Stable isotope ecology and interspecific dietary overlap among dolphin species in the Northeast Atlantic

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BACKGROUND

- Ocean warming since the 1980s is changing the distribution of marine species:
  - Warm-water species can expand their range northward.
  - Cold-water species experience habitat compression.
- Cetacean sighting and stranding data from around the UK indicate that warm and cold-water adapted dolphin species are experiencing increased range overlap (particularly in northern regions like Scotland)[1,2].
- Stable isotopes ($\delta^{13}C$ and $\delta^{15}N$) are powerful proxies for determining diet in mobile marine mammals. Isotopically, "You are what/where you eat".

OBJECTIVE: Quantify isotopic/dietary niche overlap among warm and cold-water adapted dolphin species experiencing increasing range overlap in Scottish waters.

Figure 1. *Right:* Locations of dolphin stranding events where skin samples were collected (Scotland).

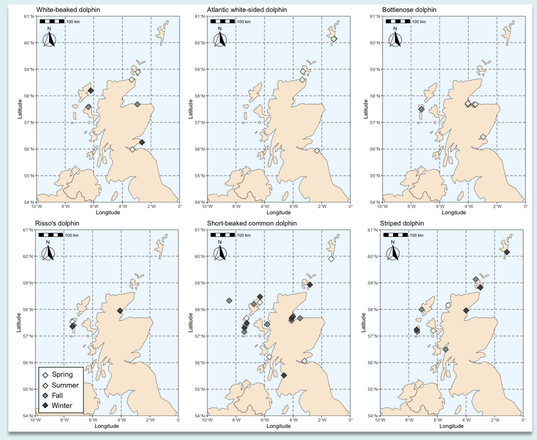

Figure 2. *Above:* Short-beaked common dolphin, Isle of Skye, Scotland (G. Hantke, 2022).

METHODS

- Dolphin skin samples collected from stranding events on Scottish coastlines (2015-2021).
- Warm-water dolphin species: Short-beaked common and striped dolphin
- Cold-water dolphin species: White-beaked and Atlantic white-sided dolphin
- Skin $\delta^{13}C$ and $\delta^{15}N$ used to determine core isotopic feeding niche for each dolphin species using SIBER (Stable Isotope Bayesian Ellipses in R).
- Dolphin isotopic niches compared with prey baseline and available stomach content records.

RESULTS & CONCLUSIONS

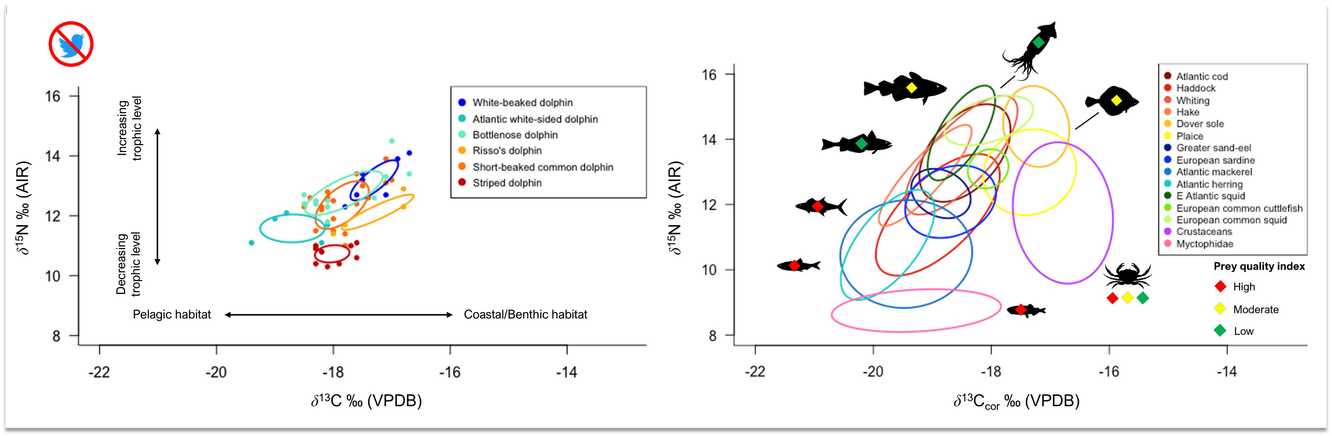

Figure 3. *Left:* Dolphin core isotopic feeding niche as represented by skin $\delta^{13}C$ and $\delta^{15}N$. *Right:* Dolphin prey baseline (NE Atlantic prey muscle $\delta^{13}C$ and $\delta^{15}N$, compiled from literature). Prey quality index determined by energy density (kJ/g^{-1}).

- Striped dolphin core isotopic niche displayed no interspecific overlap.
- SBCD core isotopic niche: 30% overlap with WBD; 7% overlap with AWSD.
- SBCD diet overlaps with WBD and AWSD (Gadiformes and high energy density pelagic schooling fish, respectively).
- These priority prey species are also a valuable component of the local and global fishing industry.
- Diet overlap with dolphin species experiencing northward range expansion should be considered when assessing potential stressors acting on Atlantic white-sided and white-beaked dolphin populations facing projected decline in available habitat.

REFERENCES & ACKNOWLEDGEMENTS

[1] Williamson, M.J., ten Doeschate, M.T.I., Deaville, R., Brownlow, A.C., and Taylor, N.L. (2021). Cetaceans as sentinels for informing climate change policy in British waters. Mar. Policy 131, 104634. doi.org/10.1016/j.marpol.2021.104634

[2] Evans, P.G.H., and Waggitt, J. (2020). Impacts of climate change on Marine Mammals, relevant to the coastal and marine environment around the UK. MCCIP Sci. Rev., 421-455. doi:10.14465/2020.arc19.mmm

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