

Curriculum Vitae
Timothy A. Hovanec, Ph.D.

Business Address:

Hovanec Consulting, Inc.
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Education:

Ph.D. 1998. Ecology, Evolution & Marine Biology. University of California, Santa Barbara. Dissertation Title: *Characterization of the Nitrifying Bacteria in Aquaria and Mono Lake, California, Using Molecular Methods*. 203p.

M.S. 1986. Biology, emphasis in Ecology. San Diego State University. Thesis Title: *Acute Ammonia Toxicity and Ammonia Excretion of Striped Bass (*Morone saxatilis*)*. 140p.

B.S. 1978. Biology, with Distinction. San Diego State University.
1976-77. Limnology Institute. Uppsala University, Uppsala, Sweden
1973. Certified SCUBA diver – NASDS

Experience and Accomplishments:

Hovanec Consulting, Inc. 2007 - present

Founded Hovanec Consulting, Inc. to provide consulting expertise related to water quality and design and troubleshooting of life support systems with emphasis on nitrifying bacteria and other microbial processes to institutions such as public aquaria, aquaculture facilities, and universities.

DrTim's Aquatics, LLC. 2007 - present

Founded DrTim's Aquatics, LLC[®] with the goal of bring Science Based Solutions[™] to aquaria of all types and sizes along with ponds and ornamental gardens. Was successful in raising start up capital and growing from 3 initial products in one market segment to 7 products in more than four market segments. Have established exclusive licensing agreements with several companies to adapt products or ideas to the aquarium industry and successfully launched those products. Have developed key domestic out-source relationships that allow products developed in-house to be manufactured off-site in a cost effective manner.

Aquaria Inc. (dba Marineland Aquarium Products). 1990 - 2007

Established the Aquatic Research Laboratory at Aquaria Inc. a research facility dedicated to: a) the scientific investigation of the biological, chemical and microbial processes occurring in aquaria; b) the testing of competitor's products, c) the design and evaluation of potentially new products in the aquarium and aquaculture fields, d) developing collaborations with other companies to apply research from other fields and e) the scale-up from research to production of new microbial-based products. Developed and lead a laboratory staff of 14 that includes researchers at the Ph.D. and Master's levels at two locations within the company. Laboratory research has been published in peer-reviewed journals and been presented at numerous conferences in which I was an invited speaker.

Have designed and staffed multiple laboratories as the Laboratory space has grown from about 1,000 ft² to 5,000 ft². Specific laboratories include a state-of-the-art water chemistry laboratory with instrumentation that includes flow injection analyzers, total organic carbon analyzer, multiple ion chromatography instruments, various pH and specific ion probes and meters for wet chemistry, and various laboratory support equipment.

Designed and staffed a microbial ecology laboratory which uses modern molecular methods (e.g., DNA sequencing, cloning, molecular probing, PCR, DGGE) to study the microbiology of aquaria. Equipment includes PCR thermal cyclers, quantitative PCR machine, DNA sequencer, epi-fluorescent microscopes, fluorescent imager, freezers, electrophoresis equipment, incubators and denaturing gradient gel electrophoresis (DGGE) instrumentation.

Managed and conducted research in the laboratory which has lead to the discovery of numerous new species of nitrifying bacteria and the awarding of numerous patents for nitrifying bacteria, the use of nitrifying bacteria and methods to detect novel nitrifying bacteria.

Managed the successful scale-up of the culture of novel freshwater and saltwater nitrifying bacteria from 15 liter reactors to 8,400 liter reactors including designing and overseeing construction of a nitrifying bacteria production facility that produces several millions of dollars worth of product per year.

Successful lead a team of multi-company researchers to develop, test and launch a new suite of fish disease treatments that are non-antibiotic based.

Employment History:

2007 – present. Hovanec Consulting, Inc. Founder. Consulting company for aquatic systems.

2007 – present. DrTim’s Aquatics, LLC. Founder and Managing Member. Founded company with the goal of producing natural based products for all types and sizes of aquaria (saltwater and freshwater) along with pond and gardens.

2004 – present. Saddleback College, Mission Viejo, CA. Associate Faculty. Instructor for a course MST205: Water Quality and Toxicity for Aquatic Systems. Aquarium & Aquaculture Science Certificate Program.

