

# The voluntary code of conduct for dolphin watching in Port Stephens, Australia: is self-regulation an effective management tool?

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## ABSTRACT

In the absence of guidelines or government regulation for a rapidly expanding industry, dolphin watching operators in Port Stephens, New South Wales, Australia, formulated and adopted a voluntary code of conduct in 1996. This code was designed to reduce perceived pressures on dolphins and was updated to conform to the Australian National Guidelines for Cetacean Observation when they were released in 2000. Compliance to this code of conduct was assessed in a shore-based survey over the austral summer of 2002/03. Operator compliance was generally high for: number of dolphin watching boats per dolphin school; time spent by individual operators with dolphins; method of approach to dolphins; and frequency of cruises conducted per day. However, operators did not discriminate between dolphin schools containing calves and those that did not (equating to a breach of the national guidelines) and three of nine regular operators committed most breaches of the code, particularly with regard to boat-handling around dolphins and frequency of cruises conducted per day. The code's aim in reducing exposure of dolphins to boats was not achieved as dolphin schools were subject to consecutive approaches by numerous boats and interactions also involved boats to which the code did not apply. This voluntary code is thus of limited value without revision, education and enforcement. The inability of a voluntary code to manage the number of operators and other watercraft highlights the need for management alternatives that will increase compliance by all users of the waterways. Furthermore, widespread assessments of compliance are necessary, particularly where assessments of the effects of cetacean-based tourism are being conducted. To determine whether identified impacts are a result of inappropriate management strategies, or non-compliance with suitable management, requires that management strategies are tested while simultaneously testing or ensuring compliance.

KEYWORDS: INDO-PACIFIC BOTTLENOSE DOLPHIN; REGULATIONS; SURVEY-SHORE-BASED; SUSTAINABILITY; WHALEWATCHING; SOUTHERN HEMISPHERE; AUSTRALASIA

## INTRODUCTION

Tourism focussing on cetaceans boomed in the 1990s, with almost 100 countries engaging in cetacean-based tourism by the year 2000 (Hoyt, 2001). Dolphin watching represents a growing portion of this industry and the activity ranges from the smallest species in remote locations (e.g. Hector's dolphins (*Cephalorhynchus hectori*) in Porpoise Bay, New Zealand; Bejder *et al.*, 1999) to the largest delphinids in busy waterways (killer whales (*Orcinus orca*) in Johnstone Strait, Canada; Williams *et al.*, 2002). Bottlenose dolphins (*Tursiops* spp.) have become popular targets for dolphin watching operations in many coastal locations around the world (Hoyt, 2001; Janik and Thompson, 1996; Lusseau and Higham, 2004). They have a sporadic distribution around the Australian coastline and there are at least seven sites (Eden, Merimbula, Jervis Bay, Port Stephens, Forster, Port Macquarie and Coffs Harbour) that offer boat-based tours to observe and interact with Indo-Pacific bottlenose dolphins (*T. aduncus*) along the New South Wales (NSW) coast alone (Gill and Burke, 1999).

Concerns regarding potential impacts on targeted cetacean populations from tourism growth have been raised for many years (e.g. IFAW *et al.*, 1995). A number of studies have found that boating around bottlenose dolphins results in short-term changes in their activities, including: swimming speeds; respiration rates; and behavioural states (Allen, 2005; Constantine *et al.*, 2004; Nowacek *et al.*, 2001). While long-term consequences of repeated

disturbance from tourism remain for the most part unproven, research in New Zealand has indicated significantly altered residency patterns and behavioural budgets as a result of tour boat activity (Lusseau, 2003; 2004; 2005). Another recent study using long-term sighting records in Western Australia has detected declines in the number of dolphins using a tourism impacted area (Bejder *et al.*, 2006). These studies report on biologically significant impacts that make the sustainability of local eco-tourism questionable (Lusseau *et al.*, 2006), with the Scientific Committee of the International Whaling Commission (IWC) agreeing 'there is new compelling evidence that the fitness of individual odontocetes repeatedly exposed to whalewatching vessel traffic can be compromised and that this can lead to population level effects' (IWC, 2006).

