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# **Opinions and perspectives of the dolphinwatching boat operators in Bocas del Toro, Panama**

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## **Abstract**

This study demonstrates that boat operators in Bocas del Toro, Panama are interested in dolphin conservation and sustainable tourism but are not familiar with the Panamanian whalewatching guidelines. Fifty-three percent of the 15 boat operators interviewed for this study said they have whalewatching received training, however, none of the boat operators follow the whalewhale guidelines. All boat operators approach dolphins closer than 100 meters. Sixty percent of the operators drive their boats 30 meters or less from the dolphins. Forty percent of the boat operators said they did not know if Panama had whalewatching guidelines, 33% said no there were no whalewatching guidelines and 27% said that there were guidelines. Even though boat operators were not aware of the guidelines in Panama, all of the boat operators would like to received training and 80% said it is was important to them for a politician they are voting for support dolphin conservation.

## **Introduction**

Commercial whalewatching started in the 1950's in California. These early whalewatching operations likely had little impact on wild populations of cetaceans as most of these activities were conducted from land-based vantage points (Hoyt & Parsons 2014). By the 1970's, boat-based whalewatching became more popular, raising concerns among the scientific community about the direct and indirect impact of the activity (Hoyt 2001). The rapid worldwide increase in whalewatching and the initial scientific studies addressing the negative impact on coastal populations of cetaceans (IWC 2001) prompted the establishment of voluntary guidelines and legislation to manage this activity (Carlson 2004; Constantine et al. 2008). Over the years, numerous studies have documented how cetaceans respond to whalewatching boats (see review in Parsons 2012). Studies of

vessels' effect on cetaceans describe a decrease in time invested in biologically important activities such as feeding and resting (e.g., Lusseau & Bejder 1997; Constantine et al. 2004; Chistiansen et al. 2010), and a change in communication signals (e.g., Buckstaff 2004; Foote et al. 2004; Parks et al. 2007; May-Collado & Wartzok 2008; May-Collado & Quinones-Lebron 2014). Although, voluntary codes of conduct and statutory regulations have been developed in many countries (Carlson 2004), the mitigation of any impact on cetacean populations ultimately depends on compliance with these by local whalewatching operators. Thus, boat operators access to training and understanding of local guidelines is fundamental to ensure a sustainable whalewatching industry.

### *Threats from Whalewatching*

As noted above, unregulated boat-based whalewatching can become a threat to cetaceans. This threat can be associated to the size and number of boats and to how the boat operators behave in the presence of the animals. The boat type and size used for whalewatching varies considerably by region. In some locations, whalewatching boats maximize tourists per tour and in other locations the use of smaller boats is more common. Independently of the size, one of the major concerns of boat-based whalewatching is the noise associated with the boat engines. Noise caused by boat propellers and engines can potentially mask signals used by cetaceans to maintain group cohesion (Richardson et al. 1995; Erbe 2002). Signal masking may increase the likelihood of collisions, the separation of mothers and their calves, and may lower the cetaceans' ability to coordinate behaviors such as foraging and may disrupt social activities that rely on sound (e.g. Erbe 2002; Tyack 2008; Jensen et al. 2009).

Another factor threatening the target cetacean population is the number of whalewatching boats interacting simultaneously with a group of animals. In many countries whalewatching boat traffic is concentrated in areas where cetaceans are predictable. This profusion of boats can increase the risk of collisions and exacerbate the impact on cetacean behaviors (e.g. Wells & Scott 1997; Ng & Leung 2003; Constantine et al. 2004; May-Collado 2007; Waerebeek et al. 2007). For example, in the Canary Islands (Spain) and Bocas del Toro (Panama), scientists have reported up to 100 boats simultaneously

using the same area for whalewatching (Hoyt & Parsons 2014; May-Collado *et al.* 2014, respectively). Previous studies have shown a correlation between dolphin collision injuries and high boat traffic (Wells & Scott 1997).

The proximity between whalewatching boats and cetaceans is another concern. Boat operators often assume that tourist satisfaction is higher when they can get closer to the animals (Orams 2000). However, close range observations of cetaceans are invasive and can increase the risk of disturbance and collision. Several studies have shown that cetaceans typically respond to close range interactions with boats by exhibiting anti-predator like behaviors such as fleeing or diving (Janik & Thompson 1996; Williams *et al.* 2002a; 2002b; Garrod & Fennel 2004; Williams & Ashe 2007; May-Collado *et al.* 2014; Sitar *et al.* 2014).

Moreover, a high number of whalewatching boats inevitably prompts competition among boat operators to have visual access to the animals, resulting in a high occurrence of aggressive and inappropriate maneuvers around the animals such as, circling the animal to entice them to jump in the wake of boats, cutting across their paths, and driving through the center of groups (Clairborne 2010; Barragán-Barrera *et al.* 2013; May-Collado *et al.* 2014; Sitar *et al.* 2014).

Most studies on whalewatching boat and cetacean interactions are about the short-term influence of the boats' presence on the surface behavior of dolphins (Blane & Jaakson, 1995; Bejder & Harraway 1999; Au & Green 2000; Nowacek *et al.* 2001; Williams *et al.* 2002; Hastie *et al.* 2003; Lusseau, 2006; and see review in Parsons 2012). As noted above, these short-term responses (such as avoidance tactics or temporary suspension of current behaviors) when vessels are present can lead to long-term, and population-level negative effects when animals are repeatedly exposed (Nowacek *et al.* 2001; Frid & Dill, 2002; Foote *et al.* 2004; Bejder 2005; Lusseau, 2005; Bejder *et al.* 2006a, 2006b; Lusseau *et al.* 2006; Williams *et al.* 2006; Lusseau & Bejder 2007). These repeated responses can lead to energetic costs to cetaceans and can influence their vitality and the viability of their population (Lusseau & Bejder 2007) especially when their forage patterns are impacted (Duffus 1996). Biologically important events such as breeding, birthing and

nursing can be affected (Garrod & Fennell 2004). There should be significant concern for cetacean population viability when research results show foraging and resting disruption as the result of boat interactions (Stockin et al. 2008), especially as the disruption of biologically important behaviors caused by whalewatching vessels, can linger even after boats have left the area (Stockin et al. 2008).

The bottlenose dolphins of Dolphin Bay, in the Archipelago of Bocas del Toro, experience the highest level of whalewatching activity in Panama. The local industry has grown rapidly and in an unplanned manner with little thought by authorities towards ensuring sustainability and minimizing negative impacts. Concerned with an exponential increase in the number of boats dedicated to whalewatching in Bocas del Toro, May-Collado et al. (2012, 2014), Barragan-Barrera et al. (2013), and Sitar et al. (2014) presented preliminary evidence of the impact and the vulnerability of this population to a continuously growing industry. These studies summarize 10 years of monitoring that found that Bocas dolphins' population was small (less than 250 animals) and showed high site fidelity. Furthermore, genetic data confirmed this high site fidelity with both males and females showing high philopatry to the site. Finally, although dolphins are found everywhere in the Archipelago, a subset is found in Dolphin Bay (approximately 100-150 individuals), and it is these animals that are exposed to daily boat interactions. This area is shallow, sheltered and is where a higher incidence of mother-calf pairs have been found (May-Collado et al. 2012). Shallow waters are commonly used for foraging and calf rearing (Nowacek et al. 2001). Because this is an important nursery ground, dolphins are particularly vulnerable to anthropogenic activities such as boat traffic (Wells 1993, Nowacek et al. 2001). Because there are so few individuals in this population, behavioral disturbance and especially boat strikes, could pose a serious threat to the population's viability (Laist et al. 2001). Due to these concerns, the International Whaling Scientific Committee recommended (International Whaling Commission 2013b, 2014) that the government of Panama promote adherence to, and enforce, Panamanian whalewatching guidelines (Resolution ADM/ARAP NO. 01, 2007).

