CURRICULUM VITAE

TODD MILAN KANA

Horn Point Laboratory
University of Maryland Center for Environmental Science
P.O. Box 775
Cambridge, MD 21613
Phone: 410 221-8481
Fax: 410 221-8490
Email: kana@hpl.umces.edu

I. Education

1974 B.A., Union College, Biology
1976 M.S., Syracuse University, Biology
1982 Ph.D., Harvard University, Organismic and Evolutionary Biology

II. Professional Background

1976-1977 *Instructor,* Mansfield State College, Mansfield, PA
1981-1983 *Computer Manager*, Harvard Univ. Herbaria, Cambridge, MA
1983-1984 *Visiting Lecturer*, Massachusetts Institute of Technology
1985-1986 *Visiting Investigator*, Woods Hole Oceanographic Institution
1986-1989 *Research Associate*, Horn Point Environmental Laboratory
1989-1994 *Research Assistant Professor,* Horn Point Laboratory
1994-pres. *Research Associate Professor,* Horn Point Laboratory

III. Research

A. Areas of professional expertise

Algal and plant physiological ecology; regulation of photosynthesis and respiration; oxygen cycling in marine systems; estuarine denitrification; applications of membrane inlet mass spectrometry

B. Publications (since 1995)

1a. Papers in refereed journals or books.

Lewitus, A.J., R.V. Jesien, T.M. Kana, J.M. Burkholder, and E. May. 1995. Discovery of the "phantom" dinoflagellate in Chesapeake Bay. *Estuaries* 18: 373-378.

Lewitus, A.J. and T.M. Kana. 1995. Light respiration in six estuarine phytoplankton species: contrasts under autotrophic and organotrophic growth conditions. *J. Phycol.* 31:754-761.

Geider, R.J., H.L. MacIntyre, and T.M. Kana. 1996. A dynamic model of photoadaptation in phytoplankton. *Limnol. Oceanogr.*41:1-15.

Geider, R.J., H.L. MacIntyre, and T.M. Kana. 1997. A dynamic model of phytoplankton growth and acclimation: responses of the balanced growth rate and the chlorophyll a:carbon ratio to light, nutrient-limitation and temperature. *Mar. Ecol. Prog. Ser.* 148: 187-200.

Kana, T.M., R.J. Geider, C. Critchley. 1997. Photosynthetic pigment regulation in microalgae by multiple environmental factors: a dynamic balance hypothesis. *New Phytol*. 137: 629-638.

Kana, T.M., M. B. Sullivan, J.C. Cornwell and K. Groszkowski. 1998. Denitrification in estuarine sediments determined by membrane inlet mass spectrometry. *Limnol Oceanogr.* 43:334-339.

Geider, R.J., H.L. MacIntyre, and T.M. Kana. 1998. A dynamic regulatory model of phytoplanktonic acclimation of phytoplankton to light, nutrients and temperature. *Limnol. Oceanogr*. 43:679-694.

Hoge, F.E., C.W. Wright, T.M. Kana, R.M. Swift, and J.K. Yungel. 1998. Spatial Variability of oceanic phycoerythrin spectral types derived from airborne laser-induced fluorescence emissions. *Appl. Optics* 37: 4744-4749.

Cornwell, J.C., W.M. Kemp, and T.M. Kana. 1999. Denitrification in coastal ecosystems: environmental controls and aspects of spatial and temporal scale. *Aquatic Ecol.* 33:41-54.

MacIntyre, J.L., T.M. Kana, and R.J. Geider. 2000. The effect of water motion on short-term rates of photosynthesis by marine phytoplankton. Trends Plant Sci. 5: 12-17.

An, S., W.S. Gardner, and T.M. Kana. 2001. Simultaneous mesurement of denitrification and nitrogen fixation using isotope pairing with membrane inlet mass spectrometer (MIMS) analysis. Appl. Env. Microbiol. 67:1171-1178.