The management of cetacean-based tourism around the world currently ranges from government regulation, to a variety of guidelines and codes of conduct, to no management whatsoever. This variability in management regimes has been described as 'haphazard' and 'highly fragmented' (Garrod and Fennell, 2004; Gjerdalen and Williams, 2000). In Australia, State wildlife government agencies are responsible for the protection of marine mammals in State waters (i.e. to 3 n.miles offshore), including the management of any industry or activity that may impact on these animals. Marine mammals are protected in NSW waters under the National Parks and Wildlife Act, 1974. Several draft bills have been formulated in recent years (e.g. National Parks and Wildlife

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Management (Conservation of Marine Mammals) Bill, 2002), with an amended regulation released in 2004 being passed later in 2006 (National Parks and Wildlife Amendment (Marine Mammals) Regulation). Nevertheless, outside marine protected areas there remains no licensing system to monitor commercial cetacean-based tourism activities in NSW waters. Monitoring the effectiveness of new regulations would seem to be a priority given the growth of the industry in NSW, reportedly undergoing a remarkable 37% per annum increase from 1998 to 2003 (IFAW, 2004).

Dolphin watching in Port Stephens is a driving force behind the growth of the industry in NSW. Two boats began conducting dedicated dolphin watching tours in Port Stephens in early 1991 and there have since been up to 17 tour boats, around half of which run multiple, daily tours on a year-round basis. Dolphin watching, and now whalewatching, bring a substantive portion of the tourist influx to the area. Figures from 2001-03 for example, indicated sustained increases in visitation for the purposes of dolphin/whale watching, despite regional and global events making this a difficult period for tourism (Bureau of Tourism Research, 2003; 2004). Over 200,000 dolphin and whalewatching tourists injected more than 55 million Australian dollars in total expenditure to the central and mid-north NSW coast in 2003 (IFAW, 2004). Port Stephens thus represents a typical site at which a multi-million dollar tourism industry has developed around a resident and/or seasonally visiting population of cetaceans, as has occurred in the Canary Islands, Spain; Hervey Bay, Australia; Kaikoura, New Zealand; Provincetown, USA and Tofino, Canada (Hoyt, 2001).

In addition to commercial dolphin watching boats, around 3,000 recreational boats are registered in Port Stephens each year, with general commercial registrations in the wider area rising 30% to almost 500 boats from 1999 to 2003 (Waterways Authority, 2003). Influxes of up to 300 boats also occur during fishing tournaments. Up to 105 boats have been counted at one time in a systematic scan of the *ca.* 30km<sup>2</sup> study area in eastern Port Stephens (Allen, 2005). The cumulative impacts of an intensive dolphin watching industry, combined with other commercial and recreational activity (including aquaculture, fishing, parasailing, jet-boating, water-skiing and sea-planes) remain almost entirely unquantified in Port Stephens. Due to concerns over the industry's impacts on dolphins, the absence of government regulation and increasing competitiveness and hostility between boat captains, dolphin watching operators formed the Port Stephens Commercial Dolphin Watch Association Inc. (PSCDWA) in 1995. A Code of Conduct (CC) was then developed and adopted in 1996 to reduce perceived pressures on dolphins and facilitate better coordination between operators. The majority of operators in Port Stephens were members of the PSCDWA. Their CC was updated in 2000 to conform to the Australian National Guidelines for Cetacean Observation (AG) and to address a number of management and operational issues (outlined in Table 1).

The CC and AG were the only guidelines by which operators in Port Stephens managed their activities until late 2006. In this study, the CC is assessed in terms of compliance by dolphin watch operators and suitability for minimising impacts on dolphins in Port Stephens, quantifying:

(1) the number of dolphin watching boats interacting (see definitions below) with dolphins;

- (2) the duration of interactions between dolphin watching boats and dolphins;
- (3) the method of approach and boat-handling around dolphins;
- (4) the number of dolphin watch cruises conducted per boat per day; and
- (5) the number of dolphin schools approached that contained calves (<1/2 the length of an adult).

## MATERIALS AND METHODS

### Study site

Port Stephens is a *ca.* 140km<sup>2</sup> estuary located 200km north of Sydney, NSW, Australia. The area observed for the purposes of this study (*ca.* 30km<sup>2</sup>) is renowned for regular dolphin sightings and hence the vast majority of dolphin watching activity (Fig. 1). It is relatively shallow for the most part (2-8m), and is dominated by marine processes, having sandy substrate, some rocky outcrops, seagrass beds and a strong tidal influx of oceanic water (Manly Hydraulics Laboratory, 1999). There is also a largely unobstructed view of the eastern port from an elevated, land-based vantage point.

### Study subjects

A population of Indo-Pacific bottlenose dolphins inhabits Port Stephens. The wider region is estimated to contain up to 160 individuals, around 90 of which are considered 'resident' and the remainder 'transient' or 'occasional visitors' to Port Stephens (Möller *et al.*, 2002).

Observations focussed on dolphin watching boats interacting with dolphin schools as they moved through the study area. A total of 15 boats conducted commercial dolphin watching tours during the study. These boats ranged in capacity from 35 to 296 passengers; 9 boats conducted regular tours and an additional 6 conducted occasional or opportunistic tours. A regular operator was defined as one that conducted a minimum of 25 dolphin watch trips during the study (i.e. a mean of one or more trips per day). Data were gathered on all boats conducting dolphin watching, but analyses were carried out only on those defined as regular operators.

