Data associated with a connectivity modeling study in Kimbe Bay, Papua New Guinea (Metapopulation Connectivity project)

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Data Type: model results
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Project
» Marine Metapopulation Connectivity: Modeling, Estimation and Demographic Consequences (Metapopulation Connectivity)

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Dataset Description

The model data were generated by a coupled hydrodynamic and Lagrangian particle tracking model in order to examine metapopulation connectivity of coral reefs in Kimbe Bay, Papua New Guinea.

Data are currently available from the project's THREDDS server:
http://delmar.whoi.edu:8080/thredds/catalog/default/kimbe/catalog.html

Methods & Sampling

The model data were generated by a coupled hydrodynamic and Lagrangian particle tracking model in order to examine metapopulation connectivity of coral reefs in Kimbe Bay, Papua New Guinea. The individual-based particle-tracking model was driven by flow fields derived from a high-resolution hydrodynamic model (Finite Volume Community Ocean Model, FVCOM) constructed for the study area. Spatial and temporal patterns of connectivity were computed using multiple simulations representative of coral reef organisms to examine the role of pelagic larval duration, timing of spawning, vertical positioning in the water column and natal location.

Data Processing Description

No additional processing was done except for extracting information from NetCDF files for plotting purposes.

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Parameters

Parameters for this dataset have not yet been identified

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Project Information

Marine Metapopulation Connectivity: Modeling, Estimation and Demographic Consequences (Metapopulation Connectivity)

Extracted from the NSF award abstract:

The goal of this project is to develop a tractable modeling framework for estimating marine metapopulation connectivity and its demographic consequences. This will be achieved using a multifaceted approach which draws upon gravity, demographic, and biological/hydrodynamic coupled models. The objectives are to: (1) Determine reliable predictors of population connectivity from a range of habitat and oceanographic metrics that influence larval dispersal and settlement. The predictive ability of these metrics will be assessed through the development of gravity models which incorporate both natal and settlement site attributes as well as "distance" functions derived from habitat distributions and biological-hydrodynamic coupled models which describe how dispersal probability declines with travel time. (2) Evaluate the robustness of these predictors and different forms of the gravity model at various temporal and spatial scales to examine their suitability for a range of marine metapopulations. (3) Develop matrix metapopulation models to improve understanding of how physical oceanographic processes and dispersal behavior influence the dynamics and spatial connectivity of marine metapopulations. Extensive research of spatial recruitment patterns across a no-take marine reserve network in Kimbe Bay, Papua New Guinea, will provide the empirical data to develop and evaluate a modeling framework for estimating metapopulation connectivity in marine communities where direct estimation of larval dispersal and settlement patterns remains intangible. These efforts will be guided by DNA parentage and trans-generational isotope labeling research of two coral reef fishes with different life histories and habitat usage. These datasets represent the most spatially expansive analysis of recruitment patterns to date and will allow evaluation of modeling approaches across multiple spatial and temporal scales to create a general modeling framework which is both empirically relevant and adaptable to other marine metapopulations with less a priori knowledge of population connectivity.

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Funding

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NSF Division of Ocean Sciences (NSF OCE)	OCE-1031256

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