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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/>)

### **Manuscripts in Review**

Scholin, C. What are “ecogenomic sensors?” A review and thoughts for the future. *Ocean Science Discussions*.

Preston, C., R. Marin III, S. Jenson, J. Feldman, E. Massion, E. DeLong, M. Suzuki, K. Wheeler, D. Cline, N. Alvarado, and C. Scholin. Near real-time, autonomous detection of marine bacterioplankton on a coastal mooring in Monterey Bay, California, using rRNA-targeted DNA probes. *Environmental Microbiology*.

Greenfield, D., R. Marin III, G.J. Doucette, C. Mikulski, S. Jensen, B. Roman, N. Alvarado, C.A. Scholin. Field applications of the second-generation Environmental Sample Processor (ESP) for remote detection of harmful algae: 2006-2007. *Limnology and Oceanography: Methods*.

Haywood, A. J., Scholin, C.A., Marin III, R., Petrik, K., Pigg, R., Garrett, M., Steidinger, K. A., and Heil, C. Detection of *Karenia brevis* in Florida coastal waters using sandwich hybridization assays in two formats. *New Zealand Journal of Marine and Freshwater Research*.

### **Selected Peer Reviewed Publications**

Marin III, R., and C. Scholin. Sandwich Hybridization. In: *Microscopic and molecular methods for quantitative phytoplankton analysis* (Ed. B. Edvardsson et al.). IOC Manuals and Guides (in press).

Scholin, C.A., G.J. Doucette, and A.D. Cembella. 2008. 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*, pp 413-462, UNESCO Publishing, Paris, France.

Mikulski, C.M., Y.T. Park, K.L. Jones, C.K. Lee, W.A. Lim, C.A. Scholin, G.J. Doucette. 2008. Development and field application of rRNA-targeted probes for the detection of *Cochlodinium polykrikoides* in Korean coastal waters using whole cell and sandwich hybridization formats. *Harmful Algae* 7: 347–359.

Jones, W.J., C. Preston, R. Marin III, C. Scholin, R. Vrijenhoek 2007. A Robotic Molecular Method for in situ Detection of Marine Invertebrate Larvae. *Molecular Ecology Notes* (in press; available on-line doi: 10.1111/j.1471-8286.2007.02021.x

Haywood, A.J., C. A. Scholin, R. Marin III, K. A. Steidinger, C. A. Heil and J. Ray. 2007. 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* 43:1271–1286

John Paul, Chris Scholin, Ger van den Engh, Mary Jane Perry. 2007. In situ Instrumentation. *Oceanography* 20: 58-66.

Roman, B., C. Scholin, S. Jensen, E. Massion, R. Marin III, C. Preston, D. Greenfield, W. Jones, and K. Wheeler. 2007. Controlling a Robotic Marine Water Sampler with the Ruby Scripting Language. *Journal of American Laboratory Automation* 12: 56-61.

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. 2006. Molecular detection of marine larvae. *Marine Biotechnology* 8: 149-160.

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. Whittedge, 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 multiseriis* 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).

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- 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., Blanko, 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., Blanko, 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 tamarense* "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 2<sup>nd</sup> 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.

Scholin, C. S. Jensen, B. Roman, E. Massion, R. Marin, C. Preston, D. Greenfield, W. Jones, K. Wheeler. 2006. The Environmental Sample Processor (ESP) – An Autonomous Robotic Device for Detecting Microorganisms Remotely using Molecular Probe Technology. Proceedings, OCEANS 2006 MTS/IEEE Conference. Boston, MA. Marine Technology Society, Columbia, MD.

### **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.geo-prose.com/ALPS/white\\_papers.html](http://www.geo-prose.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.

### **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.
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- Tyrrell, J.V., Scholin, C.A., Bergquist, P., and Bergquist, P. 2004. Composition and methods for detecting Raphidophytes. US Pat. No. 6787648