



Effectiveness of a voluntary code of conduct in reducing vessel traffic around dolphins

Nicholas M.T. Duprey*, Jody S. Weir, Bernd Würsig

Marine Mammal Research Program, Texas A&M University at Galveston, 5007 Avenue U, Galveston, TX 77551, USA

ARTICLE INFO

Article history:

Available online 21 June 2008

ABSTRACT

A voluntary “rest period” to supplement mandatory regulations off Kaikoura, New Zealand, was effective in reducing, but not eliminating vessel traffic around dolphin groups. The non-rest periods had a mean of 2.63 interactions/h, significantly more than the rest period’s mean 1.46 interactions/h. Mean interactions per hour during rest and non-rest periods was significantly different for weekdays, but not for weekends. Without education that targets users on the presence of voluntary codes of conduct, why they were developed and the benefits to the animals and community in following the regulations, it is unlikely that participation will be sustained.

© 2008 Elsevier Ltd. All rights reserved.

1. Introduction

Non-consumptive human disturbances are having noticeable effects on wildlife populations (a few of many examples are brown bears, *Ursus arctos*, [1]; raptors [2]; and sea turtles [3]), and these effects are especially noticeable around tourism activity (Asian rhinos, *Rhinoceros unicornis*, [4]; Northern Royal Albatross, *Diomedea epomophora sanfordi*, [5]; Royal penguins, *Eudyptes schlegeli*, [6]; and Magellanic penguins, *Spheniscus magellanicus*, [7]). Human activities are known to cause behavioral changes in marine mammal populations (harbour porpoises, *Phocoena phocoena*, and harbour seals, *Phoca vitulina*, [8]; Florida manatee, *Trichechus manatus latirostris*, [9,10]; and polar bears, *Ursus maritimus*, [11]), and with increases in cetacean watching tourism, several studies have focused on the effects tourism has on the behavior of wild toothed cetaceans, members of the suborder odontocetes (common bottlenose dolphins, *Tursiops truncatus*, [12–16]; Hector’s dolphins, *Cephalorhynchus hectori*, [17]; sperm whales, *Physeter macrocephalus*, [18]; killer whales, *Orcinus orca*, [19,20]; Chilean dolphins, *Cephalorhynchus eutropia*, [21]; and dusky dolphins, *Lagenorhynchus obscurus*, [22–25]). Regardless of the wildlife species in question, effective management of human activities is necessary to control the levels of human disturbance and mitigate potentially harmful effects on the wildlife population.

Two regulatory methods exist for managing wildlife populations, mandatory regulations and voluntary codes of conduct, and both have advantages and disadvantages. Mandatory

regulations can become very complex and confusing for the user being regulated [26]. The vernacular of mandatory regulations can also be a problem; words such as “harassment” are difficult to define and do not fully explain what behaviors are acceptable and unacceptable [27]. While mandatory regulations are enforceable in theory, in many regions they are often poorly enforced or simply impossible to enforce due to budgetary restraints. However, mandatory regulations do have enforceable consequences when they are not followed, usually a fine, and this in itself can lead to increased compliance.

Voluntary codes of conduct may at times be good at filling voids in mandatory regulations, especially while the latter are being developed and finely tuned – a process that can take much longer than implementing voluntary codes of conduct [28]. Voluntary codes of conduct also provide great building blocks for mandatory regulations. Usually, they can be changed and molded more easily than mandatory regulations, resulting in final regulations that are more effective and are more common sense [28]. Peer pressure from the local community, or other users, can lead to increased compliance, as individuals and companies do not want to be seen breaking or ignoring voluntary codes of conduct. However, there is no fine or direct consequence for not following a voluntary code of conduct. Commercial operators, who depend on wildlife species as an integral part of their businesses, often view these voluntary codes of conduct as a way of reducing their impact on targeted animals and preserving their business into the future. Yet, with no enforcement, voluntary codes of conduct can easily be interpreted in different ways, and over time may not be fulfilling their original intent.

Used together, the two regulatory methods allow for more adaptability to large or diverse geographic areas. For example, basic

* Corresponding author.

E-mail address: nicholas.duprey@gmail.com (N.M.T. Duprey).

mandatory regulations can cover activities on a national level, with local voluntary codes of conduct used to easily adapt management to local circumstances [28].

