Cetacean conservation planning: dealing with uncertainty and data deficiencies

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Introduction

- Cetacean species are thought to be critically at risk from anthropogenic disturbances (e.g., climate change, pollution and over-harvesting of marine habitats).
- Identifying cetacean hotspots for conservation management is therefore critical.
- Conservation efforts in Aotearoa – New Zealand may be particularly important because it is recognised as a globally important cetacean diversity hotspot (**53% of the world's cetacean species use New Zealand waters**).

Using geographic predictions of 30 cetacean taxa, hotspots within New Zealand waters were identified.

Methods

Geographic predictions were developed by Stephenson et al. (2020) using two methods:

- 15 taxa: Relative Environmental Suitability (↓ data = ↓ certainty)
- 15 taxa: Boosted Regression Tree models (↑ data = ↑ certainty)

Two **spatial estimates of uncertainty** were available:

- Prediction uncertainty for each taxa
- Number and distribution of cetacean sighting records

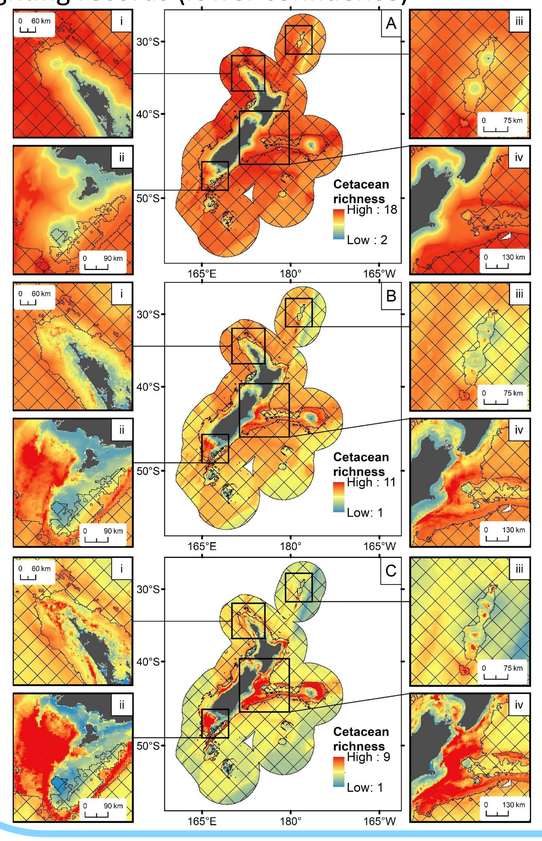
Using the geographic predictions and associated uncertainty estimates, **cetacean hotspots were identified** using two methods:

- Estimates of cetacean richness
- Spatial prioritisation analysis

Increasing levels of uncertainty were incorporated and the effect of this investigated on the distribution of hotspots

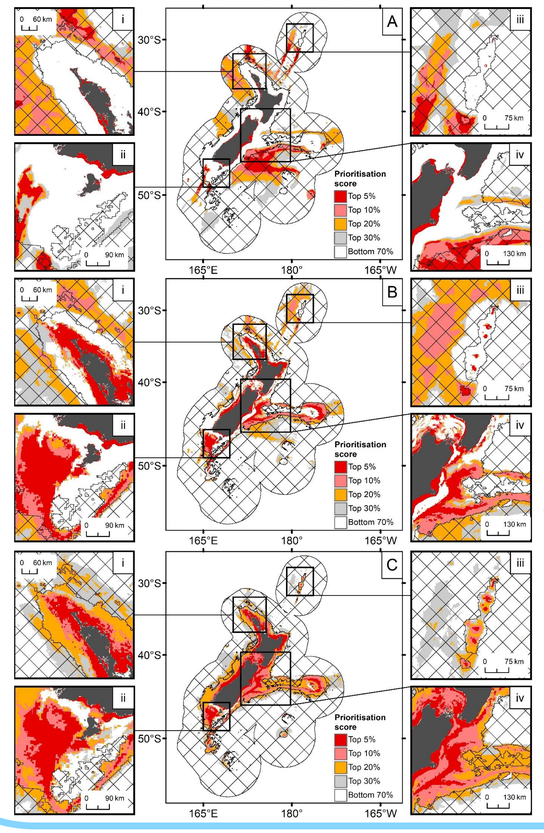
Cetacean richness estimates with increasing weighting of uncertainty.

- Red areas represent **high estimated richness**
- Criss-cross black lines indicate areas with fewer cetacean sighting records (lower confidence)



Cetacean diversity prioritisation with increased weighting of uncertainty.

- Red areas represent the **highest priority areas** to capture a full range of cetacean diversity
- Criss-cross black lines indicate areas with fewer sightings



Conclusion

Uncertainty analysis in conservation planning is used to **evaluate trade-offs** between biological quality and the certainty of that information (Moilanen et al., 2006).

- Areas consistently highlighted as important with increasing weighting of uncertainty → **Confident high value for conservation** (e.g. Kermadec Ridge, Chatham Rise and Islands, Kaikoura coastline, Cook Strait)
- Areas highlighted as important with low weighting of uncertainty but not with high weighting of uncertainty → **high biological values but uncertain** (e.g., vast offshore areas where little sampling exists but where rare species may be predicted to occur)
- Areas not highlighted as important with low weighting of uncertainty but increases with high weighting of uncertainty → **moderate levels of importance with high certainty** (e.g., East Cape, South Taranaki Bight and the west coast of South Island)

References:

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