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Education

1979–81, University of Missouri, Columbia, Department of Forestry and Wildlife
1984 B.A. (Hons.), University of California, Santa Barbara, Department of Biology
1986 M.A., Duke University Graduate School, Department of Microbiology and Immunology
1992 Ph.D., Massachusetts Institute of Technology - Woods Hole Oceanographic Institution Joint
Program in Biological Oceanography
1992-94, Postdoctoral Fellow Monterey Bay Aquarium Research Institute (MBARI)

Professional Work Experience

1986–87, University of South Carolina, Columbia, Research Assistant Professor
1994–97, MBARI, Assistant Scientist I
1997–2001, MBARI, Associate Scientist II
2001–2006, MBARI, Associate Scientist III
July 2005–present, Chair, MBARI Research Division
2006–present, MBARI, Senior Scientist IV

Current Committee Service

External advisory committee for the University of Miami's NSF-NIEHS Oceans & Human Health Center
(<http://www.rsmas.miami.edu/groups/ohh/>)

National Harmful Algal Bloom Committee (NHC)

The mission of the NHC is to facilitate coordination and communication of activities for the US HAB community at a national level. An additional more specific goal is to oversee implementation of the HARNNESS science plan (<http://www.whoi.edu/redtide/nationplan/2005nationalplan.html>)

New Manuscripts

Preston, C. M., R. Marin III, S. Jenson, J. Feldman, E. Massion, E. DeLong, J. Jones, D. Cline, and C. Scholin. Near real-time, autonomous detection of marine bacterioplankton on a coastal mooring in Monterey Bay, California using rRNA-targeted DNA probe arrays. *Applied and Environmental Microbiology* (in revision).

Haywood, A.J., C. A. Scholin, R. Marin III, K. A. Steidinger, C. A. Heil and J. Ray. Molecular detection of the brevetoxin-producing dinoflagellate *Karenia brevis* (Dinophyceae) and closely related species using ribosomal RNA probes and a semi-automated sandwich hybridization assay. *Journal of Phycology* (in revision).

Selected Peer Reviewed Publications

Roman, B., C. Scholin, S. Jensen, E. Massion, R. Marin III, C. Preston, D. Greenfield, W. Jones, and K. Wheeler. In press. Controlling a Robotic Marine Water Sampler with the Ruby Scripting Language. *Journal of American Laboratory Automation*.