### Study methods

Observations were conducted from the roof of the Port Stephens Royal Volunteer Coastal Patrol Building on Nelson Head (32°42'37"S, 152°09'40"E) on a near daily basis from 21 December 2002 to 26 January 2003. The observation period coincided with the peak in tourism activity (i.e. summer holidays) and the hours of observation (09:30-17:30, weather permitting) encompassed CC designated dolphin watching hours (10:00-17:00).

Observers used naked eye, 8×30 binoculars and a 30-45× spotting scope to observe interactions between dolphins and dolphin watching boats. Continuous sampling (Altmann, 1974) of dolphin watching boats commenced when a boat left the marina and continued for the duration of the trip. For each trip the following was recorded:

- (1) boat name and trip number for the day;
- (2) number of interactions with dolphins per trip (an 'interaction' was defined as a boat making a directed approach to one or more dolphins to within 100m for >1min; distance was estimated using number of boat lengths);
- (3) whether an interaction was considered a 'continued interaction', i.e. where a dolphin watching boat began

- an interaction with a dolphin school <5mins after departure of another boat from that same school;
- (4) duration of each interaction;
- (5) maximum number of boats interacting with a dolphin school during each interaction;
- (6) method of approach and boat-handling around dolphins (Table 2); and
- (7) whether or not the dolphin school contained a young calf (individuals <1/2 the length of an adult and closely associated with an adult).

**Data analysis**

Analyses were carried out in Microsoft *Excel 2000* and *SigmaStat* for Windows (2.03). Non-parametric tests were used where data did not fulfil assumptions of normality or equal variances (determined by Kolmogorov-Smirnov tests). A chi-squared test was used to assess the difference in proportion of breaches of the CC for number of boats interacting with dolphins under two conditions: dolphin

watching boats only; and dolphin watching boats plus recreational boats. A chi-squared test was also used to assess the difference in proportion of dolphin schools approached that contained calves against the proportion of schools that were found not to contain calves (comparison made with the proportion of schools found with/without calves during photographic identification work in the summers of 1999 and 2000). A Friedman analysis of variance by ranks test, a nonparametric analysis performed on a randomised block experimental design (Zar, 1996), was used to compare compliance rankings between all regular operators across all aspects of the CC. Boat names were withheld to maintain the anonymity of individual operators.

**RESULTS**

Observations were conducted on 27 entire days and six partial days for a total of 238.25h. During this period 716 dolphin watching trips were observed and 947 dolphin-boat

Table 1  
PSCDWA approved CC 1996 (updated in 2000). Stipulations highlighted in bold are assessed in this study.

Code issue	Code stipulation
<b>Dolphin contact</b>	<b>Maximum of two boats with a group at any one time.</b> <b>Maximum of 30min to be spent with a dolphin group.</b> Minimum approach distance of 30m to dolphin group.*
<b>Method of approach</b>	Slow approach used when within 300m of a dolphin group. <b>Approach from behind or at an angle aft of the group's beam when dolphins are travelling.</b> Approach from any angle if the group is milling, foraging or otherwise not travelling in any particular direction. When two boats are present they should stand off 30m to either side of a travelling group.
<b>Cruise frequency and operating times</b>	<b>Maximum of three advertised cruises per boat per day.**</b> <b>All interactions with dolphins to occur between 10:00 and 17:00h.</b> Time sharing should be in order of time of arrival.
Time sharing	When more than one dolphin group is present, boats should move to another group to minimise time sharing.
Communication	Boats will communicate amongst themselves to assist each other in locating dolphin groups, share information on time sharing, dolphins in the area and operational matters. Radio VHF Channel 72 will be used whenever possible.
Information provided to passengers	Provide information on local dolphin population, habitat, protection status and general biology. Inform passengers that the PSCDWA have a self imposed Code of Ethics and explain reasons for certain limits. Published materials should promote realistic expectations of the experience and dolphin behaviour including a description of the limits placed on distance of approach and time spent with dolphins.
Regulations and legislation	Operators will abide by all Government Regulations and Legislation.

\*Operators agreed to adopt the 50m minimum approach distance stipulation specified in the AG (Commonwealth of Australia, 2000), but this was not ratified by written amendment to the CC. \*\*Originally the CC stipulated two cruises per day per operator. This was changed to three cruises per day per operator in 2002 to encourage operators who wanted to run more cruises to remain in the PSCDWA. #Whilst not stipulated in the CC, operators also agreed to abide by the AG in avoiding groups containing newborns.

