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Evaluation of Human Interactions with a Provisioned Wild Bottlenose Dolphin (*Tursiops truncatus*) near Sarasota Bay, Florida, and Efforts to Curtail the Interactions

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Abstract

Boaters have provisioned a free-ranging bottlenose male dolphin (*Tursiops truncatus*) for more than 15 years near Nokomis, Florida. The dolphin is a well-known attraction to tourists and local boaters because of his predictable presence in a narrow section of the Intracoastal Waterway near the Albee Road Bridge. Observations and records collected since 1990 documented this animal being fed by and interacting with humans, sometimes resulting in injury to the humans attempting to touch, feed, or swim with it. We initiated a study in 1997 to document the dolphin's interactions with boaters, to characterize the frequency and types of boater interactions with the animal, and to evaluate the effectiveness of public education and enforcement efforts to curtail these illegal activities.

The project consisted of three phases: (1) a baseline study, (2) a docent program, and (3) a follow-up study. Approximately 26% of the 1,797 interactions observed during the baseline study involved touching, teasing, or splashing, and 11% of interactions involved feeding. The docent program involved increased signage and the operation of a marked vessel to shadow the dolphin, monitor the types and frequencies of interactions, and offer educational materials about responsible wildlife viewing. Only 1.3% of boaters interacted with the dolphin in the presence of the docents; more than half of those questioned indicated that they were aware of the illegality of their actions. During follow-up observations to assess the effectiveness of the docent program and minimally increased law enforcement efforts, boater interactions with the dolphin increased by 5% after docent discussions. The docent and follow-up studies demonstrated that a small segment of the boating public continue to interact with the dolphin in spite of highly visible public education efforts. Increased law enforcement efforts, including the application of well-publicized punitive sanctions, may be required to bring about a further reduction in dolphin-human interactions in this area.

Key Words: Atlantic bottlenose dolphin, *Tursiops truncatus*, wild dolphin-human interactions, feeding dolphins

Introduction

Literature and the media have endowed cetaceans with a reputation that predisposes people to expect friendly interactions with free-ranging dolphins. Theme parks and aquaria (where people can touch, feed, and swim with captive dolphins) often enhance this reputation. Outside such institutions, the public often seeks similar encounters with wild dolphins, using food as an enticement to facilitate these interactions. In coastal areas where boaters and dolphins share the same habitat, interactions between the boating public, eager for contact with wild dolphins, and dolphins habituated to the presence of boats and people, are becoming more frequent.

Marine mammal scientists and managers express increasing concerns over the impact of feeding and swimming with wild dolphins on the behavior and health of populations (Samuels & Bejder, 2004). These interactions can alter the normal behavior of wild dolphins substantially by creating dependency on humans, modifying foraging strategies and social relationships, and encouraging animals to approach vessels and people (Bryant, 1994).

The adverse effects of feeding wild terrestrial animals have been well-documented. At Yellowstone National Park, serious consequences resulted from humans feeding wild animals, primarily bears (Meagher & Fowler, 1989). Grizzly bears (*Ursus arctos*) so provisioned lost their

natural wariness of humans and became nuisance animals, wandering into populated areas and causing property damage (Gunther, 1992). In some cases, these animals became aggressive towards humans and were destroyed. Bears exposed to supplemental feeding in other areas have been reported to leave the safety of their natural habitat and venture into residential areas and public roadways, exposing themselves to danger from vehicles and gunshots (Herrero, 1985; Meagher & Fowler, 1989). Supplemental feeding of vervet monkeys (*Cercopitchecus aethiops*) at Amboseli National Park in Kenya resulted in the monkeys attacking tourists (Brennan et al., 1985). Members of the population engaging in these behaviors were declared to be pests and were destroyed.

Attraction to humans places dolphins at increased risk of illness or injury from ingestion of inappropriate quality or kinds of food and non-food items, physical contact with boats or fishing gear, or retaliatory vandalism (Reynolds & Wells, 2003). Dolphins conditioned to receiving food from humans may ingest inappropriate food items (Bryant, 1994) or recreational fishing gear (Gorzelany, 1998), or may be exposed to bacterial pathogens from contaminated or improperly handled fish (USDA, 1998). Dolphins attracted to boats may approach too closely, increasing the possibility of injury or death from contact with boat hulls and propellers (Wells & Scott, 1997). They also may become entangled in fishing gear deployed from the boats (Wells & Scott, 1994; Wells et al., 1998). Wild dolphins conditioned to accept food from humans have been reported to become aggressive during these interactions (Orams et al., 1996), increasing the likelihood of injury to the humans, and exposing the dolphins to the risk of retaliatory behavior by humans. In addition, dolphins engaging in these types of interactions may pass on these behaviors to conspecifics, especially juvenile offspring, as has been suggested for other feeding patterns (Nowacek, 1999; Wells, 2003; Krutzen et al., 2005).