### *Whalewatching Regulations*

A comprehensive version of these guidelines was drafted by the IWC in 2013 (International Whaling Commission 2014c) and these are a good benchmark for whalewatching management and regulation internationally.

Whalewatching guidelines generally insist whalewatching vessels remain more than 100m from cetaceans, a distance which is considered the “watch zone” (Carlson 2012). Vessels in the “watch zone” should observe cetaceans for no more than 20 to 30 minutes at a time (Carlson 2012). Any vessels within 300m of cetaceans are in the “approach zone”, i.e. a "no wake" area, where vessels should maintain speeds of no more than 6 knots (Carlson 2012).

These guidelines are the closest to an international whalewatching code of conduct because there are not any recognized international regulations (Garrod & Fennell 2004). However, whalewatching guidelines vary around the world (Garrod & Fennell 2004). Some countries have legal (non-voluntary) regulations whereas other countries have voluntary codes of conduct or best practice guidelines (Garrod & Fennell 2004). Even though a country might have legal regulations to control and prohibit certain whalewatching activities, they might not monitor or enforce these.

Panamanian whalewatching guidelines (Resolution ADM/ARAP NO. 01, 2007) require boat operators to be 100 meters or more from cetaceans. They also instruct that only 2 boats can be with dolphins at a time, and can only remain for 30 minutes (May-Collado 2013). However concerns have been expressed, as noted above, that Panamanian whalewatching guidelines are not enforced (International Whaling Commission 2013, 2014). As evidenced in Chapter 3, there is a high level of boat operator noncompliance with guidelines.

#### *Whalewatching Management Effectiveness*

Bocas del Toro, is one of many places in the world where whalewatching operators do not comply with their country’s codes of conduct (e.g. Wells & Scott 1997; Parsons & Woods-Ballard 2003; Scarpaci et al. 2003, 2004; Corbelli 2006; Clairborne 2010). In

these other locations, the majority of boat operators know about the codes of conduct but for their own reasons they decide not to comply with them (Scarpaci et al. 2003; Parsons & Woods-Ballard 2003). Guidelines produced by a “bottom up” process involving local stakeholders and nongovernment regional organizations are often preferred by whale-watching operators (Parsons & Wood-Ballard 2003) as there is a sense of ownership of the guidelines that protect their resources. Gjerdalen and Williams (2000) further stated that operators were less likely to follow codes if they did not make sense to the operators or seemed irrelevant to them. Blangy and Epler Wood (1993) additionally point out that effective voluntary guidelines need to be self-explanatory, avoid prohibitive language and need to be positive. Likewise, Scarpaci et al. (2004) suggested operators might adhere better to regulations with simple conditions that are easy to apply in the field and that are easily enforceable.

To illustrate, in western Scotland, Parsons & Woods-Ballard (2003) found that the preferred whalewatching codes of conduct were ones produced by local operators. Also, three other commonly utilized codes of conduct were created by environmental nongovernment organizations (Parsons & Wood-Ballard 2003). When asked about the whale-watching guidelines only 27% of the operators were aware that the UK had even developed whalewatching guidelines, but even those that were aware specifically did not use or refer to them (Parsons & Woods-Ballard 2003). Interestingly, Parsons & Woods-Ballard (2003) reported that the most followed (43% of operators) guideline was indeed developed by a tour operators’ association. This suggests having stakeholder-facilitated management (i.e “bottom-up”) is more effective than “top-down” regulation in some locations (Parsons & Woods-Ballard 2003), especially when whale-watching locales are remote with little official oversight.

If there is stakeholder ownership, self-policing might be an effective way to enforce regulations. In Gairloch, northwest Scotland, a whalewatching operator actually reported cetacean harassment (an incident involving a Rigid Inflatable Boat) to authorities (Pooley 2000). If the host community, whalewatching operators, and local nongovernment

organizations create their own guidelines then it is possible that like in Scotland, self-policing could occur (Parsons & Wood-Ballard 2003).

However, with any whalewatching location, scientific monitoring should be instituted as an ongoing, long-term oversight mechanism to ensure the sustainability of the whalewatching industry and to protect the target cetacean species. As with guidelines, such monitoring programs would be more effective with the support and, especially, respect of boat operators and the host community, rather than researchers and the local community having an adversarial relationship.

This study evaluates dolphinwatching operators' level of awareness of the local whalewatching guidelines and their state of knowledge about the local dolphins, in Bocas del Toro, Panama. It is important to determine if lack of compliance to the guidelines is due to willful disregard or simple unawareness of the guidelines' existence. Identifying the reason for lack of compliance is fundamental in determining future strategies for training and licensing.

Throughout this paper the term whalewatching is used to describe cetacean-viewing tourism, even though in Bocas del Toro this activity is largely restricted to watching dolphins.

## **Methods**

This study was carried out in 2013 from July to September in Bocas del Toro, an Archipelago located on the northeast Caribbean coast of Panama. More specifically, surveys were conducted in the main island, Isla Colón, where most tourists vacation and depart for dolphinwatching trips.

This study investigated Bocas del Toro boat operators' perspectives on dolphin tourism in the area, on marine/dolphin conservation and on their knowledge about dolphins. Fifteen dolphinwatching trip operators were randomly selected from tour companies in Bocas. In many cases, questionnaires were read to the boat operators by request of the boat



operators. The questionnaire was constructed in compliance with the guidelines of George Mason University's Human Subject Review Board, who also approved the questionnaire on an ethical basis. At any time the boat operators could excuse themselves from participation, and they were not required to answer any question they did not want to answer. The questionnaire consisted of 15 questions. The first four questions provided background information: amount of dolphinwatching experience; estimated income; whether they had received dolphinwatching training; and what they charged tourists for a trip. Boat operators were asked if they would like training if it were available. Three questions were related to knowledge of Bocas del Toro dolphins. A further three questions inquired about dolphinwatching tourism guidelines. Finally, the survey finished with questions on marine and/or dolphin conservation in Bocas del Toro.

### Hypotheses

- 1) “whalewatching boat operators in Bocas del Toro are not familiar with and are not practicing sustainable dolphinwatching tourism practices”;
- 2) “boat operators are not interested in practicing sustainable dolphinwatching tourism”:  
and
- 3) “boat operators in Bocas del Toro are not knowledgeable about their resident bottlenose dolphin population”

### *Hypothesis Testing*

Unless otherwise noted, answers to survey questions were grouped into 2 categories in accordance with the Likert-scale: category A= answers 1 through 3 (up to uncertain); and category B = answers 4 and 5 (Ref for Likert-scale). To test each hypothesis (see below) a Chi-square test of independence was used via the statistics program, R (64-bit version 3.1.1.: R Core Team, 2014). Throughout the rest of the paper the term whalewatching is used to describe cetacean-viewing tourism, even though in Bocas del Toro this activity is largely restricted to watching dolphins.

