CURRICULUM VITAE (March 2013)

David W. Townsend, Ph.D.

Professor of Oceanography
School of Marine Sciences
5706 Aubert Hall, Rm 341
University of Maine
Orono, ME 04469

Personal Data:

Marital Status:	Married 37 years; two daughters (& still married)
Home Address & Tel:	1 Page Place, Orono, Maine 04473; (207) 866-2145

Formal Education:

B.A.	1974	Zoology	University of Maine at Orono, Orono, ME 04473
M.S.	1977	Marine Science	Long Island University, Greenvale, NY 11548
Ph.D.	1981	Oceanography	University of Maine at Orono, Orono, ME 04473

Positions:

September 1981 - June 1993:
Research Scientist, Bigelow Laboratory for Ocean Sciences, W. Boothbay Harbor, ME.

July 1993 - August 1997:
Associate Research Professor of Oceanography and Executive Director of the Regional Marine Research Program, University of Maine.

September 1997 - August 1999:
Associate Professor of Oceanography. School of Marine Sciences. University of Maine,

July 2001 – June 2007:
Professor of Oceanography and Director of the School of Marine Sciences. Aubert Hall, University of Maine, Orono, ME 04469.

September 1999 - Present:
Professor of Oceanography. School of Marine Sciences. University of Maine.

Administrative Experience:

Executive Director
ARGO-Maine, the Association for Research on the Gulf of Maine
February 1986 - June 1991

Executive Director
The Regional Association for Research on the Gulf of Maine
October 1991 - June 1992

Executive Director
Gulf of Maine Regional Marine Research Program
July 1993 - June 1998

Director, School of Marine Sciences, University of Maine
July 2001 – June 2007

Awards:

2001 – ***College Outstanding Teacher Award.*** Awarded annually by the University of Maine's College of Natural Sciences, Forestry and Agriculture;

2006 – ***Distinguished Maine Professor Award.*** Awarded annually *"to a tenured member of the University of Maine faculty who exemplifies the highest qualities of teaching, research, and public service"*.

Societies and Affiliations:

Phi Kappa Phi
Sigma Xi
American Society of Limnology and Oceanography
American Association for the Advancement of Science
New England Estuarine Research Society (President 1990-92)
The Estuarine Research Federation
The Oceanography Society

Committees:

NOAA Coastal Ocean Progr., Coastal Fisheries Ecosystem Scientific Advisory Comm., 1991-1994.
NOAA Coastal Ocean Program, Proposal Review Panel, June 1992, Miami Fla.
UNH/Univ. of Maine Sea Grant Policy Advisory Committee, 1990-1996.
Estuarine Research Federation Governing Board, 1990-1992.
National Science Foundation, Bering Sea FOCI Review Panel, Dec. 1991, Seattle, WA
National Research Council, Coastal Ocean Program Review Panel, 1993-1994.
National Research Council, Co-Chair Science Policy Symposium, Nov. 1994.
National Undersea Research Program, NOAA, West Coast Program, Proposal Review Panel, Monterey, CA, 1995.
National Marine Fisheries Service-Marine Mammals Protection Act, Gulf of Maine Ecosystem Health Workshop, Steering Committee, 1995.
National Research Council. Life Sciences Panel for Associateship Program, 1996-1998.
National Science Foundation. Panel on the Southern Ocean Joint Global Ocean Flux Study, 1996.
National Science Foundation. Biological Oceanography Panel. May 1998.
National Research Council. Co-Chair, Life Sciences Panel for Associateship Program, 1998-2001.
Northeast Consortium Advisory Committee, Member 2000-2002.
EPA/New England Interstate Water Pollution Control Commission, Nutrient Assessment Team Member, 2000-2002.
Maine Oil Spill Advisory Committee, Maine State Legislature Appointment 2001-2004.
U.S. Georges Bank GLOBEC Executive Committee, 1999-2004.
University of Maine, Alumni Association Board of Directors, 2002-2004.
Maine Sea Grant College Program, Policy Advisory Committee, 2001-2007.
Census of Marine Life, Gulf of Maine Pilot Study, Advisory Committee, 2005 to present.
Gulf of Maine Fisheries Research Collaborative, Committee member, 2001-2004.
Regional Association for Research on the Gulf of Maine (RARGOM), U. Maine rep., 2001-2007;
UNOLS (University National Oceanographic Laboratory System), U. Maine rep., 1999-2007;
CORE (Consortium for Oceanographic Research and Education), U. Maine rep., 2001-2007;
NOAA/NSF ECOHAB Proposal Review Panel, April 2003.
University of Florida Sea Grant Program, Proposal Review Panel, May 2003.
Executive Committee, Board of Oceans and Atmosphere, NASULGC, June '03 - present.
University of Massachusetts Dartmouth, Academic External Review; April 2004.
NIH Review Panelist of Florida Internat. Univ., Oceans and Human Health program; May 2004;
University of Florida Sea Grant Program, Proposal Review Panel, May 2005.

Maine Marine Research Coalition, Committee Member, 2004 - 2007;
New York Sea Grant Review Panel, August 2005.
University of Florida Sea Grant Program, Proposal Review Panel, April 2007.
National Science Foundation, Proposal Review Panel, LTER, April 2008.

Teaching Experience:

OCE 501: Biological Oceanography: One of four University of Maine Oceanography Graduate Program core lecture courses. 3 Credits. Fall Semester 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2006.

