Research Applications of Annular Flumes

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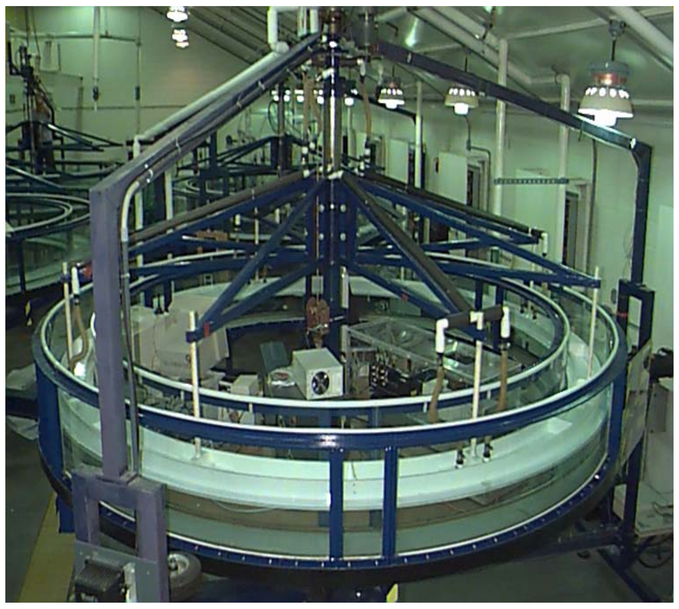


- **Ideal for long term experiments and mesocosm studies on effects of biological and chemical processes and sediment transport or distribution studies.**
- **Continuous treatment area**
- **Flow driven by rotation of top plate. Counter rotation of bottom reduces cross-channel circulation. Flow speeds up to 70 cm sec^{-1} have been achieved in mid-water column**
- **Flow direction is reversible to mimic tidal direction changes**
- **Volume of the flume with 20-cm water depth is 700 liters. Maximum water depth is 40 cm**
- **2 acrylic side panels facilitate access to water column to sample or monitor**
- **Temperature control (chilling) through titanium plate in the top on the water surface using a portable chiller**
- **Constructed of seawater resistant materials. Bottom is PVC, sidewalls are optical quality glass, top plate is PVC and titanium**

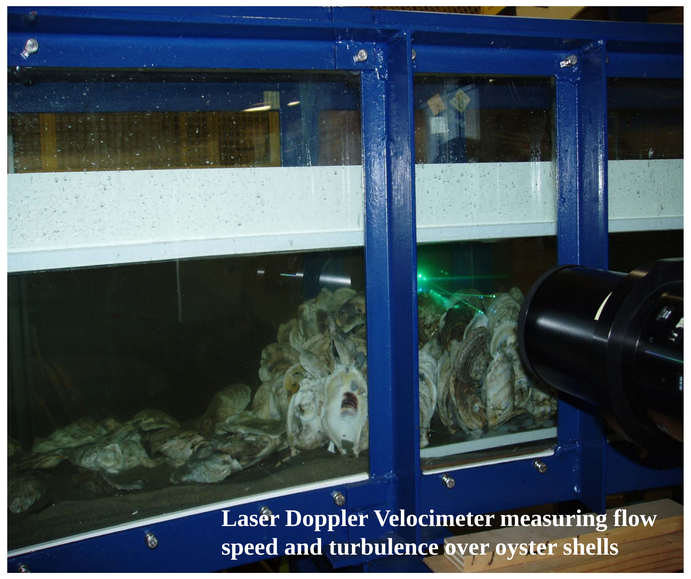
Effects of flow speed, turbulence, and spacing of oyster reefs on fertilization success in oysters

Research Projects

The following table provides examples of research in the annular flumes.