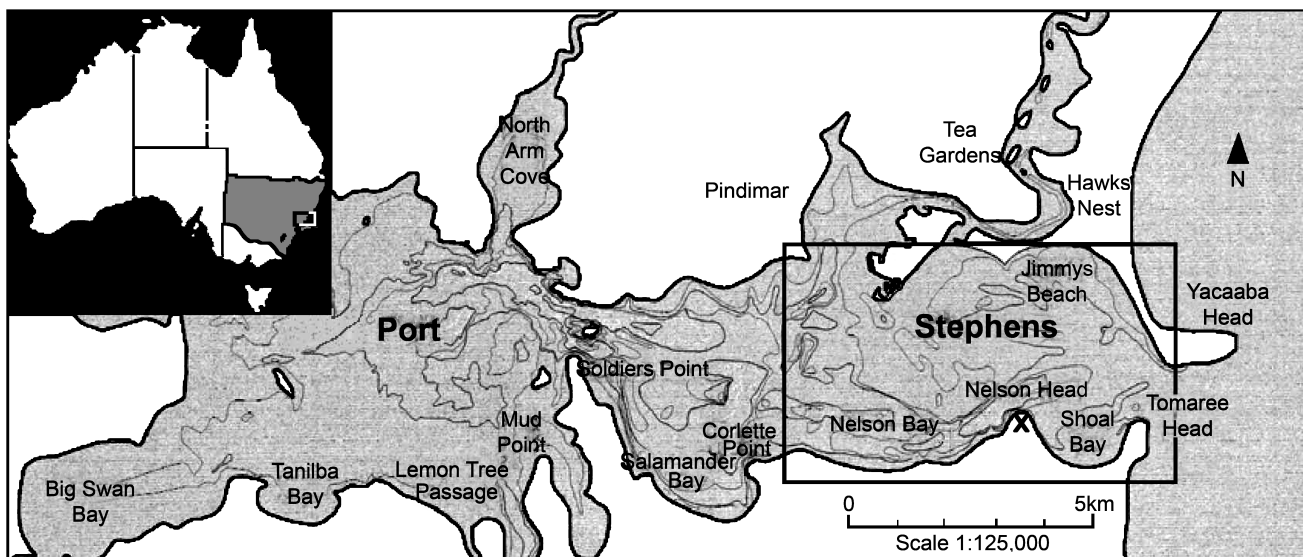


Fig. 1. Port Stephens: on NSW coast (inset map), area under observation (inset box), observation platform (x).

Table 2

Description of methods of approach and boat-handling around dolphins (bold = breach of CC).

Boat activity	Description
Pass-by	Boat steers a straight course, not altering course or stopping to interact with dolphin school.
Stationary	Boat drifts in proximity to dolphin school with motors in neutral or switched off.
Parallel	Boat takes a course parallel to dolphin travel, i.e. maintaining boat abeam of dolphin school.
Follow	Boat follows behind moving dolphin school with dolphins positioned ahead of boat.
<b>Circle</b>	<b>Boat drives around dolphin school in a circle.</b>
<b>J-curve</b>	<b>Boat drives parallel to dolphin school and then arcs in front of dolphin school.</b>
<b>Through</b>	<b>Boat drives into and over or through dolphin school.</b>

interactions were recorded. Boats approached between one and four dolphin schools during each dolphin watching trip (median=1, mean=1.4, SD=0.6) and more than one school was approached on at least 30% of observed trips. The same school was revisited on a single or subsequent trip on at least 19 occasions.

#### Number of boats in contact with a school

The number of dolphin watching boats within 100m of a particular dolphin school ranged 1-4 at any one time (median=2, mean=1.7, SD=0.7). The number of boats around dolphins ranged 1-10 during interactions that also involved recreational boats (30% of all interactions, median=3, mean=3.6, SD=1.6). The CC limit of two boats within 100m of dolphins was breached during 35% of all interactions (Fig. 2).

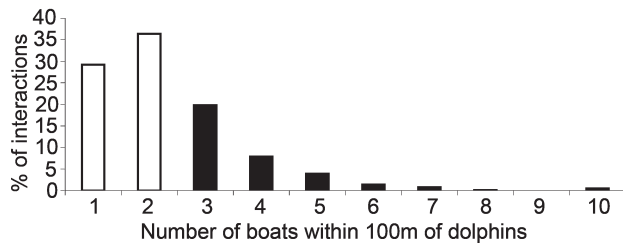


Fig. 2. Number of boats interacting with a dolphin school at any time (all boats pooled; comply with CC limit of 2 boats = no fill, breach CC limit = fill).