- Scholin, C.A., G.J. Doucette, and A.D. Cembella. In press. Prospects for developing automated systems for in situ detection of harmful algae and their toxins. In: M. Babin, C.S. Roesler and J.J. Cullen (eds.) *Real-Time Coastal Observing Systems for Ecosystem Dynamics and Harmful Algal Blooms*, UNESCO Publishing, Paris, France.
- Greenfield, D.I., R. Marin III, S. Jensen, E. Massion, B. Roman, J. Feldman, C. Scholin. 2006 Application of the Environmental Sample Processor (ESP) methodology for quantifying *Pseudo-nitzschia australis* using ribosomal RNA-targeted probes in sandwich and fluorescent *in situ* hybridization. *Limnology and Oceanography: Methods* **4**: 426-435.
- Metfies, K., K. Töbe, C. Scholin, and L.K. Medlin. 2006. Laboratory and field applications of ribosomal RNA probes to aid the detection and monitoring of harmful algae. In: *Ecology of Harmful Algae* (Granéli, E., and Turner, J.T. eds), pp. 311-325. Springer Verlag, Berlin, Heidelberg, New York.
- Lundholm, N., Ø. Moestrup, Y. Kotaki, C. Scholin, P. Miller. 2006. Inter- and intraspecific variation of the *Pseudo-nitzschia delicatissima*-complex (Bacillariophyceae) illustrated by rRNA probes, morphological data and phylogenetic analyses identification of *P. decipiens* and *P. dolorosa* spp. Nov. *Journal of Phycology* **42**: 464-481.
- O'Halloran, C., M.W. Silver, T.R. Holman and C.A. Scholin. 2006. *Heterosigma akashiwo* in Central California Waters. *Harmful Algae* **5**: 124-132.
- Goffredi, S.K., W. Jones, C. Scholin, R. Marin, S. Hallam, R.C. Vrijenhoek. 2005. Molecular detection of marine larvae. *Marine Biotechnology* **8**: 1-12.
- Ayers K, Rhodes L, Tyrrell J, Gladstone M, Scholin C. 2005. International accreditation of sandwich hybridisation assay format DNA probes for micro-algae. *New Zealand J. Marine and Freshwater Res.* **39**: 1225–1231.
- Anderson, D.M., D.M. Kulis, B.A. Keafer, K.E. Gribble, R. Marin and C.A. Scholin. 2005. Identification and enumeration of *Alexandrium* spp. from the Gulf of Maine using molecular probes. *Deep-Sea Research II* **52**: 2467-2490.
- LaGier, M.J., C.A. Scholin, J.W. Fell, J.Wang and K.D. Goodwin. 2005. An electrochemical RNA hybridization assay for detection of the fecal indicator bacterium *Escherichia coli*. *Marine Pollution Bulletin* **50**: 1251-1261.
- Babin, M., J.J. Cullen, C.S. Roesler, P.L. Donaghay, G.J. Doucette, M. Kahru, M.R. Lewis, C.A. Scholin, M.E. Sieracki, and H.M. Sosik. 2005. New approaches and technologies for observing harmful algal blooms. *Oceanography* **18**: 210-227.
- Ryan, J.P., H.M. Dierssen, R.M. Kudela, C.A. Scholin, K. S. Johnson, J.M. Sullivan, A.M. Fisher, E.V., Rienecker, P.R. McEnany, and F.P. Chavez. 2005. Coastal Ocean Physics and red tides: an example from Monterey Bay, California. *Oceanography* **18**: 246-255.
- Matweyou, J.A., D.A. Stockwell, C.A. Scholin, S. Hall, V.L. Trainer, J.D. Ray, T.E. Whitledge, A.R. Childers, F.G. Plumley. 2004. Use of *Alexandrium* rRNA targeted probes to predict PSP events on Kodiak Island, Alaska. In: K. A. Steidinger, J. H. Landsberg, C. R. Tomas and G. A. Vargo (eds.) *Harmful Algae 2002*, pp. 267-269. Florida Fish and Wildlife Conservation Commission, Florida Institute

of Oceanography, and Intergovernmental Oceanographic Commission of UNESCO. St. Petersburg, Florida, USA.

Miller, P.E., R. Marin III, C. Scholin, J.C. Goldman, G. Doucette, C. Powell. 2004. Variation in reactivity of rRNA-targeted probes towards *Pseudo-nitzschia multiseriata* grown in nitrate- and silicate-limited continuous cultures. In K. A. Steidinger, J. H. Landsberg, C. R. Tomas and G. A. Vargo (eds.) *Harmful Algae 2002*, pp. 270-272. Florida Fish and Wildlife Conservation Commission, Florida Institute of Oceanography, and Intergovernmental Oceanographic Commission of UNESCO. St. Petersburg, Florida, USA.

Rhodes, L., A. Haywood, J. Adamson, K. Ponikla, C. Scholin. 2004. DNA probes for the rapid detection of *Karenia* species in New Zealand's coastal waters. In K. A. Steidinger, J. H. Landsberg, C. R. Tomas and G. A. Vargo (eds.) *Harmful Algae 2002*, pp. 273-275. Florida Fish and Wildlife Conservation Commission, Florida Institute of Oceanography, and Intergovernmental Oceanographic Commission of UNESCO. St. Petersburg, Florida, USA.

Scholin, C.A., E. Vrieling, L. Peperzak, L. Rhodes and P. Rublee. 2003. Detection of HAB species using lectin, antibody and DNA probes. In: G.M. Hallegraeff, D.M. Anderson A.D. Cembella (eds), *Manual on Harmful Marine Microalgae*, pp. 131-64. Paris, Intergovernmental Oceanographic Commission, UNESCO. (Vol. 11. Second Edition).