A distinctively marked male Atlantic bottlenose dolphin (*Tursiops truncatus*) known as "Beggar," has been observed by Sarasota Dolphin Research Program (SDRP) scientists and reported by others to engage in interactions with humans in an area of the Intracoastal Waterway near Nokomis, Florida, since 1990 (Figure 1). This area is at the southern extent of the range of the long-term resident Sarasota Bay bottlenose dolphin community (Wells, 1991, 2003). About 150 dolphins from five generations use Sarasota Bay and the vicinity on a regular basis, but dolphin traffic through Nokomis is infrequent, and only a few dolphins use the area regularly. Local boaters and tourists frequent this narrow, sheltered waterway, and boat traffic often is heavy.

Most often, Beggar's interactions with humans involve approaching vessels, following vessels within several cm of spinning propellers, orienting vertically in the water with his head out and mouth open ("begging"), and accepting food. While Beggar is most commonly observed alone in this area, other identifiable dolphins occasionally are observed with him, and some of these have been subsequently observed engaging in similar begging behavior. Since 1990, seven other members of the Sarasota dolphin community, of both genders and a wide range of ages, have been observed begging from vessels (MOCH, BRDO, BRD2, FB96, FB98, F192, and F194), but none have exhibited the behavior with the same frequency as Beggar. All seven of these included Beggar's range within their utilization areas.

Of the 170 sighting records of Beggar collected by SDRP from 1990 to 2001, 86% involved human interactions. As more people have become familiar with Beggar's predictable occurrence and behavior, reports of the dolphin biting humans, in some cases leading to the need for medical treatment, have increased. Begging behavior has been exhibited by some of Beggar's associates and by dolphins passing through his small home range. In response to these concerns, efforts were undertaken to educate boaters about the problems associated with interacting with wild dolphins and the penalties made possible under the Marine Mammal Protection Act (MMPA) for those who interact with dolphins in violation of the Act. As part of the NOAA Fisheries "Protect Wild Dolphins" program, signs were posted on bridge fenders and channel markers. These were first installed in 1995, and they were subsequently enlarged and improved in 1999 and 2000. NOAA Fisheries and the SDRP engaged in a campaign with local and national media and town hall meetings to publicize the dangers and laws associated with interacting with wild dolphins.

In response to continuing concerns about Beggar's interactions with humans and the spread of these behaviors through the local dolphin community, we initiated a study in 1997 to document the dolphin's interactions with boaters, to characterize the frequency and types of boater interactions with the dolphin, and to evaluate the effectiveness of public education and enforcement efforts to curtail these illegal activities.

Materials and Methods

Study Area

All sightings of Beggar occurred within a 6.8-km long section of the Intracoastal Waterway between Sarasota and Nokomis, Florida. His range was delineated by the Blackburn Bridge to the north,

the Albee Bridge to the south, the narrow barrier island of Casey Key to the west, and the mainland to the east. This area consists of a narrow dredged channel, maintained to a minimum depth of about 3 m, with shallower waters on each side. Although Beggar moved through the entire range, he spent most of his time just north of the Albee Road Bridge in Nokomis (27º 08' N, 82º 28' W) (Figure 1). The waterway is most constricted at this location (about 70 m across), and boaters are forced by the proximity of the drawbridge and the designation of the area as a manatee habitat to slow their boats to idle speed. Typically, Beggar was the only dolphin in the area during observations, but during the early 1990s, he was frequently accompanied by another individual ("Mooch"). A few other identifiable dolphins traveled through Beggar's range on occasion.

Project Components

The project consisted of three phases: (1) a baseline study, (2) a docent program, and (3) a follow-up study.

Baseline Study—The first phase involved categorizing the types of boater interactions with Beggar and quantifying the interactions involving feeding. Observations were conducted from the western shore of the Intracoastal Waterway immediately north of Albee Road Bridge (Figure 1), allowing researchers a clear view of interactions between boaters and the dolphin, except when the dolphin was on the far side of a boat. Observations were recorded during daylight hours only. Binoculars and a Nikon 35-mm camera with a telephoto lens were used to facilitate observations, document identification, and record interactions. Efforts were made to photograph the dorsal fins of all dolphins in the area, for identification through comparison with the long-term SDRP identification catalog (Wells et al., 1987; Wells, 1991, 2003). The baseline study involved 43 d of observations from 30 August 1997 to 27 December 1998.