During interactions involving dolphin watching boats only (70% of interactions), compliance by individual operators to the CC limit of two boats per dolphin school ranged 71-97%. During interactions involving recreational boats as well as dolphin watching boats, however, compliance by each dolphin watching operator dropped (ranging 6-25%; Fig. 3). For each individual dolphin watching boat, a significantly greater proportion of breaches occurred during interactions involving all boats than during interactions involving dolphin watching boats alone ( $\chi^2 = 42.077, 35.509, 8.514, 51.305, 86.606, 33.726, 45.307, 83.933, 22.047$  for b1-b9, respectively, d.f.=1,  $p < 0.001$ ).

#### Durations of interactions

The durations of 810 complete interactions between regular dolphin watching boats and dolphins were recorded (Fig. 4). 87% of these were within the CC proscribed limit of 30min interaction time with dolphins. Individual dolphin watching operators spent median times of 8-24min with dolphin schools (overall range=1-70min) and compliance levels ranged from 74-98%.

While the issue is not specified in the CC, a total of 91 'continued interactions' were recorded, indicating that a single dolphin school was exposed to at least one dolphin

watching boat for periods ranging 10-142min, with a median interaction time of 43min (Fig. 5). Dolphins were continuously exposed to dolphin watching boats for longer than 30min during 76% of recorded continued interactions.

#### Methods of approach (and boat-handling)

The predominant methods of approach and boat-handling techniques were recorded during 843 dolphin-boat interactions. Methods of approach and boat-handling that breached the CC were observed on 138 (16%) occasions. This represents a minimum count since 'stationary' boats can drift over dolphins, 'parallel' interactions can involve boats approaching to within proscribed limits and 'follow' can constitute an approach from directly behind dolphins (all of which represent breaches of either the CC or AG). Regular operators engaged in boat-handling activity that complied with the CC 88-99% of the time.

#### Frequency of cruises and hours of interaction

Combined dedicated dolphin watching boats ran a median of 23 trips per day ( $n=838$  total trips, max=47 trips per day). Five boats committed 31 breaches of the CC imposed limit of three trips per day. On 18 occasions dolphin watching boats were observed interacting with dolphins outside the hours recommended by the CC (10:00-17:00). One of these events occurred before 10:00 and 17 after 17:00.

#### Approaching calves

Newborn animals or young calves were observed in a minimum of 120 (21%) of the 571 interactions in which calf presence or absence was recorded. This is not significantly different from the proportion of schools observed with newborns during boat-based photo-identification surveys at the same time of year in 1999 and 2000 (27 (17%) of 158 schools observed,  $\chi^2 = 3.28, d.f.=1, p=0.07$ : unpub. data).

#### Overall compliance

Using all aspects of compliance assessed as 'blocks' and individual boats as 'treatments', the Friedman test revealed a highly significant boat effect ( $s=5.10, 8$  and d.f.=32,  $p=0.002$ ). Results of multiple pair-wise comparisons at the 5% significance level indicated differences between boats, with three clear groupings: four boats were most compliant; two boats occupied the middle ground; and three boats were consistently least compliant across all aspects of the CC in which compliance was assessed.

## DISCUSSION

#### Is a voluntary Code of Conduct sufficient to ensure compliance in Port Stephens?

In this study, compliance was generally high, but variable between different aspects of the CC and between operators. While operators were informed that compliance would be

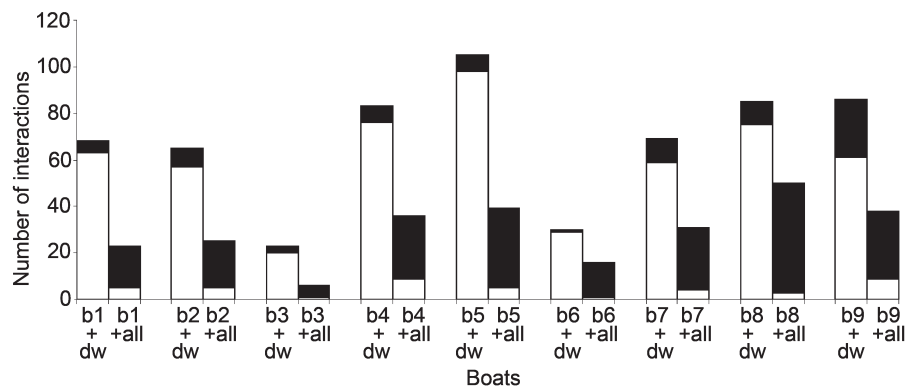


Fig. 3. Number of interactions complying with (no fill) and breaching (fill) the CC limit of 2 boats in contact with a dolphin school at any time under two conditions: dolphin watch boats alone (e.g. b1 + dw) and dolphin watch boats as well as recreational boats and all other boats (e.g. b1 + all).

