Moored ADCP data from the Fixed Station cruises of the TRANSPORT program collected from the R/V Hugh R. Sharp cruises in the Choptank River, Chesapeake Bay during 2011-2012 (TRANSPORT project)

Website: https://www.bco-dmo.org/dataset/566880
Version: 2
Version Date: 2015-09-21

Project
» Integrating field methods and numerical models to quantify the links between larval transport, connectivity, and population dynamics (TRANSPORT)

Contributors	Affiliation	Role
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Dataset Description

The ADCP data were collected in the Choptank River at four fixed locations in July 2011 and 2012.

Data Processing Description

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- created toplevel file to serve individual files as a single object
- added cruise_name, cruise_id

Versions:
- v2: 2015-09-21: added ISO_DateTime_UTC and time_UTC columns
- v1: 2015-09-14: served data

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Data Files

File
ADCP_FSBT.csv(Comma Separated Values (.csv), 8.10 MB) MD5:c21c5471beca46271a070a64b818072e Primary data file for dataset ID 566880

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Parameters

Parameter	Description	Units
cruise_name	Cruise name as given by PI	unitless
cruise_id	Official cruise identification	unitless
year	Calendar year	YYYY
month	Calendar month	mm
day	Day of month	dd
hr_UTC	Hour in UTC time base (same as GMT)	HH
min	Minutes of hour	MM
sec	Seconds of minute	SS
julian_day	Numeric time in Julian day for year in UTC time base	unitless
deploy_id	Deployment identification string	unitless
ensemble	ADCP ensemble number. Each recorded profile has a unique ensemble number. Ensembles were recorded at 1 second intervals. Mean current data represents average of 300; 1 Hz ensembles each; therefore from one avg ensemble to the next jumps by 300.	unitless
lat_start	Latitude geographic coordinate of site in decimal degree format	decimal degrees
lon_start	Longitude geographic coordinate of site in decimal degree format. Minus indicates western hemisphere	decimal degrees
bin_range	Distance from ADCP transducer to center of measurement bin in meters	meters
elev	Elevation in meters of center of measurement bin above seabed	meters
depth	Depth in meters to center of measurement bin; determined from water depth estimate from ADCP pressure sensor (if available) or ADCP acoustic surface tracking.	meters
total_depth_echo	Total water depth in meters from ADCP acoustic surface tracking estimate. This method can be unreliable under certain environmental conditions and is generally used as back-up if pressure sensor is unavailable	meters
curr_spd	Current magnitude (speed)	meters/second
curr_dirT	Direction of current travel in degrees true (Oceanographic convention)	degrees
east_vel	Easterly current velocity in meters per second. Negative values mean westerly directed current component	meters per second
north_vel	Northerly current velocity in meters per second. Negative values mean southerly directed current component	meters per second
vert_vel	Vertical (+ up) current velocity in meters per second	meters per second
error_vel	Error velocity from ADCP in meters per second	meters per second

dudz	Resultant vertical velocity shear [s-1]. Used in Richardson Number calculation	per second
princax	Direction of principal axis in degrees true	degrees
along_vel	Along channel current velocity in meters per second. Ebb direction is positive	meters per second
cross_vel	Cross channel current velocity in meters per second. Right-hand coordinate system used with thumb pointing in up direction	meters per second
percent_good	Percent good pings from internal ADCP quality checks	percent
temperature	Water temperature at ADCP transducer	degrees Celsius
heading_M	ADCP heading in degrees magnetic from internal compass	degrees
heading_T	ADCP heading in degrees true. Local magnetic variation applied to Heading_M (mv=-11.2)	degrees
pitch	ADCP pitch from internal tilt sensor	degrees
roll	ADCP roll from internal title sensor	degrees
corr_bm1	ADCP beam 1 correlation value (0-255 scale)	unitless
corr_bm2	ADCP beam 2 correlation value (0-255 scale)	unitless
corr_bm3	ADCP beam 3 correlation value (0-255 scale)	unitless
corr_bm4	ADCP beam 4 correlation value (0-255 scale)	unitless
intens_bm1	ADCP beam 1 echo intensity	decibels
intens_bm2	ADCP beam 2 echo intensity	decibels
intens_bm3	ADCP beam 3 echo intensity	decibels
intens_bm4	ADCP beam 4 echo intensity	decibels
ISO_DateTime_UTC	UTC time; ISO formatted,yyyy-mm-ddTHH:MM:SS[.xx]	
time_UTC	UTC time; formatted as HHMM	