Tyrrell, J.V., L.B. Connell and C.A. Scholin. 2002. Monitoring for *Heterosigma akashiwo* using a sandwich hybridization assay. *Harmful Algae* **1**:205-214.

Peperzak, L., B. Sandee, C. Scholin, P. Miller and L. Van Nieuwerburgh. 2001. Application and flow cytometric detection of antibody and rRNA probes to *Gymnodinium mikimotoi* (Dinophyceae) and *Pseudo-nitzschia multiseriata* (Bacillariophyceae). In: G. M. Hallegraeff, S. I. Blackburn, C. J. Bolch and R. J. Lewis [Eds.]. *Harmful Algal Blooms 2000*, pp 206-209. Intergovernmental Oceanographic Commission of UNESCO.

Rhodes, L., C.A. Scholin, J.V. Tyrrell, J. Adamson and K. Todd, K. 2001. The integration of DNA probes into New Zealand's routine phytoplankton monitoring programs. In: G. M. Hallegraeff, S. I. Blackburn, C. J. Bolch and R. J. Lewis (eds). *Harmful Algal Blooms 2000*, pp. 429-432. Intergovernmental Oceanographic Commission of UNESCO.

Tyrrell, J.V., C.A. Scholin, P.R. Bergquist and P.L. Bergquist. 2001. Detection and enumeration of *Heterosigma akashiwo* and *Fibrocapsa japonica* (Raphidophyceae) using rRNA-targeted oligonucleotide probes. *Phycologia* **40**: 457-467.

Rhodes, L.L., J. Adamson, and C. Scholin. 2000. *Pseudo-nitzschia multistriata* (Bacillariophyceae) in New Zealand. *New Zealand Journal of Marine and Freshwater Research* **34**:463-467.

Miller, P.E. and C.A. Scholin. 2000. On detection of *Pseudo-nitzschia* species using rRNA-targeted probes: sample fixation and stability. *Journal of Phycology* **36**: 238-250.

Scholin, C.A., F. Gulland, G. Doucette and others. 2000. Mortality of sea lions along the central California coast linked to a toxic diatom bloom. *Nature* **403**: 80-84.

Scholin, C., R. Marin, P. Miller, G. Doucette, C. Powell, J. Howard., P. Haydock and J. Ray. 1999. Application of DNA probes and a receptor binding assay for detection of *Pseudo-nitzschia*

(Bacillariophyceae) species and domoic acid activity in cultured and natural samples. *Journal of Phycology* **35**: 1356-1367.

Parsons, M.L., C. Scholin, G. Doucette, G.A. Fryxell, Q. Dortch and T.M. Soniat. 1999. *Pseudo-nitzschia* species (Bacillariophyceae) in Louisiana coastal waters: molecular probe field trials, genetic variability and domoic acid analyses. *Journal of Phycology* **35**: 1368-1378.

Bates, S.S., Scholin, C.A., Ferguson, M. & Leger, C. 1999. Application of ribosomal RNA-targeted probes to detect *Pseudo-nitzschia multiseriata* and *P. pungens* in Atlantic Canadian waters. *Canadian Technical Reports of Fisheries and Aquatic Sciences* **2261**:63-67.

Rhodes, L., C. Scholin and I Garthwaite. 1998. *Pseudo-nitzschia* in New Zealand and the role of DNA probes and immunoassays in refining marine biotoxin monitoring programmes. *Natural Toxins* **6**: 105-111.

Scholin, C., G. Massion, E. Mellinger, M. Brown, D. Wright and D. Cline. 1998. The development and application of molecular probes and novel instrumentation for detection of harmful algae. *Ocean Community Conference '98 Proceedings*, Marine Technology Society, Vol. 1 pp. 367-370.