We recorded the date, time, dolphins present, boat type, size, and identification information, including private vs. commercial ownership (as possible); a description of the initiation of each interaction attempt; and the dolphin's behavioral responses. Interactions were defined as follows: attempts to interact with the dolphin by pounding on the side of the boat, splashing the water,

Figure 1. Aerial view of Albee Road Bridge study area, near Sarasota Bay, Florida; north is to the left.

teasing (encouraging the dolphin to interact by pretending to offer food), trying to touch, and feeding or attempting to feed the dolphin. During this phase of the study, only boats actively involved in interactions or attempted interactions with the dolphin were recorded.

Docent Program—The second phase involved efforts to educate the local boating public about the problems associated with interacting with wild dolphins. These efforts included local media involvement, increased law enforcement presence, and a "town hall meeting" where boaters could question biologists and NOAA Fisheries personnel about the issues. Additional signage was posted in the waterway. Decals, posters, and brochures were made available to local business owners. Boater behaviors that could be considered violations of the MMPA, and punitive actions associated with such violations, were emphasized.

The docent program was conducted over 30 d from December 2000 through May 2001. The docent program used a well-marked boat to shadow Beggar during peak boating times. Types and frequencies of interactions between the dolphin and boaters were recorded. Boaters engaged in interactions that were clearly in violation of the MMPA were approached by the docents, who offered educational materials about viewing marine mammals in the wild and discussing the case of Beggar in particular. Specific boater actions leading to approach by the docent boat included feeding or attempting to feed the dolphin, trying to touch or pet the dolphin, splashing or teasing the dolphin, repeated circling of the dolphin by the boat, or pounding on the hull to attract the dolphin.

Care was taken to make both the observation boat and the docents highly visible to the boaters. A Sony digital video camera was used to document interactions between the dolphin and boaters, as well as interactions between the docents and the public. During this portion of the study, all boats passing by the dolphin were recorded in order to assess frequencies of boaters interacting with the dolphin. Boat data were collected as described above.

Follow-up Study—Observations were conducted over 5 d during May through July 2001 to assess the effectiveness of the docent program. Observations were again conducted from the land-based platform used during the baseline study. Observers recorded each interaction between boaters and the dolphin, along with boat data as described above. All boats passing by the dolphin were again recorded during this portion of the study to assess the frequency of dolphin-boater interactions.

During all three phases of the project, all attempts to feed the dolphin were documented, and the offered items were identified as possible. All incidents involving the dolphin biting boaters were recorded. Incidents were categorized by boater behavior during the biting event and whether or not food was offered during the biting incident.

NOAA Fisheries law enforcement presence varied during the project. There was no documented law enforcement action against violators during the baseline study. Law enforcement efforts were increased during the docent program, with officials conducting 472 vessel operator contacts, including two citations issued for marine mammal harassment, four formal notices of violation for feeding, and three written warnings. These punitive actions were conducted during daylight hours between January and May 2001, but without advance notice to the authors. Therefore, it was not possible to schedule before and after observations to evaluate the effects of increased law enforcement.

Results

All focal dolphin behavioral observations and most of the incidental observations of human interactions with dolphins during all three phases of the project involved Beggar. Boaters continued to try to feed and otherwise interact with Beggar throughout all three phases, and they continued to be bitten by Beggar during all three phases. These behaviors continue through the time of this writing, summer 2005.

We completed 87.5 h of focal observation and recorded 1,797 interaction attempts during the baseline study. Approximately 26% of interactions involved attraction or contact behaviors with the dolphin such as touching, teasing, or splashing. Feeding comprised 10.9% of all interactions. Feeding included offering items not expected in a wild dolphin diet. We observed dolphin bites to eight people during the baseline study. Numbers of boats passing through the area were not recorded during this phase of the study, but preliminary analyses indicated the importance of collecting these data for the subsequent phases.

We conducted 125.4 h of focal animal behavioral observations of Beggar during the docent program. During this time, 8,173 boats passed through the study area. Of these, 108 (1.321%) engaged in illegal interactions with the dolphin. There were 68 feeding attempts (0.008% of passing boats) and 80 touching attempts (0.009% of passing boats). Docents delivered 173 information packets to boaters whose interactions with the animal were clearly in violation of the U.S. MMPA, and to those who expressed curiosity as to why they should not interact with the dolphin. Of the 146 violators who responded to queries when approached by the docents, 61% indicated

that they were already aware that their interactions with Beggar were illegal. Docents observed dolphin bites to seven boaters during this phase of the study (0.001% of passing boats).

