Posted on Authorea 31 Aug 2021 — The copyright holder is the author/funder. All rights reserved. No reuse without permission. — https://doi.org/10.22541/au.163039355.53142212/v1 — This a preprint and has not been peer reviewed. Data may be preliminary.

The use of singlebeam echo-sounder depth data to produce demersal fish distribution models that are comparable to models produced using multibeam echo-sounder depth

Marcela Montserrat Landero Figueroa[1], Miles Parsons[2], Benjamin Saunders[1], Ben Radford[2], Chandra Salgado-Kent[1], and Iain Parnum[1]

[1]Curtin University
[2]Australian Institute of Marine Science

August 31, 2021

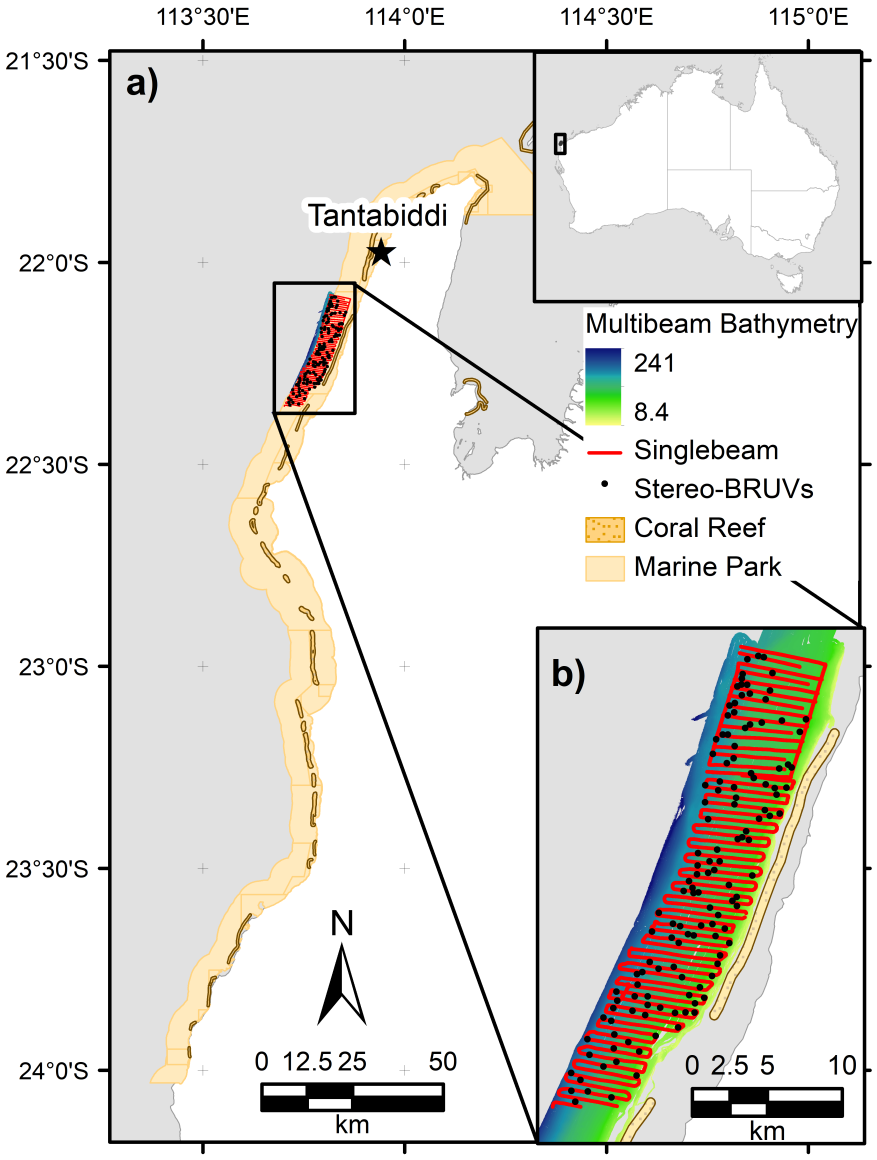
Abstract

Seafloor characteristics can help in the prediction of fish distribution, which is required for fisheries and conservation management. Despite this, only 5-10% of the world's seafloor has been mapped at high resolution as it is a time-consuming and expensive process. Multibeam echo-sounders (MBES) can produce high-resolution bathymetry and a broad swath coverage of the seafloor, but require greater financial and technical resources for operation and data analysis than singlebeam echo-sounders (SBES). In contrast, SBES provide comparatively limited spatial coverage, as only a single measurement is made from directly under the vessel. Thus, producing a continuous map requires interpolation to fill gaps between transects. This study assesses the performance of demersal fish species distribution models by comparing those derived from interpolated SBES data with full-coverage MBES distribution models. A Random Forest classifier was used to model the distribution of Abalistes stellatus, Gymnocranius grandoculis, Lagocephalus sceleratus, Loxodon macrorhinus, Pristipomoides multidens and Pristipomoides typus, with depth and depth derivatives (slope, aspect, standard deviation of depth, terrain ruggedness index, mean curvature and topographic position index) as explanatory variables. The results indicated that distribution models for A. stellatus, G. grandoculis, L. sceleratus, and L. macrorhinus performed poorly for MBES and SBES data with Area Under the Receiver Operator Curves (AUC) below 0.7. Consequently, the distribution of these species could not be predicted by seafloor characteristics produced from either echo-sounder type. Distribution models for P. multidens and P. typus performed well for MBES and the SBES data with an AUC above 0.8. Depth was the most important variable explaining the distribution of P. multidens and P. typus in both MBES and SBES models. While further research is needed, this study shows that in resource-limited scenarios, SBES can produce comparable results to MBES for use in demersal fish management and conservation.