In New Zealand, mandatory regulations in the form of the Marine Mammal Protection Act (1974) and the more recent Marine Mammal Protection Regulations (1992) restrict the number of boats within 300 m of a dolphin group to 3, impose a no wake speed limit while around dolphin pods, and advise on proper methods of approaching pods. All tourist operators in New Zealand are required to have permits to take paying customers to view or swim with dolphins; they are also required to have an educational component to their tours.

Kaikoura, a small town on the east coast of the South Island, is well-known for whale watching and swim with dolphins tourism; more than 250,000 people visit Kaikoura annually to participate in cetacean tourism [29]. Two boat-based commercial tour companies hold permits to view and/or swim with wild dusky dolphins in the Kaikoura area; For Hire Company#1 holds three permits allowing up to 50 trips per week with a maximum of 13 swimmers per trip. These permits are restricted to swimming with dolphins and their business is directed solely at dusky dolphin groups in the area. For Hire Company#2 holds four permits for a maximum of 112 trips per week to view whales and dolphins. While their main target is the sperm whale population along the Kaikoura coast, this company visits dolphin groups between whale surfacings or at the beginning or end of a tour. For Hire Company #3 consists of several entities that, combined, have four permits to use fixed wing airplanes and helicopters; their permits do not have a maximum number of trips per week. These tours are often primarily targeting sperm whales, with visits to view dolphin groups if time allows. In 1999, the New Zealand Department of Conservation worked with both boat-based For Hire Companies in Kaikoura and established a voluntary code of conduct in the form of a 'rest-period'. As part of this code of conduct both companies agreed to avoid dusky dolphin groups between the hours of 1130–1330 from 1 December to 31 March, as this is when dolphins spend a large proportion of their time resting, and the summer period is the busiest time of the year for cetacean tourism [22–24,30]. The voluntary code of conduct does not include For Hire Companies using aircraft as the viewing platform. However, private recreational vessels have been encouraged to follow the initiative and avoid interacting with dusky dolphins during the 2 h window [30].

Kaikoura is coming to a cross roads in marine mammal tourism activities. In 2009, the Department of Conservation must decide whether to grant more permits to applicants or to continue the current moratorium on new permits for the area. Tourism operations in Kaikoura are also viewed by some locals to be crowding the dolphins and changing their behavior. Research in other areas of New Zealand has shown that marine mammal populations are changing their behavior due to tourism activities (Hector's dolphins, [17]; bottlenose dolphins, [12–14]). Past research in Kaikoura has also indicated concern at the increasing vessel activities around dusky dolphins along the Kaikoura coast [22–24,31].

Our objectives were to: (1) evaluate the effectiveness of the voluntary code of conduct, (2) determine the contribution that recreational vessels make to traffic around dolphins, and (3) make recommendations for future strategies in managing commercial eco-tourism enterprises via voluntary codes of conduct or mandatory measures.

2. Methods

2.1. Theodolite tracking

Between 25 January and 18 April 2005, all large groups, over 150 individuals, of dusky dolphins were tracked by theodolite between

the Kaikoura Peninsula and Haumuri Bluffs. Theodolite tracking is a non-invasive method of collecting cetacean movement and behavior data from an elevated shore-based station [32]. The Ota-Matu observation site was used as the theodolite station for the study (this has been used in past theodolite studies; [24,31,33,34]). The station height was 72.6 m above mean low tide.

2.2. Vessel interactions data

Boat activity around dolphin groups was collected by recording arrival and departure times of vessels. Any aircraft, boat, kayak, or surfer (from now on termed "vessel") was recorded as "visiting" when it approached within 400 m of the outside edge of a focal dolphin group. The distance of 400 m was chosen as it is well within the acoustic range of dusky dolphins and it would ensure the recording of all vessel traffic within 300 m of the focal group. The time the vessel arrived and departed was recorded (hh:mm:ss), allowing for visit length to be calculated; vessel behavior around the dolphins was also categorized (see below for description of vessel behaviors). When weather conditions deteriorated (Beaufort sea state >3, rain, fog, or mist), tracking was ended. An observation session had to last a minimum of 30 min in either the rest period or non-rest period to qualify for analysis.

