Operator's Association and Code of Conduct, Clearwater operators can add to existing guidelines and address possible cumulative impacts of the industry. Increased compliance with guidelines and structured interpretation programs can promote responsible marine mammal viewing and enhance public awareness and support of marine conservation. Establishment of a long-term monitoring program can ensure continued operator compliance and examine the long-term effects of ecotourism on the local dolphin population. The success of this pilot workshop will generate support for marine mammal viewing workshops throughout the U.S. and worldwide and will employ a bottom-up management system in which operators collaborate with scientists and policy-makers to improve the industry and minimize impacts on the marine environment.

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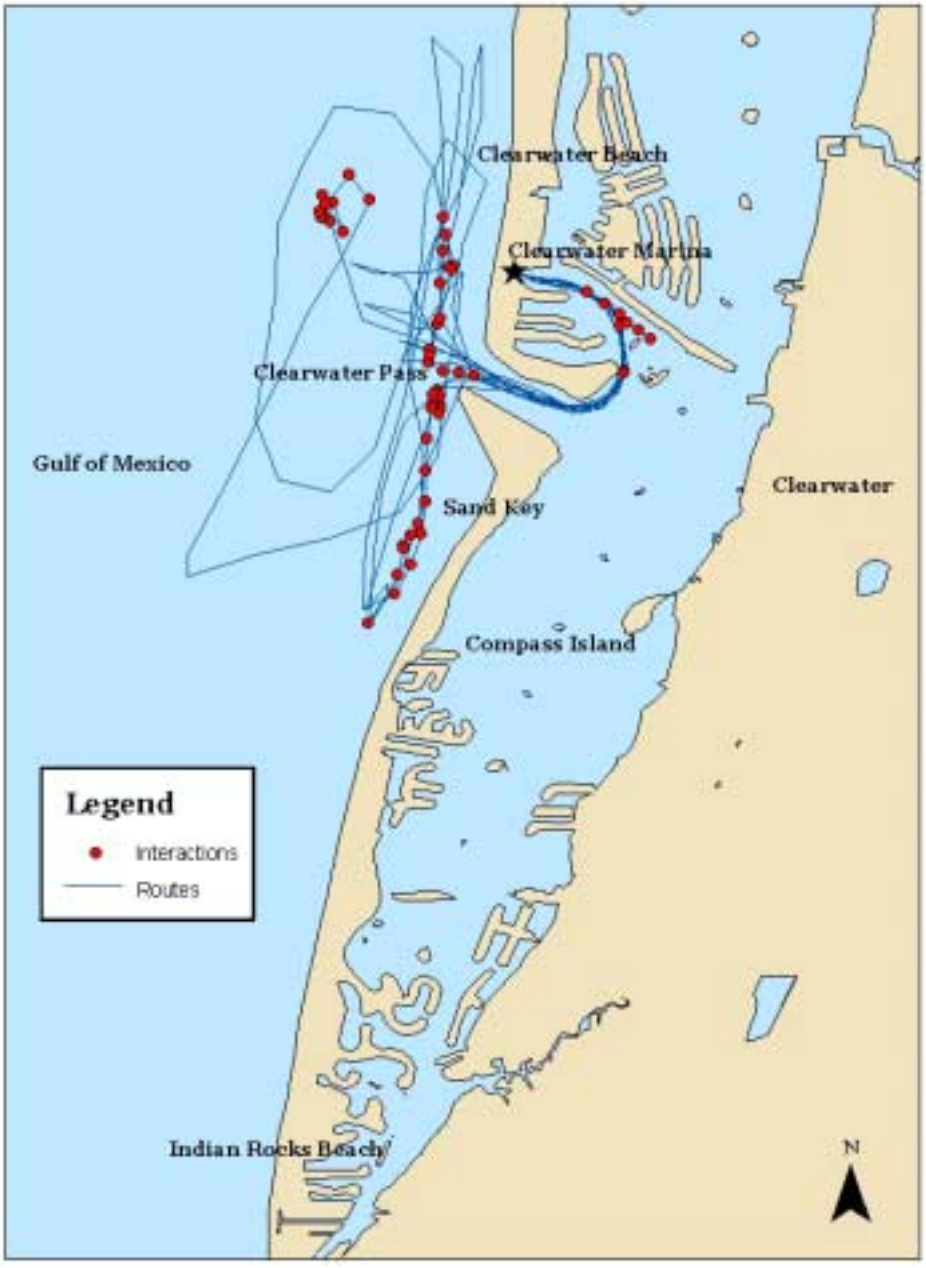
Appendix A

Maps of tour company routes and dolphin interactions.