Beggar was observed for 11.0 h during the follow-up study. A total of 813 boats passed through the area, leading to 30 feeding attempts (0.037% of passing boats), 21 touching attempts (0.026% of passing boats), and bites to three people (0.004% of passing boats).

Boater behaviors during interactions with the dolphin were categorized and quantified per focal observation hour across all three phases of the project (Figure 2). Specific behaviors initiated by the boater

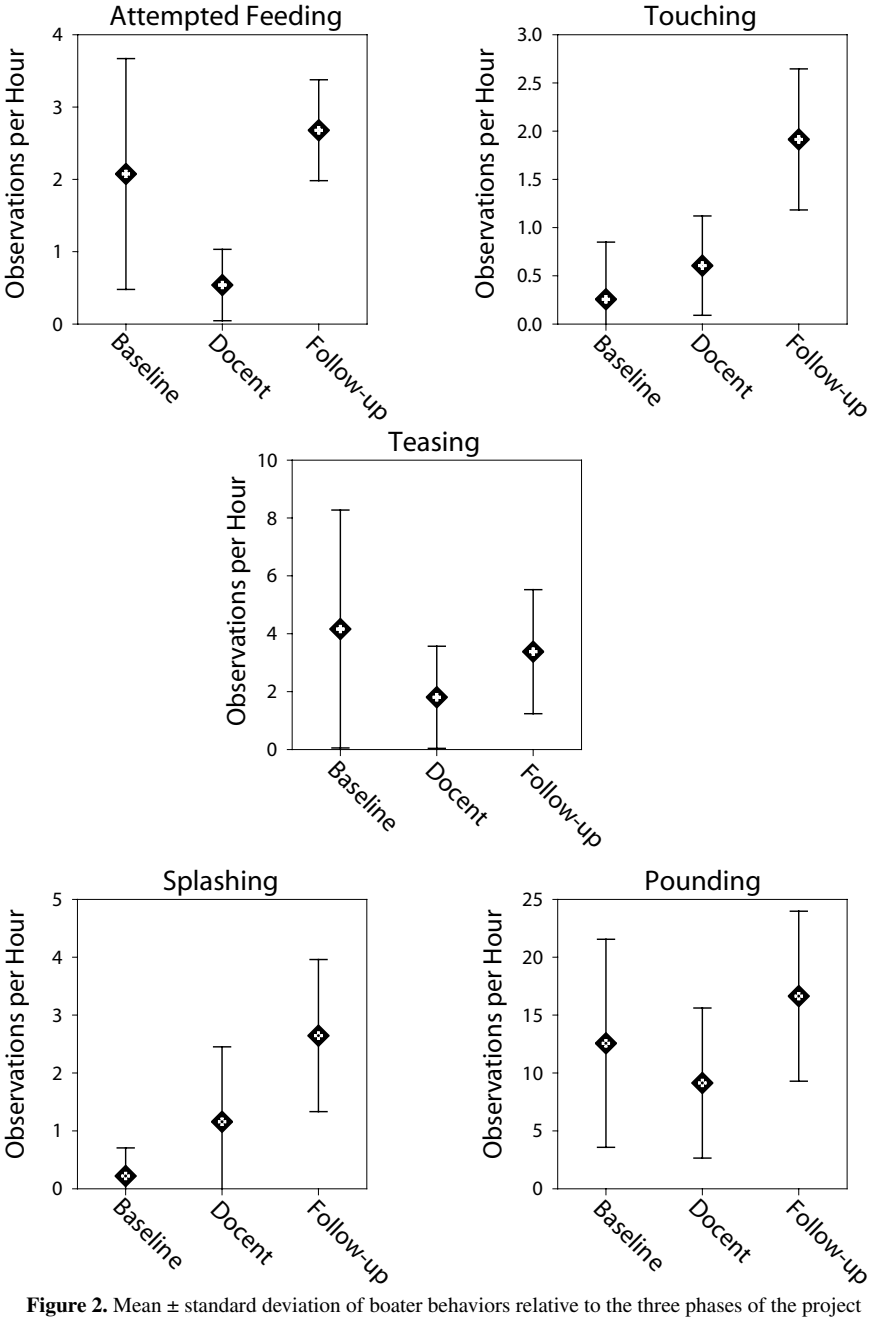

Figure 2. Mean ± standard deviation of boater behaviors relative to the three phases of the project

(feeding or attempting to feed, teasing, touching or attempting to touch, splashing, and pounding the hull) were examined. Feeding attempts appeared to decline from the baseline phase to the docent phase, and then increased significantly during the follow-up phase, suggesting a positive impact from the presence of the docent vessel. Touching increased significantly from baseline and docent conditions to follow-up. The incidence of splashing appeared to increase steadily across all three phases of the project, with significantly greater levels during follow-up than during baseline, perhaps indicating an increase in the least intrusive behavior in response to constraints on the more blatantly illegal activities. No significant differences across treatments were noted for teasing or pounding.