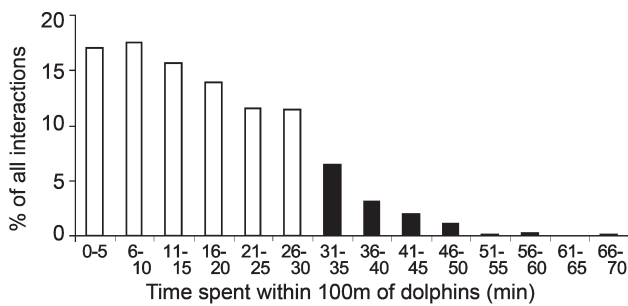


Fig. 4. Compliance with (no fill) and breaches of (fill) the 30min interaction time limit recommended by the CC (n=810).

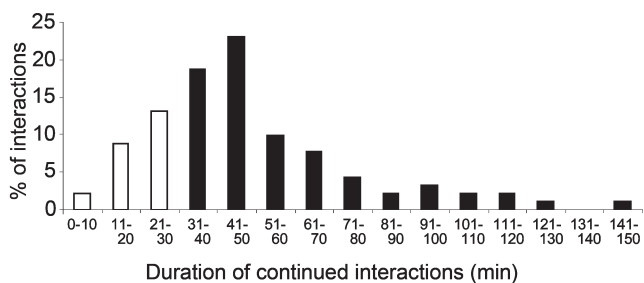


Fig. 5. Duration dolphins were exposed to dolphin watch boats during continued interactions (no fill = comply with CC, fill >30 mins exposure to boats, n=91).

assessed, they were unaware of exactly when they were under observation. Compliance levels reported here are thus likely to represent levels influenced little by the presence of observers, as opposed to assessments made by observers on board tour boats (e.g. Lalime-Bauer, 2000; Scarpaci *et al.*, 2003; Scarpaci *et al.*, 2004; Whitt and Read, 2006). For the purposes of this discussion, an 'acceptable' threshold of compliance to each particular aspect of the CC is defined as 80% or greater (based on discussions with regional managers of NSW National Parks and Wildlife Service and NSW Maritime Authority regarding realistic targets for a voluntary Code of Conduct; R. Gibbs and M. Dunkley, pers. comm.).

There was a high degree of compliance by most dolphin watching operators with regard to the upper limit of two boats interacting with dolphins at any one time, with eight of

the nine regular operators maintaining 'acceptable compliance'. However, the level of compliance dropped significantly during interactions that also involved recreational boats and this occurred for almost a third of interactions. This meant that the efficacy of the CC in limiting crowding of dolphins was compromised by boaters to which the CC did not apply. The AG sets an upper limit of three boats within 150m of cetaceans (Commonwealth of Australia, 2000), so it appears that most recreational boaters were unaware of, or chose to ignore, these guidelines and dolphin watching operators seemed to regard the CC to only apply to the number of dolphin watching boats, not taking into account the presence of recreational vessels.

The mean duration of interactions with dolphins by all individual boats was well below the CC stipulated maximum of 30min per boat, with most dolphin watching operators exceeding this period on relatively few occasions. Seven of the nine regular operators demonstrated above 80% compliance. Nevertheless, staggered departure times, visits to multiple schools, returning to a previously approached school and regular 'continued interactions' involving multiple boats meant dolphins were exposed to boats for protracted periods of up to several hours. Thus, while compliance was acceptable, the CC was not adequate in protecting dolphins from prolonged exposure to boats.

Acceptable levels of compliance were maintained by all dolphin watching operators in methods of approach and boat handling around dolphin schools. However, around one in six interactions involved a breach of the CC (which equates to multiple breaches every day) and three of the nine regular operators committed the majority of these breaches. The frequency of dedicated dolphin watching cruises was also generally within the bounds of the CC limit of three per day. However, two operators regularly breached this limit, placing competitive pressure on other operators and exposing dolphins to a disproportionate amount of boating activity.

Avoiding calves is not specifically referred to in the CC. There was, however, agreement to abide by the AG when they were released, under which there are recommendations to 'exercise additional caution when observing pods containing calves' and to 'not approach very young calves or pods containing very young calves' (Commonwealth of Australia, 2000, p.6). The proportion of interactions involving approaches to dolphin schools containing calves in Port Stephens is a reflection of how many schools

actually contain them, rather than a dedicated effort to approach or avoid young animals. This lack of discrimination was not an artefact of calves going unnoticed, since operators regularly communicated as to whether or not calves were present in the schools they approached, and calves were often seen (with the aid of binoculars) from the remote observation point on a headland. The lack of discrimination does not strictly equate to a breach of the CC, but is a violation of the recommendations in the AG by failing to withdraw outside a 150m caution zone and is another inadequacy of the CC in that it does not provide additional protection for these more vulnerable animals to the standard set by the AG.

