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Associations or alliances? Comparisons of male social relationships in two UK bottlenose populations

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Introduction

Male bottlenose dolphins (*Tursiops* spp.) can often form complex social bonds, termed alliances with other male individuals, affording greater access to female consorts and protection from rival males (Connor *et al.*, 1992). However, alliance formation remains unconfirmed in the two largest UK populations from the Moray Firth (MF), in Scotland, and Cardigan Bay (CB), in Wales (Figure 1). Here, long-term datasets are used to investigate this behaviour in all known males (MF: from 1997 to 2014; and CB: from 2001 to 2014) using SOCPROG v.2.6.

Figure 1. Map of Britain showing the two study areas in the Moray Firth, Scotland (A), and Cardigan Bay,Wales (B).

Results

- A total of 66 males from the MF, and 50 males from CB were identified
- Monte Carlo tests (>40,000 permutations) found preferential associations between males in both areas, although groups containing single males were less common in the MF than in CB
- Social bond strength was measured using Half-Weight Indices (HWIs), where 1= constant association and 0= never observed together. Overall associations were weak in both MF and CB males (mean HWIs 0.09± 0.05 and 0.03± 0.02 respectively)
- Two significant (p>0.05) preferred pairs were found in the MF, with a mean HWI of 0.46. A triad was also identified, with a mean HWI of 0.58
- Fourteen significant (p>0.05) preferred pairs were found in CB, with a mean HWI of 0.23
- Bonds between males in the MF averaged c. three years (Fig.2A), while bonds in CB remained non-random between males across the study period (Fig.2B)
- Associations were also likely affected by mortality and emigration

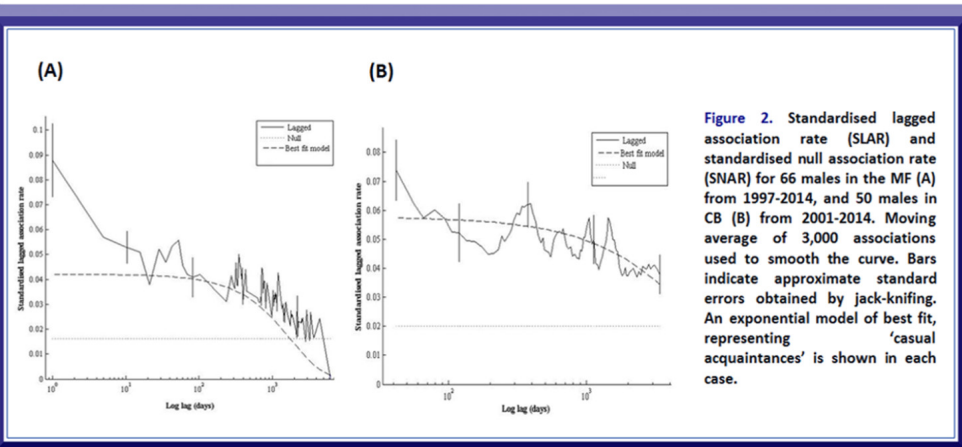

Figure 2. Standardised lagged association rate (SLAR) and standardised null association rate (SNAR) for 66 males in the MF (A) from 1997-2014, and 50 males in CB (B) from 2001-2014. Moving average of 3,000 associations used to smooth the curve. Bars indicate approximate standard errors obtained by jack-knifing. An exponential model of best fit, representing 'casual acquaintances' is shown in each case.

Figure 3. An interaction between two males #398 and #433 (HWI= 0.51) identified as allied in the present study, and an unallied male #275 in the Moray Firth. Photo credit: K. Robinson.

Discussion

The long-term encounter data suggest that bottlenose males from the MF and CB did indeed form alliance-type associations. The strongest bonds were seen between MF males, but these appeared to be shorter than the greater number of more weakly bonded alliances observed in CB. In general, whereas strong and labile alliances established between some males, most males showed no observable associations with their conspecifics. Similar combinations of both solitary and paired males have been observed in other study populations (e.g Parsons *et al.*, 2003; Wisniewski *et al.*, 2012a; Ermak, 2014). This may represent the range of mating strategies used by the species in the UK, but might also be indicative of transitional periods of association (e.g Wisniewski *et al.*, 2012b; Connor & Krützen, 2015). The present study offers further insight into the associations between male bottlenose dolphins in UK waters, and demonstrates the importance of long-term monitoring for detailed analyses of the socio-biology of these coastal delphinids in protected areas.

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