

Variation in the whistle characteristics of bottlenose dolphins between four locations in the North Atlantic Ocean

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Introduction

Bottlenose dolphin whistle characteristics can differ between geographic location. Variations have been attributed to different factors such as genetic differences between populations (Pichler *et al.* 1998; Tyson *et al.* 2011), group size (Jones & Sayigh 2002; Ansmann *et al.* 2007), and different levels of ambient noise (Wang *et al.* 1995; May-Collado & Wartzok 2008). As yet, the whistle characteristics from bottlenose dolphin populations around the eastern North Atlantic Ocean have not been compared in any great depth. This study aimed to determine whether variation existed between four locations in the North Atlantic Ocean.

Methods

- Recording analyses were compared from four different populations of bottlenose dolphins from the North Atlantic Ocean - Cardigan Bay, Wales; Shannon Estuary, Ireland; Molène Archipelago, France; and Sado Estuary, Portugal.
- Recordings were collected using either hydrophones or bottom-moored autonomous recorders between 2001 and 2012.
- Whistles were extracted from the recordings using *Ishmael*, and nine whistle characteristics were measured from each whistle (Figure 1).
- One-way ANOVAs and Kruskal-Wallis tests were undertaken on each whistle characteristic to determine the ways in which whistles varied between location.

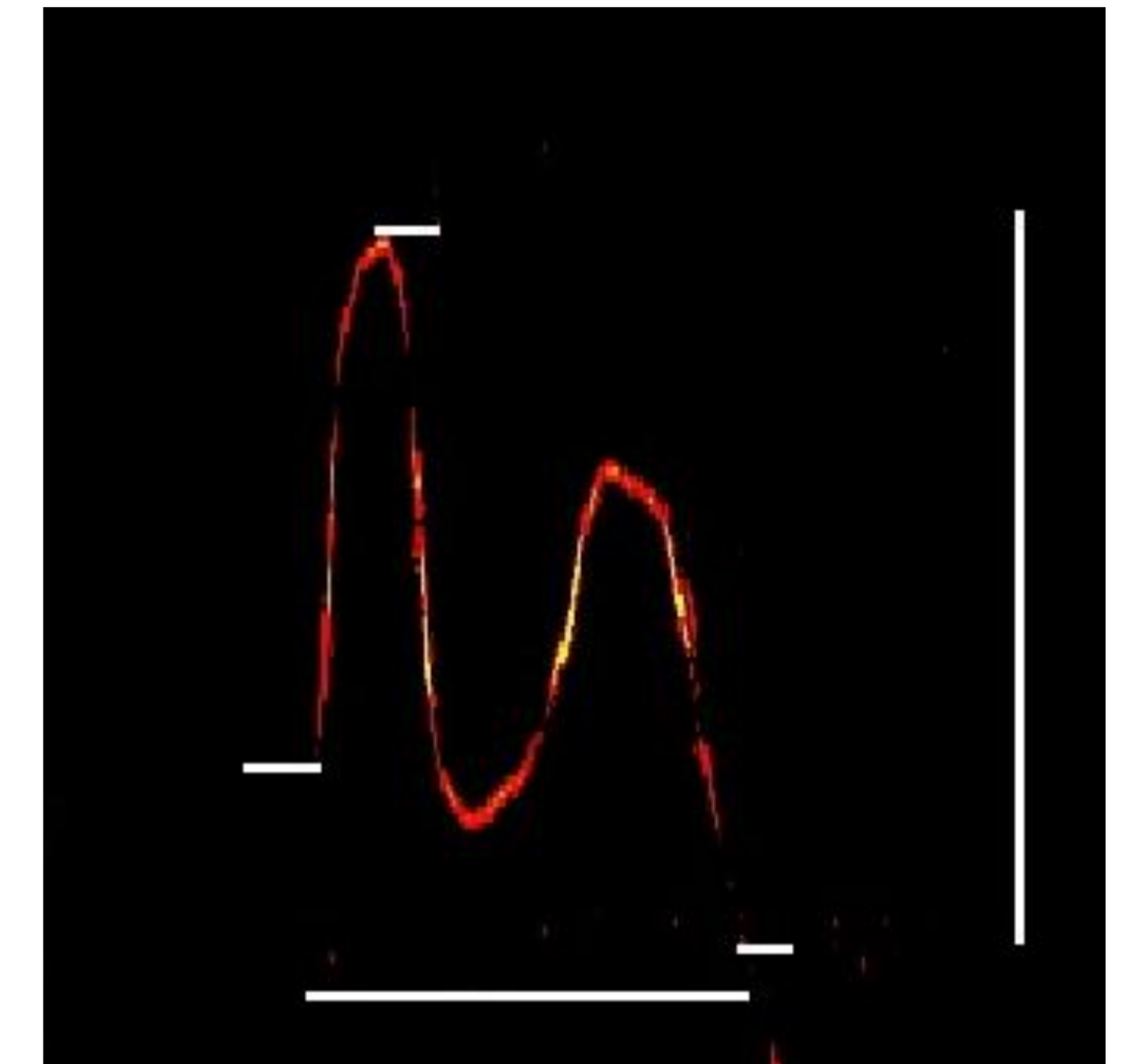


Figure 1. An example of a bottlenose dolphin whistle, demonstrating 7 of the 9 measured whistle characteristics

