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## **Eutrophication**

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### **Books, Reports and Special Issues:**

Ambio, 1990. Marine eutrophication. *Ambio* 19:101-176, a whole issue.

Bricker, S. B., C. G. Clement, D. E. Pirhalla, S. P. Orlando and D. R. G. Farrow. 1999. National Estuarine Eutrophication Assessment. Effects of Nutrient Enrichment in the Nation's Estuaries. National Ocean Service, National Oceanic and Atmospheric Administration, Silver Spring, Maryland.

Halwagy, R. D., B. Clayton and M. Behbehani. 1986. Coastal Eutrophication. The Alden Press, Oxford.

Jørgensen, B. B. and K. Richardson (eds.), Eutrophication in Coastal Marine Systems. Coastal and Estuarine Studies, Volume 52, American Geophysical Union, Washington, D.C.

Neilson, B. J. and L. E. Cronin (eds.). 1981. Estuaries and Nutrients. Humana Press, Inc., Clifton, New Jersey.

### **Classic Papers:**

Officer, C. B. and J. H. Ryther. 1980. The possible importance of silicon in marine eutrophication. *Marine Ecology Progress Series* 3: 83-91.

Officer, C. B., R. B. Biggs, J. L. Taft, L. E. Cronin, M. A. Tyler and W. R. Boynton. 1984. Chesapeake Bay anoxia. Origin, development and significance. *Science* 223: 22-27.

Paerl, H. 1985. Enhancement of marine primary production by nitrogen-enriched acid rain. *Nature* 315: 747-749.

Ryther, J. and W. Dunstan. 1971. Nitrogen, phosphorus, and eutrophication in the coastal marine environment. *Science* 171: 1008-1112.

### **Recent Papers:**

Andersson, L. and L. Rydberg. 1987. Trends in nutrient and oxygen conditions within the Kattegat: Effects of local nutrient supply. *Estuarine, Coastal and Shelf Science* 26: 559-579.

Boynton, W. R., J. H. Garber, R. Summers and W. M. Kemp. 1995. Inputs, transformations and transport of nitrogen and phosphorus in Chesapeake Bay and selected tributaries. *Estuaries* 18(1B): 285-314.

Caraco, N. F. and J. J. Cole. 1999. Human impact on nitrate export: An analysis using major world rivers. *Ambio* 28(2): 167-170.

Cloern, J.E. 2001. Review. Our evolving conceptual model of the coastal eutrophication problem. *Mar. Ecol. Prog. Ser.* 210: 223-253.

Conley, D. J., C. L. Schelske and E. F. Stoermer. 1993. Modification of the biogeochemical cycle of silica with eutrophication. *Marine Ecology Progress Series* 101: 179-192.

Cooper, S. and G. Brush. 1991. Long-term history of Chesapeake Bay anoxia. *Science* 254: 992-996.