For Hire Companies were designated as For Hire Company#1 (FHC#1), For Hire Company#2 (FHC#2), and For Hire Company#3 (FHC#3). These vessels were easy to distinguish due to their size and company name displayed on the hull of the vessel, and this prevented any confusion between vessel categories. For Hire Company vessels were given one of the following behaviors; traveling, viewing, or swimming and viewing. Private Recreational Vessels were given one of the following behaviors; traveling, viewing, swimming and viewing, fishing, fishing and viewing or S.C.U.B.A. diving. Boat-based research was also conducted on dusky dolphins in the Kaikoura area, aboard "Punua Aihe", a 5.5 m rigid hulled inflatable boat with 85 hp outboard 2-cycle engine. Whenever Punua Aihe was present within 400 m of a focal group, she was recorded as a Research Vessel. Kayaks and surfers were recorded as other; as these types of vessels are non-motorized they are not as likely as motorized vessels to create disturbances for dolphin groups.

Behaviors were defined to ensure that all vessel interactions were covered by definitions. "Traveling" was moving past a group of dolphins without stopping to view them. Vessels could have slowed down when close to a group, but did not come to a stop and approach the group to view dolphins. "Viewing" was when a vessel stopped traveling to view dolphins and came along side the group so dolphins were very close to the vessel. Viewing vessels (except aircraft) had dolphins within 1 m of their vessel during their visit. Aircraft were described as viewing when they circled groups, or "buzzed" groups by flying low directly over the group. "Swimming" designation required at least one swimmer, from the vessel, entering the water to swim with the dolphins; most of the time vessels remained in the area for an extended amount of time, either before or after a swimmer was in the water. "Fishing" was designated for any vessel in which crew were setting fishing nets, placing crayfish pots, or fishing with a rod and reel. Occasionally, a Private Recreational Vessel would be seen fishing, and after some time travel to view the dolphins. These vessels were designated a behavior of fishing and viewing; for analysis they were included as a vessel viewing and/or swimming. The number of interactions per hour was only computed using vessels with a behavior of viewing and/or swimming, as these vessels were within 1 m of the focal group and therefore within the 300 m buffer used in current mandatory regulations.

3. Results

A total of 8032 min, during 36 days, were spent searching for and observing dusky dolphin groups along the Kaikoura coast. During this time, 38 groups were tracked via theodolite and had vessel interactions recorded (mean follow time 204.4 min SD = 15.57). In total, 387 vessels approached within 400 m of the focal group; For Hire Companies made 236 (61.0%) of the vessel approaches. For Hire Company (FHC)#1 made 118 visits to our focal follow groups, FHC#2 made 88 and FHC#3 made 30. Private Recreational Vessels made 113 visits to our focal follow groups, Research Vessels made 23 visits, and 15 visits occurred by Other Vessel types.

3.1. Vessel interactions during non-rest and rest periods

During the summer season (1 December to 31 March), the voluntary rest period was in effect. Over 28 days (between 25 January and 30 March 2005) 35 dolphin groups were tracked and observed for vessel traffic (mean follow time 201.9 min SD = 16.35).

Observations of vessel traffic were divided into 2 blocks, the rest period, 26.00 h, and non-rest periods, 89.63 h. Of the 292 vessels observed viewing/swimming with dolphin groups, 253 visits occurred during non-rest periods and 39 during rest periods. The non-rest periods had a mean of 2.63 interactions/h (34 groups tracked, SE = 0.245); the rest period had a mean of 1.46 interactions/h (17 groups tracked, SE = 0.350). Mean interactions per hour indicate a significant decrease in the number of vessels viewing/swimming with dolphin groups between the voluntary rest period (1130–1330) and other times of the day (Mann–Whitney $U = 164.5$, $P = 0.013$). This decrease is mostly made up of the lack of FHC#1 vessels visiting groups during this period, as they were seen visiting dolphin groups more than any other vessel type, but were never seen approaching dolphins during the rest period (Table 1).