Results

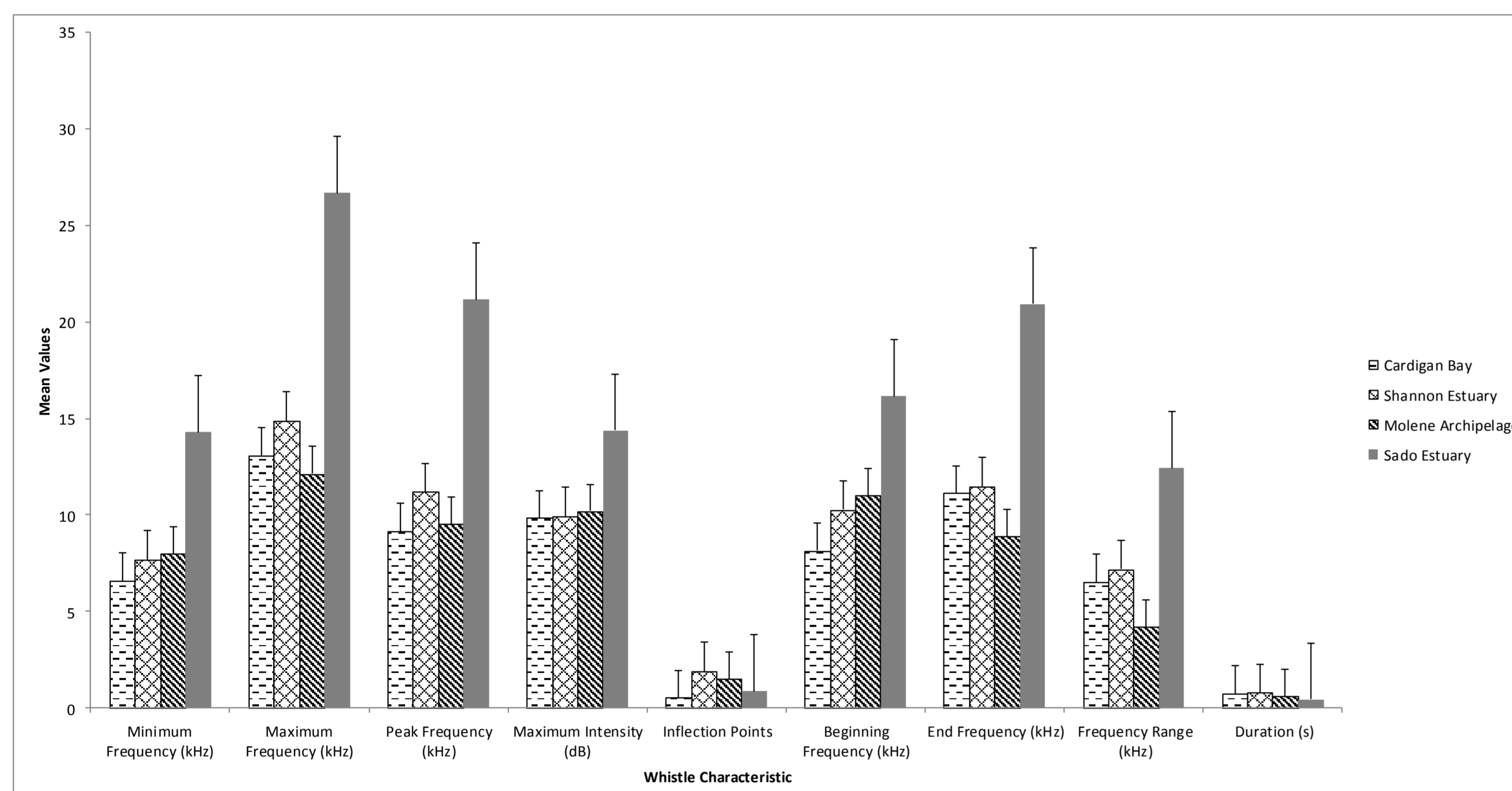


Figure 2. Mean values +/- Standard Error for each of the 9 bottlenose dolphin whistle characteristics from the four different locations