1994 - 1995. Teaching Assistant. University of California, Santa Barbara. Taught laboratory class (145AL) in physical and chemical limnological methods. Instruction on how to sample aquatic habitats, use spectrophotometers and other water analysis equipment, make chemical standards, analyze water samples, write a scientific report and present the results.

1990 - 2007. Chief Science Officer, Aquaria Inc. Moorpark. CA. Aquaria Inc. is the parent company of Marineland Aquarium Products (consumer products), Marineland Commercial Aquariums (grocery stores/restaurants), Marineland Retailer Systems (fish display/sales units), Aquarium Systems Inc. (Instant Ocean® sea salts) and Perfecto Manufacturing (aquaria and stands). Responsible for the development of a research facility dedicated to the investigation of the biological, chemical and microbiological processes in closed aquatic systems such as tropical fish aquaria and life-support systems for the holding of seafood. Editor of SeaScope® a quarterly newsletter sent to retail pet stores regarding topic related to the science of marine and freshwater fishkeeping.

1980 - 1990. Manager, Aquatic Systems Incorporated (now Kent SeaTech), San Diego, CA. Oversaw construction and management of a research program, hatchery operations and production facility of a commercial aquaculture operation dedicated to the intensive culture of hybrid striped bass. Also reared striped bass, channel catfish and carp. Consulting biologist on numerous private and government contracts (USAID) for the aquaculture potential and facilities development for many species (shrimp, fish and lobsters) in several countries (Costa Rica, Nigeria, Turkey). Researcher on several SBIR grants associated with new methods for the intensive culture of non-traditional aquaculture species and conservation of natural resources.

1979 - 1980. Graduate Research Assistant. San Diego State University. Environmental impact study on the effects of power plant cooling water on fishes, invertebrates and aquatic plants impinged and entrained at the Encina Power Plant owned by San Diego Gas & Electric, Carlsbad, CA.

1979. Biological Technician. Lockheed Center for Marine Sciences (through Volt Employment Services). Construction and operation of the Bioassay Laboratory. Obtained EPA certification. Conducted bioassays associated with environmental impact statement of dredging of Humboldt Bay by the U.S. Army Corps of Engineers.
1978. United States Peace Corps Volunteer. Iloilo, Philippines. Penaeid shrimp hatchery biologist for Bureau of Fisheries and Aquatic Resources (BFAR).

Professional Activity

Lecturer, Aquatic Medicine Seminar and Workshop. Shark Reef at Mandalay Bay Resort, Las Vegas. Annual workshop for professionals from public aquaria to learn the latest in techniques and technology for designing and operating life support systems along with care and husbandry of marine animals.

President, Pet Industry Joint Advisory Council (PIJAC). 1997- 2003. Head of the Washington, D.C. based council that consist of three members from five different segments of the pet industry and has a permanent staff in Washington, D.C. Represented the council at governmental meetings and testifying before government committees. Oversaw staffing, budgets and fund raising. Worked closely with executive vice-president to determine goals and objectives.

Member Organizing Committee of Aqualitysymposia.org, Inc., which is a non-profit corporation consisting of public aquarium industry professionals and commercial sponsors volunteering their time and giving financial support to organize and create resources for education and development of Water Quality and Life Support Systems. The Aquality Program includes the 1st International Symposium held in April 2004, in Lisbon, Portugal.

Member Ph.D. committee: Roeland Grommen, Ghent University, 2005. Nitrification and denitrification in aquaria and aquaculture systems. Professor W. Verstraete, Chair.

Co-Chair Marine Ornamentals 2006 and 2008. 4th in a series of international conferences held every 2 years to foster communication between governmental agencies, non-governmental agencies, industry and researchers on the conservation, harvest, culture and research of marine ornamental organisms. Feb 13-16, 2006. Las Vegas, NV in conjunction with Aquaculture America 2006.