Private Recreational Vessel viewing/swimming interactions were high during both the voluntary rest period and other times of the day. During the non-rest period, Private Recreational Vessels had the third highest mean interactions per hour of all vessel categories, FHC#1 vessel interactions per hour was highest. During the rest period, Private Recreational Vessels did not have a significantly different number of mean interactions per hour (Mann–Whitney $U = 281.0$, $P = 0.856$; Table 1). Private Recreational Vessel traffic was variable during both rest and non-rest periods and ranged from 0 for an entire field day to as many as 13 vessels viewing/swimming with a focal dolphin group over a 3.5 h focal follow (3.64 interactions/h). No FHC#1 vessels were seen approaching within 400 m of a focal dolphin group during the voluntary rest period, 1130–1330, resulting in their interactions per hour being significantly lower between rest and non-rest periods (Mann–Whitney $U = 42.5$, $P < 0.000$). FHC#2 vessels were seen interacting with focal dolphin groups during the rest period, and there was no significant

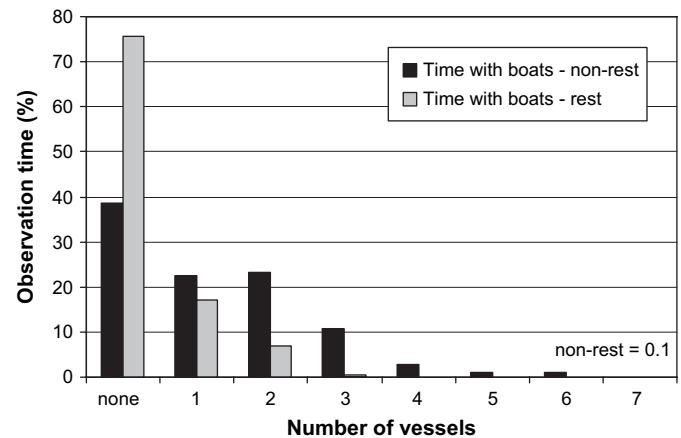


Fig. 1. The percentage of observation time vessels were within 400 m of the focal dusky dolphin group during rest and non-rest periods.

change in their mean visits per hour between rest and non-rest periods (Mann–Whitney $U = 240.0$, $P = 0.315$). When all non-FHC#1 vessels were combined for analysis, there was no significant change in interaction rate between rest and non-rest periods (Mann–Whitney $U = 271.5$, $P = 0.725$).

3.2. Visit lengths

Between 25 January and 30 March 2005, 115.53 h were spent observing dolphin groups for vessel traffic, and 54.37 h (47.1%) had no vessels within 400 m of the groups. During the remainder of the observation time, anywhere from 1 to 7 vessels were seen around the dolphin groups. The number of vessels exceeded 3 for 4.31 h (3.7%) during the entire observation time. There was more 'vessel free time' during rest periods than during the non-rest periods (Fig. 1). During the rest period, 24.4% of the observation time had one or more vessels visiting a focal dolphin group; at no time were more than 3 vessels seen around a focal dolphin group during the rest period (Fig. 1).

Of the 387 visits observed during the study, vessel arrival time, departure time and behavior were recorded near the dolphin group on 311 occasions. The mean time spent within 400 m of a dolphin group, for all vessel types and behaviors, was 20.9 min (SE = 1.45). This mean was reduced by vessels simply traveling by the group, unlike those that spent more time viewing or swimming with the dolphins. For vessels viewing and/or swimming, FHC#1 had mean visit lengths significantly longer than all other vessel types (ANOVA $F = 82.732$, $P < 0.05$, Bonferroni $P < 0.05$ for all vessel type comparisons, Table 2). Mean lengths of FHC#3 visits were significantly shorter than FHC#1, FHC#2 and Private Recreational Vessels (ANOVA $F = 82.732$, $P < 0.05$, Bonferroni $P < 0.05$ for FHC#1, FHC#2

Table 1

The number of interactions per hour occurring with focal follow groups of dusky dolphins during the non-rest periods and the rest period (1130–1330) by vessel type

Vessel type	Mean interactions per hour ($\pm$ SE)	
	Non-rest period	Rest period
All vessels	2.63 $\pm$ 0.245	1.46 $\pm$ 0.350
For hire company#1	1.11 $\pm$ 0.120	0.00 $\pm$ 0.000
For hire company#2	0.70 $\pm$ 0.117	0.62 $\pm$ 0.204
For hire company#3	0.17 $\pm$ 0.054	0.35 $\pm$ 0.121
Private recreational vessels	0.44 $\pm$ 0.134	0.36 $\pm$ 0.136
Research	0.20 $\pm$ 0.050	0.07 $\pm$ 0.046
Kayaks and surfers	0.02 $\pm$ 0.014	0.06 $\pm$ 0.064