While the patterns in Figure 2 may represent the situation accurately, it was necessary to examine these data for biases relative to opportunities for interactions to occur. All of the follow-up study data were collected on Sundays, one of the busiest days of the week for boat traffic. Measurements of the frequency of occurrence of boater behaviors are likely affected by the number of vessels passing through the area. We examined the frequency of occurrence of boater behaviors per hour by day of the week and determined, not surprisingly, that many of the behaviors occurred most frequently on Sundays, the day of heaviest boat traffic, across all three phases of the study (Table 1).

We controlled for the fact that frequency of occurrence of boater behaviors appears to vary with the level of boat traffic by examining only data from Sunday observations for which boat traffic data were collected (docent and follow-up studies). We then standardized these data relative to the number of boats passing through the study area. Observations of each behavior per 100 passing boats were calculated. Significant increases were noted in the number of feeding and touching behaviors initiated by boaters during the follow-up study, in the absence of docents and law enforcement vessels (Figure 3). This agrees with the previous interpretations based on examination of behaviors per observation hour.

Food type and the percentage of instances that it was offered, consumed, and refused are presented in Table 2. Beggar consumed 84% of the items he was offered, and refused only 6% (the remaining 10% of items could not be observed as consumed or refused). Fish, shrimp, and squid (items commonly used in this area as bait for recreational fishermen) comprised 50.3% of the food items offered to the dolphin. The quality of most of the "natural" food items could not be determined in most cases. Some of it was purchased from a nearby bait stand. The remaining items were human food. The human food items were typically dropped or poured into Beggar's mouth as he positioned himself alongside a boat with his head out of the water, mouth open.

In total, 18 bite incidents were documented during the three phases of the program. In all cases, bites were inflicted only when the boater engaged in attempts to touch or tease the dolphin, as opposed to engaging in other behaviors. Only 27% of the biting incidents involved offering food to the dolphin.

Discussion

There are a number of published accounts of sociable dolphins interacting with people (Lockyer, 1990). The increasing number of recreational boaters in coastal waters makes encounters between wild dolphins and humans more likely. The proliferation of programs where people can feed

Table 1. Boater behaviors per focal hour, relative to day of the week, during the bottlenose dolphin-human interaction study near Sarasota Bay, Florida; bold print indicates the highest values within each phase of the study.

Study	Day no.	Day of week	No. of days	Hours	Boater behavior				
					Feed	Touch	Pound	Tease	Splash
Baseline	1	Su	10	29.00	2.48	0.14	**17.21**	5.38	**0.45**
Baseline	2	Mo	3	5.75	2.09	0.17	16.52	3.48	0.00
Baseline	3	Tu	3	4.75	1.89	0.00	9.68	**5.89**	0.00
Baseline	4	We	2	7.75	0.90	0.00	3.61	1.42	0.13
Baseline	5	Th	7	15.50	2.13	0.26	7.55	5.29	0.13
Baseline	6	Fr	2	4.75	**3.16**	**1.89**	12.42	9.47	0.00
Baseline	7	Sa	8	20.00	2.40	0.35	14.05	4.25	0.40
Docent	1	Su	11	49.50	**0.71**	0.61	**12.34**	**2.63**	**1.76**
Docent	2	Mo	2	7.03	0.14	0.28	4.27	0.57	0.28
Docent	6	Fr	5	19.34	0.67	0.62	8.48	1.24	0.31
Docent	7	Sa	12	49.51	0.38	**0.73**	7.88	1.47	0.83
Follow-up	1	Su	5	10.95	**2.74**	**1.92**	**17.17**	**3.56**	**2.74**

and/or swim with captive dolphins may lead to more public interest in engaging in these activities with wild dolphins. It is important to recognize that these activities may put individuals from both species at risk in the wild (Samuels & Bejder, 2004).

