Behavioural response of southern right whales (*Eubalaena australis*) to anthropogenic approaches in Bahía San Antonio, Río Negro Argentina

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ABSTRACT

The behavioural response of southern right whales (SRWs) to human approaches was studied in Bahia San Antonio, Río Negro Argentina, to obtain essential information for the evaluation of a recent authorized whale-based tourism and the implementation of accurate regulations and conservation measurements.

A total of 50 SRW groups were approached with a small zodiac during the whale-seasons (June-October) of 2008 and 2009, accounting for a total of 39h of behavioural observations. The approaches occurred in a slow and controlled way up to a minimum distance of 100m. A focal animal observation (instantaneous point sample) was used to record three mutual exclusive behavioural states: rest, travel and socializing and/or aerial activity. Groups (chosen ad random) consisted out of solitary animals (0.52), Surface Active Groups (SAG; 0.32) and non-SAGs (0.13). Nevertheless, because of the low amount of data, up to now all behavioural responses were analysed regardless group composition.

Results indicated that whales continued travelling during an approach, but doubled their time resting after an approach had finished (22% → 40%) and decreased drastically their time socializing or aerially active (21% → 2%).

Although the probability that a whale remained in a social/aerially active behaviour when affected by anthropogenic approaches decreased notably (-22%), no significant effect could be found up to now (Z-test for 2 proportions, p>0.05), probably due to the relative small dataset. Nevertheless, the apparent change in SRW social behaviour requires urgently more detailed information to implement conservation strategies regulating adequately the commercial whale-based tourism in the area.

KEYWORDS: SOUTHERN RIGHT WHALE, *EUBALAENA AUSTRALIS*, TOURISM, CONSERVATION STRATEGIES

INTRODUCTION

Marine mammal based tourism is one of the fastest growing eco-tourism activities in the world, the highest growth rates found in South-America (Hoyt and Iñiguez 2008). In many cases it helps to improve the appreciation towards marine wildlife but on the other hand the activity keeps raising questions on its effect on the animals themselves. Although it has been proven to induce short-term behavioural changes (Rivarola *et al.*

2001, Mattson *et al.* 2005), increased stress levels (Rose *et al.* 2003) and in a specific case even the abandonment of the region by the whales (Reeves 1977), it remains difficult to measure the long-term consequences they might suffer (Bejder *et al.* 2006).

The southern right whale (SRW) is one of Patagonians most emblematic species, whose charisma attracts nearly 250.000 tourists per year generating over 60 million dollars annually (Hoyt and Iñiguez 2008). With these numbers, Argentina is one of the leaders in South-America in terms of marine mammal tourism but it has in turn raised questions concerning the sustainability of the activity and the consequences of its extent on the whales. Over the last decades, numerous laws and regulations were set up in this country to control this form of tourism but it can be argued whether these regulations effectively ensure the protection of the whales or merely the endurance of the activity itself. Over the last years, a mayor discussion raised concerning a possible legalization of a swimming-with-whales activity, an activity that has been carried out illegally for many years already. The debate came to its peak when the province Río Negro finally approved this form of tourism in 2006 in waters under their jurisdiction, based on the assumption that this region is not a main reproductive nor calving ground and whales therefore less vulnerable.

The effect of tourism based on cetaceans has been the aim of several workshops in the last years (IFAW, Tethys Research Institute and Europe Conservation 1995, IFAW, WWF and WDCS 1997, IFAW 1999 and 2000) pointing out that there is a *great individual variety of responses within and among cetacean species* particularly while they reproduce, feed or migrate. It was therefore recommended that one should *evaluate in each case and species the biggest quantity of possible impact factors* (IWC 1986). Underlining this recommendation, the presented study is aimed to obtain initial information on the reaction of SRWs to the presence of human activity in Bahía San Antonio (BSA), the most touristic coastal area of the Río Negro province, essential for the evaluation of the recent authorized whale-based tourism and the implementation of accurate regulations and conservation measurements.