OCE 693-003: Advances in Biological Oceanography: 2 Credits. Spring Semester 1995.

SMS 691: Oceanography of the Gulf of Maine: 2 Credits, Spring Semester 2007; 2011.

SMS 100: Introduction to Ocean Science. Undergraduate lecture course. 3 Credits. Fall Semesters 1997 to present.

Research Interests:

Biological oceanography of estuaries and shelf seas; Fisheries oceanography; Ecology and population dynamics of larval fishes and zooplankton; Plankton ecology and trophodynamics; Coupling of physical and biological processes.

Research Cruise Experience:

Total of 81 cruises; chief scientist on 38; 591 days at sea.

Publications (*Published Abstracts and Technical Reports not included*):

A. College Textbook:

David W. Townsend. 2012. *Oceanography and Marine Biology: An Introduction to Marine Science*. Sinauer Associates, Publishers. 577 pp.

B. Articles, Reviews, and Edited Volumes:

1. **Townsend, D.W.** 1980. Microstructural growth increments in some Antarctic fish otoliths. *Cybium* 3(8): 17-22.
2. **Townsend, D.W.** and J.J. Graham. 1981. Growth and age structure of larval herring (*Clupea harengus* L.) in the Sheepscot River estuary of Maine as determined by daily growth increments in otoliths. *Fishery Bulletin, U.S.* 79(1): 123-130.
3. Barker, S.L., **D.W. Townsend** and J.S. Hacunda. 1981. Mortalities of herring (*Clupea harengus*), smooth flounder (*Liopsetta putnami*) and smelt (*Osmerus mordax*) larvae exposed to acute thermal shock. *Fishery Bulletin, U.S.* 79(1): 198-200.
4. DeWitt, H.H., P.A. Grecay, J.S. Hacunda, B.P. Lindsay, R.F. Shaw and **D.W. Townsend**. 1981. An addition to the fish fauna of the Gulf of Maine with records of rare species. *Proc.Biol. Soc. Washington.* 94: 669-674.
5. **Townsend, D.W.** and R.F. Shaw. 1982. Daily growth increments in fish otoliths of blue whiting, *Micromesistius poutassou* (Risso) from above the Arctic Circle. *Sarsia* 67(3): 147-152.
6. **Townsend, D.W.** 1983. The relations between larval fishes and zooplankton in two inshore areas of the Gulf of Maine. *Journal of Plankton Research* 5(2): 145-173.
7. **Townsend, D.W.** 1983. Review of: *Atlas of Fish Larvae of the Southern Ocean*, by Efremenko, V.N. Cybium, Bull. Soc. Fr., Ichthyol., Mus. Hist. Nat. Vol. 7(2), 1983. Published In: *Biomass*

Newsletter, Vol. 5(1): 11, 1983.
8. **Townsend, D.W.,** C.M. Yentsch, W.M. Balch, E.D. True and C.E. Parker. 1983. An island mixing effect in the coastal Gulf of Maine. *Helgolander Meeresunters* 36: 347-356.
9. **Townsend, D.W.** 1984. Comparison of inshore zooplankton and ichthyoplankton populations in the Gulf of Maine. *Marine Ecology - Progress Series* 15: 79-90.
10. **Townsend, D.W**., T.L. Cucci and T. Berman. 1984. Subsurface chlorophyll maxima and vertical distributions of zooplankton in the Gulf of Maine. *Journal of Plankton Research* 6(5): 793-802.
11. Berman, T., **D.W. Townsend**, S.Z. El-Sayed, C. Trees and Y. Azov. 1984. Optical transparency, chlorophyll and primary productivity in the eastern Mediterranean near the Israeli coast. *Oceanologica Acta* 7(3): 367-372.
12. Berman, T., Y. Azov and **D.W. Townsend**. 1984. Understanding oligotrophic oceans: Can the eastern Mediterranean be a useful mode? *In:* O. Holm-Hansen, L. Bolis and R. Giles (eds.). *Marine Phytoplankton and Productivity*, pp. 101-112. Lecture Notes on Coastal and Estuarine Studies, Vol. 8. Springer-Verlag, NY.
13. Graham, J.J., B.J. Joule, C.L. Crosby and **D.W. Townsend.** 1984. Characteristics of Atlantic herring (*Clupea harengus* L.) spawning population along the Maine coast, inferred from larval studies. *Journal of Northwest Atlantic Fisheries Science* 5(2): 131-142.
14. Carlson, C.J., **D.W. Townsend,** A.L. Hillyard and J.F. Eaton. 1984. Effect of an intertidal mudflat on the plankton of the overlying water column. *Canadian Journal of Fisheries and Aquatic Science* 41: 1523-1528.
15. **Townsend, D.W.** 1985. Review of: Pitcher, T.J. and P.J.B. Hart.1982. *Fisheries Ecology*. Avi Publishing Co., Westport, Conn. 414 p. Published In: *National Fisherman*, 1985.
16. Berman, T., P.D. Walline, A. Schneller, J. Rothenberg and **D.W. Townsend.** 1985. Secchi disk depth record: A claim for the Eastern Mediterranean. *Limnology and Oceanography* 30(2): 447-448.
17. **Townsend, D.W.** and L.M. Cammen. 1985. A deep protozoan maximum in the Gulf of Maine. *Marine Ecology - Progress Series* 24: 177-182.
18. Graham, J.J. and **D.W. Townsend.** 1985. Estimates of mortality, growth and transport for cohorts of larval Atlantic herring, Clupea harengus, from Maine coastal waters. *Transactions of the American Fisheries Society* 114: 490-498.
19. **Townsend, D.W.** and R.W. Spinrad. 1986. Early spring phytoplankton blooms in the Gulf of Maine. *Continental Shelf Research* 6(3): 515-529.
20. Berman, T., Y. Azov, A. Schneller, P. Walline and **D.W. Townsend**. 1986. Extent, transparency, and phytoplankton distribution of the neritic waters overlying the Israeli coastal shelf. *Oceanologica Acta* 9: 439-447.
21. **Townsend, D.W.,** J.J. Graham and D.K. Stevenson. 1986. Dynamics of larval herring production in tidally mixed waters of the eastern coastal Gulf of Maine. pp. 253-277. *In:* M.J. Bowman, C.M. Yentsch and W.T. Peterson (eds.). *Tidal Mixing and Plankton Dynamics*. Springer-Verlag, Berlin. 502 p.
22. King, F.D., T.L. Cucci and **D.W. Townsend.** 1987. Microzooplankton and macrozooplankton glutamate dehydrogenase as indices of the relative contributions of these fractions to ammonium regeneration in the Gulf of Maine. *Journal of Plankton Research* 9:277-289.
23. **Townsend, D.W.,** J.P. Christensen, D.K. Stevenson, J.J. Graham and S.B. Chenoweth. 1987. The importance of a plume of tidally-mixed water to the biological oceanography of the Gulf of Maine. *Journal of Marine Research* 45: 699-728.
24. **Townsend, D.W.** and L.M. Cammen. 1988. Potential importance of the timing of spring plankton blooms to benthic-pelagic coupling and recruitment of juvenile demersal fishes. *Biological Oceanography* 5(3): 215-228.
25. Holligan, P.M. and **D.W. Townsend**. 1988. Review of: Backus, R.H. and D.W. Bourne, 1984, *Georges Bank*. MIT Press. 593 p. Pubished In: *Science*, 240: 1070-1071.
26. **Townsend, D.W.,** J.P. Christensen, T. Berman, P. Walline, A. Schneller and C.S. Yentsch. 1988. Near-bottom chlorophyll maxima in shelf waters of the southeastern Mediterranean Sea:

Upwelling and sediments as possible nutrient sources. *Oceanologica Acta* N.Sp. 1988: 235-244.
27. Dortch, Q., **D.W. Townsend**, R.W. Spinrad and L.M. Mayer. 1988. The role of nepheloid layers in benthic-pelagic coupling. *NOAA Symp, Series for Underwater Research*. 6(1): 181-204.
28. **Townsend, D.W.,** R.L. Radtke, M.A. Morrison and S.D. Folsom. 1989. Recruitment implications of larval herring overwintering distributions in the Gulf of Maine, inferred using a new otolith technique. *Marine Ecology - Progress Series* 55: 1-13.
29. Brooks, D.A. and **D.W. Townsend.** 1989. Variability in the coastal current and nutrient pathways in the eastern Gulf of Maine. *Journal of Marine Research* 47: 303-321.
30. Radtke, R.L., **D.W. Townsend**, S.D. Folsom and M.A. Morrison. 1990. Strontium:Calcium concentration ratios in larval herring otoliths as indicators of environmental histories. *Envirnmental Biology of Fishes* 27: 51-61.
31. **Townsend, D.W.** and H.H. El Rashidi. 1991. Ichthyoplankton of the southeastern Mediterranean Sea. *Thalassia Jugoslavica* 23: 65-73.
32. **Townsend, D.W**. 1991. Influences of oceanographic processes on the biological productivity of the Gulf of Maine. *Reviews in Aquatic Sciences* 5: 211-230.
33. Radtke, R.L. and **D.W. Townsend.** 1991. Herring life history parameters resolved from structural and chemical analyses of otoliths. pp. 53-70. *In: Proceedings of the International Herring Symposium*, Anchorage, Alaska, October 1990. University of Alaska Sea Grant Program Spec. Publ. AK-SG-91-01. 684 pp
34. **Townsend, D.W.,** L.M. Mayer, Q. Dortch and R.W. Spinrad. 1992. Vertical structure and biological activity in the botton nepeloid layer of the Gulf of Maine. *Continental Shelf Research* 12: 367-387.
35. **Townsend, D.W.** and P.F. Larsen (eds). 1992. The Gulf of Maine. *NOAA Coastal Ocean Program, Regional Synthesis Series*, No. 1. 135 p.
36. **Townsend, D.W.** 1992. Review of: Singer, S. Fred. 1989. *Global Climate Change: Human and Natural Influences.* Paragon, N.Y. 424 p. Published In: *Environmental Management*, 16(6): 822-823.
37. **Townsend, D.W.** 1992. Ecology of larval herring in relation to the oceanography of the Gulf of Maine. *Journal of Plankton Research* 14: 467-493.
38. **Townsend, D.W.,** R.L. Radtke, S. Corwin and D.A. Libby. 1992. Strontium:calcium ratios in juvenile Atlantic herring (*Clupea harengus* L.) otoliths as a function of temperature. *Journal of Experimental Marine Biology and Ecology* 160: 131-140.
39. **Townsend, D.W.** 1992. An overview of the oceanography and biological productivity of the Gulf of Maine. pp. 5-26 *In:* Townsend, D.W. and P.F. Larsen (eds). The Gulf of Maine. *NOAA Coastal Ocean Program, Regional Synthesis Series*, No. 1. 135 p.
40. **Townsend, D.W.,** M.D. Keller, M.E. Sieracki and S.G. Ackleson. 1992. Spring phytoplankton blooms in the absence of vertical water column stability. *Nature* 360: 59-62.
41. **Townsend, D.W.** and P.F. Larsen (eds). 1992. The Gulf of Maine. *NOAA Coastal Ocean Program, Regional Synthesis Series*, No. 1. 135 p.
42. **Townsend, D.W.** and J.P. Christensen. 1992. A Nutrient Trap in the Western Gulf of Maine. pp. 284-287. *In:* J. Wiggins and C.N.K. Mooers (Eds.), *Proceedings of the Gulf of Maine Scientific Workshop*, Woods Hole, MA, 8-10 January 1991. Publ. by the Urban Harbors Institute, University of Massachusetts Boston. 394 pp.
43. **Townsend, D.W.,** M.D. Keller, P.M. Holligan, S.G. Ackleson and W.M. Balch. 1994. Coccolithophore blooms in relation to hydrography in the Gulf of Maine. *Continental Shelf Res.* 14: 979-1000.
44. **Townsend, D.W.,** L.M. Cammen, P.M. Holligan, D.E. Campbell and N.R. Pettigrew. 1994. Causes and consequences of variability in the timing of spring phytoplankton blooms. *Deep-Sea Res.* 41: 747-765.
45. **Townsend, D.W.**, R.L. Radtke, D. Malone and J.P. Wallinga. 1995. Use of otolith strontium : calcium ratios for hindcasting larval cod *Gadus morhua* distributions relative to water masses on Georges Bank. *Marine Ecology Progress Series*. 119: 37-44.