There are a number of risks to the dolphins as a result of interactions with humans. Habituation to feeding of animals by humans may result in conditioning adverse behavior that is passed along to conspecifics. Offspring of animals habituated

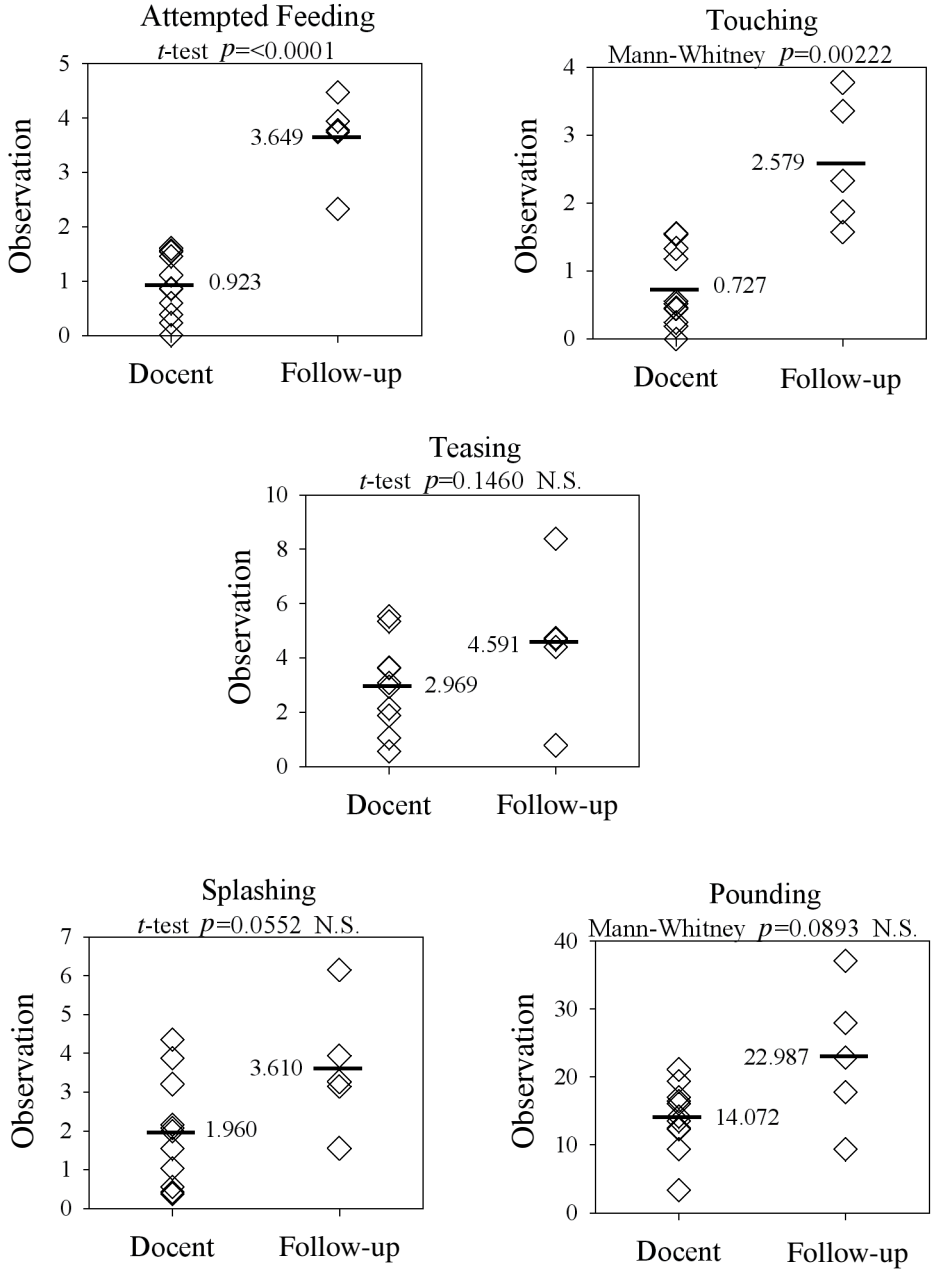

Figure 3. Scatterplots and statistical test results for five human behaviors shown towards Beggar (the bottlenose dolphin) during two study periods; the diamond symbols indicate the counts per 100 boats for each behavior. Only data from Sundays are included. The mean is indicated with a horizontal line and labeled; the statistical test, *p*-value, and significance are shown above each graph.