To test the first hypothesis, that "whalewatching boat operators in Bocas del Toro are not familiar with and are not practicing sustainable dolphinwatching tourism practices", the survey questions "when whalewatching how close do you get to the dolphins?" (Q#10) and "did you receive whalewatching tourism training?" (Q#3) were evaluated with a Chi-square test. For the question "how many boats do you think should be around a group of dolphins?" (Q#11) average mean, mode and range were evaluated. Additionally, "does Panama have a whalewatching conduct regulation?" (Q#9) was evaluated with descriptive statistics.

To measure level of compliance the question on "closeness of approach" (Q#10) a chi-square test was conducted to measure the proportion of operators that did, or did not, comply with whalewatching guidelines. For the question on "closeness of approach" (Q#10), operators had a choice of six answers of which only one complied with the whalewatching guidelines' distance. These answers were grouped into 2 categories: category A= noncompliant with Panama's current whalewatching guidelines which included answers 5 m or less, 5-10m, 10-30m, 30-50m, and 50-100m; and category B= compliant with the whalewatching guideline distance (100m or more).

To test the second hypothesis "boat operators are not interested in practicing sustainable dolphinwatching tourism" a chi-square test was conducted for survey question "how important is it to you that Bocas' marine environment be protected" (Q#12) and "how important is it to you that you would be more likely to vote for a politician that supports dolphin conservation" (Q#15). Both of these survey questions were answered on a Likert-scale (1= "not at all" or "not important" to 5 = "very" or "very important"). The answers were grouped in 2 categories (A & B). Likert-scale responses 1= "not at all" or "not important", 2= "little", and 3= "somewhat", were collaborated as category A=not important. Likert-scale answers 4= "well" or "important", and 5= "very well" or very important" were combined as category B= important, because answers 4 and 5 are the definitive statements of importance. Any answer that has "some" importance incorporates a certain amount of uncertainty and thus cannot be considered a definitive opinion.

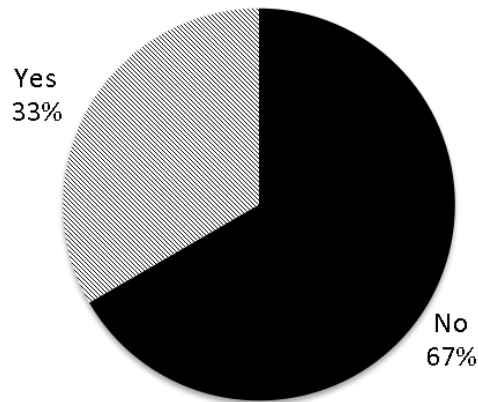
To test the third hypothesis “boat operators in Bocas del Toro are not knowledgeable about their resident bottlenose dolphin population” three survey questions were analyzed to evaluate boat operator knowledge about the status of resident dolphins: “do you think the dolphin population is increasing, decreasing or staying the same?” (Q#5); "how many dolphins do you think are in Bocas del Toro?" (Q#6); and “do you think the size of the dolphin population will stay the same over the next 20 years?” (Q#7). These questions were evaluated with descriptive statistics.

## Results

Of the 15 interviewed operators, 47% had seven years or more of dolphinwatching experience, and 33% had five to six years of experience (Table 1). Of the 15 boat operators 33% of operators depended upon tour activities that include dolphinwatching as their primary source of income (Figure 1). The average amount boat operators said they charged a tourist for a whalewatching trip was US\$20 (mode= US\$20, range =US\$12.5 - \$25; n =15).

**Table 1.** Number of years experienced in whale watching (N=15)

Years of experience	>1yr	1-2yrs	3-4yrs	5-6yrs	7yrs or more
Total of Operators	1	0	2	5	7
Percent of Operators (%)	6.67	0.00	13.33	33.33	46.67

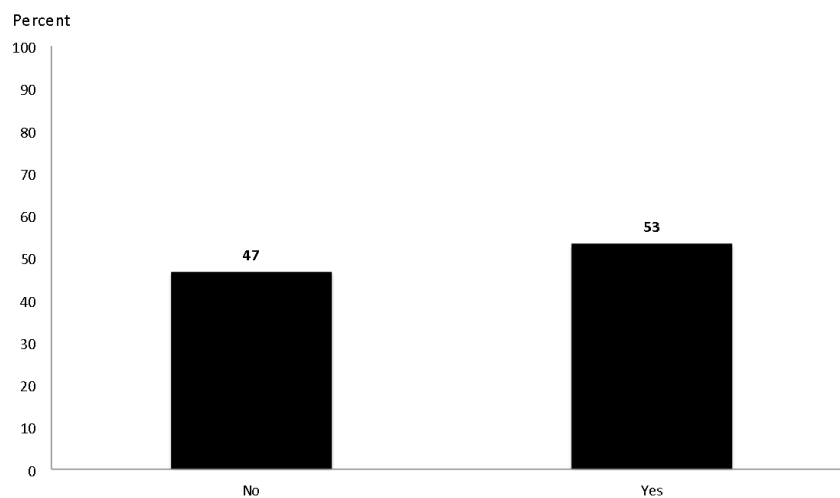


**Figure 1.** Answers to the question “is whalewatching your primary source of income?”

*Hypothesis 1 analysis*

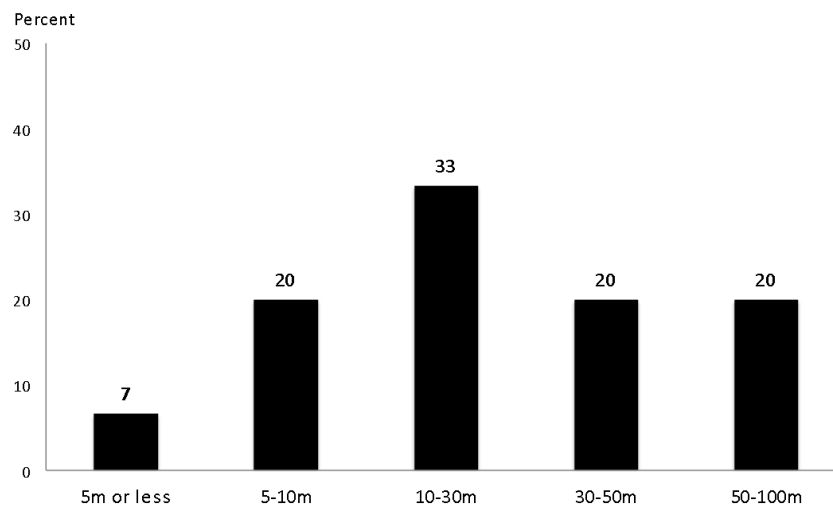
The various analyses supported the null hypothesis, i.e., boat operators are not familiar with, and are not practicing, sustainable whalewatching tourism practices.

Results from the chi-square test demonstrated that responses about receiving training (Q#3) were non-significant ( $X^2 = 0.0667$ ,  $df = 1$ ,  $p\text{-value} = 0.7963$ ,  $N=15$ ). Slightly less than half (47% of participants) answered that they had received no whalewatching training, whilst 53% stated that they had (Figure 2).



**Figure 2.** Proportion of boat operators that have received whalewatching training (N=15). Figures above the bars are percentages.