If all dolphin watching operators as a group were assessed against the individual stipulations of the voluntary CC, compliance could be considered acceptable. However, when individual variation between operators and all aspects of the CC are taken into account, certain themes emerge; some operators were consistently or reasonably compliant but three did not generally abide by the CC. The voluntary CC does not, then, ensure compliance by all operators in this industry and some measures are needed to improve compliance. Education for operators, for example, or legislative adoption and enforcement of a suitably modified CC or AG, seem necessary.

Membership of the PSCDWA and compliance with the CC remain entirely voluntary. Indeed membership has fluctuated considerably throughout the PSCDWA's existence as new operators have joined, or established members have either been requested to leave the association or have withdrawn of their own accord. Two operators were not members of the PSCDWA at the time of this assessment of compliance and they ranked in the 'middle ground' and 'least compliant' groupings. Thus, not all PSCDWA members were more compliant than non-members. This suggests a need for an association (or set of regulations) that all operators are subject to, rather than just those that choose to belong, and that has the capacity to encourage or ensure compliance with its code. There is potential for investigation into the reasons why compliance by some operators was low and the strategies that may be required to improve understanding, acceptance and adoption of a code.

Given the prevalence of whale and dolphin watching industries around Australia and the world and the diversity of methods used to manage them (Carlson, 2001; Hoyt, 2001), there are surprisingly few published assessments of compliance with cetacean-based tourism management regimes with which to make comparisons. The trend in results from this limited literature is, nevertheless, not encouraging. A lack of compliance is highlighted, as is a need for review and standardisation of industry management, as well as the application of better education and enforcement of regulations. For example, a lack of compliance where there is no enforcement is reported from a number of locations in the United States, particularly with regard to recreational boat-handling around dolphins and manatees (Marine Mammal Commission, 2001); frequent breaches of commercial dolphin watching and swim regulations have been reported from Port Phillip Bay, Victoria, where operators breached numerous stipulations of the law (Scarpaci *et al.*, 2003) and continued breaching regulations after an industry review (Scarpaci *et al.*, 2004); numerous violations of a number of clauses within the US Marine Mammal Protection Act by swimmers and boaters around dolphins at Panama City Beach, Florida, were documented by Samuels and Bejder (2004); and most recently from Florida, Whitt and Read (2006) report just

60% overall adherence to dolphin-watching guidelines by tour operators at Clearwater. Similar to this study, operators complied with interaction time limits, but there was variation between operators, frequent violation of minimum approach distances and inappropriate vessel manoeuvring when near dolphins (Whitt and Read, 2006).

### **Is a voluntary CC effective in minimising perceived impacts on dolphins in Port Stephens?**

While each stipulation should have reduced exposure of dolphins to boats, the results of this study indicate that the CC was rendered ineffective in minimising impacts due to: (1) some operators not adhering to all stipulations of the CC; (2) repeated exposure of dolphins to numerous dolphin watching operators and other boats; and (3) the lack of discrimination between schools containing calves and those that do not. Inadequate or inappropriate controls similar to this exist in the Bay of Islands, New Zealand, where legislation that is designed to protect a dolphin population targeted by tourism is apparently ineffective (Constantine *et al.*, 2004). While the legislation provides specific controls over the number of tours conducted per day, time of departure and the number of operators present, exposure of dolphins to boat activity has not been reduced.

More than three continued interactions were recorded every day in Port Stephens, which equates to over 20 occasions per week in which dolphins were exposed to tour boat activity for protracted periods. This is of concern as boat presence in the area has been found to cause similar disruption to resting and socialising behaviour as that observed elsewhere (e.g. New Zealand (Constantine *et al.*, 2004; Lusseau, 2003); Port Stephens (Allen, 2005)). Furthermore, Port Stephens represents a busy waterway – a mean of 35 boats (all vessels, including commercial dolphin watching boats, recreational boats, etc.) were recorded per scan in the Port Stephens study area and in excess of 20 dolphin watching tours were conducted per day by up to 15 boats (Allen, 2005). By way of comparison, a mean of 3.7 boats (again, all vessels) were recorded per scan of a similar-sized area in Shark Bay, Western Australia, and a maximum of six dedicated dolphin watching tours were conducted per day by two boats (Bejder *et al.*, 2004). The intensity of recreational boating and commercial dolphin watching traffic in Port Stephens is therefore an order of magnitude higher than that which occurs in an area where a decline in relative abundance of bottlenose dolphins has been attributed to an increase in dolphin watching activity from one to two dedicated dolphin watching boats (Bejder *et al.*, 2006).

