Boat traffic effects on the social behaviour of bottlenose dolphins in Cardigan Bay, Wales

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Introduction

Boat traffic has been implicated as a significant factor negatively impacting the distribution and behaviour of coastal cetaceans. Within Cardigan Bay, two Special Areas of Conservation (SAC) are designated for the protection of the local semi-resident population of bottlenose dolphins (Fig. 1). Additionally, a compulsory code of conduct regulates boat behaviour in the presence of cetaceans, limiting speed and distance of approach within Cardigan Bay SAC. This study aimed to assess the impacts of boat traffic on the social behaviour of Cardigan Bay bottlenose dolphins.

Methods

Data collection: Data were collected in Cardigan Bay during dedicated line transect surveys from 2001 to 2012. Sightings were recorded continuously, with number of boats logged every fifteen minutes.

Analysis: Group size differences were tested using Minitab 15; social network analysis was conducted using SOCPROG 2.4 (Whitehead, 2009) and a Mann-Whitney U test applied to determine differences in boat traffic between regulated and unregulated areas.
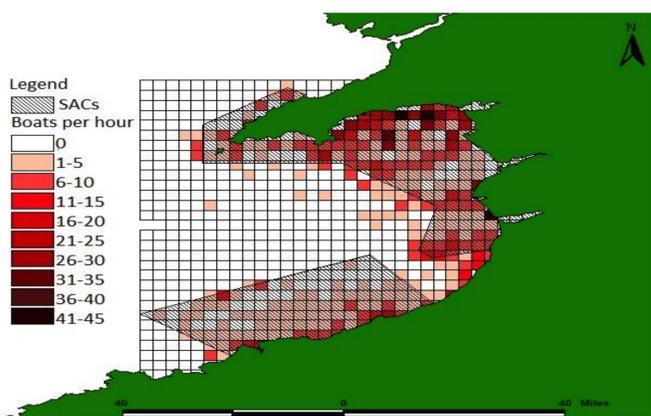
Results and Discussion

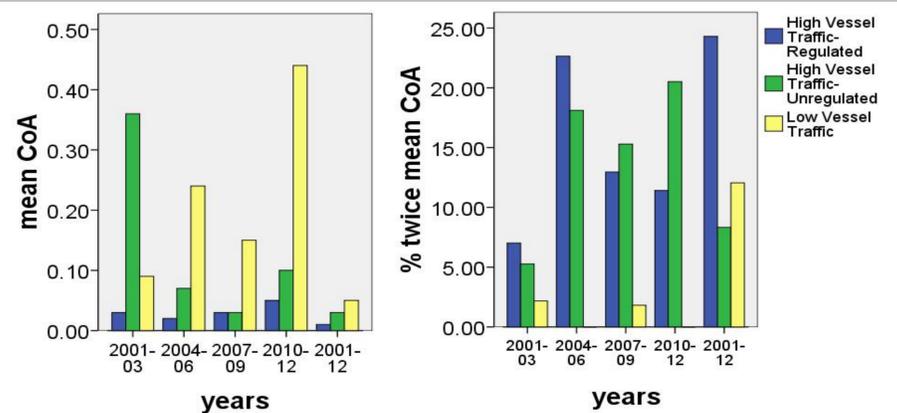Fig. 1. Average boat traffic rates per hour in Cardigan Bay within and outside SACs (2006-2011)

Fig. 2. Graph showing the mean Coefficient of Association (CoA) and % dolphins with twice the mean CoA at different levels of boat traffic in Cardigan Bay

In areas of high vessel traffic, both regulated (HVTR) and unregulated (HVTU), group size was significantly smaller than in areas of low vessel traffic (LVT) (Paired T-test: P<0.001 and P<0.05 respectively). The mean Coefficient of Association (CoA) was lower in areas of HVTR than in areas of LVT for all pooled year periods; in areas of HVTU, mean CoA was lower in all the pooled year periods, except 2001-03 (Fig. 2). Strong associations were defined as those where the individual CoA was more than twice the average CoA of the population (Gero *et al*, 2005; Whitehead, 2008); the percentage of individuals with twice the mean CoA was higher in areas of HVTR when compared to areas of LVT for all 3-year periods and when all years, 2001-12, were combined; in HVTU areas it was also higher for all 3-year periods but not when all years, 2001-12, were combined (Fig. 2). This suggests fewer, stronger bonds form in LVT areas. Values for Strength and Cluster Coefficient were lower in both HVTR and HVTU areas compared to areas of LVT. Despite stricter boating regulations in regulated areas, we found no significant difference in the number of boats (W = 19, p = 0.9372) in regulated and unregulated areas of high traffic. There was also no difference in the proportion of motorised vessels between regulated and unregulated areas of high traffic.

Conclusions

• Although boat behaviour is regulated in some parts of Cardigan Bay, it appears to be the number of vessels (particularly those that are motorised) that actually affects bottlenose dolphin community structure, and as yet that is not regulated.
• Recreational boat traffic in Cardigan Bay continues to increase. It is therefore important that in order to minimise negative effects resulting from boat disturbance, a limit is placed on the number of vessels in key areas.

References

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