



Spoonbills as indicator of the Wadden Sea condition

a study with stable $\delta^{13}\text{C}$ & $\delta^{15}\text{N}$ isotope analysis

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INTRODUCTION

Ecologically the Wadden Sea impoverished for the last decades. It is thought that a West-East gradient exists along the Dutch Wadden Sea, where the Western part is in an ecologically poorer state than the Eastern part.

Spoonbills are an ideal species to study the ecological states along this West-East gradient. Unlike most Wadden Sea species, the Spoonbill populations still seemed to grow the last decades but *. Spoonbills are opportunistic and tactile foragers. They breed on all Dutch Wadden Sea islands, where they feed their nestlings with prey from nearby areas. The diet of Spoonbills nestlings on different Wadden Sea islands, will therefore reflect differences in prey species abundance and occurrence along the West-East gradient. Diet analysis of Spoonbills is done by stable $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ isotope analysis and regurgitate analysis.

* Tamar Lok (NIOZ) recently found that the yearly survival of Spoonbills decreases.



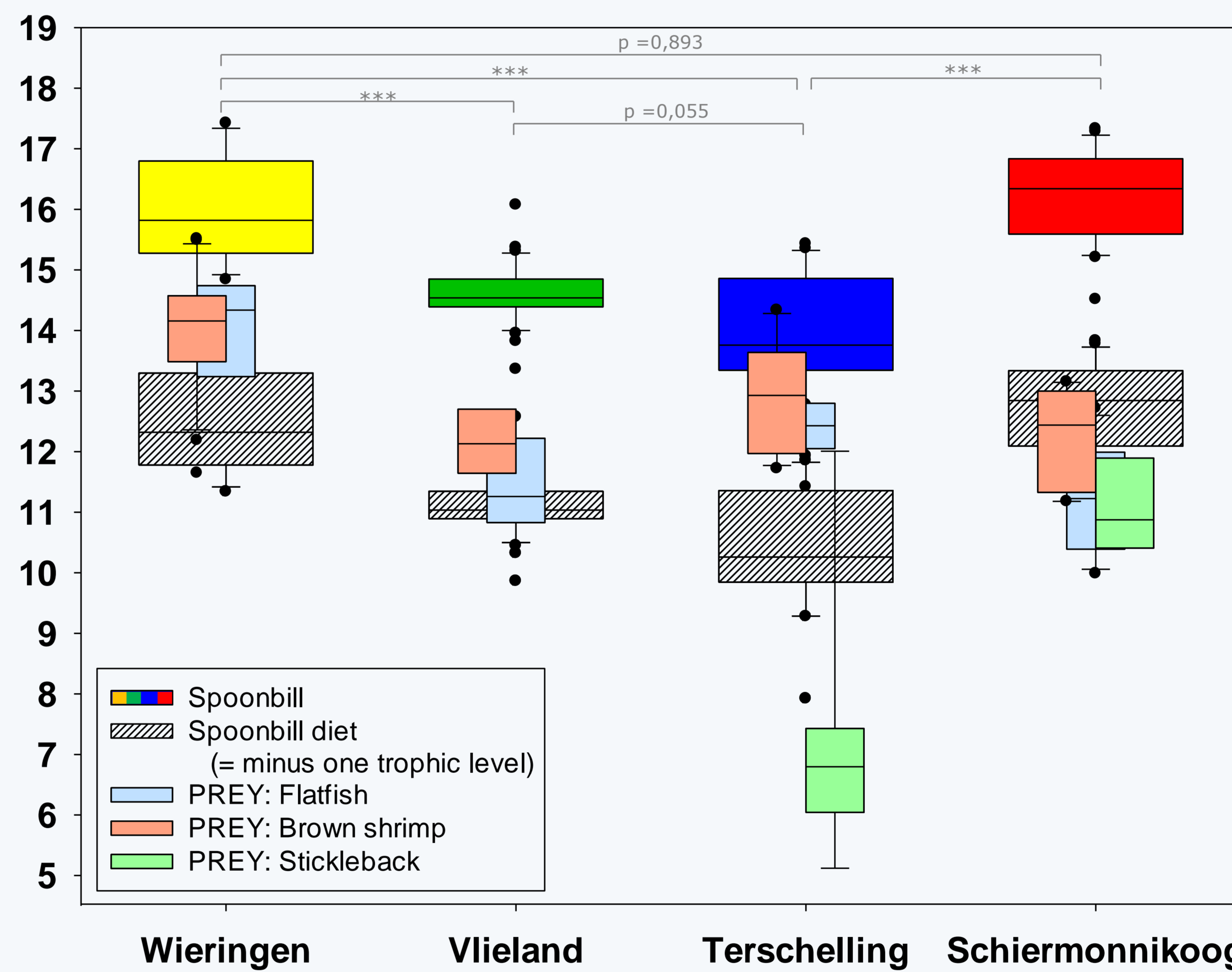
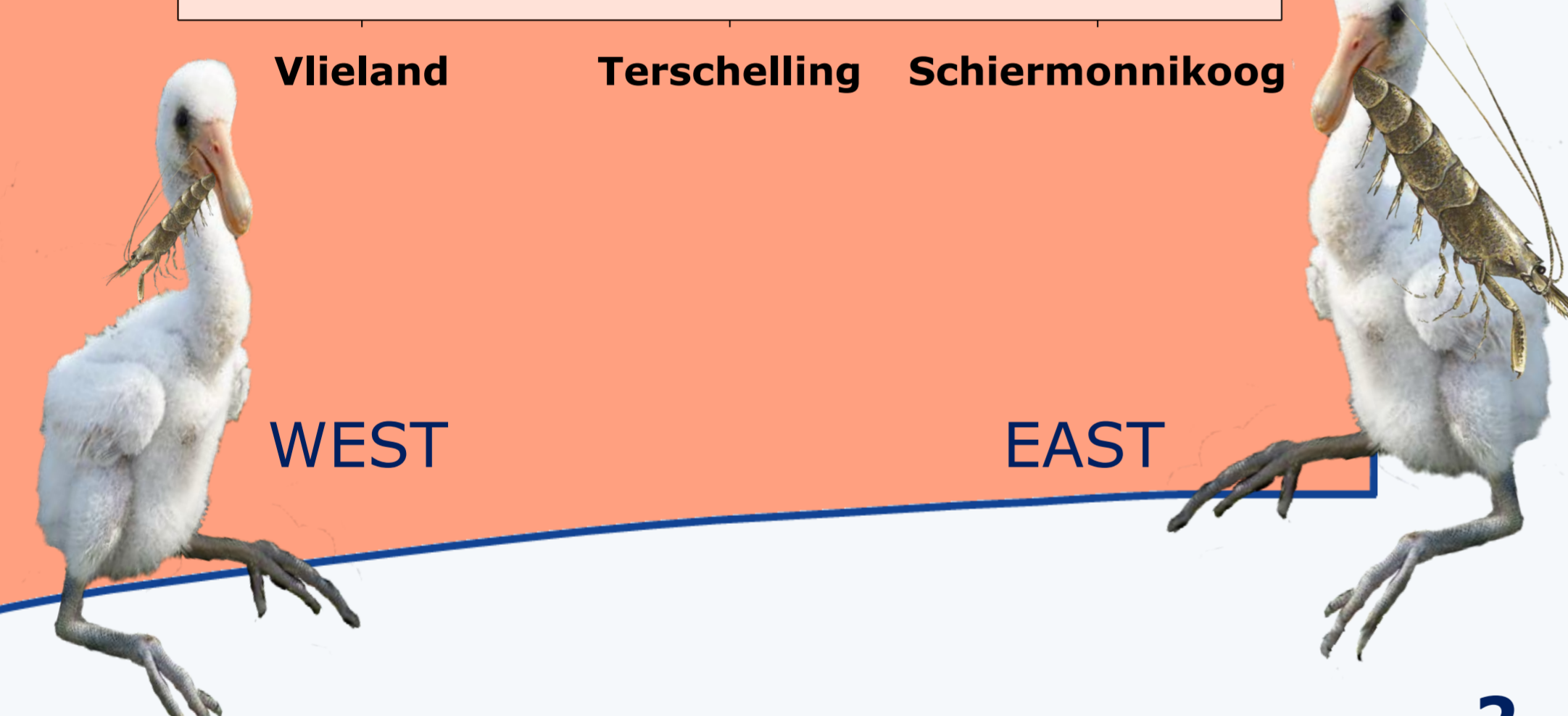
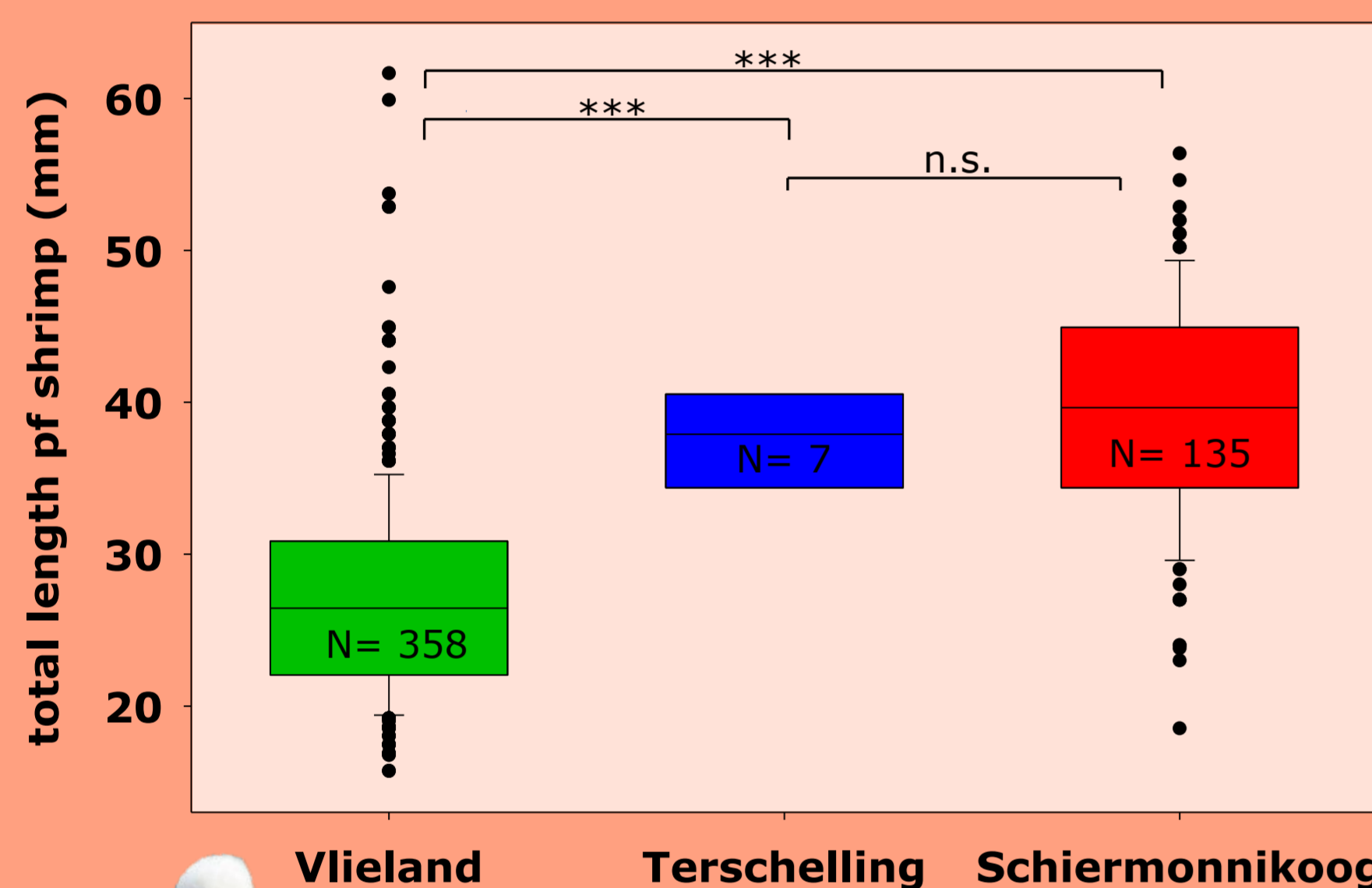
RESULTS