46. Christensen, J.P., **D.W. Townsend** and J.P. Montoya. 1995. Water column nutrients and sedimentary denitrification in the Gulf of Maine. *Continental Shelf Res.* 16: 489-516.
47. **Townsend, D.W.** and M.D. Keller. 1996. Dimethylsulfide (DMS) and Dimethylsulfonio-propionate (DMSP) in the Gulf of Maine. *Marine Ecology Progress Series* 137: 229-241.
48. Laursen, A.K., L.M. Mayer and **D.W Townsend.** 1996. Lability of proteinaceaus material in estuarine seston and subcellular fractions of phytoplankton. *Marine Ecology Progress Series* 136: 227-234.
49. **Townsend, D.W.** and N.R. Pettigrew. 1996. The role of frontal currents in larval fish transport on Georges Bank. *Deep-Sea Research II.* 43: 1773-1792.
50. **Townsend, D.W.** 1997. Biogeochemical cycling of carbon and nitrogen in the Gulf of Maine. In: Braasch, G. and G. Wallace (eds.). *Proceedings of Gulf of Maine Ecosystem Dynamics: a Scientific Symposium and Workshop*, 16-20 Sept. 1996, St. Andrews, N.B., pp. 117-134.
51. **Townsend, D.W.** and N.R. Pettigrew. 1997. Nitrogen limitation of secondary production on Georges Bank. *Journal of Plankton Research* 19: 221-235.
52. **Townsend, D.W.** 1997. Review of: Conkling, P.h. [Ed.]. 1995. *From Cape Cod to the Bay of Fundy: An Environmental Atlas of the Gulf of Maine.* MIT Press, Cambridge, MA. 258pp. Published In: *Limnology and Oceanography* 41: 1586-1587.
53. Pettigrew, N.R., D.A. Kistner, G.B. Barbin, A.K. Laursen, **D.W. Townsend,** and J.P. Christensen. 1997. The summer hydrography of Somes Sound. *Maine Naturalist.* 4: 35-44.
54. **Townsend, D.W**. 1998. Sources and cycling of nitrogen in the Gulf of Maine. *Journal of Marine Systems* 16 (3/4): 283-295.
55. Pettigrew, N.R., **D.W. Townsend**, H. Xue, J.P. Wallinga and P. Brickley. 1998. Observations of the Eastern Maine Coastal Current and its Offshore Extensions in 1994. *Journal of Geophysical Research*. 103 (C13): 30,623 - 30,639.
56. Radtke, R.L., **D.W. Townsend**, R.A. Kinzie III and D. Fey. 1999. Two dimensional X-ray mapping of otoliths, a high resolution technique for determining amphidromy in the tropical goby *Lentipes concolor*. *Journal of Experimental Marine Biology and Ecology* 238: 21-27.
57. Wong, M.W. and **D.W. Townsend**. 1999. Phytoplankton and hydrography of the Kennebec estuary, Maine (USA). *Marine Ecology Progress Series* 178: 133-144.
58. **Townsend, D.W**. and A.C. Thomas. 2001. Winter-Spring Transition of Phytoplankton Chlorophyll and Inorganic Nutrients on Georges Bank. *Deep-Sea Research* II. 48: 199-214.
59. Ryan, J.P., J.A. Loder and **D.W. Townsend**. 2001. Influence of a Gulf Stream Warm-Core Ring on Water Mass and Chlorophyll Distributions along the Southern Flank of Georges Bank. *Deep-Sea Research II* . 48: 159-178.
60. **Townsend, D.W.** 2001. Review of: Castro, C. and M.E. Huber (2000) *Marine Biology*, 3rd Ed. 444p. McGraw-Hill. Published In: *The Quarterly Review of Biology* 76: 100.
61. **Townsend, D.W.,** N.R. Pettigrew and A.C. Thomas. 2001. Offshore blooms of the red tide dinoflagellate, *Alexandrium* sp., in the Gulf of Maine. *Continental Shelf Research* 21: 347-369.
62. **Townsend, D.W.** and M. Thomas. 2002. Springtime nutrient and phytoplankton dynamics on Georges Bank. *Marine Ecology – Progress Series* 228: 57-74.
63. Thomas, A.C., **D.W. Townsend** and R. Weatherbee. 2003. Satellite-measured phytoplankton variability in the Gulf of Maine. *Continental Shelf Research 23: 971-989.*
64. **Townsend, D.W.** 2003. Review of: Levinton, J.S. (2001) *Marine Biology: Function, Biodiversity, Ecology*, 2nd Edition. Oxford. Published In: *The Quarterly Review of Biology* 78: 107.
65. **Townsend, D.W**. and J. Pederson. 2004. Aspects of the oceanography of the Gulf of Maine relevant to ballast water issues. Pp. 29-37 In: Pederson, J. (Ed). *Ballast Water Exchange: Exploring the Feasibility of Alternate Ballast Water Exchange Zones in the North Atlantic*. MIT Sea Grant College Program.
66. **Townsend, D.W.** 2004. Review of: Parsons, T., *The Seas Enthrawl: Memoirs of an Oceanographer.* Ecce Nova Press, 2004. Published In: *Oceanography* 17: 138-139.
67. Anderson, D.M., **D.W. Townsend**, D.J. McGillicuddy Jr. and J.T. Turner (eds). 2005. The Ecology and Oceanography of Toxic it *Alexandrium fundyense* Blooms in the Gulf of Maine. *Deep Sea*