METHODS

Data were collected during the whale season (June-October) of 2008 and 2009 in BSA Province of Río Negro, Argentina. Boat-based observations were conducted on board of a Kiel zodiac (4.6m) with a Suziki 40Hp outboard motor. When whale groups were seen, data were noted on group size and composition using following categories: (1) *solitary whale* (2) *mother and calf* (M&C), defined as an adult whale in close association with a whale notably smaller in size that presents orange coloured callosities (3) *Surface Active Group* (SAG), defined by their apparent courtship behaviour (Kraus and Hatch 2001) and (4) *non-SAG* (Best *et al.* 2003). However, as previous results already indicated that mothers and claves are most affected by human interactions (Payne 1986, Lundquist *et al.* 2008), and as mothers and calves were included in the restrictions of the provincial laws regarding whale based tourism, no approaches were made with these whales.
A focal animal observation (Altmann 1974, Martin and Bateson 1993) was used to record an instantaneous point sample of the behaviour of the focal animal every two minutes

using three mutual exclusive behavioural states as was done previously by Lundquist (*et al.* 2008, Thomas and Taber 1984, Sironi 2004): (1) *rest* when the animal is motionless in the water (2) *travel* when the animals is moving from one location to another leaving surface "footprints" (3) *socializing and or aerial activity* when the animal is causing white water at the surface by rolling, breaching, tail- or flipper-slapping or the whale is actively rubbing, touching or circling around another animal.

These behavioural observations were made *before* a boat approaches (BI), *during* a boat approach and/or swimmer interaction (DI), and *after* swimmers exited the water and/or the boat left the area (AI) (Bejder and Samuels 2004, Lunquist *et al.* 2008). "Before" was defined as all activity from the moment behavioural observations started to the moment the boat first approached within ±500m of the animal. "During" was defined to begin when the boat approached within 500m from the animal, included the entire time the boat was near the whale and/or the swimmers were in the water, and ended when the boat travelled more than 500m from the animal. "After" was then defined as when the boat started returning to the coast and travelled more than 500m from the whale.

The behavioural data was later analysed as series of time-discrete Markov chains (for more details see Lundquist *et al.* 2008). To further compare the calculated probabilities between control (undisturbed behaviour) and impact chains, a Z-test for proportions (Fleiss 1981) was used to test whether the interaction with boat and/or swimmers had a significant effect on the behaviour of the animals. All statistical analysis was performed using STATISTICA 6.0 and Zar (1996).

RESULTS

A total of 39h of behavioural observations were made of 50 whale groups. Groups (chosen ad random) consisted out of solitary animals (0.52), Surface Active Groups (SAG; 0.32) and non-SAG (0.13). In 3% of the cases, the approach was ceased at the initial point when it became clear that it concerned a mother and calf pair.

However, due to the low amount of data, up to now all behavioural responses were analysed regardless the group composition or swimmer and/or boat activity level (further mentioned as just *interaction*).

Before any interaction occurred, whales spent up to 56% of their time travelling and this remained rather constant both during (61%) and after an interaction had occurred (57%). It could however been observed how the time whales spent resting increased (40%) after an interaction while the time they were socializing or aerially active decreased to barely 2% (figure 1).
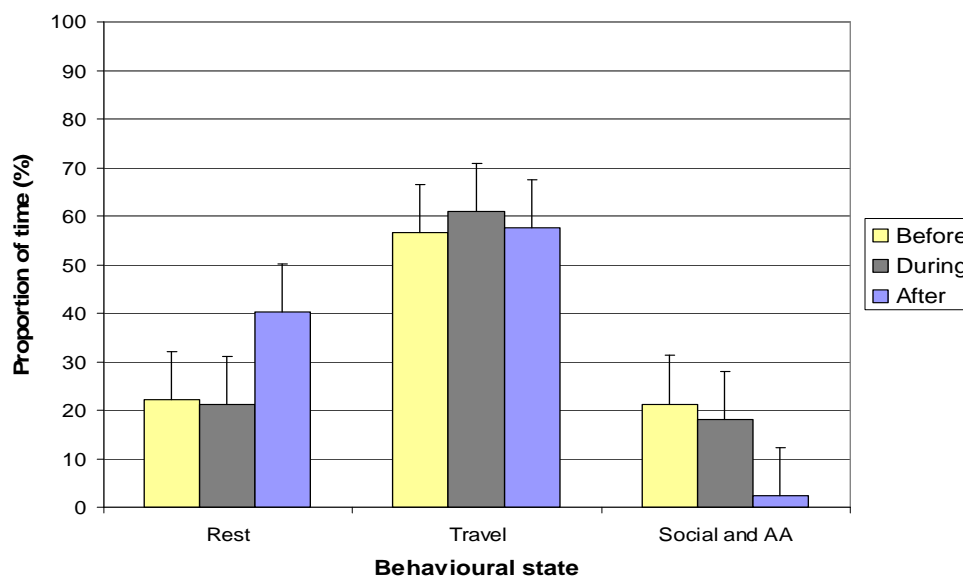
Figure 1: Proportion of time spent in each behavioural state before, during and after an interaction in BSA. Error bars are 95% confidence intervals (n=48).