Patents:

- 13 U.S. Patent No. 7,544,501. Issued June 6, 2009. Nitrite-Oxidizing Bacteria and Methods of Using and Detecting the same.
 - 12 U.S. Patent No. 7,482,151. Issued Jan. 27, 2009. Method for Using Ammonia Oxidizing Bacteria.
 - 11 U.S. Patent No. 7,270,957. Issued Sept. 18, 2007. Method for Detecting Ammonia Oxidizing Bacteria.
 - 10 U.S. Patent No. 7,267,816. Issued Sept. 11, 2007. Ammonia Oxidizing Bacteria.
 - 9 Commonwealth of Australia Patent No. 2003272297. Issued 31 August 2006. Ammonia-oxidizing bacteria and methods of using and detecting the same.
 - 8 Commonwealth of Australia Patent No. 2001263305. Issued 5 July 2006. Ammonia-oxidizing bacteria.
 - 7 Mexico Patent No. 238,832. Issued 21 July 2006. Freshwater nitrite bacteria.
 - 6 Mexico Patent No. 233,120. Issued 19 December 2005. Ammonia oxidizing bacteria.
 - 5 European Patent No. EP 1 282 688. Issued March 16, 2005. Ammonia oxidizing bacteria.
 - 4 Commonwealth of Australia Patent No. 750,945. Issued 21 November 2002. Bacterial nitrite oxidizer and method of use thereof.
 - 3 U.S. Patent No. 6,268,154. Issued July 31, 2001. Method for Detecting Bacterial Nitrite Oxidizer.
 - 2 U.S. Patent No. 6,265,206. Issued July 24, 2001. Method of Using Bacterial Nitrite Oxidizer.
 - 1 U.S. Patent No. 6,207,440. Issued March 21, 2001. Bacterial Nitrite Oxidizer.
- Other U.S. and foreign patents pending

Editorial Services:

Editor SeaScope (1998 – 2006): Quarterly publication on research topics related to care, maintenance and filtration of marine aquaria. ISSN 1045-3520.

Technical Consultant – *Encyclopedia of Aquarium and Pond Fishes* – by David Alderton 2005.

Reviewer of manuscripts for: *Aquaculture*, *Journal of Applied Microbiology*, *Environmental Microbiology*,

Grant reviewer: Sea Grant, Vienna Science and Technology Fund (WWTF: www.wwtf.at)

Community Service and Professional Memberships:

President, 1997 - 2003, Pet Industry Joint Advisory Council

Member, 1993 – 2003, Board of Trustees, Pet Industry Joint Advisory Council

Member, 2003 – current, Marine Science and Technology Advisory Committee, Saddleback College, Mission Viejo, CA.

Past chair (1994-96), past secretary (1993-1994) and current treasurer (1998-present), American Cichlid Association.

Memberships: American Society for Microbiology, American Society of Limnology and Oceanography, American Chemical Society, World Aquaculture Society, American Water Works Association, International Society for Microbial Ecology, Society for Applied Microbiology, American Association for the Advancement of Science, Society for Cryobiology, Society for Industrial Microbiology.

Publications:

Professional and Peer-Reviewed Papers

- Carlberg, J. M., J. C. Van Olst, M. J. Massingill and T. A. Hovanec. 1984. Intensive Culture of Striped Bass: A review of Recent Technological Developments p. 89-127. *In* J. P. McCraren (ed.), *The Aquaculture of Striped Bass: A Proceedings*. Univ. Maryland Sea Grant.
- Hovanec, T. A. 1995. New Trends in Biological Filtration. In Annual Conference Proceedings of the 1995 AZA/CAZPA Conference. pp. 217-223. Seattle Washington, September 15-19, 1995.
- Hovanec, T. A. and E. F. DeLong. 1996. Comparative Analysis of Nitrifying Bacteria Associated with Freshwater and Marine Aquaria. *Applied and Environmental Microbiology* 62(8): 2888-2896.
- Hovanec, T. A. L. T. Taylor, A. Blakis and E. F. DeLong. 1998. *Nitrospira*-like bacteria associated with nitrite oxidation in freshwater aquaria. *Applied and Environmental Microbiology* 64(1): 258-264.
- Hovanec, T. A. 2001. Marine aquarium equipment: from biological to mechanical and back again p. 37-43. *In* C. M. Brown and L. Young (ed)., *Proceeding of the Marine Ornamentals '99*. UNIHI-SEAGRANT-CP-00-04. Univ, Hawaii Sea Grant.
- Hovanec, T. A., L. L. Wilson, Jr., J. Niemans, J. L. Coshland, S. Wirtz and J. R. Sears-Hartley. 2001. A comparison of four types of coral reef filtration systems: preliminary results p. 45-52. *In* C. M. Brown and L. Young (ed)., *Proceeding of the Marine Ornamentals '99*. UNIHI-SEAGRANT-CP-00-04. Univ, Hawaii Sea Grant.
- Burrell, P.C., C. M. Phalen and T. A. Hovanec. 2001. Identification of Bacteria Responsible for Ammonia Oxidation in Freshwater Aquaria. *Applied and Environmental Microbiology* 67(12): 5791-5800.
- Hovanec, T. A. submitted. Nitrifying Bacteria – the Current State of Affairs. *In* *Water Quality Manual for Zoos and Aquaria*, a manual from the Aquality symposium.
- Hovanec, T. A. submitted. Biological Cycles in Closed Display Systems. *In* *Water Quality Manual for Zoos and Aquaria*, a manual from the Aquality symposium.
- Hovanec, T. A. submitted. Biological Filters – a review. *In* *Water Quality Manual for Zoos and Aquaria*, a manual from the Aquality symposium.