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Instruments

Dataset-specific Instrument Name	ADCP
Generic Instrument Name	Acoustic Doppler Current Profiler
Dataset-specific Description	TRDI Workhorse sentinel 1200 KHz, with mode 12 (high ping rate)
Generic Instrument Description	The ADCP measures water currents with sound, using a principle of sound waves called the Doppler effect. A sound wave has a higher frequency, or pitch, when it moves to you than when it moves away. You hear the Doppler effect in action when a car speeds past with a characteristic building of sound that fades when the car passes. The ADCP works by transmitting "pings" of sound at a constant frequency into the water. (The pings are so highly pitched that humans and even dolphins can't hear them.) As the sound waves travel, they ricochet off particles suspended in the moving water, and reflect back to the instrument. Due to the Doppler effect, sound waves bounced back from a particle moving away from the profiler have a slightly lowered frequency when they return. Particles moving toward the instrument send back higher frequency waves. The difference in frequency between the waves the profiler sends out and the waves it receives is called the Doppler shift. The instrument uses this shift to calculate how fast the particle and the water around it are moving. Sound waves that hit particles far from the profiler take longer to come back than waves that strike close by. By measuring the time it takes for the waves to bounce back and the Doppler shift, the profiler can measure current speed at many different depths with each series of pings. (More from WHOI instruments listing).

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Deployments

HRS110714EN

Website	https://www.bco-dmo.org/deployment/565814
Platform	R/V Hugh R. Sharp
Report	http://dmoserv3.bco-dmo.org/data_docs/TRANSPORT/2011cruise_reports/TRANSPORT_Cruise_Report_FSBT11.pdf
Start Date	2011-07-14
End Date	2011-07-18

HRS120711EN

Website	https://www.bco-dmo.org/deployment/565816
Platform	R/V Hugh R. Sharp
Report	http://dmoserv3.bco-dmo.org/data_docs/TRANSPORT/2012cruise_reports/TRANSPORT_Cruise_Report_FSBT12.pdf
Start Date	2012-07-10
End Date	2012-07-14

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Project Information

Integrating field methods and numerical models to quantify the links between larval transport, connectivity, and population dynamics (TRANSPORT)

Website: http://northweb.hpl.umces.edu/TRANSPORT/home.htm

Additional information can be found at the TRANSPORT website:
http://northweb.hpl.umces.edu/TRANSPORT/home.htm

Project description:
This coupled field-and-modeling research project is designed to address fundamental, cutting-edge questions that will significantly enhance our understanding of physical-biological interactions in planktonic organisms and quantify how pelagic life stages influence population dynamics. Technological advances in field methodology and numerical modeling will be integrated and applied to investigate and compare how circulation patterns, larval transport, sub-population connectivity, and population dynamics of the Eastern oyster, *Crassostrea virginica*, respond to environmental variability and habitat alteration. This project will provide information that will significantly enhance the restoration and management of oysters.

Physical-biological interactions are an integral part of understanding fish, bivalve, and crustacean early-life history and the processes that affect inter-annual variability in their recruitment to reproducing populations. The combined modeling and field approach builds on existing state-of-the-art models, it applies a new technology that will significantly advance our ability to investigate in-situ bivalve larvae dynamics, and it will generate critical information about the early life of oysters (timing of spawning, larval behavior) that is necessary for enhancing our understanding and prediction of recruitment processes.

This research will also advance our understanding of population dynamics of organisms with a pelagic life stages by making quantitative links between larval transport and a full life-cycle model. In doing so, it will provide improved understanding of the inter-relationships between, and relative importance of, larval transport, the connectivity of different reef systems, and adult growth, mortality, and gamete production, and how these relationships are influenced by changes in physical conditions and habitat.