While the greater number of dolphin watching operators in Port Stephens show acceptable levels of compliance to the CC, dolphin-boat interactions need to be viewed in the wider context of an industry involving many operators focussing their activities in a limited area and a busy waterway that is by no means limited to dedicated dolphin watching boats. Large numbers of boats, including those prohibited from interacting with cetaceans under the AG (Commonwealth of Australia, 2000; 2005), use eastern Port Stephens on a daily basis during peak holiday periods. Recreational runabouts are by far the most numerous, followed by dolphin watching boats, sailing boats and jetskis (Allen, 2005; Waterways Authority, 2003). There may be a threshold of boating traffic or tourism industry intensity beyond which a voluntary code becomes ineffective.

Gjerdalen and Williams (2000) highlight that industry-developed whalewatching codes can be useful in empowering local tourism, encouraging stewardship and helping individuals administer their activities with integrity. Nevertheless, operators in the area of their study ranked direct legal sanctions as the most effective method of ensuring compliance (Gjerdalen and Williams, 2000). The voluntary CC in Port Stephens may be useful in some regards, but it requires revision and greater incentive for compliance by all operators in order to be effective in reducing the exposure of dolphins to boats. The CC's efficacy is compromised by the total number of operators and the lack of compliance by all operators (those belonging and those not belonging to the PSCDWA) and other boaters in the area. This voluntary code is thus of limited value without revision, education and enforcement.

Evidence from this study indicates that conditions within the CC requiring revision include: (1) the CC should be made applicable to all operators; (2) recreational boaters need to be made aware of the AG and the CC and their responsibilities on the water to ensure the safety of wildlife; (3) a general limit needs to be set for the total number of all vessels within a certain distance of dolphins; (4) the hours of commercial dolphin watching activities should include a cessation of dolphin watching in the middle of the day in order to limit consecutive dolphin watches targeting the same school for prolonged periods (a mechanism to reduce continued interactions); and (5) a directive (again similar to the AG) should be included to withdraw outside a 150m caution zone when small calves are observed in a school.

The issue of cumulative impacts from combined commercial and recreational boating activities needs to be addressed in Port Stephens. If minimising potential impacts on dolphins is the goal of managing cetacean-tourism interactions, the challenge lies in improving the effectiveness of management, rather than simply improving compliance. Both compliance to, and efficacy of, stipulations within the CC for industry and rules that govern how recreational users operate might be improved with educational programmes designed to target dolphin watching operators, recreational boaters and the tourists that drive the industry. Rules need to be enforced when breaches occur in order to serve any function in minimising impacts on dolphins.

In 2006, the NSW government introduced the National Parks and Wildlife Amendment (Marine Mammals) Regulation and, furthermore, Port Stephens was declared a Marine Protected Area. The new Regulation adopted all aspects of the updated AG (Commonwealth of Australia, 2005) including proscribing minimum approach distances, number of vessels permitted within this distance and the operation of vessels around marine mammals. Thus, most stipulations within the CC are now enforceable and it is up to the NSW government to ensure that the public and dolphin watching operators are aware of the regulations and that compliance with them is enforced. It is therefore also critical that monitoring of dolphin-boat interactions continues, including compliance monitoring, to identify impacts as they arise and assess the validity and effectiveness of education programmes and the new legislation. The designation of Port Stephens as a Marine Protected Area also means that commercial tour operators will require licenses to use the area, under which any stipulations of the CC that are not already addressed in the amended Regulation could be adopted and later enforced (e.g. dolphins may be afforded additional

protection from over-exposure to boating activity through the application of spatial and temporal dolphin watching zones).

## ACKNOWLEDGEMENTS

Financial and logistical support for this project was provided by the NSW National Parks and Wildlife Service, Port Stephens Commercial Dolphin Watch Association, Port Stephens Royal Volunteer Coastal Patrol and Graduate School of the Environment, Macquarie University. Simon Allen and Holly Smith were supported by an ARC (SPIRT) grant to Rob Harcourt. We thank Rochelle Constantine for advice in the field, Brett Mitchell for assisting with data collection and Julian Leslie for assistance with statistical analyses. Lars Bejder, David Lusseau, Mark Orams and Vic Peddemors provided helpful reviews and comments on earlier versions of the manuscript. This research was conducted under a scientific investigation license from NSW National Parks and Wildlife Service and ethics approval from Macquarie University.

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Date received: April 2006  
Date accepted: August 2007