Professional Presentations

- Hovanec, T. A. 1995. New Trends in Biological Filtration. Annual Conference of the AZA/CAZPA. Seattle Washington, September 15-19, 1995. Invited.
- Hovanec, T. A. and E. F. DeLong. 1996. Comparative Analysis of Nitrifying Bacteria Phylotypes in Freshwater and Marine Aquaria. Poster presentation at the 96th Annual Meeting of the American Society for Microbiology. New Orleans, LA. May 19-23, 1996.
- Hovanec, T. A., A. Blakis and E. F. DeLong. 1997. Comparative Analysis of Nitrifying Bacteria Phylotypes in Freshwater and Marine Aquaria. Poster presentation at the 97th Annual Meeting of the American Society for Microbiology. Miami Beach, FL. May 4-8, 1997.

- Hovanec, T. A., E. F. DeLong, and J. M. Melack. 1998. Investigating Ammonia Oxidizing Bacteria in Mono Lake. Poster Presentation at 1998 Ocean Sciences. San Diego, CA. Feb. 9-13, 1998. Won Best Poster in session.
- Hovanec, T. A. and E. F. DeLong. 1998. Comparative Analysis of Nitrifying Bacteria Phylotypes on Biofilters of Freshwater and Marine Aquaria. Presentation at Aquaculture 1998. Annual Meeting of the World Aquaculture Society. Las Vegas, NV Feb. 15-19, 1998.
- Hovanec, T. A. and E. F. DeLong. 1998. The Effects of Commercial Bacteria Additives for Nitrification in Saltwater and Freshwater Aquaria under Varying Conditions. Poster presentation at the 98th Annual Meeting of the American Society for Microbiology. Atlanta, GA. May 17-21, 1998.
- Hovanec, T. A. and J. M. Melack. 1999. Investigating the Presence of Ammonia Oxidizing Bacteria in Mono Lake, CA. Poster Presentation at the 7th International Conference on Salt Lakes. Death Valley, CA Sept. 12-15, 1999.
- Hovanec, T. A. 1999. Marine aquarium equipment: from biological to mechanical and back again. Presentation at Marine Ornamentals '99. Kailua-Kona, Hawaii Nov. 16-19, 1999. Invited.
- Hovanec, T. A., L. L. Wilson, Jr., J. Niemans, J. L. Coshland, S. Wirtz and J. R. Sears-Hartley. 1999. A comparison of four types of coral reef filtration systems: preliminary results. Presentation at Marine Ornamentals '99. Kailua-Kona, Hawaii Nov. 16-19, 1999.
- Hovanec, T. A., J. R. Sears-Hartley, L. L. Wilson Jr., J. Coshland, C. M. Phalen, S. Wirtz, J. Niemans and P. C. Burrell. 2001. Investigations into the lack of efficacy of starter bacterial cultures for nitrification in seawater and freshwater systems. Presentation at Aquaculture 2001, Annual Meeting of the World Aquaculture Society. Orlando, FL Jan. 21-25, 2001.
- Hovanec, T.A. Pathways of animal supply, transport and awareness in the aquarium industry. RID NIS (Reducing the Introduction and Distribution of Aquatic Non-Native Invasive Species Through Outreach and Education (RID NIS) Workshop "The San Francisco Urban Perspective" May 8, 2001. Holiday Inn, San Mateo, CA. Invited.
- Burrell, P. C., C. M. Phalen, J. R. Sears-Hartley, L. L. Wilson Jr., J. Coshland and T. A. Hovanec. 2001. Identification of Ammonia Oxidizing Bacteria Responsible for Accelerating Nitrification in Freshwater Aquaria. Poster presentation at the 101st Annual Meeting of the American Society for Microbiology. Orlando, FL May 20-24, 2001.
- Hovanec, T. A., C. M. Phalen, J. R. Sears-Hartley, L. L. Wilson Jr., J. Coshland and P. C. Burrell. 2001. Identification of Ammonia- and Nitrite-Oxidizing Bacteria Responsible for Nitrification in Saltwater Aquaria. Poster presentation at the 101st Annual Meeting of the American Society for Microbiology. Orlando, FL May 20-24, 2001.
- Hovanec, T. A. 2001. Latest Discoveries Concerning Nitrifying Bacteria in Aquaria. Presentation at the 2001 Regional Aquatic Workshop. Atlantis, Paradise Island, Bahamas, June 1-5, 2001. Invited.
- Hovanec, T. A. 2001. Recent Developments in Nitrification/Denitrification. Aquaculture Waste Management Symposium, July 22-24, 2001. Virginia Tech, Div. Continuing Education. Invited.
- Hovanec, T. A. and J. L. Coshland. 2004. Trace Metal Analysis of Synthetic Sea salts and Natural Seawater. Marine Ornamentals '04. Honolulu, HI. March 2-5, 2004.
- Hovanec, T. A. 2004. Seascope Magazine – A Publication's History. Marine Ornamentals '04. Honolulu, HI. March 2-5, 2004. Invited.