Research II, 52: 2365-2876.
68. **Townsend, D.W.,** N.R. Pettigrew and A.C. Thomas. 2005. On the nature of *Alexandrium fundyense* blooms in the Gulf of Maine. *Deep Sea Research* II, 52: 2603-2630.
69. **Townsend, D.W**., S. Bennett and M. Thomas. 2005. Vertical distributions of *Alexandrium fundyense* in the Gulf of Maine. *Deep-Sea Research II*, 52: 2593-2602.
70. McGillicuddy, D.J., D.M. Anderson, D.R. Lynch and **D.W. Townsend**. 2005. Mechanisms regulating the large-scale fluctuations in *Alexandrium fundyense* populations in the Gulf of Maine: Results from a physical-biological model. *Deep-Sea Research II*, 52: 2698-2714.
71. McGillicuddy, Jr., D.M. Anderson, A.R. Solow, and **D.W. Townsend**. 2005. Interannual variability of *Alexandrium fundyense* abundance and shellfish toxicity in the Gulf of Maine *Deep-Sea Research II*, 52: 2843-2855.
72. Anderson, D.M., D.J. McGillicuddy, **D. W. Townsend**, and J.T. Turner. 2005. The ecology and oceanography of toxic *Alexandrium fundyense* blooms in the Gulf of Maine: Preface. *Deep-Sea Research II* 52: 2365-2368
73. Kirn, S.L., **D.W. Townsend** and N.R. Pettigrew. 2005. Suspended *Alexandrium* spp. hypnozygote cysts in the Gulf of Maine. *Deep-Sea Research II*, 52: 2543-2559.
74. Pettigrew. N.R., J.H. Churchill, C.D. Janzen, L.J. Mangum, R.P. Signell, A.C. Thomas, **D.W. Townsend**, J.P. Wallinga, and H. Xue. 2005. The kinematic and hydrographic structure of the Gulf of Maine Coastal Current. *Deep-Sea Research II, 52:* 2369-2391.
75. Ji, R., C. Chen, P.J.S. Franks, **D.W. Townsend**, E.G. Durbin, R.C. Beardsley, R.G. Lough, and R.W. Houghton. 2006. The impact of Scotian Shelf Water cross-over on the phytoplankton dynamics on Georges Bank: A 3-D experiment for the 1999 spring bloom.*Deep-Sea Research II.* 53: 2684–2707.
76. **Townsend, D.W**.,A.C. Thomas, L.M. Mayer, M. Thomas and J. Quinlan. 2006. Oceanography of the Northwest Atlantic Continental Shelf. pp. 119-168. *In:* Robinson, A.R. and K.H. Brink (eds). *The Sea*, Volume 14, Harvard University Press.
77. Ji, R., C. Chen, P.J.S. Franks, **D.W. Townsend**, E.G. Durbin, R.C. Beardsley, R.G. Lough, and R.W. Houghton. 2006. Spring Phytoplankton Bloom and Associated Lower Trophic Level Food Web Dynamics on Georges Bank: 1-D and 2-D Model Studies. *Deep-Sea Research II.* 53: 2656–2683.
78. Ralston, D.K., D.J. McGillicuddy and **D.W. Townsend.** 2007. Asynchronous vertical migration and bimodal distribution of motile phytoplankton. *J. Plankton Res.* 29: 803-821
79. Ji, R., C.S. Davis, C. Chen, **D.W. Townsend**, D.G. Mountain, R.C. Beardsley. 2007. Influence of ocean freshening on shelf phytoplankton dynamics. *Geophys. Res. Letters* 34, L24607, doi:10.1029/ 2007 GL032010.
80. Hu, S., **D.W. Townsend**, C. Chen, G. Cowles, R.C. Beardsley, R. Ji, R.W. Houghton. 2008. Tidal Pumping and Nutrient Fluxes on Georges Bank: A Process-Oriented Modeling Study. *J. Marine Systems* 74: 528–544.
81. Anderson, D.M., J.M. Burkholder, W.P. Cochlan, P.M. Glibert, C.J. Gobler, C.A. Heil, R. Kudela, M.L. Parsons, J. E. Rensel , **D.W. Townsend** , V.L. Trainer, G. A. Vargo. 2008. Harmful algal blooms and eutrophication: Examining linkages from selected coastal regions of the United States. *Harmful Algae* 8: 39-53, doi:10.1016/j.hal.2008.08.017.
82. McGillicuddy, D.J., Anderson, D.M., Stock, C.A., Lynch, D.R. and **D.W. Townsend.** 2008. Modeling blooms of *Alexandrium fundyense* in the Gulf of Maine. *In:* M. Babin, C.S. Roesler, J.J. Cullen, (eds.) *Real-time Coastal Observing Systems for Marine Ecosystems Dynamics and Harmful Algal Blooms: Theory, Instrumentation and Modelling.* UNESCO, United Nations Educational, Scientific and Cultural Organization. 860 p.
83. Ji, R., C.S. Davis, C. Chen, **D.W. Townsend**, D.G. Mountain, R.C. Beardsley. 2008. Modeling the influence of low-salinity water inflow on winter-spring phytoplankton dynamics in the Nova Scotian Shelf - Gulf of Maine region. *Journal of Plankton Research* 30: 1399–1416.
84. Pettigrew, N.R., Xue, H.J., Irish, J.D., Perrie, W., Roesler, C.S., Thomas, A.C., **Townsend, D.W.** 2008. The Gulf of Maine Ocean Observing System: Generic Lessons Learned in the First Seven Years of Operation (2001-2008). *Marine Technology Society Journal.* 42(3): 91-102.