Geider, R.J., DeLucia E.H., Falkowski P.G., Finze A., Grime J.P., Grace J., Kana T.M., LaRoche J., Long S.P., Osborne B.A., Platt T., Prentice I.C., Raven J.A., Sathyendranath S., Schlesinger W.H., Smetacek V., Stuart V., Thomas R.B., Vogelmann T.C., Williams P. & Woodward F.I. (2001) "Forum. Primary productivity of planet earth: biological determinants and physical constraints in terrestrial and aquatic habitats." Global Change Biology, 7, 849-882.

Glibert, P.M., R.Magnien, M.W. Lomas, J. Alexander, C. Fan, E. Haramoto, M. Trice, and T.M. Kana. 2001. Harmful algal blooms in the Chesapeake and coastal bays of Maryland: comparison of 1997, 1998, and 1999 events. Estuaries 24: 875-883.

MacIntyre, H.L., T.M. Kana, T. Anning, and R.J. Geider. 2002. Photoacclimation of photosynthesis irradiance response cures and photosynthetic pigments in microalgae and cyanobacteria. J. Phycol. 38: 17-38.

Ben J. Longstaff, Tim Kildea, John W. Runcie, Anthony Cheshire, William C. Dennison, Catriona Hurd, Todd Kana, John A. Raven & Anthony W.D. Larkum. 2002. An *in situ* study of photosynthetic O_2 exchange and electron transport rate using the marine macroalga *Ulva lactuca* (Chlorophyta). Photosyn. Res. 74: 281-293.

Suggett, D.J., K Oxborough, N.R. Baker, H.L. MacIntyre, T.M. Kana, and R.J. Geider. 2003. Evaluation of Fast Repetition Rate and Pulse Amplitude Modulation fluorescence measurements for estimating photosynthetic electron transport in marine phytoplankton. Euro. J. Phycol. 38 (4): 371-384.

Kana, T.M. and D.L. Weiss. 2004. Comment on "Comparison of isotope pairing and N_2/Ar methods for measured sediments" by B.D. Eyre, S. Rysaard, T. Dalsgaard, and P. Bondo Christensen. 2002. Estuaries 25: 1077-1087. Estuaries 27: 157-160.

MacIntyre, H. L., M. W. Lomas, J. Cornwell, D. J. Suggett, C. J. Gobler, E. W. Koch and T. M. Kana. 2004. Mediation of benthic-pelagic coupling by microphytobenthos: An energy- and material-based model for initiation of blooms of *Aureococcus anophagefferens*. Harmful Algae 3: 403-437.

Lomas, M. W., T. M. Kana, H. L. MacIntyre, J. C. Cornwell. 2004. Interannual variability of Aureococcus anophagefferens in Quantuck Bay Long Island: Natural test of the DON hypothesis. Harmful Algae.3: 389-402

Kana, T M., M W. Lomas, H. L. MacIntyre, J. C. Cornwell and C. J. Gobler. 2004. Stimulation of the brown tide organism, *Aureococcus anophagefferens*, by selective nutrient additions to in situ mesocosms. Harmful Algae. 3:377-388.

Groffman, P.M., M.A. Altabet, J.K. Böhlke, K. Butterbach-Bahl, M. B. David, M.K. Firestone, A.E. Giblin, T.M. Kana, L.P. Nielsen and M.A. Voytek. 2006. Methods for measuring denitrification: Diverse approaches to a difficult problem. Ecological Applications. 16: 2091-2122.

Kana, T.M., J.C. Cornwell, L. Zhong. 2006. Determination of denitrification in the Chesapeake Bay from measurements of N_2 accumulation in bottom water. Estuaries and Coasts 29:222-231.

Glibert, P.M. and 56 other authors. 2008. Ocean urea fertilization for carbon credits poses high ecological risks. Mar. Pollution Bull. 56: 1049-1056.

Glibert, P.M., J.M. Burkholder, T. M. Kana, J. Alexander, H. Skelton and C. Shilling. 2009. Grazing by *Karenia brevis* on *Synechococcus* enhances their growth rate and may help to sustain blooms. Aquatic Microbial Ecol. 55:17-30.