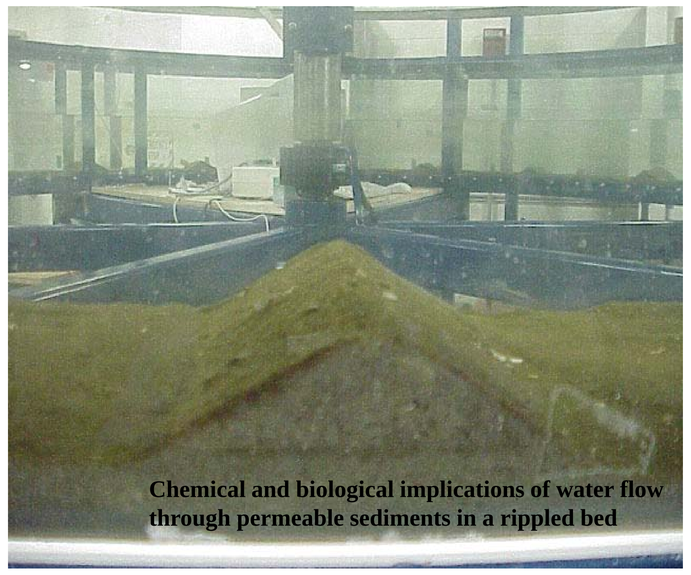
Project Title	Investigators
Effects of bottom roughness and turbulent flows on growth of the commercially valuable Atlantic surfclam	Patricia Ramey, C. Fuller, G. Taghon, J.P. Grassle, C. Noji, H. Fuchs, Y. Chen (IMCS, Rutgers)
Assessing the transport characteristics of flocculent organic sediment in the Florida Everglades	Laurel G. Larsen, J.W. Harvey, J.P. Crimaldi, G. Noe, D. Nowacki (University of Colorado, Boulder and U.S. Geological Survey, Reston, VA)
Evaluating essential shellfish habitat of hard clams, *Mercenaria mercenaria*, during larval settlement and early recruitment	Di Li & Judith P. Grassle (IMCS, Rutgers)
Effects of distance between individual spawning oysters on fertilization success.	David Bushek & John Quinlan, (IMCS, Rutgers)
Effects of turbulence on algal cell aggregation	Alex Kahl (IMCS, Rutgers)
Effect of predator activity on the rate of postlarval transport of clams	Heather Hunt (IMCS, Rutgers, currently University of New Brunswick, St John, Canada
Chemical and biological implications of water flow through permeable sediments	Gary Taghon & Charlotte Fuller (IMCS, Rutgers), Clare Reimers (Oregon State University)
Ontogenetic changes in feeding modes in Spionid polychaetes	Brian Hentschel (San Diego State University), Gary Taghon (IMCS, Rutgers), Jeff Shimeta (Franklin & Marshall College), now in Australia

Spisula clam burrowed in sand with siphon extended



Laser Doppler Velocimeter measuring flow speed and turbulence over oyster shells

Algal cell growth and aggregation as a function of flow speed and turbulence.



Chemical and biological implications of water flow through permeable sediments in a rippled bed

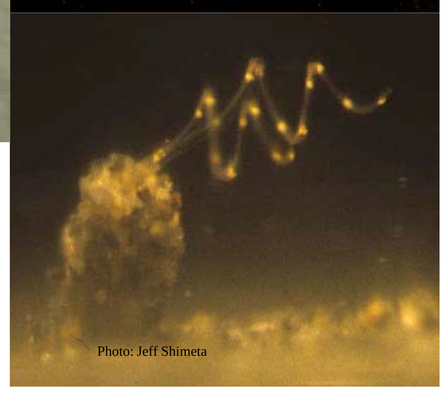


Photo: Jeff Shimeta

A. *Polydora cornuta* feeding tubes and fecal mounds in flume. B. *Polydora cornuta*. C. *Pseudopolydora paucibranchiata* with palps extended out of tube for feeding.

B T Hentschel and J Shimeta. 2008. Suspension Feeders. In S E Jørgensen and B D. Fath (Editor-in-Chief), General Ecology. Vol. [4] of Encyclopedia of Ecology, 5 vols. pp. [3437-3442] Oxford: Elsevier.

Recent Publications Generated from Research in the Annular Flume Facility

Hentschel, B.T. 2004. Sediment resuspension and boundary layer flow dramatically increase the growth rates of interface-feeding spionid polychaetes. J. Mar. Systems 49: 209-224.
Hentschel, B.T. and B.S. Herrick. 2005. Growth rates of interface-feeding spionid polychaetes in simulated tidal currents. J. Mar. Res. 63: 983-999.
Hentschel, B.T. and A.A. Larson. 2005. Growth rates of interface-feeding polychaetes: combined effects of flow speed and suspended food concentration. MEPS 293: 119-129.
Hentschel, B.T. and N.S. Harper. 2006. Effects of simulated sublethal predation on the growth and regeneration rates of a spionid polychaete in laboratory flumes. Mar. Biol. 149: 1175-1183.
Hentschel, B.T. and A.A. Larson. 2006. Hydrodynamic mediation of density-dependent growth and adult-juvenile interactions of a spionid polychaete. Limnol. Oceanogr. 51: 1031-1037.
Hunt, H.L. 2004. Effects of epibenthic predators in flow: transport and mortality of juveniles of the soft shell clam *Mya arenaria*. MEPS 279: 151-160.
Kahl, L.A., A. Vardi and O. Schofield. 2008. Effects of phytoplankton physiology on export flux. MEPS 354: 3-19.
Larsen, L., J.W. Harvey, G.B. Noe, and J.P. Crimaldi. 2009. Predicting organic floc transport dynamics in shallow aquatic ecosystems: Insights from the field, the laboratory, and numerical modeling. Water Resources Res. 45: W01411.
Larsen, L., J.W. Harvey, and J.P. Crimaldi. 2009. Morphologic and transport properties of natural organic floc. Water Resources Res. 45: W01410.

http://marine.rutgers.edu/flume/index.html