Although whales seemed to spend less time in a social/surface active behaviour (-22%) when affected by anthropogenic interaction, the interaction had no significant effect (Z-test for 2 proportions, $p > 0.05$) on all behavioural transition probabilities when comparing the BI and DI segments (figure 2).
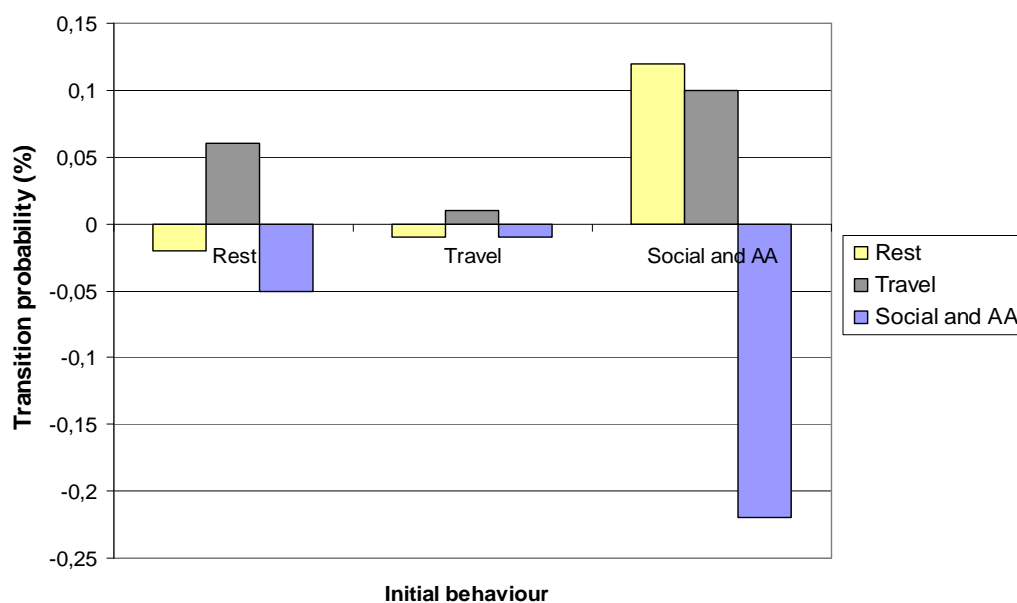

Figure 2: Difference in transition probability between BI and DI segments from BSA (n=48).

DISCUSSION

More than 50% of the whales observed in BSA during the study period were solitary animals. This is according to the trend seen in 2007 (48%; Cammareri and Vermeulen, 2008). In general, very few mothers with calves can be seen in the area. This, in combination with the prohibited interaction with mother and calf pairs and their repeatedly confirmed vulnerability, made it preferable to exclude interactions with these whales. It does however reconfirm that the area is not a main calving ground for this species.

Results from this study, although preliminary, suggest that the initial behaviour of the whales is a predicting factor for the behavioural reaction towards human interactions. It was observed how whales tend to increase the amount of time resting after an interaction had occurred, which could be a reflection of an elevated stress level experienced during interaction. Furthermore, it was shown how the probability of a social active whale to remain in its social active state during interaction decreased notably. However, up to now no changes in transition probability could be tested significant, probably due to the small dataset. Therefore, even though whales seem least affected in their behaviour when travelling from one site to another and most affected in their social behaviour, more data is needed to draw concrete conclusions.

When our data are compared to information obtained Peninsula Valdes (350km south) (Lundquist 2007, Lundquist *et al*. 2008), it can be seen that whales in Peninsula Valdes react in a similar way to anthropogenic approaches but to a greater extend. This could be explained amongst others by the fact that up to 41% of the whale groups studied in Peninsula Valdes were mothers and calves, found to be the most vulnerable group composition in their study (Lundquist *et al.* 2008).

Swimming with whales is a highly discussed touristic activity in Argentina, involving many ecological, economical and political interests. In 2006 it was approved by law in the province Río Negro, but commercialization of the activity should still be dependent on its regulation. Understanding the possible impact of human interactions on mainly social and therefore possible reproductive behaviour, it seems vital to obtain urgently more detailed information, including behavioural reactions according to group composition and boat and/or swimmer interaction level.

Whale-based tourism can have a positive effect on conservation through an increase in awareness, but it must be regulated and monitored at all times to ensure the least possible impact in the whales themselves. Adequate regulations should furthermore reduce any impact on the long term to its minimum.

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