Scholin, C.A. and D.M. Anderson. 1998. Detection and quantification of HAB species using antibody and DNA probes: progress to date and future research objectives. In: Regura, B., Blanco, J., Fernandez, M.L. and Wyatt, T [Eds.], *Harmful Algae*. Xunta de Galicia and Intergovernmental Oceanographic Commission of UNESCO pp. 253-257.

Rhodes, L., C. Scholin, I. Garthwaite, A. Haywood and A. Thomas. 1998. Domoic acid-producing *Pseudo-nitzschia* species detected by whole cell DNA probe-based and immunochemical assays. In: Regura, B., Blanco, J., Fernandez, M.L. and Wyatt, T [Eds.], *Harmful Algae*. Xunta de Galicia and Intergovernmental Oceanographic Commission of UNESCO pp. 274-277.

Miller, P.E. and C.A. Scholin. 1998. Identification and enumeration of cultured and wild *Pseudo-nitzschia* (Bacillariophyceae) using species-specific LSU rRNA-targeted fluorescent probes and filter-based whole cell hybridization. *Journal of Phycology* **34**: 371-382.

Scholin, C.A. Development of nucleic acid probe-based diagnostics for identifying and enumerating harmful algal bloom species. 1998. In: Anderson, D.M., Hallegraeff, G.M. and Cembella A.D. [Eds.], *The Physiological Ecology of Harmful Algal Blooms*. NATO Advanced Study Institute Series. Springer-Verlag, Heidelberg pp. 337-349.

Scholin, C.A. Morphological, genetic and biogeographic relationships of *Alexandrium tamarense*, *A. catenella* and *A. fundyense*. 1998. In: Anderson, D.M., Hallegraeff, G.M. and Cembella A.D. [Eds.], *The Physiological Ecology of Harmful Algal Blooms*. NATO Advanced Study Institute Series. Springer-Verlag, Heidelberg. pp 13-27.

Cangelosi, G.A., A.M. Hamlin, R. Marin III, C.A. Scholin. Detection of stable pre-rRNA in toxigenic *Pseudo-nitzschia* species. 1997. *Applied and Environmental Microbiology* **63**: 4859-4865.

Scholin, C.A., P. Miller, K. Buck, F. Chavez, P. Harris, P. Haydock, J. Howard and G. Cangelosi. 1997. Detection and quantification of *Pseudo-nitzschia australis* in cultured and natural populations using LSU rRNA-targeted probes. *Limnology and Oceanography* **42**: 1265-1272.