85. **Townsend, D.W.**, N.D. Rebuck, M.A. Thomas, L. Karp-Boss, and R. M. Gettings. 2010. A changing nutrient regime in the Gulf of Maine. *Continental Shelf Res.* 30: 820–832.
86. Jordaan, A., Y. Chen, **D.W. Townsend** and S. Sherman. 2010. Identification of ecological structure and species relationships along an oceanographic gradient in the Gulf of Maine using multivariate analysis with bootstrapping. *Canadian J. Fish. Aq. Sci.* 67: 701-719.
87. Runge, J.A., A. Kovach, J. Churchill, L. Kerr, J.R. Morrison, R.C. Beardsley, D. Berlinsky, C. Chen, S. Cadrin, C. Davis, K. Ford, J.H. Grabowski, W.H. Howell, R. Ji, R. Jones, A. Pershing, N. Record, A.C. Thomas, G. Sherwood, S. Tallack, **D.W. Townsend.** 2010. Understanding Climate Impacts on Recruitment and Spatial Dynamics of Atlantic Cod in the Gulf of Maine: Integration of Observations and Modeling. *Progress Oceanogr*. 87: 251–263.
88. **Townsend, D.W.** and W.G. Ellis. 2010. Primary production and nutrient cycling on the Northwest Atlantic continental shelf. Pp. 234-248, In: Liu, K.-K., Atkinson, L., Quiñones, R., Talaue-McManus, L. (Eds). *Carbon and Nutrient Fluxes in Continental Margins: A Global Synthesis.* IGBP Book Series. Springer, Berlin, 744 p + XXVIII.
89. Hu, S., C. Chen, R. Ji, **D.W. Townsend**, R. Tian, R.C. Beardsley, C.S. Davis. 2011. Effects of surface forcing on interannual variability of the fall phytoplankton bloom in the Gulf of Maine revealed using a process-oriented model. *Marine Ecology – Progress Series*. 427: 29-49.
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94. Fogarty, M.J., **D.W. Townsend** and E. Klein. 2012. Advances in understanding ecosystem structure and function in the Gulf of Maine. pp. 261-272, *In:* Stephenson, R.L., J.H. Annala, J.A. Runge and M. Hall-Arber, (Eds). Advancing an Ecosystem Approach in the Gulf of Maine. *American Fisheries Society, Symposium 79,* Bethesda, MD. 415 pp.
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96. Gettings, R.M., **D.W. Townsend**, M.A. Thomas, L. Karp-Boss. 2013. Dynamics of late spring and summer phytoplankton communities on Georges Bank, with emphasis on diatoms, *Alexandrium* spp., and other dinoflagellates. *Deep Sea Research II* (in press).
97. McGillicuddy, D.J., Jr., M.L. Brosnahan, D.A. Couture, R. He, B.A. Keafer, J.P. Manning, J.L. Martin, C.H. Pilskaln, **D.W. Townsend**, D.M. Anderson. 2013. A red tide *of Alexandrium fundyense* in the Gulf of Maine. *Deep Sea Research II* (in press).
98. **Townsend, D.W.**, M.A. Thomas, D.J. McGillicuddy, N.R. Rebuck. ms. Nutrients and water masses in the Gulf of Maine - Georges Bank region: Variability and importance to blooms of the toxic dinoflagellate *Alexandrium fundyense. Deep Sea Research II* (in review for Deep Sea Research II).
99. Jiang, M., D.G. Borkman, P. S. Libby, **D.W. Townsend** and M. Zhou. 2012. Nutrient input and the competition of Phaeocystis and diatoms in Massachusetts Bay spring bloom. *Marine Ecology Progress Series* (In Revision)
100. Brickley, P., N.R. Pettigrew and **D.W. Townsend**. Ms. A transient phytoplankton bloom in the

wake of Hurricane Eduoard by mixing and inertial waves in the western Gulf of Maine. *Continental Shelf Research* (In Revision).