Although focused on the oyster, *Crassostrea virginica*, the ecological studies and comparisons will result in a significant enhancement in our understanding of the interactions between physical conditions and a suite of bivalve species. This program will benefit society by providing new insights and understanding that will enhance fisheries management capabilities. The numerical tools developed will have the resolution appropriate for helping to guide oyster restoration programs, locate optimal sanctuaries (i.e., marine protected areas), and inform spatial management of oyster harvest. Although the quantitative tools and information generated will directly support oyster management and restoration activities of state and federal partners in Chesapeake Bay, the findings and tools developed in this project will be applicable to many other systems where bivalves comprise an important component of commercial and recreational fisheries. A PhD graduate student will be trained in field and numerical modeling research in this coupled field-and-modeling program. In addition to gaining a solid foundation in a cutting-edge field, the student will have the opportunity to develop science communication skills and interact with management agency representatives.

Publications Produced as a Result of this Research:

Gallego, A., E.W. North and E.D. Houde. 2012. Understanding and quantifying mortality in pelagic, early life stages of marine organisms — Old challenges and new perspectives. Journal of Marine Systems 93: 1-3.

Goodwin, J. D., and E.W. North. In prep. Identifying factors that influence the swimming behavior of *Crassostrea virginica* larvae in Choptank River and calculating their mortality.

Goodwin, J. D., E. W. North, and C. M. Thompson. 2014. Evaluating and improving a semi-automated image analysis technique for identifying bivalve larvae. Limnology and Oceanography: Methods 12: 548-562. DOI: 10.4319/lom.2014.12.548

Goodwin, J. D., E. W. North, and V. S. Kennedy. 2016. Identification of eastern oyster *Crassostrea virginica* larvae using polarized light microscopy in a mesohaline region of Chesapeake Bay. Journal of Shellfish Research 35(1): 157-168.

Goodwin, J. D., E. W. North, C. M. Thompson, I. Mitchell and H.M McFadden. In press. Improving a semi-automated classification technique for bivalve larvae: automated image acquisition and measures of quality control. Limnology and Oceanography: Methods.

North, E. W., D. M. King, J. Xu, R. R. Hood, R. I. E. Newell, K. T. Paynter, M. L. Kellogg, M. K. Liddel, and D. F. Boesch. 2010. Linking optimization and ecological models in a decision support tool for oyster restoration and management. Ecological Applications 20(3): 851–866.

Spires, J. E., E. W. North, and W. Long. In prep. The influence of salinity-induced mortality on larval transport between eastern oyster (*Crassostrea virginica*) reefs in an oligohaline estuary: model simulations and implications for restoration. Estuaries and Coasts.

Thompson, C. M., E. W. North, V. S. Kennedy, and S. N. White. 2015. Classifying bivalve larvae using shell pigments identified by Raman spectra. Analytical and Bioanalytical Chemistry 407:3591-3604, DOI 10.1007/s00216-015-8575-8

Thompson, C.M., E.W. North, S.N. White, and S.M. Gallager. 2014. An analysis of bivalve larval shell pigments using micro-Raman spectroscopy. Journal of Raman Spectroscopy 45(5):349-358

Dissertations and Theses:

Goodwin, J. D. 2015. Integrating automated imaging and a novel identification technique to estimate mortality and factors that determine the vertical distribution of *Crassostrea virginica* larvae. Ph.D. Dissertation. University of Maryland College Park and the University of Maryland Center for Environmental Science.

Spires, J. E. The exchange of eastern oyster (*Crassostrea virginica*) larvae between subpopulations in the Chotpank and Little Choptank Rivers: model simulations, the influence of salinity, and implications for restoration. Master of Science Thesis, University of Maryland College Park and Center for Environmental Science, 79 pp.

Books and One-Time Proceedings:

Anthony, Z. 2014. Optimal microscope and camera settings for counting and identifying copepods (*Acartia tonsa*) using a newly developed semi-automated image analysis technology. Undergraduate Research Report. 14 pp.

Hinson, K. I., E.W. North, and C.M. Thompson. 2011. New technologies to support shellfish restoration. Research Experience for Undergraduates (REU) final report.

Mitchell, I. 2013. Updates in LTRANS v.2b. University of Maryland Center for Environmental Science, Horn Point Laboratory. Cambridge, MD. 2 pp.

North, E. W. 2010. Q&A: Elizabeth North. 10/01/2009-09/30/2010, ICES Insight, September 2010, vol. 47, p. 43-44.

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.

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Funding

Funding Source	Award
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