- Scholin, C.A. and D.M. Anderson. 1996. LSU rDNA-based RFLP assays for discriminating species and strains of *Alexandrium* (Dinophyceae). *Journal of Phycology* **32**: 1022-1035.
- Miller, P.E. and C.A. Scholin. 1996. Identification of cultured *Pseudo-nitzschia* (Bacillariophyceae) using species-specific LSU rRNA-targeted fluorescent probes. *Journal of Phycology* **32**: 646-655.
- Scholin, C. and D.M. Anderson. 1996. Identification of *Alexandrium* species and strains using RFLP analysis of PCR-amplified LSU rDNA. In: Oshima, Y and Fukuyo, Y [Eds.] *Harmful and Toxic Algal Blooms*, Intergovernmental Oceanographic Commission of UNESCO, Paris. pp 451-454.
- Scholin, C., P. Miller, K. Buck, F. Chavez, G. Cangelosi, P. Haydock, J. Howard and P. Harris. 1996. DNA Probe-based detection of harmful algal species using *Pseudo-nitzschia* species as models. In: Oshima, Y and Fukuyo, Y [Eds.] *Harmful and Toxic Algal Blooms*, Intergovernmental Oceanographic Commission of UNESCO, Paris. pp 439-442.
- Vrieling, E., R. Koeman, C. Scholin, P. Scheerman, L. Peperzak, M. Veenhuis and W. Gieskes. 1996. Detection of a domoic acid-producing *Pseudo-nitzschia* species in the Dutch Wadden Sea by electron microscopy and molecular probes. *European Journal of Phycology* **31**: 333-340.
- Scholin, C.A., K.R. Buck, T. Britschgi, J. Cangelosi and F.P. Chavez. 1996. Identification of *Pseudo-nitzschia australis* (Bacillariophyceae) using rRNA-targeted probes in whole cell and sandwich hybridization formats. *Phycologia* **35**: 190-197.
- Scholin, C.A., G.M. Hallegraeff and D.M. Anderson. 1995. Molecular evolution of the *Alexandrium tamarensis* "species complex" (Dinophyceae): dispersal in the North American and West Pacific regions. *Phycologia* **34**: 472-485.
- Scholin, C.A. and D.M. Anderson. 1994. Identification of species and strain-specific genetic markers for globally distributed *Alexandrium* (Dinophyceae). I. RFLP analysis of SSU rRNA genes. *Journal of Phycology* **30**: 744-754.
- Scholin, C.A., M. Herzog, M.L. Sogin and D.M. Anderson. 1994. Identification of group and strain-specific genetic markers for globally distributed *Alexandrium* (Dinophyceae). II. Sequence analysis of a fragment of the LSU rRNA gene. *Journal of Phycology* **30**: 999-1011.
- Scholin, C.A., M.C. Villac, K.R. Buck, J.M. Krupp, D.A. Powers, G.A. Fryxell and F.P. Chavez. 1994. Ribosomal DNA sequences discriminate among toxic and non-toxic *Pseudonitzschia* species. *Natural Toxins* **2**: 152-165.
- Judge, B.S., C.A. Scholin and D. M. Anderson. 1993. RFLP analysis of the large-subunit ribosomal RNA gene of globally distributed populations of the toxic dinoflagellate *Alexandrium*. *Biological Bulletin* **185**: 329-330.
- Scholin, C.A. and D.M. Anderson. 1993. Population analysis of toxic and non-toxic *Alexandrium* species using ribosomal RNA signature sequences. In: Smayda, T.J., and Shimizu, Y. [Eds.], *Toxic Phytoplankton Blooms in the Sea*. Elsevier, New York, pp. 95-102.
- Scholin, C.A., D.M. Anderson and M. Sogin. 1993. The existence of two distinct small-subunit rRNA genes in the toxic dinoflagellate *Alexandrium fundyense*. *Journal of Phycology* **29**: 209-216.

Lenaers, G., C. A. Scholin, Y. Bhaud, D. Saint-Hilaire and M. Herzog. 1991. A molecular phylogeny of dinoflagellate protists (Pyrrhophyta) inferred from the sequence of the 24S rRNA divergent domains D1 and D8. *Journal of Molecular Evolution* **32**: 53-63.

Yoch, D.C., J. Li, C-Z. Hu and C.A. Scholin. 1988. Ammonia switch-off of nitrogenase from *Rhodobacter sphaeroides* and *Methylosinus trichosporium*: no evidence for Fe protein modification. *Archives of Microbiology* **150**: 1-5.

Selected Contributions

Roman, B., C. Scholin, S. Jensen, R. Marin III, E. Massion, and J. Feldman. The 2nd generation environmental sample processor: Evolution of a robotic underwater biochemical laboratory. Proceedings, OCEANS 2005 MTS/IEEE Conference. Washington, D.C. 2004. Marine Technology Society, Columbia, MD. ISBN CD-ROM 0-933957-33-5.

Selected Reports

Scholin, C.A. 2003. Molecular Biological Technologies Applicable to Autonomous and Lagrangian Platforms (invited white paper presented at the Autonomous and Lagrangian Platforms and Sensors (ALPS) workshop, Scripps Institute of Oceanography, March '03; available at: http://www.geoprose.com/ALPS/white_papers.html).

Littaker, W., C. Scholin, G.R. Vasta. 2000. *Molecular approaches for identification and environmental detection of Pfiesteria piscicida and Pfiesteria-like dinoflagellates*. Workshop held at the Center of Marine Biotechnology September 1999, Baltimore, MD.