Table 2. Food offered to bottlenose dolphins, by category, during dolphin-human interaction study near Sarasota Bay, Florida

Category	Offered	Consumed	Refused	Unknown
Baseline	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Fish	104 (47.9)	101 (46.5)	3 (1.3)	0
Shrimp	6 (2.7)	5 (2.3)	1 (0.4)	0
Squid	5 (2.3)	4 (1.8)	1 (0.4)	0
Sandwiches/bread/ meat/cheese	20 (9.2)	20 (9.2)	0	0
Chips/crackers/ pretzels/nuts	26 (12.0)	26 (12.0)	0	0
Pastries/cookies	6 (2.7)	6 (2.7)	0	0
Fruit/vegetables	6 (2.7)	6 (2.7)	0	0
Ice	1 (0.4)	1 (0.4)	0	0
Unidentified items	42 (19.4)	33 (15.2)	3 (1.3)	6 (2.7)
Unidentified liquid	1 (0.4)	0	0	1 (0.4)
Docent				
Fish	42 (63.6)	25 (37.8)	6 (9.0)	11 (16.6)
Shrimp	7 (10.6)	3 (4.5)	1 (1.5)	3 (4.5)
Squid	4 (6.0)	4 (6.0)	0	0
Chips/crackers	5 (7.5)	3 (4.5)	1 (1.5)	1 (1.5)
Fruit/vegetables	1 (1.5)	0	0	1 (1.5)
Ice	1 (1.5)	0	0	1 (1.5)
Unidentified items	6 (9.0)	0	0	6 (9.0)
Follow-up				
Fish	12 (40.0)	12 (40.0)	0	0
Shrimp	2 (6.6)	2 (6.6)	0	0
Squid	3 (10.0)	3 (10.0)	0	0
Sandwiches/meat	2 (6.6)	2 (6.6)	0	0
Chips/crackers	6 (20.0)	5 (16.6)	0	1 (3.3)
Fruit/vegetables	1 (3.3)	1 (3.3)	0	0
Beer	1 (3.3)	0	1 (3.3)	0
Unidentified items	3 (10.0)	1 (3.3)	1 (3.3)	1 (3.3)
Total items offered	313			
Consumed	263			
Refused	19			
Unknown	31			

to humans as a source of food may not learn essential hunting and foraging skills. At Monkey Mia Resort in Shark Bay, Australia, a group of wild dolphins habituated to humans have come to the same beach for years to accept the hand feeding of fish by humans. Feeding is now controlled by park rangers, who give quantities of fish to paying guests, who then feed the fish to the dolphins. The Australian dolphins have been extensively studied, and biologists have observed at least one juvenile offspring that exhibited a lack of learned foraging skills, making it dependent on human handouts to survive (Bryant, 1994). Researchers have linked an increase in calf mortality at Monkey Mia to human activities related to the provisioning of food to the dolphins (Anderson, 1994).

Human interactions prompted by Beggar's activities may have contributed to the death of a young dolphin near Nokomis in 2000. A 4-y-old male calf of a begging mother was observed begging up to several weeks prior to its death. This animal and his mother were documented associates of Beggar. The calf stranded alive near Beggar's home range, but died shortly thereafter, with evidence of several kinds of human interactions. The young dolphin was extremely emaciated (Figure 3), weighing only half of what would be typical for a dolphin of his length and age (Read et al., 1993). He had a fishing hook and line in his stomach; scars from line entanglement on his dorsal and pectoral fins; and three fresh, large, deep, parallel vertical slices on his tail stock, indicative of recent boat propeller wounds

Figure 4. Four-year-old male dolphin calf, the son of a begging mother, that died within six weeks of being observed begging in the region occupied by Beggar; note the severe emaciation, presumed boat propeller cuts on the peduncle, healed entanglement scars at the base of the pectoral flippers, and shark bite scar. (Photograph from R. S. Wells)

(Wells & Scott, 1997). Although the specific role of begging in the sequence of events that led to this dolphin's demise cannot be determined, it is clear that this animal, a known beggar and the son of a begging mother, was involved in a surprisingly high number of adverse human interactions.

As indicated above, marine mammals that accept fish, shrimp, or squid from humans risk ingesting foreign objects associated with recreational fishing, including hooks and rod and reel fishing tackle. Dolphins have been reported ingesting baited hooks meant for fishing (Bryant, 1994), and the ingestion of fishing tackle has been reported as a cause of mortality in dolphins (Gorzelany, 1998). The animals are also at increased risk from entanglement in fishing gear (e.g., Wells & Scott, 1994; Wells et al., 1998).

Wild animals provisioned by humans may also risk ingesting contaminated or inappropriate food. Beggar was observed to be fed a total of 313 items. Many of these items, such as potato chips, macadamia nuts, apples, and oranges are clearly not the normal components of a wild dolphin diet (Barros & Wells, 1998). Many interactions involved the dolphin being fed a combination of food items such as fresh fish and human food. Elsewhere, wild dolphins have been fed inappropriate food items such as pretzels, crackers, and candy bars (Bryant, 1994). Ingestion of such inappropriate items may have detrimental effects on the health of wild dolphins. A wild sociable rough-toothed dolphin (*Steno bredanensis*) was observed being fed by swimmers and boaters near the coast of Aruba. Within a month of the first observation, this animal became ill and died after vomiting up chicken bones, bottle nipples, plastic bags, and other debris (Rodriguez-Lopez & Mignucci-Giannoni, 1999).