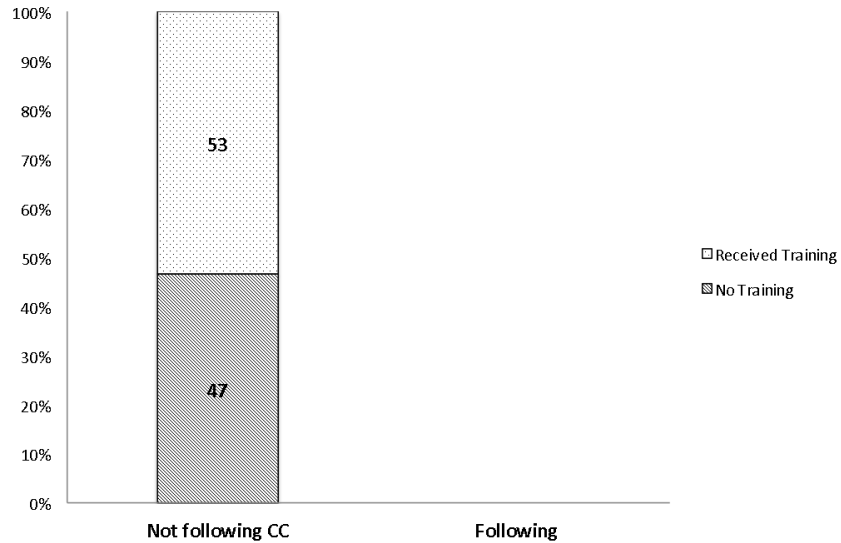
With respect to closeness of approaches to dolphins (Q#10), a chi-square test determined a significant difference between the proportions of incorrect versus correct responses ( $X^2= 15$ ,  $df = 1$ ,  $p\text{-value} < 0.001$ ,  $N=15$ ). In fact, none of the boat operators in Bocas responded that they actually operated at the distance required by Panamanian whalewatching guidelines (100 meters or more) (Figure 3). Four-fifths of boat operators responded they approach closer than 50 meters from dolphins. This implies that boat operators in Bocas del Toro are arguably not practicing sustainable whalewatching tourism practices.



**Figure 3.** Summary of how close boat operators (N=15) in Bocas del Toro stated that they approach dolphins while on a whalewatching trip. All 15 of the boat operators stated that they approach closer (< 100m) than Panamanian guidelines permit, i.e. all operators effectively admitted to being non-compliant.

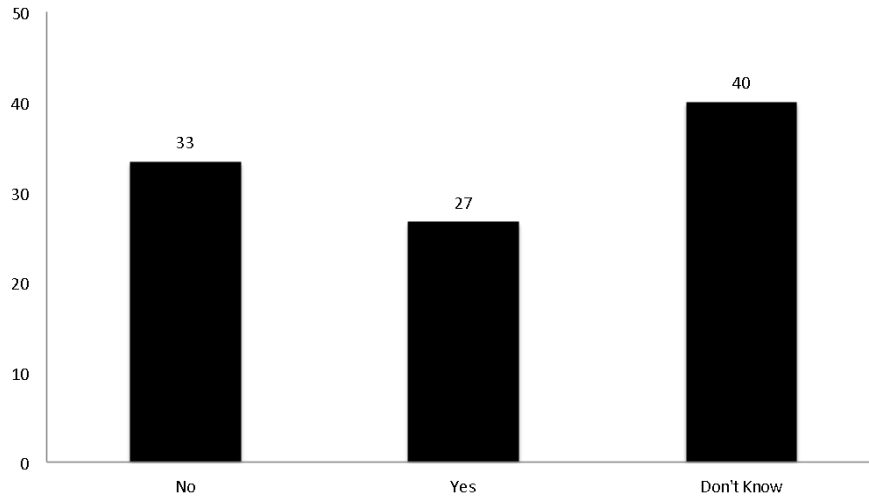
A Pearson's Chi-squared test with Yates' continuity correction was used to test a relationship between having “received training” (Q#3) and level of regulation compliance via the question on approach distance (Q#10). Approach distance results were grouped into the same two categories A and B (mentioned above), i.e. a two-way split of a five-point Likert scale. A non-significant result was obtained ( $X^2= 0.4537$ ,  $df = 1$ ,  $p\text{-value} = 0.5006$  with Yates,  $N=122$ ). Thus, there was no significant difference in undergoing whalewatching training and whether the code of conduct was complied with. Figure 4

clearly illustrates that all boat operators were noncompliant with the Panamanian whalewatching codes of conduct and having received whalewatching training made no difference in their level of regulation compliance.



**Figure 4.** Comparison of the responses to the question of “did you receive whalewatching tourism training?” to compliance with whalewatching guidelines with respect to approach distances (N=15). Figures within the bars are percentages of participants.

To evaluate their familiarity with the whalewatching guidelines boat operators were asked whether or not Panama had official whalewatching guidelines (Q#9). Of the 15 boat operators 40% said they did not know that Panama had whalewatching guidelines, and 33% confidently stated that there were no official guidelines. Only 27% said that Panama did indeed have whalewatching guidelines (Figure 5).



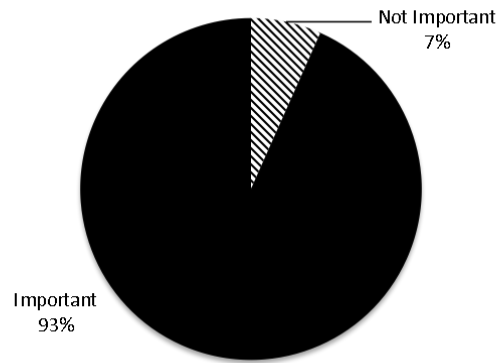
**Figure 5.** A comparison of boat operator responses to whether there are official Panamanian whalewatching guidelines (n=15).

In response to the “how many boats do you think should be around a group of dolphins?” (Q#11) the mean value of responses was 5.43 (SD 3.3) and the modal value was 5. Responses ranged from 3 boats to 15 boats. The guidelines currently prohibit more than 2 boats around dolphin groups.

### *Hypothesis 2 analysis*

The results showed for that boat operators do, in fact, have an interest in engaging in sustainable dolphinwatching tourism practices. Therefore hypothesis 2 was rejected.

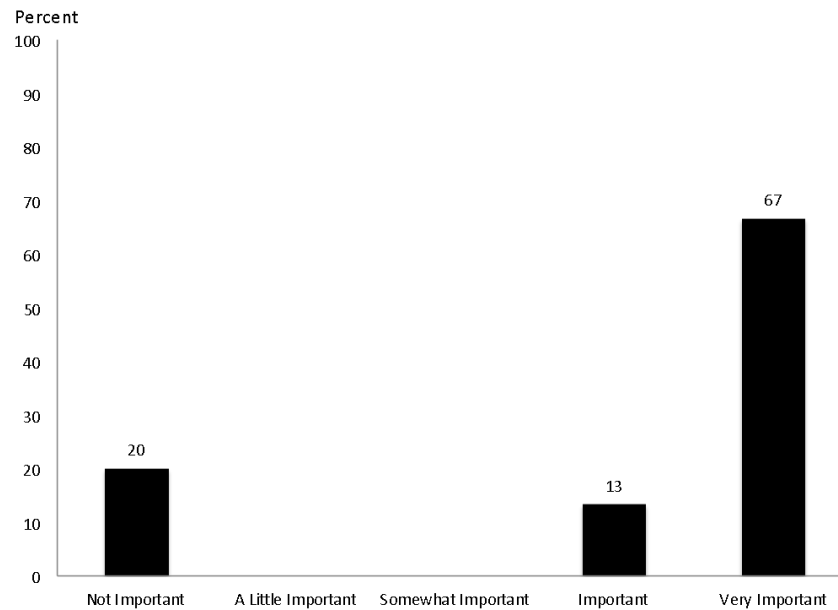
A chi-square test of independence was conducted for the question “how important is marine environment protection” (Q#12). The chi-square results showed a significant difference in responses on level of importance for dolphin conservation ( $X^2= 11.2667$ ,  $df = 1$ ,  $p\text{-value} = 0.0007891$ ,  $N=15$ ). More specifically 93% of the boat operators stated that dolphin protection was “very important” (Figure 6). Thus, protecting Bocas del Toro’s marine environment is clearly a priority to the large majority of local boat operators.