Scholin, C.A., N. Wainwright and G.M. Hallegraeff. 1994. *Feasibility of developing a rapid diagnostic test for toxic dinoflagellates in ships' ballast water*. Report for the Australian Quarantine and Inspection Service.

Professional Societies

American Society of Limnology and Oceanography
Phycological Society of America
International Phycological Society
International Society for the Study of Harmful Algae

Selected Workshops and Training Courses

National plan for algal toxins and harmful algal blooms steering committee member.

HARRNESS (Harmful Algae Research and Response: A National Environmental Science Strategy). Charleston, SC, March 2004.

Molecular Probe Technology for the Detection of Harmful Algae. Workshop, May '02, Galway, Ireland. (lab demonstrations)

HAB Probe Workshop, MBARI, March 2001 (lab demonstrations/training course)

HAB Tech 2000, Nelson, New Zealand, February 2000 (lab demonstrations)

IOC training course on the taxonomy and biology of harmful marine microalgae, Copenhagen, Denmark, January 1999.

Molecular approaches for identification and environmental detection of *Pfiesteria piscicida* and *Pfiesteria*-like dinoflagellates Baltimore, MD, September 1999.

Workshop on Developing a U. S. Coastal Observing System, Solomons, MD, May 1999.

New Zealand Marine Biotoxins Workshop No. 8. Wellington, New Zealand, November 1997

EPA Workshop on Harmful Algal Blooms, Pensacola Beach, FL, October 1997.

NOAA Assessment of the management and mitigation of harmful algal blooms in coastal waters, Seattle, WA, September 1996.
NATO ASI on the Physiological Ecology of Harmful Algae, Bermuda, May 1996.
Workshop on Molecular Evolution, Woods Hole, MA, August 1995.
The Ecology and Oceanography of Harmful Algal Blooms, Snow Mtn Ranch, CO, August 1994.

Selected Invited Presentations

Institute of Industrial Science, University of Tokyo – *In Situ 05*, November 2005
Earth system Initiative Symposium, M.I.T., Boston, MA, October 2005
National plan for algal toxins and harmful algal blooms, workshop, Chaleston, SC, March 2004.
10th International Conference on Harmful Algae, St. Petersburg, FL, October 2002.
9th International Conference on Harmful Algal Blooms, Hobart, Australia, February 2000.
Ocean Technology Society, Baltimore, MD, November 1998.
Phycological Society of America, Flagstaff, AZ, August 1998.
8th International Conference on Toxic Marine Algae. Vigo, Spain, June 1997.
NATO ASI, The Physiological Ecology of Harmful Algae, Bermuda May 1996
AGU/ASLO, Ecology & Oceanography of Harmful Algal Blooms, San Diego, CA, Feb. 1996.
7th International Conference on Toxic Marine Algae, Sendai, Japan, July 1995.
ASLO/Phycological Society of America, Ecology of Algal Toxins, Miami, FL, June 1994.
6th International Conference on Toxic Marine Algae, Nantes, France, Oct. 1993.
5th International Conference on Toxic Marine Algae, Newport Rhode Island, Oct. 1991.

Patents

Anderson, D.M., and Scholin, C.A. 1996. Genetic markers and methods of identifying *Alexandrium* (Dinophyceae) species. US Pat. No. 5582983.
Scholin, C.A., Haydock, P., and Cangelosi, G. 1999. Detection of toxigenic marine pennate diatoms of the genus *Pseudo-nitzschia* US Pat. No. 5958689.
Scholin, C.A., Massion, E.I., Wright, D.K., Cline, D.E., Mellinger, E., Brown, M. 2001. Aquatic autosampler device. US Pat. No. 6187530.
Tyrrell, J.V., Scholin, C.A., Bergquist, P., and Bergquist, P. 2004. Composition and methods for detecting Raphidophytes. US Pat. No. 6787648