Spoonbills show heterogeneousness in trophic level ($\delta^{15}\text{N}$) along the West-East gradient of the Dutch Wadden Sea. These differences are caused by two factors:

1. The prey of Spoonbills also show a heterogeneous pattern in trophic position.

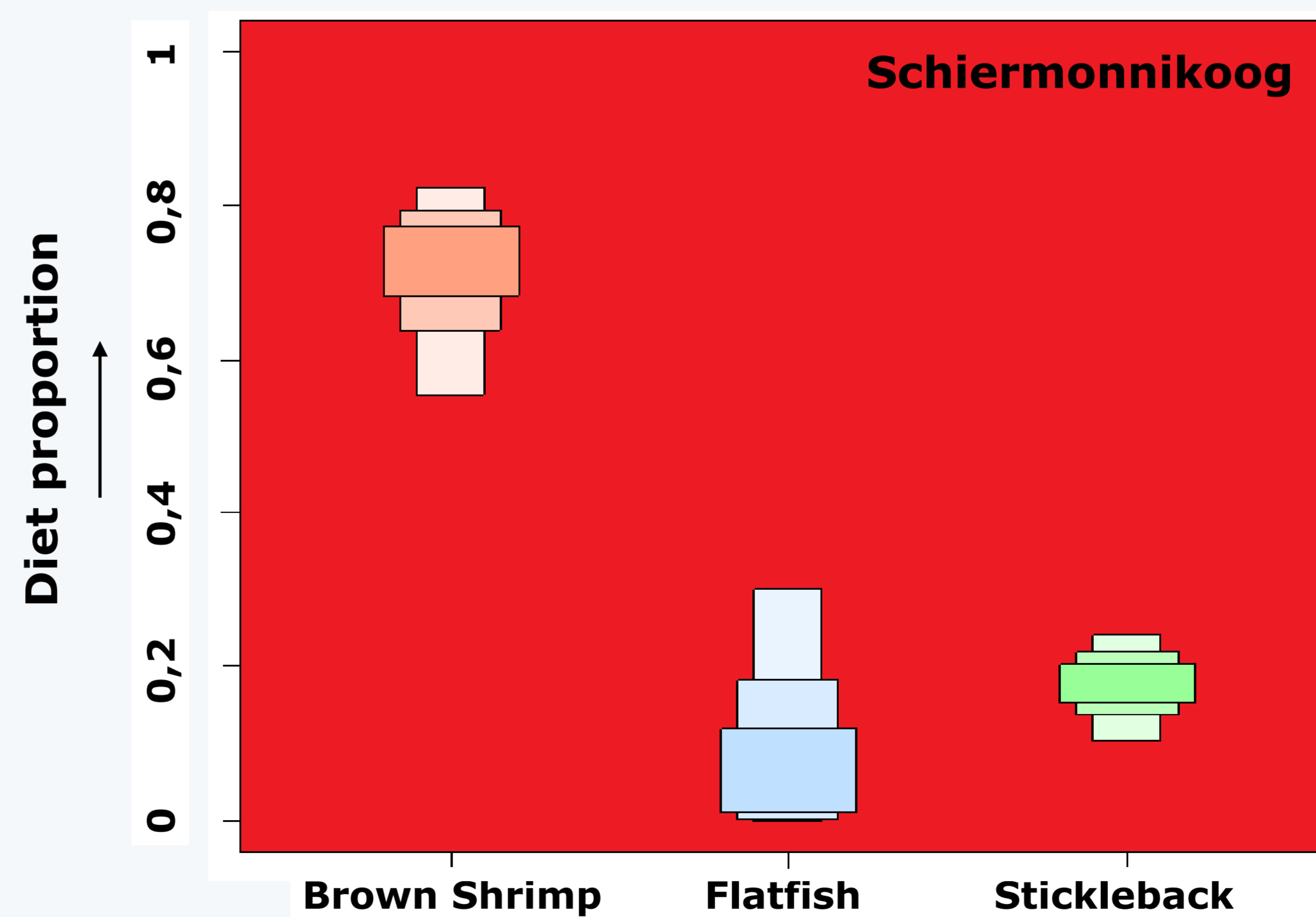
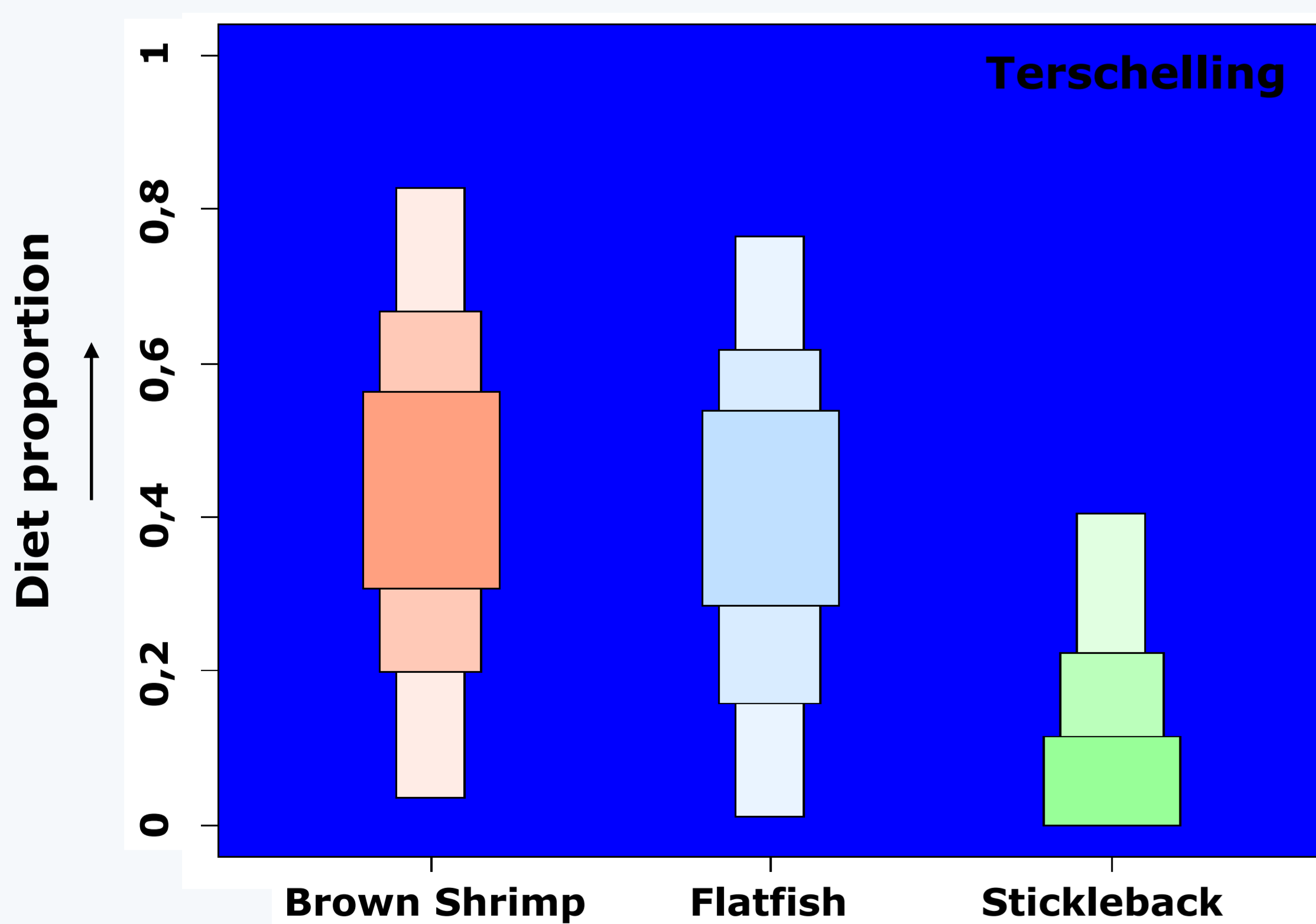
SHRIMP IN SPOONBILL DIET