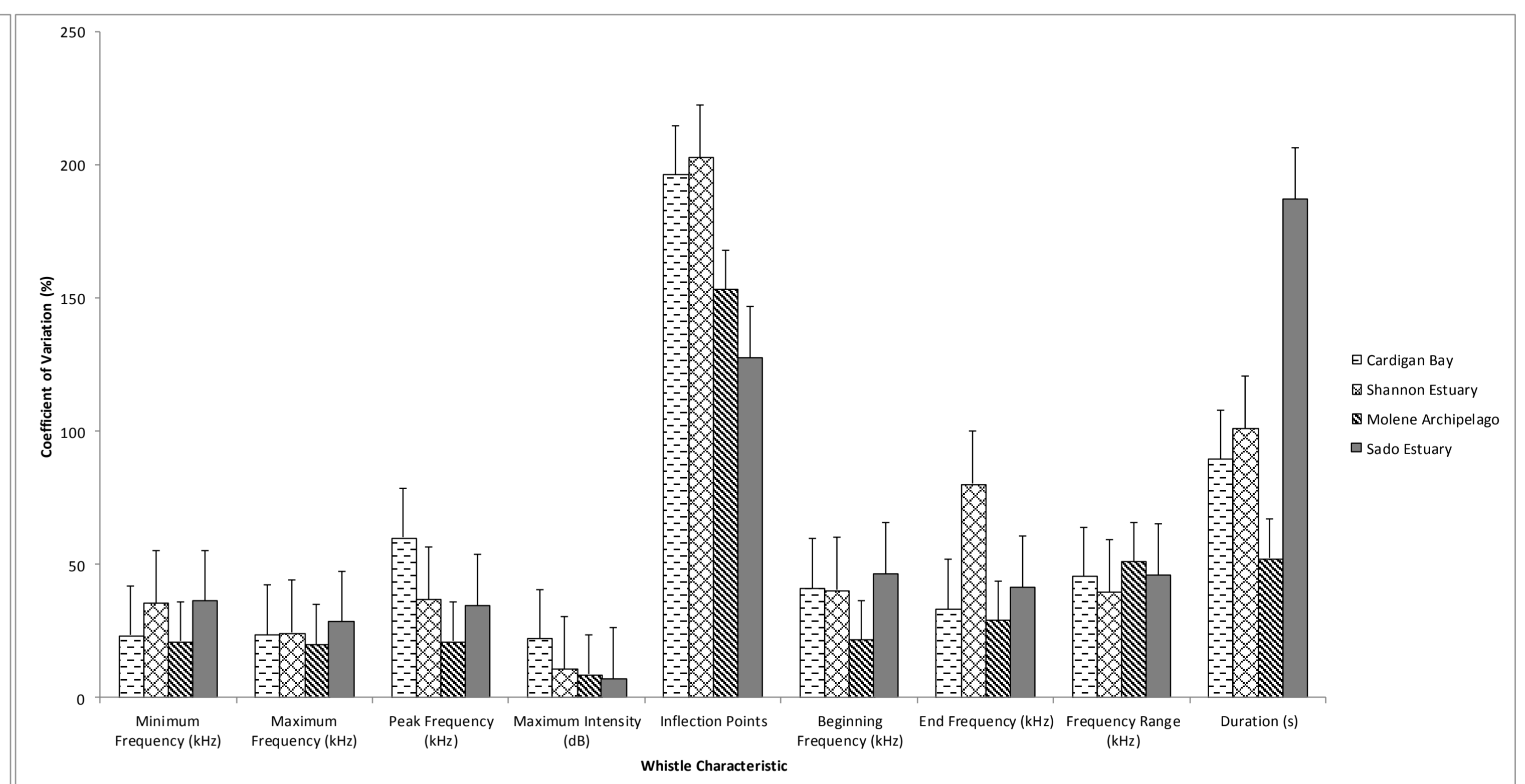


Figure 3. Coefficient of variation +/- Standard Error for each of the 9 bottlenose dolphin whistle characteristics from the four different locations

- There was no significant difference between the four populations in the amount of variation occurring within each population (One-way ANOVA: $F = 0.298$, d.f. = 3, $P > 0.05$).
- The number of inflection points and the duration of whistles were similar between all four populations (Duration: One-way ANOVA: $F = 1.235$, d.f. = 3, $P > 0.05$; Inflection points: Kruskal-Wallis: $X^2 = 1.640$, d.f. = 3, $P > 0.05$).
- Dolphins in the Sado Estuary had significantly higher frequency variables and maximum intensities than the dolphins from the other three areas (Figure 2).
- The dolphins in Cardigan Bay, the Shannon Estuary and the Molène Archipelago did not differ in frequency or intensity variables (Figure 2).
- Within populations, there was little variation in the frequency variables, but high variation in duration and number of inflection points (Figure 3).

Conclusions

- Geographic variation does exist between whistle characteristics of bottlenose dolphins from the four areas.
- The dolphins from the Sado Estuary are acoustically very different from the dolphins in the other three areas most likely due to higher level of background noise in the Sado Estuary.
- Future studies should attempt to determine the reasons for the variation more conclusively.

References