Master's Thesis: Seasonal variation in lipid content of giant Atlantic bluefin tuna (*Thunnus thynnus* Linneaus) of the Gulf of Maine. 57 pp.

Doctoral Thesis: Comparative ecology and population dynamics of larval fishes and zooplankton in two hydrographically different areas on the Maine coast. xiii + 270 pp.

Research Grants and Contracts:

1. Agency for International Development. 1983-1986. Biological productivity of the southeastern Mediterranean Sea in the post Aswan Dam period. (PIs: C.S. Yentsch and D.W. Townsend). $101,938.00.
2. NOAA Sea Grant (U. Maine). 1982-1986. Dynamics of larval herring production in the eastern coastal Gulf of Maine. (PIs: D.K. Stevenson, D.W. Townsend and J.J. Graham). $80,000.00.
3. National Science Foundation. EXP-8011448. 1983-1985. Relations between ichthyoplankton and fronts in the Gulf of Maine. $39,902.00
4. Coastal Zone Program, Maine State Planning Office. 1986-1987. The design marketing and implementation of a scientific research program on the biological productivity of the Gulf of Maine. (PIs: D.W. Townsend and L.M. Mayer) $4,614.00
5. National Science Foundation. OCE-8608808. 1986-1987. Organism-food interactions in the nepheloid layer. (PIs: F.Q. Dortch, D.W. Townsend and L.M. Mayer). $10,750.00
6. National Science Foundation. OCE-8614187. 1986-1989. Environmental histories of larval herring in the Gulf of Maine. $131,696.
7. National Science Foundation. OCE-8800532. 1988-1989. The timing of early spring plankton blooms in relation to benthic productivity. (PIs: D.W. Townsend and L.M. Cammen). $52,974.
8. National Science Foundation. OCE-8801682. 1988-1991. Vertical zonation of suspension feeders: Effects of benthic and oceanographic factors. (PIs: J. Witman and D.W. Townsend). $57,104.
9. National Science Foundation. OCE-8816662. 1986-89. Environmental histories of larval herring in the Gulf of Maine. $230,000.
10. National Science Foundation. OCE-8816662. 1989-1991. Environmental histories of larval herring in the Gulf of Maine. (Renewal) $160,000.
11. Massachusetts Water Resources Authority. 1989-1990. Phytoplankton and Nutrient Dynamics in Massachusetts Bay. (PIs: D.W. Townsend, L. Cammen, J. Christensen, S. Ackleson, and M. Keller) $250,000.
12. National Science Foundation. OCE-9202061. 1992-1994. Distribution and survival of cod larvae in relation to hydrography on Georges Bank. $269,010.
13. Environmental Protection Agency. 5/92-4/94. The role of zooplankton and bacterioplankton in dimethyl sulfide fluxes in the Gulf of Maine (PIs: M.D. Keller and D.W. Townsend) $336,223.
14. NOAA Sea Grant. 2/93-1/95. Variable Freshwater Discharge and Water Column Stability in Estuaries: Effects on Biological and Geochemical Particle Dynamics. PIs: Mayer, L.M., D.W. Townsend, N.R. Pettigrew and T.C. Loder. $125,872.
15. NOAA Sea Grant. 2/95-1/96. Particle Dynamics in Variably Stratified Estuaries. PIs: Mayer, L.M., D.W. Townsend, N.R. Pettigrew and T.C. Loder. $37,000.
16. Office of Naval Research. 8/94-7/97. Internal waves and nutrient fluxes in the Gulf of Maine. (PIs: D.W. Townsend, N.R. Pettigrew, F. Chai, C. Yentsch, and M. Sieracki). $1,135,636 (includes $110,000 University of Maine cash match).
17. National Science Foundation. 4/95-3/96. Acquition of shipboard oceanographic equipment. $49,363 (PIs: D.W. Townsend and N.R. Pettigrew)
18. National Science Foundation, SGER: Small Grants for Exploratory Research. 10/95-9/96. Subdaily temperature histories of cod larvae on Georges Bank. $49,736.
19. NOAA: 10/96-9/99. U.S. GLOBEC: Broad-Scale Ichthyoplankton, Hydrography and Nutrient Studies on Georges Bank. III. Nutrients and Phytoplankton Chlorophyll. $210,000.