GRAPH 3, shows the total length of Brown Shrimp found in regurgitates of Spoonbill nestlings on Wadden Sea islands in 2011. Spoonbills on Terschelling and Schiermonnikoog eat significantly bigger Brown Shrimp, compared to those on Vlieland.



GRAPH 1: Spoonbills show a heterogeneous pattern along the West-East gradient. The three main prey species of Spoonbills also vary along this gradient. Although the variance in trophic position of the three main prey species may partly explain the Spoonbill heterogeneousness in trophic position, it cannot be the only causing factor.

2. The diet ratio of the Spoonbills fluctuates along the West-East gradient.



GRAPH 2a/b: With help of "Stable Isotope Analysis in R" (SIAR) a best fit of the diet ratios of the three main prey species of Spoonbill nestlings is depicted for two islands. Spoonbill nestlings on Schiermonnikoog have a much higher proportion of Shrimp in their diet, compared to the Spoonbill nestlings on Terschelling.

It should be noted that this model is run by using Spoonbills from 2011 and prey from 2012. Currently, Spoonbill isotopes of 2012 are measured.

MAIN CONCLUSION

Spoonbills on Dutch Wadden Sea islands differ in trophic position along the West-East gradient, because the trophic position of their prey differ and also because Spoonbills have a different diet composition along the West-East gradient of the Dutch Wadden Sea.

CONTINUING RESEARCH

To get a precise view of (the reason of) the differences in the diet of Spoonbills; we analyse $\delta^{15}\text{N}$ & $\delta^{13}\text{C}$ of Spoonbills on all islands for multiple years, we analyse the Spoonbill diet by regurgitate analysis and we complement the 'prey' stable isotope database.