**Figure 6.** How important is marine environment protection to boat operators (N=15) in Bocas del Toro. A majority of 93% said it was “very important” while only 7% answered, it was not.

For question which asked how likely boat operators would be to vote for a politician that supported dolphin conservation (Q#15) responses from the boat operators were found to be significantly different ( $X^2=5.4$ ,  $df = 1$ ,  $p\text{-value} = 0.02014$ ,  $N=15$ ). Eighty percent of boat operators said they were more likely to vote for a politician that supported dolphin conservation (noting that this was "important" or "very important" on a Likert scale; Figure 7). This infers that that dolphin conservation is potentially a political “hot topic” that could increase votes from boat operators for a specific politician who visibly supported dolphin protection.





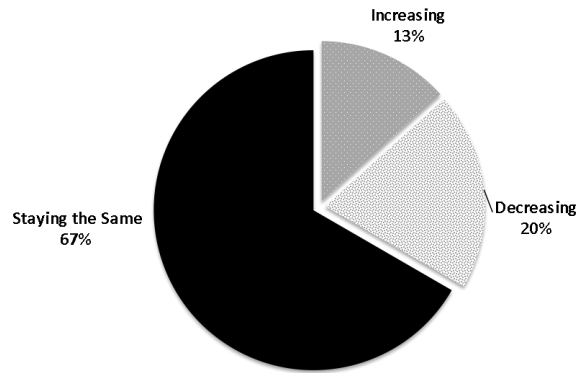
**Figure 7.** Comparison of the responses to the question “How important is it to you that you that a politician that supports dolphin conservation” (N=15). Numbers above bars are percentages of responses.

Additionally, when boat operators were asked “would you like whalewatching training (including dolphin information) if it were available” 100% of the operators said yes. Similarly, 93% of operators answered “very important” to the question “how important is dolphin conservation to you.”

### *Hypothesis 3 analysis*

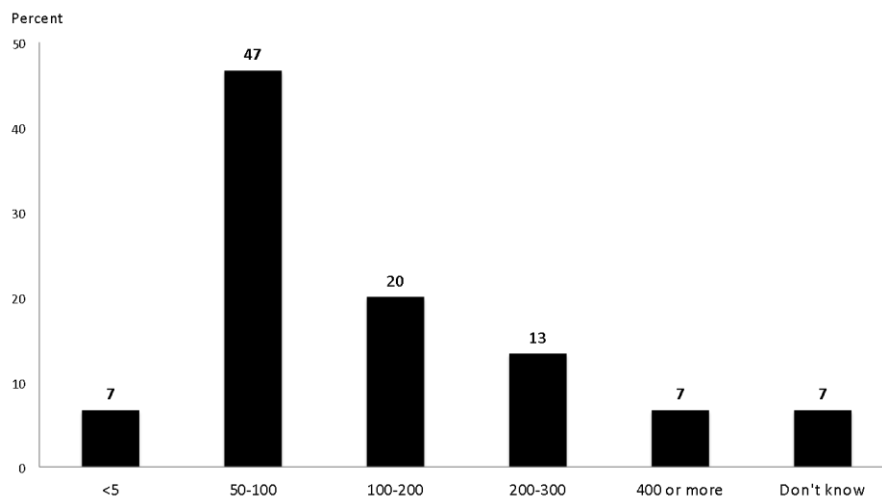
The results demonstrate that “boat operators in Bocas del Toro are not knowledgeable about their resident bottlenose dolphin population” and thus the third hypothesis was accepted.

When boat operators were asked if the Bocas del Toro dolphin population is increasing, decreasing or staying the same (Q#5), approximately 67% answered staying the same (Figure 8). Thirteen percent answered that the population is increasing and only 20% of the boat operators answered correctly that it was “decreasing”.



**Chart 8.** Boat operators' (N=15) opinion on the of the current population status of the resident Bocas del Toro dolphin population.

Moreover, 47% of the boat operators believe there to be 50 to 100 bottlenose dolphins in the resident Bocas del Toro population (Q#6) (Figure 9). Only, 13% percent of boat operators chose the correct population estimate category (200 to 300 individuals). Approximately 7% of participants answered “less than 5” individuals, and the same proportion responded “400 or more” individuals in the population. Twenty percent of participants believed there to be 100 to 200 individuals (7% answered, “don’t know” to the question), which is approximately the number of animals that utilize Dolphin Bay (May-Collado et al. 2012), the main whalewatching location.



**Figure 9.** Boat operators' (N=15) perspectives on the number of individual dolphins in the resident bottlenose dolphin population in Bocas del Toro. The correct number at present is 200-300 individuals. Figures above the bars are the percentage of respondents answering different categories.

Final question asked to boat operators to measure their level of knowledge about their bottlenose dolphins (Q#7), showed that operators were unaware of their dolphin population status. When boat operators were asked about the resident dolphin populations' 20 year projected future 50% said the dolphin population will “stay the same” and 50% said it would “not stay the same”, i.e. that the population is sustainable in the long term.

## **Discussion**

In Bocas del Toro, it appears that most of the boat operators claimed to have years of experience (5 or more years for approximately 80% of operators) in whalewatching activity and that for two-thirds of the operators whalewatching is not their primary source of income. In Bocas whalewatching tours are not as expensive as in other places around the world. This study found that the average cost for a dolphinwatching trip in Bocas is just \$20 per person. Interestingly, in other whalewatching studies in similar locations (Iniguez et al. 1998; Hoyt 2001; Draheim et al. 2010) whalewatchers would spend more for a trip: US\$30 - 60. This demonstrates that the price of trips in Bocas del Toro could potentially be increased, especially if this increased cost went towards funding dolphin conservation. As found in previous studies (e.g. Wilson & Tisdell 2002; Warren 2012), tourists are willing to pay more for conservation efforts and Stamation et al. (2007) found that boat-based whalewatchers were willing to pay money to help an environmental organization. Warren (2012) noted that whalewatchers were also willing to pay an additional fee (up to \$15) for habitat protection. Therefore, elevating prices slightly (i.e. a conservation tithe) could be an opportunity for raising funds for dolphin conservation in Bocas del Toro. A partnership between a local NGO and the boat operators could be developed to set up a community trust fund where the extra charge would go to support conservation projects, community educational programs, habitat restoration and training for local boat operators. Such training might help boat operators to increase tourists' satisfaction level as boat operators will be more informed about the dolphins, better able to answer questions, and be more professional in their operations (e.g. Shapiro 2006; Kessler et al. 2014). The result would be mutually beneficial.