- D'Elia, C. F., J. G. Sanders and W. R. Boynton. 1986. Nutrient enrichment studies in a coastal plain estuary: phytoplankton growth in large scale, continuous cultures. *Canadian Journal of Fisheries and Aquatic Science* 43: 397-406.
- Diaz, R. and R. Rosenberg. 1995. Marine benthic hypoxia: A review of its ecological effects and the behavioural responses of benthic macrofauna. *Oceanography and Marine Biology: An Annual Review* 33: 245-303.
- Forsberg, C. 1994. The large-scale flux of nutrients from land to water and the eutrophication of lakes and marine waters. *Marine Pollution Bulletin* 29: 409-413.
- Galloway, J. N., W. H. Schlesinger, H. Lavy II, A. Michaels and J. L. Schnoor. 1995. Nitrogen fixation: Anthropogenic enhancement-environmental response. *Global Biogeochemical Cycles* 9: 235-252.
- Hallegraeff, G. 1993. A review of harmful algal blooms and their apparent global increase. *Phycologia* 32: 79-99.
- Howarth, R. W. 1988. Nutrient limitation of net primary productivity in marine ecosystems. *Annual Review of Ecology and Systematics* 19: 29-110.
- Howarth, R. W., G. Billen, D. Swaney, A. Townsend, N. Jaworski, K. Lajtha, J. A. Downing, R. Elmgren, N. Caraco, T. Jordan, F. Berendse, J. Freney, V. Kudeyarov, P. Murdoch and Z. Zhao-Liang. 1996. Regional nitrogen budgets and riverine N & P fluxes for the drainages to the North Atlantic Ocean: Natural and human influences. *Biogeochemistry* 35: 75-79.
- Jordan, T. E. and D. E. Weller. 1996. Human contributions to terrestrial nitrogen flux. *BioScience* 46: 655-664.
- Justic', D., N. N. Rabalais and R. E. Turner. 1995. Stoichiometric nutrient balance and origin of coastal eutrophication. *Marine Pollution Bulletin* 30: 41-46.
- Justic', D., N. N. Rabalais, R. E. Turner and Q. Dortch. 1995. Changes in nutrient structure of river-dominated coastal waters: Stoichiometric nutrient balance and its consequences. *Estuarine, Coastal and Shelf Science* 40: 339-356.
- Lohrenz, S. E., G. L. Fahnenstiel, D. G. Redalje, G. A. Lang, X. Chen, and M. J. Dagg. 1997. Variations in primary production of northern Gulf of Mexico continental shelf waters linked to nutrient inputs from the Mississippi River. *Marine Ecology Progress Series* 155: 435-454.
- Nixon, S. W. 1988. Physical energy inputs and comparative ecology of lake and marine ecosystems. *Limnology and Oceanography* 33(4, part 2): 1005-1025.
- Nixon, S. W. 1995. Coastal marine eutrophication: A definition, social causes, and future concerns. *Ophelia* 41: 199-219.
- Nixon, S. W., J. W. Ammerman, L. P. Atkinson, V. M. Berounsky, G. Billen, W. C. Boicourt, W. R. Boynton, T. M. Church, D. M. DiToro, R. Elmgren, J. H. Garber, A. E. Giblin, R. A. Jahnke, N. J. P. Owens, M. E. Q. Pilson and S. P. Seitzinger. 1996. The fate of nitrogen and phosphorus at the land-sea margin of the North Atlantic Ocean. *Biogeochemistry* 35: 141-180.
- Paerl, H. 1993. Emerging role of atmospheric nitrogen deposition in coastal eutrophication: biogeochemical and trophic perspectives. *Canadian Journal of Fisheries and Aquatic Science* 50: 2254-2269.
- Paerl, H. W. 1997. Coastal eutrophication and harmful algal blooms: Importance of atmospheric deposition and groundwater as "new" nitrogen and other sources. *Limnology and oceanography* 42 (part 2): 1154-1165.
- Peierls, B. L., N. F. Caraco, M. L. Pace and J. J. Cole. 1991. Human influence on river nitrogen. *Nature* 350: 386-387.

- Rabalais, N. N., R. E. Turner, D. Justic', Q. Dortch, W. J. Wiseman, Jr. and B. K. Sen Gupta. 1996. Nutrient changes in the Mississippi River and system responses on the adjacent continental shelf. *Estuaries* 19: 386-407.
- Rosenberg, R. 1985. Eutrophication—the future marine coastal nuisance? *Marine Pollution Bulletin* 16: 227-231.
- Seitzinger, S. and J. Sanders. 1997. Contribution of dissolved organic nitrogen from rivers to estuarine eutrophication. *Marine Ecology Progress Series* 159: 1-12.
- Smayda, T. J. 1990. Novel and nuisance phytoplankton blooms in the sea: Evidence for global epidemic. Pages 29-40 in E. Graneli, B. Sundstrom, R. Edler and D. M. Anderson (eds.), *Toxic Marine Phytoplankton*. Elsevier, New York.
- Smetacek, V., U. Bathmann, E. M. Nöthig and R. Scharek. 1991. Coastal eutrophication: Causes and consequences. Pages 251-279 in R. C. F. Mantoura, J.-M. Martin and R. Wollast (eds.), *Ocean Margin processes in Global Change*. John Wiley & Sons, Chichester.
- Turner, R. E. and N. N. Rabalais. 1991. Changes in Mississippi River water quality this century. Implications for coastal food webs. *BioScience* 41: 140-148.
- Turner, R. E. and N. N. Rabalais. 1994. Coastal eutrophication near the Mississippi river delta. *Nature* 368: 619-621.
- Turner, R. E., N. Qureshi, N. N. Rabalais, Q. Dortch, D. Justic, R. F. Shaw and J. Cope. 1998. Fluctuating silicate:nitrate ratios and coastal plankton food webs. *Proceedings of the National Academy of Science, USA* 95: 13048-13051.
- Vitousek, P. M., J. D. Aber, R. W. Howarth, G. E. Likens, P. A. Matson, D. W. Schindler, W. H. Schlesinger and G. D. Tilman. 1997. Human alterations of the global nitrogen cycle: Causes and consequences. *Issues in Ecology* 1: 1-15.
- Vitousek, P. M., H. A. Mooney, J. Lubchenko and J. M. Mellilo. 1997. Human domination of Earth's ecosystems. *Science* 277: 494-499.
- Vollenweider, R. A., R. Marchetti and R. Viviani (eds.). 1992. *Marine Coastal Eutrophication. The Response of Marine Transitional Systems to Human Impact : Problems and Perspectives for Restoration*. Proceedings, International Conference, Bologna, Italy, 21-24 March 1990. Elsevier, Amsterdam.

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