Tour Company B Routes & Dolphin Interactions



Amy Whitt

Tour Company C Routes & Dolphin Interactions

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Tour Company D Routes & Dolphin Interactions

Amy Whitt

Tour Company E Routes & Dolphin Interactions

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Appendix B

Table 1. Summary of watercraft data within 100 yards of tour vessels during interactions.

Tour Company	**A**	**B**	**C**	**D**	**E**	**Total**
Number of jet skis	6	3	11	1	1	22
Number of dolphin-watch boats	6	1	3	0	0	10
Number of other boats	5	4	7	14	4	34

Table 2. Summary of viewing time data.

Tour Company	**A**	**B**	**C**	**D**	**E**
Average interaction time (min)	11.33	7.38	10.98	10.69	11.67
SD	5.98	5.04	8.43	6.50	5.64

Table 3. Summary of dolphin disturbance and vessel response data.

Tour Company	**Dolphin Behavior**	**Distance (yards)**	**Vessel Response**	**Previous Maneuver**	**Calf Present**
A	Chuffing	30	Neutral	Neutral	Yes
	Chuffing	20	Parallel	Head-on	Yes
B	Tailslap	100	Head-on	Head-on	Yes
	Tailslap	20	Parallel	Parallel	Yes
C	Tailslap	45	Neutral	Neutral	Yes
	Tailslap	65	Behind	Neutral	Yes
	Chuffing	25	Side-on	Side-on	No
	Chuffing	50	Parallel	Behind	Yes
E	Chuffing	65	Neutral	Neutral	No
	Tailslap	60	Behind	Behind	No

Note: I did not observe any signs of disturbance during interactions with Company D.

Table 4. Proportions and confidence intervals of compliance with approach distance per tour company.

Tour Company	**A**	**B**	**C**	**D**	**E**
% Appropriate	39.2	78.0	45.6	69.6	63.0
95% CI	25.8-52.6	66.5-89.5	34.6-56.6	56.3-82.9	61.3-64.7
n	51	50	79	46	27

Table 5. Proportions and confidence intervals of compliance with approach maneuvers per tour company.

Tour Company	**A**	**B**	**C**	**D**	**E**
% Appropriate	84.8	75.3	69.4	72.0	88.1
95% CI	77.9-91.6	66.1-84.5	60.3-78.5	62.2-81.7	78.3-97.9
n	**105**	**85**	**98**	**82**	**42**

Table 6. Proportions and confidence intervals of compliance with maneuvers within 50 yards per tour company.

Tour Company	**A**	**B**	**C**	**D**	**E**
% Appropriate	78.9	64.5	24.5	67.4	44.4
95% CI	69.8-88.1	47.7-81.4	13.0-36.1	53.8-80.9	21.5-67.4
n	76	31	53	46	18

Table 7. Proportions and confidence intervals of overall compliance per tour company.

Tour Company	**A**	**B**	**C**	**D**	**E**
% Appropriate	65.7	72.6	37.8	59.8	64.3
95% CI	56.6-74.8	63.1-82.2	28.2-47.4	49.2-70.4	49.8-78.8
n	105	84	98	82	42

Table 8. Proportions and confidence intervals of compliance among all operators.

	Approach Maneuver Method	**Approach Distance**	**Maneuver Method Within 50 yd**	**Viewing Time**	**Response to Disturbance Behaviors**
% Appropriate	76.9	56.9	58.9	100	0
95% CI	72.9-81.0	50.8-63.0	52.5-65.4	100	0