In this study, boat operators were found to be unfamiliar with Panama's whalewatching guidelines even though 53% claimed they had whalewatching training. Boat operators generally believed the appropriate number of boats that could be around a group of dolphins was 5 boats, but opinions ranged up to 15 boats. Clearly, the number of boats they consider to be appropriate around a group of dolphins was higher than the permitted number (2 boats) under the Panamanian whalewatching guidelines. These results support May-Collado and colleagues previous work (2014b) that mentioned high numbers of boats around Bocas dolphins.

Likewise, lack of compliance with guidelines is illustrated by the fact that 100% of the boat operators stated that they approached dolphins closer than 100m on a trip. Troublingly, 80% of these operators stated that they approached closer than 50m when viewing the dolphins. This suggests that the findings from Sitar et al. (2014) are accurate and that the majority of boat operators get far too close to dolphin groups increasing the risk of collisions between dolphins and boats. Panacetacea (2013) and May-Collado et al. (2014) reported that 10 dolphins were killed by boat strikes in the period 2012-14, which considering the self-confessed close approach distances by boat operators is not surprising.

This study suggests that whalewatching boat operators in Bocas del Toro are not familiar with sustainable whalewatching tourism practices, are not following the Panamanian whalewatching guidelines, and indeed are largely unaware of these guidelines. Among the boat operators 53% said they had received whalewatching training, but there were no differences in operations when looking at non-trained boat operators and trained boat operators (see Fig. 4). Neither trained nor untrained operators followed the official whalewatching guidelines (see Fig. 4). Boat operators who claimed to be trained may have been trained by an NGO or local body or were "self-trained". Only 27% of boat operators even knew that Panama has whalewatching guidelines which conflicts somewhat with the statement by half of the operators that they were trained. It is, however, critical to note that before this study was conducted, the Panamanian Government in Bocas apparently provided formal whalewatching training. So it is

interesting that even though many boat operators might have had formal training before this study, they were still not following the guidelines. Clearly any such training was unsatisfactory. The reason why this training was unsuccessful should be further investigated. It is, however, important to consider the nature of whalewatching training methods in locations such as Bocas del Toro. In a recent study (Betzi Perez, Lissette Trejos, and Laura May-Collado pers. com. 2015) and in this study, it was clear that many of the boat operators in Bocas do not know how to read or write. Training based on written materials and presentations is unlikely to be effective.

In October, 2014, new formal whalewatching training was provided by the Panamanian government and facilitated by the local NGO Panacetacea (Betzi Perez, Lissette Trejos, and Laura May-Collado pers. com. 2015). It will be interesting to see if this training has any impact on whalewatching guideline compliance.

Despite a lack of compliance with guidelines, boat operators were nonetheless interested in participating in sustainable whalewatching tourism. Results showed that boat operators have a strong regard for dolphin conservation with 93% of boat operators stating that marine protection is “important”. Additionally, 80% said that they would be more likely to vote for a politician who supported dolphin conservation. Likewise, 93% of boat operators said that dolphin conservation was "very important", and 100% of them would like whalewatching training if it were available.

However, boat operators in Bocas del Toro were not that knowledgeable about the status of the resident bottlenose dolphin population. Only 13% stated the correct size category of the dolphin population with several responses being very off the mark. However, as noted, May-Collado et al. (2012) estimated that probably fewer than 150 animals regularly utilize Dolphin Bay and are continuously exposed to whalewatching vessels. This matches more closely with the answers of a larger proportion of the boat operators. If operators actually thought the dolphin population was just 50 to 100 individuals, one would think that this would provoke some sort of concern. However, it is possible that because Bocas is such unique area where dolphins are sighted on an everyday basis, the is

a disregard for the population. Two-thirds of the boat operators indicated that they thought that the dolphin population is stable. As noted above, within just two years (2012 to 2014), 10 resident dolphins were killed by boat strikes (Panacetacea 2013). However, this figure only includes incidences that were reported to scientists, thus it is entirely possible that more dolphins have been killed by dolphinwatching in Bocas. The fact that half of the operators thought that the dolphin population would remain stable for the next twenty years suggests that they do not see unregulated dolphinwatching as a threat to the population.

In conclusion, this study shows that boat operators in Bocas del Toro are not following Panama's whalewatching guidelines and/or are unfamiliar with them. More importantly, boat operators are putting the dolphin population in Bocas at risk from higher chances of collision and behavioral disturbance (May-Collado et al. 2012, 2014) because they approach dolphins too closely. These results are in line with several other studies of dolphinwatching activities around the world (e.g. Herman 1989; Wells 1993; Wells & Scott 1997; Constantine 1999; Nowacek et al. 2001; Ng & Leung 2003; Ng & Leung 2003; Constantine et al. 2004; Buckstaff 2004; Bejder 2005; Lusseau, 2005; Bejder et al. 2006a; Bejder et al. 2006b; Dolman et al. 2006; Lusseau et al. 2006).

On the positive side, the results showed that boat operators do care about the resident bottlenose dolphins and support conservation. They also would like formal whalewatching training if it were made available to them. Therefore, the situation in Bocas with unregulated and unmanaged dolphinwatching trips is not hopeless. Because the boat operators care about the dolphins and want to learn more about them, swift change may be possible if appropriate training were provided.

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## References

- Au, W. L., & Green, M. (2000). Acoustic interaction of humpback whales and whale-watching boats. *Marine Environmental Research*, 49(5), 469-481.
- Baker, C. S., & Herman, L. M. (1989). *Behavioral responses of summering humpback whales to vessel traffic: experimental and opportunistic observations*. Anchorage, Alaska: National Park Service NPS-NR-TRS-89-01.
- Barragán-Barrera, D.C., May-Collado, L.J., Quiñones-Lebrón, S.G., & Caballero, S. (2013). Population at risk: low genetic diversity in bottlenose dolphins of Bocas del Toro, Panama. Paper presented to the Scientific Committee at the 65<sup>th</sup> Meeting of the International Whaling Commission, 3-15 June 2013, Jeju, South Korea. SC/65a/SM15. 11pp.
- Bejder, L. (2005). *Linking short and long-term effects of nature-based tourism on cetaceans*. PhD thesis. Dalhousie University, Halifax.
- Bejder, L., Dawson, S. M., & Harraway, J. A. (1999). Responses by Hector's dolphins to boats and swimmers in Porpoise Bay, New Zealand. *Marine Mammal Science*, 15(3), 738-750.
- Bejder, L., Samuels, A., Whitehead, H., & Gales, N. (2006a). Interpreting short-term behavioural responses to disturbance within a longitudinal perspective. *Animal Behaviour* 72, 1149-1158.
- Bejder, L., Samuels, A., Whitehead, H., Gales, N., Mann, J., Connor, R. C., Heithaus, M. R., Watson-Capps, J., Flaherty, C., & Krutzen, M. (2006b). Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance. *Conservation Biology*, 20(6), 1791-1798.
- Blane, J. M., & Jaakson, R. (1995). The impact of ecotourism boats on the Saint Lawrence beluga whales. *Environmental Conservation*, 21(3), 267-269.
- Blangy, S., & Epler Wood, M. (1993). Developing and implementing ecotourism guidelines for wildlands and neighbouring communities. In *Ecotourism: A Guide for Local Planners* (eds. K. Lindberg & D. Hawkins), pp. 32-55. The Ecotourism Society, North Bennington
- Buckstaff, K.C. (2004). Effects of watercraft noise on the acoustic behavior of bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. *Marine Mammal Science*, 20(4), 709-725.