Table 2

The length of visits, in minutes, by vessels engaged in all behaviors and viewing and/or swimming behaviors only to focal follow groups of dusky dolphins

Vessel type	All visits			Viewing and/or swimming visits only		
	n	Mean	SE	n	Mean	SE
For hire company#1	62	60.5	3.77	62	60.5	3.77
For hire company#2	80	13.3	0.52	79	13.5	0.50
For hire company#3	30	1.6	0.18	30	1.6	0.18
Private recreational vessels	105	10.6	1.17	58	13.3	1.76
Research	20	15.9	3.22	20	15.9	3.22
Kayaks and surfers	14	14.25	3.45	13	15.29	3.55

and PRV). The FHC#1 vessels were always either swimming or viewing dolphin groups, they were never recorded traveling by our focal group of dolphins.

3.3. Weekends vs. weekdays

Results of our 7 weekend and 27 weekday samples indicate an uneven distribution of interactions between weekends and weekdays. Mean visits per hour were significantly higher on Saturday–Sunday (3.66 visits/h, SE = 0.419) compared to Monday–Friday (2.07 visits/h, SE = 0.226; Mann–Whitney $U = 28.5$, $P = 0.005$). Weekends provided less vessel free time during the rest period compared to weekdays, while non-rest periods remained relatively stable in vessel free time between Monday–Friday and Saturday–Sunday (Fig. 2). The mean visits per hour during rest and non-rest periods remained significantly different for Monday–Friday samples (Mann–Whitney $U = 27.5$, $P = 0.004$), but Saturday–Sunday samples did not reach significantly different interaction rates between rest and non-rest periods (Mann–Whitney $U = 21.0$, $P = 0.332$). However, Monday–Friday non-rest periods had a significantly lower mean number of interactions per hour than weekend non-rest periods (Mann–Whitney $U = 92.0$, $P = 0.033$).

4. Discussion

4.1. Effectiveness of voluntary rest period

The voluntary code of conduct developed to reduce vessel traffic near dusky dolphin groups in the Kaikoura area was effective in some respects, but not in others. The overall number of visits to dolphin groups during the “rest period” was lower than other times of the day; however, visits still occurred and commercial traffic still made up more than half of the traffic near groups. One local operator, whose business was directed solely at dusky dolphin groups in the area, followed the voluntary code of conduct 100% of the time, never visiting dolphin groups during the “rest period”. Another local operator, whose main target was the sperm whale population along the Kaikoura coast, did not follow the voluntary code of conduct and continued visiting dusky dolphin groups during the rest period. It could be that these two companies have different incentives for following the voluntary “rest period” due to their different levels of attachment to the dolphin population as a part of their business. The difference could also be due to the fact that FHC#2 operates tours to visit sperm whales throughout the day, and it is desirable to show tourists a dusky dolphin group after sperm whale watching, or while a nearby sperm whale is on one of its 30-min plus dives. The reduction of commercial traffic between

rest and non-rest periods was almost completely a result of For Hire Company#1 avoiding dolphin groups during this time.

4.2. Private recreational vessel traffic

Private recreational vessel traffic in the Kaikoura area increased in the mid-1990s [23], yet recreational vessels were not the direct focus of management plans. This is mostly due to the difficulty in enforcing private recreational non-licensed traffic. With no license requirement to view or swim with dolphins, Private Recreational Vessels have no limit on the number of visits they can make in one day or how long they remain with a group. Regulating this class of traffic is very difficult. Private recreational vessels are not financially invested in dolphins, unlike the For Hire Companies whose economic success depends heavily on a healthy cetacean population remaining in the area. Also, operators of Private Recreational Vessels may not be as aware of existing regulations for interacting with marine mammals, or the potential to adversely affect them by traveling too close and too rapidly with loud and changing engine noise.

Recreational traffic spent less time near groups; their mean visit lengths were much shorter than For Hire Company#1 tours, and when viewing or swimming with groups, they remained with groups for similar lengths of time as For Hire Company#2 vessels. Weekends had higher traffic levels than weekdays and this was heavily influenced by recreational traffic. The significantly higher rate of visits on Saturday and Sunday during the non-rest periods, compared to Monday–Friday non-rest periods, was partially a result of increased Private Recreational Vessels visiting groups on weekends. This increase in traffic on weekends resulted in a decreased amount of vessel free time for dolphin groups during the rest period.