20. NOAA: 9/97-8/02. ECOHAB-GOM: Ecology and Oceanography of Harmful Algal Blooms in the Gulf of Maine. (PIs: D. Townsend, N. Pettigrew and A. Thomas) $1,154,482.
21. NASA. 9/97-8/00. Biological-Physical coupling in the Gulf of Maine: Satellite and Model Studies of Phytoplankton Variability. (PIs: Thomas, A.C., F. Chai, D.W. Townsend and H. Xue) $351,586.
22. NOAA. 10/98 - 9/01. Small-scale Nutrient Distributions Accross Tidal Fronts on Georges Bank. $96,503.
23. NOAA. 10/98 - 9/01. U.S. Globec: Broad-scale Studies of Nutrients and Phytoplankton on Georges Bank. $300,211.
24. National Science Foundation. 10/98 - 9/01. Origins of Cod on Georges Bank: Contributions of Early Developmental Stages From the Scotian Shelf. (PIs: D.W. Townsend, I. Kornfield and L. Kling). $492,561.
25. Office of Naval Research. 6/00 - 5/02. Nutrient monitoring component of the Gulf of Maine Ocean Observing System. $115,000.
26. NASA. 2/01-1/04. Multi-sensor and Modeling Analysis of Gulf of Maine Phytoplankton Variability. (PIs: Thomas, A.C., F. Chai, H. Xue, and D.W. Townsend) $386,728.
27. NOAA. 4/02-12/02. ECOHAB-GOM: Ecology and Oceanography of Harmful Algal Blooms in the Gulf of Maine. (PIs: D. Townsend, N. Pettigrew and A. Thomas) $102,138.
28. National Science Foundation. 7/02 - 6/05. Tidal Front Mixing and Exchange on Georges Bank: Controls on Production of Phytoplankton, Zooplankton and Fishes. (Multiple PI's and Institutions) Townsend portion: $149,965.
29. NOAA. 9/02 - 8/05. Predictive Models of the Toxic Dinoflagellate *Alexandrium fundyense* in the Gulf of Maine: Quantitative Evaluation, Refinement, and Transition to Operational Mode . (Multiple PI's and Institutions) Townsend portion: $107,601.
30. NOAA, Northeast Consortium. 10/02 - 9/03. Abundance, Migration and Recruitment of Northern Shrimp in the Gulf of Maine.(Multiple PI's and Institutions) Townsend portion: $14,958.
31. Office of Naval Research. 7/02 - 6/03. Gulf of Maine Ocean Observing System: Nutrients. (Multiple PI's and Institutions) Townsend portion: $48,653.
32. National Science Foundation 3/03 - 2/05. U.S. GLOBEC: Integration and Synthesis of Georges Bank Broad-Scale Survey Results. (Multiple PI's and Institutions) Townsend portion: $71, 874.
33. NOAA. 9/02 - 8/04. Synthesis: Impact of Transport Processes on Lobster Fishery Patterns. PIs: L.S. Incze (USM); H. Xue, N.R. Pettigrew, D.W. Townsend, Y. Chen & R. Steneck (Univ. Maine); D.A. Brooks (Texas A&M Univ.); C. Wilson (Maine DMR). University of Maine portion: $348,737.
34. NOAA, Northeast Consortium. 10/03 - 9/04. Abundance, Migration and Recruitment of Northern Shrimp in the Gulf of Maine.(Multiple PI's and Institutions) Townsend portion: $14,995.
35. NOAA/Sea Grant. 1/1/04 - 12/30/06. Environmental Controls on Shrimp Recruitment Dynamics. (With L. Incze and D. Schick). Townsend Univ. Maine portion: $106,259.
36. Office of Naval Research, 6/1/04 - 5/1/07. Growth and Phenomenology of Phytoplankton Thin Layers in the Gulf of Maine (M.J. Perry and D.W. Townsend) $617,000.
37. NOAA 7/03 - 6/04 Gulf of Maine Ocean Observing System: Nutrients. (Multiple PI's and Institutions) Townsend portion: $35,000.
38. NOAA 7/04 - 6/05 Gulf of Maine Ocean Observing System: Nutrients. (Multiple PI's and Institutions) Townsend portion: $71,000.
39. NOAA 7/05 - 6/06 Gulf of Maine Ocean Observing System: Nutrients. (Multiple PI's and Institutions) Townsend portion: $50,000.
40. Office of Naval Research 07/2005 – 06/2006. Acquisition of Underwater Gliders for Autonomous Sampling in the Gulf of Maine. (with M.J. Perry, C. Jansen & N.R. Pettigrew; Townsend portion: $52,000).
41. National Science Foundation 01/06 - 12/07. U.S. GLOBEC: Processes controlling abundance of dominant copepod species on Georges Bank: Local dynamics and large-scale forcing. Townsend portion $60,213.
42. NOAA 09/06- 08/11. Dynamics of *Alexandrium fundyense* Blooms in the Gulf of Maine and Southern New England. Multi PIs, Townsend portion: $388,814.

43. National Science Foundation 10/07 - 09/10. Interannual Variability of Coastal Phytoplankton Blooms in the Gulf of Maine and Their Relationships to Local and Remote Forcings. With: R. Ji *et al.*, Townsend portion: $102,361.
44. NOAA 09/09 – 08/12. Bloom Dynamics of *Alexandrium*: The Roles of Resource Competition and Allelopathy. PIs: L. Karp-Boss and D.W. Townsend; $599,000.
45. NOAA/CINAR. 07/2010 - 06/2011. Nutrient Dynamics on the NE Continental Shelf. $10,000.
46. NOAA/CINAR. 07/2011 - 06/2012. Nutrient Dynamics on the NE Continental Shelf. $10,000.
47. NOAA. 09/2011 - 08/2015. MERHAB: GOM-ESP: Incorporation of Environmental Sample Processor Technology into Gulf of Maine HAB Monitoring and Management. With D.M. Anderson *et al.*, Townsend portion: $388,000.