- Christiansen, F., Lusseau, D., Stensland, E., & Berggren, P. (2010). Effects of tourist boats on the behaviour of Indo-Pacific bottlenose dolphins off the south coast of Zanzibar. *Endangered Species Research*, 11(1), 91-99.
- Constantine, R. (2001). Increased avoidance of swimmers by wild bottlenose dolphins (*Tursiops truncatus*) due to long-term exposure to swim-with-dolphin tourism. *Marine Mammal Science*, 17, 689–702.
- Constantine R., Brunton D.H., & Dennis, T. (2004). Dolphin-watching tour boats change bottlenose dolphin (*Tursiops truncatus*) behaviour. *Biological Conservation*, 117(3), 299–307.
- Corbelli, C. (2006). *An evaluation of the impact of commercial whale watching on Humpback whales, Megaptera novaengliae, in Newfoundland and Labrador, and of the effectiveness of a voluntary code of conduct as a management strategy*. PhD Thesis. Department of Biology, Memorial University of Newfoundland.
- Duffus, D. (1996). The recreational use of grey whales in Southern Clayoquot Sound, Canada. *Applied Geography*, 16, 179–190.
- Dolman, S., Williams-Grey, C., Asmutis-Silvia, R., & Isaac S. (2006). *Vessel Collisions and Cetaceans: What Happens when They Don't Miss the Boat*. WDCS, Whale and Dolphin Conservation Society, Chippenham, UK. 25p.
- Dwyer, S.L., Kozmian-Ledward, L., & Stockin, K.A. (2014). Short-term survival of severe propeller strike injuries and observations on wound progression in a bottlenose dolphin. *New Zealand Journal of Marine and Freshwater Research*, 48(2), 294-302.
- Erbe, C. (2002). Underwater noise of whale-watching boats and potential effects on killer whales (*Orcinus orca*), based on an acoustic impact model. *Marine Mammal Science*, 18(2), 394-418.
- Foote, A. D., Osborne, R. W., & Hoelzel, A. R. (2004). Whale call response to masking boat noise. *Nature*, 428, 910.
- Frid, A., & Dill, L.M. (2002). Human-caused disturbance stimuli as a form of predation risk. *Conservation Ecology*, 6(1), 11.
- Garrod, B., & Fennell, D. A. (2004). An analysis of whalewatching codes of conduct. *Annals of Tourism Research*, 31, 334-352.
- Gordon, G., Leaper, R., Hartley F.G., & Chappell, O. (1992). *Effects of whale-watching vessels on the surface and underwater acoustic behaviour of sperm whales off Kaikoura, New Zealand*. Department of Conservation, Wellington, New Zealand.
- Gjerdalen, G., & Williams, P. (2000). An evaluation of the utility of a whale watching code of conduct. *Tourism Recreation Research*, 25, 27–37.



Hastie, G.D., Wilson, B., Tufft, L.H., & Thompson, P. M. (2003). Bottlenose dolphins increase breathing synchrony in response to boat traffic. *Marine Mammal Science*, 19(1), 74-84.

International Whaling Commission (2001). Report of the work-shop on assessing long-term effects of whalewatching on cetaceans. *Journal of Cetacean Research and Management* 3(Suppl), 308-315.

International Whaling Commission (2013). Report of the sub-committee on whalewatching. *Journal of Cetacean Research and Management*, 14 (Suppl.), 318-329

International Whaling Commission (2014). Report of the sub-committee on whalewatching. *Journal of Cetacean Research and Management*, 15(Suppl.), 380-392

International Whaling Commission (2014b). General principles for whalewatching. [www.iwc.int/wwguidelines](http://www.iwc.int/wwguidelines) Accessed 8 April 2015.

International Whaling Commission (2014c). General principles for cetacean watching. Report of the sub-committee on whalewatching. *Journal of Cetacean Research and Management*, 15(Suppl.), 390-392.

Jensen, F.H., Bejder, L., Wahlberg, M., Aguilar Soto, N., Johnson, M., & Madsen, P.T. (2009). Vessel noise effects on delphinid communication. *Marine Ecology Progress Series*, 395, 161-175

Janik, V.M., & Thompson, P.M. (1996). Changes in surfacing patterns of bottlenose dolphins in response to boat traffic. *Marine Mammal Science*, 12, 597-602.

Kessler, M., Harcourt, R., & Bradford, W. (2014). Will whale watchers sacrifice personal experience to minimize harm to whales? *Tourism in Marine Environments*, 10, 21–30.

Laist, D.W., Knowlton, A. R., Mead, J., Collet A.S., & Podesta, M. (2001). Collisions between ships and great whales. *Marine Mammal Science*, 17(1), 35-75.

Lusseau, D. (2005). The residency pattern of bottlenose dolphins (*Tursiops* spp.) in Milford Sound, New Zealand, is related to boat traffic. *Marine Ecology Progress Series*, 295, 265-272.

Lusseau, D. (2006). The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand. *Marine Mammal Science*, 22(4), 802-818.

Lusseau, D., & Bejder, L. (2007). The long-term consequences of short-term responses to disturbance experiences from whalewatching impact assessment. *International Journal of Comparative Psychology*, 20(2), 228-236.

May-Collado, L. J. (2013). Conservation status of the dolphins of Bocas del Toro: 2004-2012. Retrieved from <http://www.panacetacea.org/uploads/6/6/8/1/6681148/reportedolphinsbocasfinal2013.pdf>

May-Collado, L.J. & Wartzok, D. (2008). A comparison of bottlenose dolphin whistles in the Atlantic Ocean: insights on factors promoting whistle variation. *Journal of Mammalogy*, 89, 1229-1240.

May-Collado, L.J., Barragán-Barrera, D.C., Quiñones-Lebrón, S. G., & Aquino-Reynos W. (2012). Dolphin watching boats impact on habitat use and communication of bottlenose dolphins in Bocas del Toro, Panama during 2004, 2006-2010. Paper presented to the Scientific Committee at the 64<sup>th</sup> Meeting of the International Whaling Commission, 11-23 June 2012, Panama City, Panama. SC/64/WW2.

May-Collado, L.J., Quiñones-Lebrón, S.G., Barragán-Barrera, D. C., Palacios, J.D. Gamboa-Poveda, M. (2014). The dolphin watching industry of Bocas del Toro continues impacting the resident bottlenose dolphin population. Paper presented to the Scientific Committee at the 65<sup>th</sup> Meeting of the International Whaling Commission, 12-24 May 2014, Bled, Slovenia. SC/65b/WW06.

May-Collado, L.J., & Quiñones-Lebrón, S. (2014). Dolphin changes in whistle structure with watercraft activity depends on their behavioral state. *Journal of the Acoustical Society of America*, 135, EL193-198.

Nowacek, S. M., Wells, R. S., & Solow, A. R. (2001). Short-term effects of boat traffic on bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. *Marine Mammal Science*, 17(4), 673-688.

