The connectivity matrix derived from the OysterFutures larval transport model simulations

Website: https://www.bco-dmo.org/dataset/808259
Data Type: model results
Version: 1
Version Date: 2020-04-03

Project
» Coastal SEES Collaborative Research: Oyster fisheries in the Chesapeake Bay: Integrating stakeholder objectives with natural system models to promote sustainable policy (Chesapeake Bay Oyster Fisheries)

Contributors	Affiliation	Role
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Abstract
This dataset includes the connectivity matrix derived from the OysterFutures larval transport model simulations.

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Coverage

Spatial Extent: **N**:38.807864 **E**:-75.96064487 **S**:38.4876211 **W**:-76.323769

Dataset Description

This dataset contains estimates of the proportion of larvae that were transported between oyster habitat polygons in the Choptank and Little Choptank River and was derived from larval transport model simulations. This matrix was used to simulate the transport of progeny between the 1,132 habitat polygons in the in the OysterFutures simulation model.

Methods & Sampling

Connectivity matrix estimates were derived using the output of the open-source Lagrangian TRANSport model (LTRANS) which was implemented for oyster larvae in the Chotpank and Little Choptank Rivers in Maryland. Methods for implementation are described in Spires (2015).

The 'Connectivity' worksheet in this spreadsheet contains the connectivity matrix which was created with the comnined output of larval transport model simulations.
The first column contains the polygon ID numbers where particles were released (startpolygons).
The first row contains the polygon ID numbers where particles encountered suitable habitat ("settled") (endpolygons).

The elements of the matrix contain the proportion of particles that were released from each habitat polygon and encountered suitable habitat ("settled").

There are 1132 starting polygons and 1132 ending polygons. It is a SQUARE matrix because the endpolygons that were not also startpolygons were dropped from this table.
The last two columns contain the centriod locations (lat/lon) of the startpolygons.
The last two rows contain the centriod locations (lat/lon) of the endpolygons.

Definitions:
polygon ID numbers - the unique polygon identification number for each habitat polygon used in the larval transport model.
startpolygon - polygon that a particle was released from.
endpolygon - polygon that a particle was "settled on" (encountered) when in the pediveliger stage.

The code of LTRANS is available on the PI's website at https://northweb.hpl.umces.edu/LTRANS.htm and on GitHub at https://github.com/LTRANS/LTRANSv.2b.

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Data Files

File
Connectivity matrix for OysterFutures model filename: ConnectivityMatrix_4OF_final_3May17_4BCO-DMO.xlsx (Microsoft Excel, 4.10 MB) MD5:e41031fae2a744ed6023afc7ca774e2e Created by Enorth using 2017 Chotpank larval transport (LTRANS) model runs The 'Connectivity' worksheet in this spreadsheet contains the connectivity matrix which was created with the comnined output of larval transport model simulations. The first column contains the polygon ID numbers where particles were released (startpolygons). The first row contains the polygon ID numbers where particles encountered suitable habitat ("settled") (endpolygons). The elements of the matrix contain the proportion of particles that were released from each habitat polygon and encountered suitable habitat ("settled"). There are 1132 starting polygons and 1132 ending polygons. It is a SQUARE matrix because the endpolygons that were not also startpolygons were dropped from this table. The last two columns contain the centriod locations (lat/lon) of the startpolygons. The last two rows contain the centriod locations (lat/lon) of the endpolygons. Definitions polygon ID numbers - the unique polygon identification number for each habitat polygon used in the larval transport model startpolygon - polygon that a particle was released from endpolygon - polygon that a particle was "settled on" (encountered) when in the pediveliger stage

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Related Publications

Schlag, Z. R., and E. W. North. 2012. Lagrangian TRANSport model (LTRANS v.2) User's Guide. University of Maryland Center for Environmental Science, Horn Point Laboratory. Cambridge, MD. 183 pp. (1.7 MB .pdf) *Software*

Spires, J. E. (2015). THE EXCHANGE OF EASTERN OYSTER (CRASSOSTREA VIRGINICA) LARVAE BETWEEN SUBPOPULATIONS IN THE CHOPTANK AND LITTLE CHOPTANK RIVERS: MODEL SIMULATIONS, THE

INFLUENCE OF SALINITY, AND IMPLICATIONS FOR RESTORATION. *Digital Repository at the University of Maryland*. https://doi.org/10.13016/M2F949
Methods

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Parameters

Parameters for this dataset have not yet been identified

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Project Information

Coastal SEES Collaborative Research: Oyster fisheries in the Chesapeake Bay: Integrating stakeholder objectives with natural system models to promote sustainable policy (Chesapeake Bay Oyster Fisheries)

Website: https://oysterfutures.wordpress.com/

Coverage: Chesapeake Bay

NSF Award Abstract:
Researchers will use the oyster fisheries in the Chesapeake Bay as a test case for collaborative policy development that is grounded in sound science. Environmental policies often create controversy and can be difficult to enforce, particularly when people do not understand the reason for the rules or do not consider the rules to be fair. Natural resources can be better sustained by policies developed cooperatively among all affected stakeholders, scientists, and government representatives. In a systematic approach, the project team will hold a series of workshops in which a full set of stakeholders will work with scientists to guide development of a model, select policy objectives, and apply the model to make policy recommendations. A collaborative modeling approach will ensure that stakeholders have an opportunity to incorporate their values, objectives, and knowledge into the model of the estuarine ecosystem which will include many benefits from the natural system such as commercial and recreational fishing, safe swimmable water, and other ecosystem services. Researchers will study the sociology and economics that influence stakeholder involvement and policy formation in order to better understand the human dimensions, improve the process, and enhance the implementation success of recommended policies. The lessons learned regarding the oyster ecosystem and fishery will advance the tools and practices of sustainable management of shellfisheries. The policy recommendations from the stakeholder workshops will be evaluated by state and federal agencies, and if implemented, would be an outcome that would directly enhance coastal sustainability. One Ph.D. student, two masters students, and one postdoctoral researcher will be trained in the science of coupled natural-human systems. This project is supported as part of the National Science Foundation's Coastal Science, Engineering, and Education for Sustainability program - Coastal SEES.

This research aims to improve the utility of predictive models for shaping natural resource policy and management. The research team will build an innovative natural systems model that integrates three-dimensional hydrodynamic, water quality and larval transport models with oyster demographics, human uses, and economics at a scale that is applicable to restoration and management. The modeling system developed will substantially advance methods for investigating, and understanding, natural systems with complex feedbacks between physical conditions, vital rates of organisms, and humans. Researchers will include stakeholder values, objectives, and knowledge in the model design process. Through a series of workshops, stakeholders will select the policy objectives and the integrated model will project how well policies are expected to meet these objectives. This iterative process will ensure that the natural system model will incorporate the complex human uses of the ecosystem. A targeted effort will be made to study the socioeconomic drivers of stakeholder involvement, information flow, use and influence, and the policy formation in order to improve the process and enhance the implementation success of recommended policies. By doing so, this research will advance understanding of the human dimensions needed to create sustainable policy as well as provide important new strategies for integrating natural and social sciences, and scientists, in sustainable resource management. This generalizable research component provides an important complement to the research on oysters, both of which will advance the tools and practices of sustainable management of shellfisheries.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1427019

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