Suggett, D.J., H.L. MacIntyre, T.M. Kana, R.J. Geider. 2009. Comparing electron transport with gas exchange: parameterising exchange rates between alternative photosynthetic currencies for eukaryotic phytoplankton. Aquatic Microbial Ecol. 56: 147-162.

Glibert, P.M., D. Fullerton, J.M. Burkholder, J.C. Cornwell and T.M. Kana. 2011. Ecological Stoichiometry, Biogeochemical Cycling, Invasive Species, and Aquatic Food Webs: San Francisco Estuary and Comparative Systems. Reviews Fish. Sci. 19: 358-417.

Glibert, P.M., J.M. Burkholder and T.M. Kana. 2012. Recent insights about relationships between nutrient availability, forms, and stoichiometry, and the distribution, ecophysiology, and food web effects of pelagic and benthic Prorocentrum species. Harmful Algae. 14: 231-259.

Glibert, P.M., T. M. Kana, K. Brown. 2012 (in press). From limitation to excess: the consequences of substrate excess and stoichiometry for phytoplankton physiology, trophodynamics and biogeochemistry, and the implications for modeling. J. Marine Systems. http://dx.doi.org/10.1016/j.jmarsys.2012.10.004

Li, X.B., Y.Q. Xia, Y.F. Li, X.Y., T. M. Kana, S.D. Kimura, M. Saito and X.Y. Yan. In press 2013. Sediment denitrification in waterways in a rice-paddy-dominated watershed in eastern China. J. Soils and Sediments. DOI 10.1007/s11368-013-0651-0

1b. Papers submitted.

Zhao, Y.Q, Y.Q. Xia, T.M. Kana, Y.C. Wu, X.B. Li, X.Y. Yan. Submitted. Measurement of anaerobic ammonium oxidation in an agricultural river system using membrane inlet mass spectrometry and ^{15}N isotope pairing. Env. Sci. Technol.

Stout, L.M, T.M. Kana and D.P Jaisi. Submitted. Application of phosphate oxygen isotope ratios to study microbial activity. Env. Sci. Technol.

2. Book Chapters

Fisher, T.R., A.B. Gustafson, A.I. Koskelo, R.J. Fox, T. Kana, K.A. Beckert, J.P. Stone. 2010. The Choptank Basin in Transition: intensifying Agriculture, slow Urbanization, and Estuarine Eutrophication. In: Coastal Lagoons: Critical Habitats of Environmental Change.

Inglett, P.W., T.M. Kana, and S. An. Submitted. Denitrification measurement using membrane inlet mass spectrometry. In: R. DeLaune (ed.) Methods in Biogeochemistry of Wetlands. Soil Science Society of America.

2. Web based products

Online Training module for the Denitrification Research Coordination Network: The use of membrane inlet mass spectrometry (MIMS) for the measurement of high precision N2/Ar ratios. Located at www.denitrification.org

C. Contracts and Grants (as senior investigator except where noted)

1. Awarded (activity since 1995)

National Science Foundation

How do phytoplankton adapt to fluctuating light? Response of the photosynthetic apparatus to intermittent exposure to bright light. 6/1/93-5/31/96. $96,648 (Kana's component). Co-principal investigator with R.J. Geider (U. Delaware) (15%).

The role of alternative respiration in marine phytoplankton. 12/1/93-11/30/96. $125,378 (Kana's component). Co-principal investigator with A.J. Lewitus (Univ. So. Carolina) (10%)

Denitrification in tidal river-marsh ecosystems. 9/1/96-8/31/99. $249,985. J. Cornwell, co-PI. (30%)

On a dynamic balance theory of photosynthetic pigment regulation in unicellular algae: tests of a novel hypothesis. 8/1/96-7/31/99. $338,753. (40%)

Coping with darkness: The physiological responses of marine microalgae to aphotic conditions and their ecological implications. 3/15/98-3/14/01. $264,598. Co-principal investigator with H. MacIntyre and E. Koch. (10%)

Phytoplankton Photochemical Budgets: translating optical measurements to productivity. 2/15/00-1/14/03 (awarded and anticipated period). $387,014. T. Kana, PI. H. MacIntyre co-PI. (25%)

BioComplexity of Aquatic Microbial Systems: Relating Diversity of Microorganisms to Ecosystem Function. 4/1/00-3/31/05 $1,863,080 approx. B. Ward (Princeton), PI. T. Kana one of 8 co-PIs. (18%)

Oxygen consumption and isotope fractionation in marine phytoplankton. 8/1/07-7/30/10. $396,776. Principal Investigator (25%).

