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

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## Do knots have 'friends'? ATLAS may provide answers

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'?

## Knot association is low, but 10% of pairs are 'friends'

We found that of 556 unique knot pairs tracked over 44 tidal intervals *(high tide to high tide, ~19 days)*, ~10% were associated *(proportion of positions in proximity, Kolmogorov-Smirnov test)* higher than expected by chance. 10% were associated less than expected.

## Association is largely environmentally driven

Within tidal intervals, knot association was highest in the hours just before *(advancing tide)* and after *(receding tide)* high tide, and lowest around low tide (Fig. 1).

## Conclusion & future work

Our results align with the idea that wader flocks are good examples of random mixing driven by environmental effects.[4]

However, red knots have been shown to have consistent individual differences in exploratory behaviour, which may be linked to different foraging needs and movement patterns.[5] It remains to be tested whether knot personality is a factor in determining association in the dynamic Wadden Sea landscape.

[1] Bijleveld et al. 2015. *Behav. Processes*

[2] Bijleveld et al. 2010. *Oikos*

[3] Time of Arrival radio tracking using 4.2 g tags glued to dorsal surface; 5-point median filter applied.

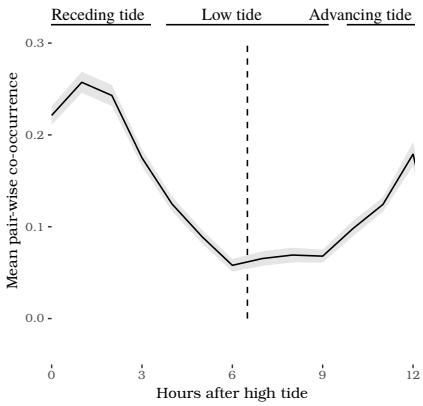


Figure 1: *Mean pair-wise association over the tidal interval ± 95% CI. Low tide at dashed line.*

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

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