It is possible that the trend for private recreational traffic to be lower during the “rest period” is because their operators do not have the larger For Hire Company vessels to use as guides to dolphin pods. Local residents and returning visitors to the Kaikoura coast are familiar with the For Hire Company vessels and know that if the vessels are grouped together in one spot, a large group of dolphins is likely in the area. Further study of recreational traffic should include an assessment of boater knowledge of the voluntary code of conduct and marine mammal populations in the area. Currently, there is no on-site education regarding the voluntary rest period for the Kaikoura area, and therefore it is unlikely that recreational vessels have an opportunity to learn about and respect the voluntary code of conduct. A study on the total number of Private Recreational Vessels using the marine area and the number targeting dolphin groups would be very useful to managers and should be carefully considered for upcoming research.

4.3. Management recommendations

The use of a voluntary “rest period” to supplement mandatory regulations off Kaikoura was effective in reducing traffic, but not eliminating it. The company with the strongest ties to the dolphin population along the coast had the greatest amount of compliance compared to other types of visitors. This being the case, we suspect that a voluntary code of conduct, such as the “rest period” established in Kaikoura, is not likely to change the business practices of a company not heavily dependent on the regulated population for the success of their business. Without increased pressure from either the community or controlling government departments, in the form of public reprimands, media attention, more community support for complying businesses, or the threat of more mandatory regulations, these companies will, most likely, not comply with voluntary codes of conduct as there is little encouragement for compliance. Further research on the correlations

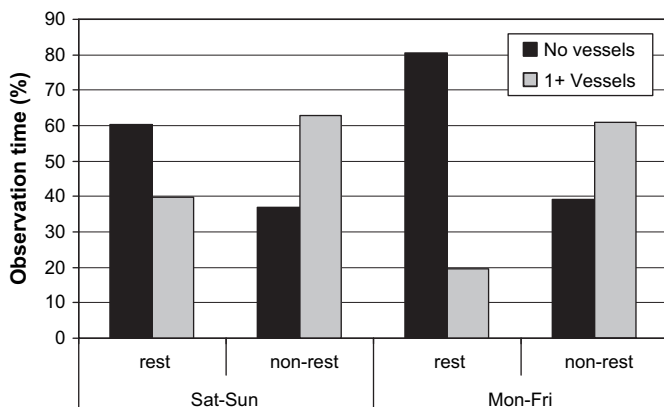


Fig. 2. The percentage of observation time vessels were and were not present during Monday–Friday and Saturday–Sunday.

between compliance and financial attachment to the species being regulated would be very insightful.

We recommend that management focus resources first on weekend and holiday traffic, when both commercial and non-commercial traffic is highest. Dolphins were being targeted more during these busy weekends especially by private recreational traffic, perhaps not familiar with either the mandatory regulations or the voluntary code of conduct. If the management goal was to have no vessel interactions during the mid-day “rest period”, then more education was needed targeting the private recreational users and more effort needed to be focused at getting all For Hire Companies to participate in the vessel free time period. This would have allowed the dolphins time to truly rest, the activity seen most during this time of the day [23,24].

Voluntary whale watching codes of conduct in British Columbia, Canada, put in place for viewing northern resident killer whales, request vessels to approach from the side, at slow speed, no closer than 100 m [20]. Williams et al. [20] found that the voluntary guideline of remaining 100 m from individual killer whales still caused them disturbance, and they commented that it was not sufficient to prevent noticeable reactions in individuals.

Simply because a regulation is implemented does not mean a problem has been resolved. Without field studies as to the effectiveness of these regulations and codes of conduct, regulators do not know if policy changes were in fact successful. Constantine et al. [12] found that current mandatory regulations in New Zealand were not affording the bottlenose dolphin population in Bay of Islands, North Island, sufficient protection from disturbance. Scarpaci et al. [35] found that Australian permit regulations were being violated by Port Phillip Bay operators when taking tourists out to swim with bottlenose dolphins. The mandatory Australian regulations did not have local enforcement in Port Phillip Bay and all aspects of permit regulations were being violated. We know that vessels have the potential to disturb dolphins, so it is important that voluntary codes of conduct and mandatory regulations already in place are actually effective at their intended task.