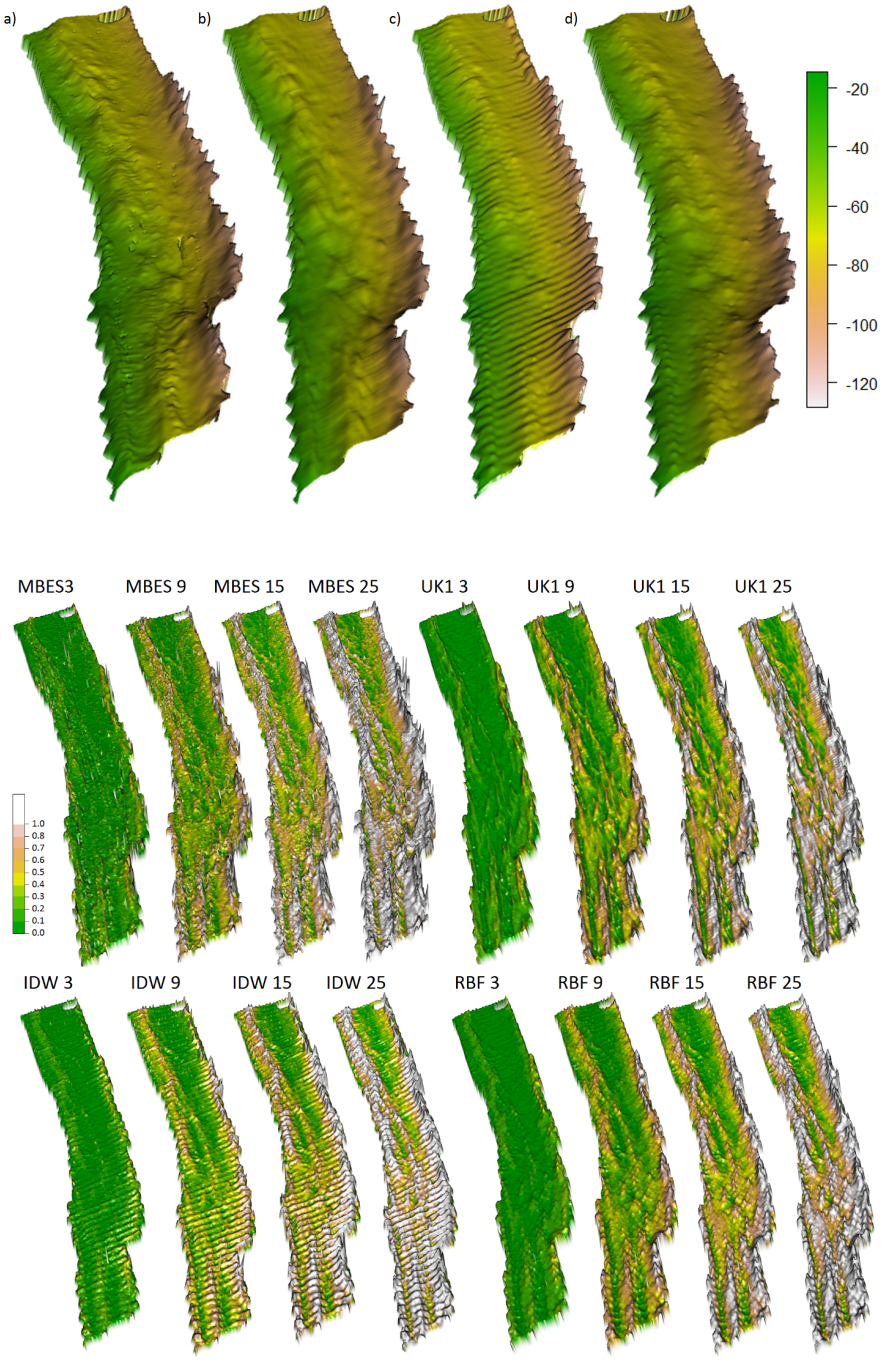
Hosted file

`Main_doc.docx` available at https://authorea.com/users/432300/articles/535788-the-use-of-singlebeam-echo-sounder-depth-data-to-produce-demersal-fish-distribution-models-that-are-comparable-to-models-produced-using-multibeam-echo-sounder-depth

Posted on Authorea 31 Aug 2021 — The copyright holder is the author/funder. All rights reserved. No reuse without permission. — https://doi.org/10.22541/au.163039355.53142212/v1 — This a preprint and has not been peer reviewed. Data may be preliminary.



Posted on Authorea 31 Aug 2021 — The copyright holder is the author/funder. All rights reserved. No reuse without permission. — https://doi.org/10.22541/au.163039355.53142212/v1 — This a preprint and has not been peer reviewed. Data may be preliminary.



Posted on Authorea 31 Aug 2021 — The copyright holder is the author/funder. All rights reserved. No reuse without permission. — https://doi.org/10.22541/au.163039355.53142212/v1 — This a preprint and has not been peer reviewed. Data may be preliminary.