Maryland Water Resources Research Center

Direct ecosystem-integrated measurement of denitrification in a Chesapeake Bay tributary and tidal embayment. 5/1/92-4/30/93. $23,000. (15%)

Denitrification in estuarine systems: new approaches using a rapid, high precision method for N_2 measurements. 5/1/93-4/30/94. $22,500 (15%)

US EPA

Multiscale Experimental Ecosystem Research Center (MEERC). Regulation of SAV photosynthesis by environmental stressors: evaluation of PAM fluorometry for the measurement of primary productivity and stress effects. Principal investigator. 1/1/95-12/31/95, $31,140. (8%)

Multiscale Experimental Ecosystem Research Center (MEERC). Productivity in submersed aquatic vegetation. 1/1/96-12/31/96. ca. $16,000. (8%)

US Department of Agriculture

Northeast Regional Aquaculture Center: Water quality and waste management in aquaculture production. (Co-principal investigator with R. Harrell, P. Glibert and J. Cornwell) 5/1/95 - 8/15/95; $37,284. (8%)

National Research Initiative - Competitive Grants: Looking inside the black box: nutrient cycling in estuarine aquaculture ponds. (Co-principal investigator with P. Glibert and C. Miller) 7/1/95 - 6/30/97; ca. $156,600. (8%)

NOAA

New York Sea Grant:

Mechanisms for nutrient and energy acquisition in low light: successful strategies of *Aureococcus anophagefferens*. Co-PI with P. Glibert, P.I. 9/1/97-8/31/99. $140,031. (15%)

ECOHAB: Benthic-pelagic coupling and LI brown tide. 9/1/99-8/30/02. $587,399. T.Kana, PI. H. MacIntyre and J. Cornwell, co-PIs. (18%).

MD Sea Grant:

Nutrient cycling in oligohaline sediments and marshes: is denitrification a major sink for nitrogen? Co-principal investigator with J. Cornwell. 2/1/98-1/31/00. $111,109. (15%)

Environmental Controls of Denitrification in Estuarine Sediments. 2/1/00-1/31/02. $124,652. J. Cornwell, PI. T. Kana, co-PI.

Predicting the restoration trajectory and water quality value of benthic microalgae in shallow water Chesapeake sediments. 2/1/05-1/31/07. $140,190. 1 mo./year. J Cornwell, PI. T. Kana, co-PI.

Method assessment for DNRA measurements and application to the Coastal Bays. 2/1/11-1/31/12. Approx. $80,000 pending final funding decision. P.M. Glibert (PI) and T. M. Kana (co-PI).

D. Conferences (Invited – last 5 years)

Workshop on Advanced Approaches to Quantify Denitrification. Woods Hole Research Center, Woods Hole, MA May 2004. Talk titled: Direct N2 Quantitation: Opportunities and challenges of using direct N2 measurements of denitrification.

Workshop on Respiration and Planktonic Food Webs. Vigo Spain. June 2006 Talk titled: Perspectives on the measurement of respiration in aquatic systems.

E. Meetings (poster or oral presentations – last 5 years

Maryland Water Monitoring Council Annual Conference, Linthicum, MD, Nov. 2006. Kana, T.M., J. C. Cornwell, and T. R. Fisher. Applications of rapid high precision measurements of dissolved nitrogen and argon for assessment of denitrification.

ASLO, Santa Fe, Feb. 2007, Fisher, T. R., Gustafson, A. B., Sutton, A, J, Kana, T, McCarty, G. Staver, K, Jordan, T. E., Fogel, M. Groundwater denitrification of agricultural nitrate.