This study indicates that voluntary measures can be a successful supplementary tool to mandatory regulations, and partially mitigate potential human disturbances. However, these voluntary measures require constant observations, education and encouragement so that they continue to be effective year after year. Without education that targets users on the presence of voluntary codes of conduct, why they were developed and the benefits to the animals and community in following the regulations, it is unlikely that participation will be sustained. Finally, because voluntary codes of conduct are not necessarily self-maintained, continued education, encouragement, and surveillance are needed to ensure that any regulation is successful.

Acknowledgements

The authors would like to thank Robert Ditton, Frances Gelwick and two anonymous reviewers for their insightful comments on earlier versions of this manuscript. We thank the Earthwatch Institute and the New Zealand Department of Conservation for providing funding to conduct this research. We also thank Thomas Egli, Keltie Dienes and all the Earthwatch Institute volunteers who helped in collecting the data presented in this manuscript.

References

- [1] Olson TL, Gilbert BK, Squibb RC. The effect of increasing human activity on brown bear use of an Alaskan river. *Biological Conservation* 1997;82:95–9.
- [2] Bautista LM, Garcia JT, Calmaestra RG, Palacin C, Martin CA, Morales MB, et al. Effect of weekend road traffic on the use of space by raptors. *Conservation Biology* 2004;18:726–32.

