

Modeling and mapping of trophic overlap between marine mammals and fisheries in the North Atlantic: Implications for fisheries management

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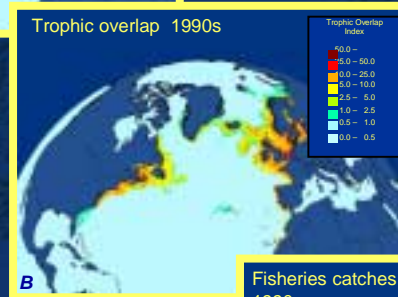
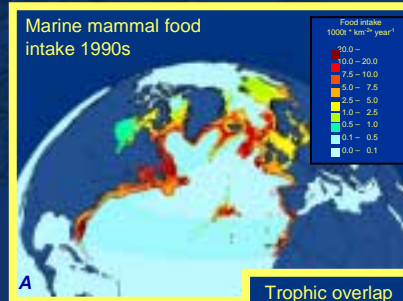
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I. Introduction

- To date, most modeling approaches investigating trophic competition between marine mammals & fisheries have omitted spatial considerations
- Spatially explicit modeling of trophic overlap may help to assess the impact fisheries may have on marine mammal populations



II. Methods & Model Input Parameters

1. Compile species-specific estimates for 47 North Atlantic marine mammal species

- abundance (1990s)
- mean body mass (sex-specific)
- feeding rates (weight-specific)
- standardized diet composition (in proportions of 9 food groups)

2. Construct basic food consumption model

- Calculation of species & sex-specific food consumption based on input parameters

3. Construct spatial model

- Digitization & conversion of species-specific maximum distributional ranges into a 0.5° latitude/longitude grid using GIS
- Linking of geographic ranges with basic model

4. Refine spatial model

- Incorporation of species-specific habitat preferences (depth ranges & ice edge association)

5. Calculate resource overlap index

- Superimposing geographically matching fisheries catches (average annual 1990s) as generated by the *Sea Around Us Project*

III. Model Results & Discussion

- Total mammal consumption was ~3x higher than fisheries catches (Fig. 2)
- However, marine mammals and fisheries mostly utilize different food sources in different areas (Fig. 1a, c & 2) and trophic overlap was quite low (Fig. 1b)
- Areas of highest overlap were concentrated along the east coast of North America and in European shelf waters (Fig. 1b)
- Highest spatial overlap was predicted to occur between fisheries & mysticetes, followed by pinnipeds, odontocetes and ziphiids (Fig. 3a, b, c, d)

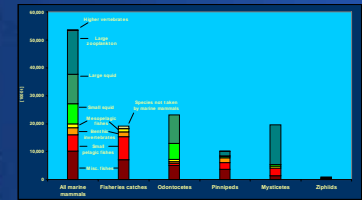


Fig. 2 – total fisheries catches & marine mammal food intake specified by food group.

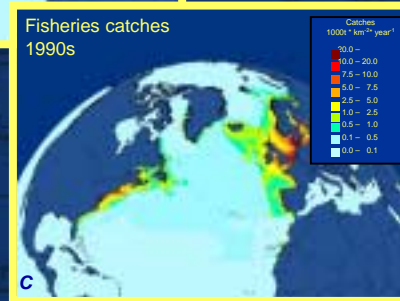


Fig. 1 – spatially explicit marine mammal food intake, fisheries catches and trophic overlap (expressed as proportions of total amount in 0.5 degree cells)

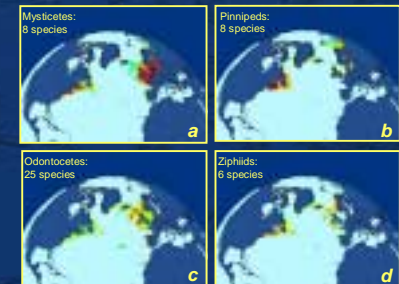


Fig. 3 – spatially explicit trophic overlap between different taxonomic MM groups & fisheries

IV. Conclusions

- Overlap between marine mammal food intake and fisheries catches in the North Atlantic appears to be quite low, if geographical and food type differences are taken into account
- Visualizing geographical 'hotspots' of marine mammal-fisheries interactions may aid in efficient design of marine reserves

Acknowledgements

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