Panacetacea. (2013). Bocas dolphin mortality increase to 12 animals between 2012-2013. Newsletter Issue #2 (September, 2013). <http://panacetacea.org> Accessed September, 2013

Parks, S.E., Clark, C.W., & Tyack, P.L. (2007). Short- and long-term changes in right whale calling behavior: the potential effects of noise on acoustic communication. *Journal of the Acoustical Society of America*, 122(6), 3725–3731

Richardson, W.J., Greene, C.R., Malme, C.I. & Thomson, D.H. (1995). *Marine Mammals and Noise*. Academic Press, San Diego.

Scarpaci, C., Dayanthi, N., & Corkeron, P.J. (2003). Compliance with regulation by ‘swim-with-dolphins’ operations in Port Phillip Bay, Victoria, Australia. *Environmental Management*, 31, 342 – 347

Scarpaci, C., Nugegoda, D., & Corkeron, P.J. (2004). No detectable improvement in compliance to regulations by “swim-with-dolphin” operators in Port Philip Bay, Victoria, Australia. *Tourism Marine Environments*, 1, 41-48.

Shapiro, K.R. (2006). *Whale watch passengers' preferences for tour attributes and*

*marine management in Maui, Hawaii*. PhD Thesis. School of Resource and Environmental Management, Simon Fraser University, British Columbia, Canada.

Simmonds, M.P. (2000). *Chasing Dolphins. A WDCS Science Report*. Whale and Dolphin Conservation Society, Chippenham, UK. 26 pp.

Sitar, A., May-Collado, L.J., & Parsons E.C.M. (2014). High levels of non-compliance with whale-watching regulations in Bocas del Toro, Panama and effects of non-compliance on bottlenose dolphin behavior. Paper presented to the Scientific Committee at the 65<sup>th</sup> Meeting of the International Whaling Commission, 12-24 May 2014, Bled, Slovenia. SC/65b/WW09.

Stamation, K.A., Croft, D.B., Shaughnessy, P.D., Waples, K.A., & Briggs, S.V. (2007). Educational and conservation value of whale watching. *Tourism in Marine Environments*, 4(1), 41–55.

Stockin, K. A., Lusseau, D., Binedell, V., Wiseman, N., & Orams, M. B. (2008). Tourism affects the behavioural budget of the common dolphin *Delphinus* sp. in the Hauraki Gulf, New Zealand. *Marine Ecology-Progress Series*, 355, 287.

Stone, C. J., & Tasker, M. L. (2006). The effects of seismic airguns on cetaceans in UK waters. *Journal of Cetacean Research and Management*, 8(3), 255.

Tyack, P.L. (2008). Implications for marine mammals of large-scale changes in the marine acoustic environment. *Journal of Mammalogy*, 89(3), 549–558.

Orams, M. (2004). Why dolphins may get ulcers: considering the impacts of cetacean-based tourism in New Zealand. *Tourism in Marine Environments*, 1(1), 17-28.

Warren, S. (2012). *Passenger Preferences for Whale Watching Tour Attributes and Payment for Grey Whale Habitat Protection: A Case Study in Tofino, B.C.* Masters Thesis. Simon Fraser University, British Columbia, Canada.

Weinrich, M. 2004. A review of worldwide collisions between whales and fast ferries. Paper presented to the Scientific Committee at the 56<sup>th</sup> Meeting of the International Whaling Commission, 29 June–10 July 2004, Sorrento, Italy. SC/56/BC9.

Wright, A.J., Aguilar Soto, N., Baldwin, A.L., Bateson, M., Beale, C., Clark, C., Deak, T., Edwards, E.F., Fernández, A., Godinho, A., Hatch, L., Kakuschke, A., Lusseau, D., Martineau, D., Romero, L.M., Weilgart, L., Wintle, B., Notarbartolo di Sciara, G., Martin, V., (2007). Do marine mammals experience stress related to anthropogenic noise? *International Journal of Comparative Psychology*, 20 (2– 3), 274–316.

WDCS (2003). *Friendly Dolphin Causes a Stir off Dorset Coast: but WDCS Calls for Responsible Behaviour by Members of the Public*. <<http://www.wdcs.org/dan/news.nsf/webnews/39E6D2433E5D76D080256B98005D3777>> (accessed October

3)

Wells, R.S. (1993). The marine mammals of Sarasota Bay. In *Sarasota Bay: 1992 Framework for Action*. (eds. P. Roat, C. Ciciccolella, H. Smith & D. Tomasko), pp. 9.1-9.23. Sarasota National Estuary Program, Tamiami Trail, Sarasota, Florida.

Wells, R.S., & Scott, M.D. (1997). Seasonal incidence of boat strikes on bottlenose dolphins near Sarasota, Florida. *Marine Mammal Science*, 13(3), 475-480.

Williams, R., Bain, D.E., Ford, K.K.B., & Trites, A.W. (2002a). Behavioural responses of male killer whales to a 'leapfrogging' vessel. *Journal of Cetacean Research and Management*, 4, 305-310.

Williams, R., Trites, A. W., & Bain, D. E. (2002b). Behavioural responses of killer whales (*Orcinus orca*) to whale-watching boats: opportunistic observations and experimental approaches. *Journal Zoological Society of London*, 256, 255-270.

Williams, R., Lusseau, D., & Hammond, P.S. (2006). Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*). *Biological Conservation*, 133(3), 301-311.

Williams R., & Ashe, E. (2007). Killer whale evasive tactics vary with boat number. *Journal of Zoology*, 272, 390-397.

Wilson, C., & Tisdell, C. (2002). *Conservation and Economic Benefits of Wildlife-Based Marine Tourism: Sea turtles and Whales as Case Studies*. Economics, Ecology and Environment Working Papers 48734. School of Economics, University of Queensland, Brisbane, Australia.

Appendix

Questionnaire for Whale Watching Boat Operators

1. How long have you been a whale watching Boat operator?  
Less than 1yr      1-2years      3-4years      5-6yrs      7 or more
  
2. Is dolphin watching your primary income?  
Yes      No
  
3. Did you receive whale watching tourism training?  
Yes      No
  
4. Would you like whale watching training (including dolphin info) if it were available?  
Yes      No
  
5. Do you think the dolphin population is increasing, decreasing or staying the same?  
Increasing      Decreasing      Staying the Same
  
6. How many dolphins do you think are in Bocas?  
10-50      50-100      100-200      200-300      300-400      400 or more  
Don't Know
  
7. Do you think the dolphin size of the population will stay the same in 20 years?  
Yes      No
  
8. How much do you charge an individual for a dolphin tours?
  
9. Does Panama have a Whale Watching Conduct Regulation?  
Yes      No      Don't Know
  
10. When whale watching how close do you get to the dolphins?  
5meters or less    5-10meters    10-30meters    30-50meters    50-100meters    100meters or more
  
11. How many boats do you think should be around a group of dolphins?
  
12. How important is it to you that Bocas' marine environment be protected? 5- Very Important and 1- Not important  
1      2      3      4      5
  
13. Who do you think it would be best at protecting the marine environment? Rank 1-3 (1 most effective 3 least effective)

Panamanian Government

Local Government

Local community

14. How important is dolphin conservation to you? 5- Very Important and 1- Not important

1

2

3

4

5

15. How important is it to you that you would be more likely to vote for a politician that supports dolphin conservation? 5- Very Important and 1- Not important