USEPA NCER, Kansas City, April 2007. Thomas R. Fisher, Anne B. Gustafson, Adrienne J. Sutton, Todd Kana, Thomas E. Jordan, Kenneth W. Staver, and Marilyn L. Fogel. Reduction of NO_3 losses from crop fields associated with controlled drainage structures in the Choptank River basin.

ASLO – Nice France, Feb. 2009. Gsilassie, T. and T. M. Kana. Application of membrane inlet mass spectrometry to assess bubble formation in productivity and denitrification experiments.

Memberships in Professional Societies 1998

American Society of Limnology and Oceanography, American Geophysical Union.

III. Teaching and Training

1987-1997 Associate member, UMCES Graduate Faculty
1997-present: Member, USM Inter-Institutional Graduate Faculty

A. University System of Maryland courses taught

Course no.	Title	Instit.	Semester	Enrol.	Credits	Co-instructors
MEES 608	Regulation of photosynthesis	HPL	Fall 1994	8	1	

MEES 699	Plant Physiological Ecology	HPL	Sum 1995	6	2	
MEES 698T	Methods in Photosyn: PAM Fluorometry	HPL	Spring 1997	4	1	
MEES 608K	Primary Productivity	HPL	Fall 1997	6	1	Harding
MEES 698M	Regulation of Photosynthesis and Primary Production	HPL	Fall 1999	8	3	MacIntyre, Lomas
MEES 608	Oxygen (seminar)	HPL	Spring 2004	2	1	
MEES 608J	Algal and Plant Physiology (seminar)	HPL	Spring 2006	4	1	
MEES 698B	Phytoplankton Ecological Physiology	HPL	January 2007	5	2	Glibert
MEES 698C	Phytoplankton Ecol. Phys. Laboratory	HPL	January 2007	5	1	Glibert
MEES 608P	Aquatic Plant Physiology	HPL	Fall 2008	4	1	
MEES 699	Practical Mass Spectrometry	HPL	Spring 2009	6	1	
MEES 698P	Phytoplankton Physiological Ecology	HPL	January 2013	5	3	Glibert, Stoecker

B. Graduate students supervised as major advisor:

Degrees completed

Scheppe, K.D.; M.S. MEES. 1997. HPL. “Light Dependent respiration in estuarine phytoplankton.”

Hentschke, P.G.; M.S. MEES. 1997. HPL. “A fluorescence-based method for determining true gross photosynthesis reveals a significant photorespiratory flux in *Potomogeton perfoliatus* L.

Graduate Student Committee Memberships

Daniel Lee	Ph.D	MEES	HPL
Christopher Chick	M.S.	MEES	HPL
Carina Chiscano	M.S.	MEES	HPL
Theresa Coley	M.S.	MEES	HPL
Kelly Cunningham	Ph.D.	MEES	CBL
Joyce Dewar	Ph.D.	MEES	HPL
Chung Lei Fan	Ph.D.	MEES	HPL
Rebecca Fox	Ph.D.	MEES	HPL
Eric Haberkern	M.S.	MEES	HPL
Matthew Johnson	Ph.D.	MEES	HPL
Terry Jordan	M.S.	MEES	HPL
Daniel Lee	Ph.D	MEES	HPL
Hugh MacIntyre	Ph.D.	Oceanography	U Delaware
Mark Monaco	Ph.D.	MEES	HPL
Michael Owens	M.S.	MEES	HPL
John Peterson	Ph.D.	MEES	HPL
Catherine Stokes	M.S.	MEES	HPL

Outreach and Service

A. HPL Committees (since 1994)

Library Committee 1994-1995.
Seminar Committee 1994-1996.
Computer Committee 1995-1996.
Seminar Committee 1997-1998.
Computer Committee 1998-1999.
Library Committee 2000-2001; 2004-.

B. Public Lectures

Shallow water: influence of the bay bottom on brown tide events. BTRI Information Symposium, NY Sea Grant. Southampton, NY. March 10, 2001

C. Journal Services

a. Associate editor Limnology and Oceanography Methods 2009-present