- [3] Luttcavage ME, Plotkin P, Witherington B, Lutz PL. In: Lutz PL, Musick JA, editors. *Biology of sea turtles*, vol. 1. Boca Raton, Florida, USA: CRC Press; 1997. p. 387–410.
- [4] Lot DF, McCoy M. Asian rhinos *Rhinoceros unicornis* on the run? Impact of tourism visits on one population. *Biological Conservation* 1995;73:23–6.
- [5] Highman JES. Tourists and albatrosses: the dynamics of tourism at the Northern Royal Albatross colony, Taiaroa Head, New Zealand. *Tourism Management* 1998;19:521–31.
- [6] Holmes N, Giese M, Kriwoken LK. Testing the minimum approach distance guidelines for incubating Royal penguins *Eudyptes schlegeli*. *Biological Conservation* 2005;126:339–50.
- [7] Walker BG, Boersma PD, Wingfield JC. Habituation of adult Magellanic penguins to human visitation as expressed through behaviour and corticosterone secretion. *Conservation Biology* 2006;20:146–54.
- [8] Koschinski S, Culik BM, Henriksen OD, Tregenza N, Ellis G, Jansen C, et al. Behavioural reactions of free-ranging porpoises and seals to the noise of a simulated 2 MW windpower generator. *Marine Ecology Progress Series* 2003;265:263–73.
- [9] Nowacek SM, Wells RS, Owen ECG, Speakman TR, Flamm RO, Nowacek DP. Florida manatees, *Trichechus manatus latirostris*, response to approaching vessels. *Conservation Biology* 2004;119:517–23.
- [10] Soric MG, Shaffer CS, Ditton RB. Managing endangered species within the use-preservation paradox: the Florida manatee (*Trichechus manatus latirostris*) as a tourism attraction. *Environmental Management* 2006;37:69–83.
- [11] Dyck MG, Baydack RK. Vigilance behaviours of polar bears (*Ursus maritimus*) in the context of wildlife-viewing activities in Churchill, Manitoba, Canada. *Biological Conservation* 2004;116:343–50.
- [12] Constantine R, Brunton DH, Dennis T. Dolphin-watching tour boats change bottlenose dolphin (*Tursiops truncatus*) behaviour. *Biological Conservation* 2004;117:299–307.
- [13] Lusseau D. Male and female bottlenose dolphins *Tursiops* spp. have different strategies to avoid interactions with tour boats in Doubtful Sound, New Zealand. *Marine Ecology Progress Series* 2003;257:267–74.
- [14] Lusseau D. The effects of tour boats on the behavior of bottlenose dolphins: using Markov chains to model anthropogenic effects. *Conservation Biology* 2003;17:1785–93.
- [15] Lusseau D, Highman JES. Managing the impacts of dolphin-based tourism through the definition of critical habitats: the case of bottlenose dolphins (*Tursiops* spp.) in Doubtful Sound, New Zealand. *Tourism Management* 2004;25:657–67.
- [16] Samuels A, Bejder L. Chronic interactions between humans and free-ranging bottlenose dolphins near Panama City Beach, Florida, USA. *Journal of Cetacean Research and Management* 2004;6:69–77.
- [17] Bejder L, Dawson SM, Harraway JA. Responses by Hector's dolphins to boats and swimmers in Porpoise Bay, New Zealand. *Marine Mammal Science* 1999;15:738–50.
- [18] Richter C, Dawson S, Slooten E. Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand. *Marine Mammal Science* 2006;22:46–63.
- [19] Williams R, Bain DE, Ford JKB, Trites AW. Behavioural responses of male killer whales to a ‘leapfrogging’ vessel. *Journal of Cetacean Research Management* 2002;4:305–10.
- [20] Williams R, Trites AW, Bain DE. Behavioural responses of killer whales (*Orcinus orca*) to whale-watching boats: opportunistic observations and experimental approaches. *Journal of Zoology* 2002;256:255–70.
- [21] Ribiero S, Viddi FA, Freitas TRO. Behavioural responses of Chilean dolphins to boats in Yaldad Bay, Southern Chile. *Aquatic Mammals* 2005;31:234–42.
- [22] Würsig B, Cipriano F, Slooten E, Constantine R, Barr K, Yin S. Dusky dolphins (*Lagenorhynchus obscurus*) off New Zealand: status of present knowledge. Reports of the International Whaling Commission 1997;47:715–22.
- [23] Barr K, Slooten E. Effects of tourism on dusky dolphins at Kaikoura. In: *Conservation Advisory Science notes no.229*. Wellington, New Zealand: Department of Conservation; 1999.
- [24] Yin S. Movement patterns, behaviors, and whistle sounds of dolphin groups off Kaikoura, New Zealand. Thesis, Texas A&M University, College Station, USA; 1999.
- [25] Coscarella MA, Dans SL, Crespo EA, Pedraza SN. Potential impact of unregulated dolphin watching activities in Patagonia. *Journal of Cetacean Research Management* 2003;5:77–84.
- [26] Gjerdalen G, Williams PW. An evaluation of the utility of a whale watching code of conduct. *Tourism Recreational Research* 2000;25:27–37.
- [27] Soric MG, Shafer CS, Scott D. Managing endangered species within the use-preservation paradox: understanding and defining harassment of the West Indian manatee (*Trichechus manatus*). *Coastal Management* 2003;31:319–38.
- [28] Garrod B, Fennel DA. An analysis of whale watching codes of conduct. *Annals of Tourism Research* 2004;31:334–52.
- [29] Simmons DG, Fairweather JR. Towards a tourism plan for Kaikoura, report no. 10. In: *Tourism Research and Education Centre*. New Zealand: Lincoln University; 1998.
- [30] Department of Conservation. Dolphin watching at Kaikoura, guidelines for boat operators. Nelson/Marlborough Conservancy, Department of Conservation 1999. Fact sheet no.79.
- [31] Brown N. The dusky dolphin, *Lagenorhynchus obscurus*, off Kaikoura, New Zealand: a long-term comparison of behaviour and habitat use. Thesis, University of Auckland, New Zealand; 2000.

- [32] Würsig B, Cipriano F, Würsig M. Dolphin movement patterns: information from radio-tracking and theodolite tracking studies. In: Pryor K, Norris KS, editors. *Dolphin societies: discoveries and puzzles*. Berkeley, CA, USA: University of California Press; 1991. p. 79–112.
- [33] Cipriano F. Behavior and occurrence patterns, feeding ecology, and life history of dusky dolphins (*Lagenorhynchus obscurus*) off Kaikoura, New Zealand. Ph.D. dissertation, University of Arizona: Tucson, AZ, USA; 1992.
- [34] Barr K. The impacts of marine tourism on the behaviour and movement patterns of dusky dolphins (*Lagenorhynchus obscurus*) at Kaikoura, New Zealand. Thesis, University of Otago: Dunedin, New Zealand; 1997.
- [35] Scarpaci C, Dayanthi N, Corkeron PJ. Compliance with regulations by “swim-with-dolphins” operations in Port Phillip Bay, Victoria, Australia. *Environmental Management* 2003;31:342–7.