Over half of the feeding interactions involved Beggar being fed "natural" items such as fish, shrimp, or squid. While some of these items have been identified as natural prey for dolphins in different populations, shrimp and squid are not part of the normal diet of bottlenose dolphins near Sarasota Bay (Barros & Wells, 1998). The fish offered included those caught by the boaters in local waters, as well as purchased fish that may or may not have originated locally.

In addition to the problems of inappropriate fish species being offered, the dolphins were placed at risk of health problems from improperly handled or stored fish. Dead fish supplied by humans, unless it is properly stored, frozen, and thawed, can be a source of lethal bacterial infection to dolphins (USDA, 1998). Fish spoils easily when exposed to Florida's warm temperatures. To protect dolphin health in captive situations, the USDA imposes strict regulations regarding the storage and preparation of cetacean food. The fish, shrimp, and squid offered to Beggar came from bait buckets, plastic bags, and other containers. The freshness of these items could not be determined, but it is reasonable to assume that most boaters are not familiar with the rigorous government standards established for preparing dolphin food.

The long-term effects of this eclectic menu on the health of dolphins are unknown. It is reasonable to assume that this animal was at risk from ingesting inappropriate food items or from eating

fish whose quality and freshness may be compromised. Over 84% of all interactions in which food was offered resulted in the dolphin consuming the food item. It is probable that the dolphin accepts and eats food from the hands of boaters that it would otherwise refuse to eat if the item were found floating in its natural environment. The fact that Beggar has continued to remain in apparent good body condition after more than 15 y of consuming a mixed diet of natural prey that he catches and items fed to him by humans is surprising.

Humans who feed or harass dolphins in the wild risk injury from animal bites or other aggressive behavior (Samuels & Bejder, 2004). There are documented examples of wild dolphins engaging in aggressive or "pushy" behavior with humans (Orams et al., 1996). We documented 18 instances of bites by Beggar, but anecdotal reports credit Beggar with at least an additional ten instances of injuring boaters through bites. All of the documented bites observed during this study occurred while the boater was engaged in attempts to touch or tease the dolphin. Only 27% of the biting incidents involved the offer of food to the dolphin in addition to touching or teasing, suggesting that most bites are not the accidental result of the dolphin attempting to obtain food from the boater. Our findings suggest that biting may be an aggressive response by the dolphins toward humans who touch or tease, or who do not produce the expected food handout.

Signage and public relations efforts prior to and during our research program attempted to inform the public that feeding wild marine mammals, or engaging in activities that have the potential to alter their natural behavior or interfere with their ability to feed, raise their young, or socialize with conspecifics, is illegal in the United States under the Marine Mammal Protection Act, and that violation of the MMPA carries civil and criminal penalties, including fines of up to $20,000. Prosecution of those who violate these statutes is uncommon. During our study, violations appeared to be infrequent in the presence of marked law enforcement vessels. From the docent program to the follow-up study, interaction rates between the dolphin and boaters increased from less than 2% of passing boaters to nearly 7%. These findings suggest that the well-marked docent boat also had a deterrent effect. The majority of boaters queried indicated that they were aware that their actions were illegal.

The facts that few boaters violate the MMPA and that many who violate the Act readily admit that they are in violation suggest that educational messages have been successfully disseminated, but interactions with wild dolphins continue because the risk of law enforcement action is small. There are relatively few law enforcement officers assigned to marine patrol, and officers and boats that are available must cover many waterways and competing issues, including protection of endangered species. As a result, law enforcement near Nokomis has been sporadic at best. Heavy boat traffic in the Intracoastal Waterway also interferes with enforcement. On several occasions during this study, boaters attempted to interact with the dolphin while a single law enforcement officer was present. While the officer was talking to the occupants of one boat about the dangers of feeding wild marine mammals, other boats engaged in feeding interactions with the dolphin.

To date, local educational programs conducted appear to have reached the vast majority of boaters using these waters. We suggest that increased law enforcement efforts, including the application of well-publicized punitive sanctions, may be required to bring about any further reduction of dolphin-boater interactions in this area. Increased law enforcement, combined with systematic evaluation efforts, may be used to develop improved public education programs that will encourage boaters to observe wildlife from a distance, and minimize harmful interactions between dolphins and boaters.

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