# Bound together or loose ends? Foraging association in Red Knots

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## Introduction and Methods

Waders such as red knots *Calidris canutus* are highly social, and gather in large non-breeding flocks in the Wadden Sea, where they feed on the macrozoobenthos buried in intertidal mudflats. Knots have been shown to use social information in lab settings[1], and are hypothesised to use communal roosts as information centres[2]. Persistent association with specific individuals could help knots make use of collective sensing, or exploit an informed flockmate. We used high frequency *(1 minute interval)* ATLAS[3] tracking data to test whether knots have non-random associations — in a sense, do knots have friends?

[1] Bijleveld et al. 2015. *Behav. Processes*
[2] Bijleveld et al. 2010. *Oikos*

[3] Time of Arrival radio tracking using tags glued to dorsal surface; 5-point median filter applied.

## Results

We found that of 556 unique knot pairs tracked over the entire tracking duration of 44 tidal periods *(high tide to high tide, ~19 days)*, only ~10% had a co-occurence *(proportion of positions in proximity)* higher than expected by chance. Within tidal intervals, knot co-occurrence was highest in the hours just before and after high tide, and lowest around low tide (Fig. 1).

We further found that the co-occurrence of a pair after the foraging period *(advancing tide)* was not related to its co-occurrence prior to the foraging period *(receding tide)*. However, pairs with high co-occurrence in the advancing tide had travelled similar distances in the foraging period around low tide.
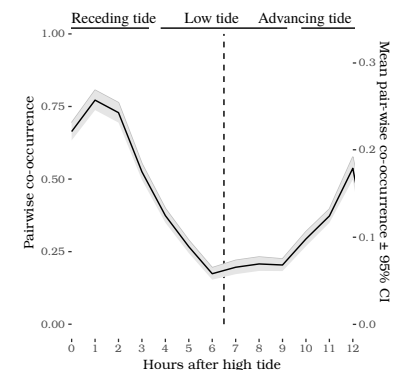


Figure 1: *Pair-wise co-occurrence over the tidal interval, with mean ± 95% CI shown in black, multiplied by 3 for visibility (refer Y-axis right)*

## Discussion

Our results align with the long-suspected notion that wader flocks are good examples of random mixing driven by environmental effects[4] — possibly, individual presence is sufficient to inform about the resource landscape without individual identity being key. However, knots have been shown to have consistent individual differences in exploratory behaviour, which is linked to foraging needs and patterns[5] — it remains to be tested both whether knots are more discriminating about the *kind*, rather than identity, of individuals they associate with, and whether association and information use occurs at a larger or finer scale than used here[6].

[4] Myers 1983. *Behav. Ecol. Sociobiol.*; Conklin & Colwell 2007. *JOFO.*

[5] Bijleveld et al. 2014. *Proc. B.*

[6] Harrington & Leddy 1982. *Wader Study Group Bull.*