- 1) Ansmann, I., Goold, J., Evans, P., Simmonds, M., Keith, S. (2007). Variation in the whistle characteristics of short-beaked common dolphins, *Delphinus delphis*, at two locations around the British Isles. *Journal of the Marine Biological Association of the UK*, 37:19-26.
- 2) Jones, G., Sayigh, L. (2002). Geographic variation in rates of vocal production of free-ranging bottlenose dolphins. *Marine Mammal Science*, 18(2):374-393.
- 3) May-Collado, L., Wartzok, D. (2008). A comparison of bottlenose dolphin whistles in the Atlantic Ocean: factors promoting whistle variation. *Journal of Mammalogy*, 89(5):1229-1240.
- 4) Pichler, F., Dawson, S., Slooten, E., Baker, C. (1998). Geographic isolation of Hector's dolphin populations described by mitochondrial DNA sequences. *Conservation Biology*, 12(3): 676-682.
- 5) Tyson, R., Nowacek, S., Nowacek, D. (2011). Community structure and abundance of bottlenose dolphins, *Tursiops truncatus*, in coastal waters of the northeast Gulf of Mexico. *Marine Ecology Progress Series*, 438: 253-265.
- 6) Wang, D., Wursig, B., Evans, W. (1995). Whistles of bottlenose dolphins: comparisons among populations. *Aquatic Mammals*, 21(1): 65-77.

Acknowledgements

Thanks to all Sea Watch Foundation volunteers who assisted in data collection and to Gemma Veneruso for her help with the project. Thanks to the skippers of the *Dunbar Castle II* and *Ma Chipe Seabrin*, Anneli Englund (County College Cork), Lucia Di Iorio (ENSTA), Manuel Dos Santos (ISPA). This project was funded largely by the Countryside Council for Wales.