- Hovanec, T. A., J. L. Coshland, L. K. Herbertson, E. L. Toy, J. Niemans and C. M. Phalen. 2004. Identification, Culture and Use of New Species of Nitrifying Bacteria in Seawater Systems. Marine Ornamentals '04. Honolulu, HI. March 2-5, 2004.
- Hovanec, T. A. 2004. Biological Cycles. Aquality – 1st International Water Quality Symposium for Aquaria. Lisbon, Portugal, April 1-6, 2004. Invited.
- Hovanec, T. A. 2004. Nitrifying Bacteria. Aquality – 1st International Water Quality Symposium for Aquaria. Lisbon, Portugal, April 1-6, 2004. Invited.
- Hovanec, T. A. 2004. Types of Biofilters: Advantages and Disadvantages. Aquality – 1st International Water Quality Symposium for Aquaria. Lisbon, Portugal, April 1-6, 2004. Invited.
- Hovanec, T. A. 2006. Water Quality and Diseases. Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Feb. 17-18, 2006. Invited.
- Hovanec, T. A. 2007. Techniques, Methods and Equipment or Determination of Water Quality Parameters. Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Feb. 23-25, 2007. Invited.
- Hovanec, T. A. 2008. Trace Elements in Sea Water and Sea Salts – Analysis and Role. Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Feb. 22-24, 2008. Invited.
- Hovanec, T. A. 2008. Biochemical Cycles in Marine Aquaria – Minding Your P, C, Si and N. Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Feb. 22-24, 2008. Invited.
- Hovanec, T. A. 2009. Microbial Pathways: How to Get the Most from the Smallest. Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Feb. 20-22, 2009. Invited.
- Hovanec, T. A. 2009. Activated Carbon, Ion Exchange Resins and Other Chemical Filtration Media: How, When and Why. Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Feb. 20-22, 2009. Invited.
- Hovanec, T. A. 2010. Phosphate in Marine Aquaria – Forms, Pathways and Concerns. Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Feb. 18-21, 2010. Invited.
- Hovanec, T. A. 2010. Probiotics for Marine Aquaria – Current Trends. Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Feb. 18-21, 2010. Invited.
- Hovanec, T. A. 2011. Biodegradable Polymers for Removing Nitrate and Phosphate: Theory and Operation. Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Mar. 4-6, 2011. Invited.
- Hovanec, T. A. 2011. LED Lighting – is it Time? Aquatic Medicine Seminar. Shark Reef at Mandalay Bay, Las Vegas, NV, Mar. 4-6, 2011. Invited.