

Vance Thomas Vredenburg
Professor and Chair
Department of Biology
San Francisco State University

Research Area: climate change ecology, disease ecology, behavior, amphibian conservation

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Education

Ph.D., University of California, Berkeley (Integrative Biology), Dec 2002 “The effects of introduced trout and ultraviolet radiation on anurans in the Sierra Nevada” Co-advisors: Dr.’s ME Power and DB Wake
B.A., University of California, Santa Barbara (Biology), 1992

Professional appointments

2023 -present *Chair:* Department of Biology, San Francisco State University
2021-2023 *Associate Chair:* Department of Biology, San Francisco State University
2017-present *Professor:* Department of Biology, San Francisco State University
2012- present *Fellow:* California Academy of Sciences, San Francisco, California, USA
2007-present *Research Associate:* Museum of Vertebrate Zoology, University of California Berkeley
2008-present *Research Associate* California Academy of Sciences, San Francisco, California, USA
1998-present *Associate Director & co-founder:* AmphibiaWeb.org, University of California Berkeley
2019-2020 *Visiting Fulbright Fellow:* Museo Nacional de Ciencias Naturales, Madrid, Spain
2019-2020 *Visiting Fulbright Fellow:* Abdelmalek Essaâdi University, Tétouan, Morocco
2012-2017 *Associate Professor:* Department of Biology, San Francisco State University
2007-2012 *Assistant Professor:* Department of Biology, San Francisco State University
2003-2007 *Postdoctoral Scholar:* Dept. Int. Biol. & Mus. Vert. Zool., University of California Berkeley

Honors and Awards

Fulbright Scholar: Morocco and Spain (2019-2020)
Elected *Fellow* of the California Academy of Sciences (2012)
Presidential Award for Faculty, San Francisco State University (2012)
Elected International Herpetological Committee of the World Congress of Herpetology (2012)
Outstanding Graduate Student Instructor, UC Berkeley (1997)
National Science Foundation Antarctica Service Medal (1992)

Research Grants (most recent)

2023-2024 NSF subaward; *Does the Pacific chorus frog (Pseudacris regilla) skin microbiome exhibit inhibitory functions against a global fungal pathogen?* \$15,000; Vredenburg (Kira Miller, graduate student, is Principal Investigator, PI)
2023-2024 Save the Redwoods League: *Investigating redwood forests as refugia from disease and climate change for terrestrial salamanders.* \$30,000; Vredenburg (PI)
2019-2020 Fulbright Research Scholarship: A global amphibian pandemic: Unravelling pathogen invasion history and present-day dynamics in Morocco and Spain.
2016-2020 NSF: Belmont Forum on Climate Change; *People, pollution and pathogens – mountain ecosystems in a human-altered world* (mountain ranges in California, USA, France, Oman, and China)
2015-2019 USFWS; *Wyoming toad bioaugmentation, immunization and susceptibility trials*

Selected Publications (last 5 years)

Dodge, CM, C Brown, AJ Lind, RA Knapp, LR Wilkinson, VT **Vredenburg**. 2024. Historical and contemporary impacts of the invasive fungal pathogen, *Batrachochytrium dendrobatidis*, on the Yosemite toad. *Biological Conservation* <https://doi.org/10.1016/j.biocon.2024.110504>
Belasen, AM, Peek R, Adams A, Russell I, De León M, Adams M, Bettaso J, Breedveld K, Catenazzi A, Dillingham C, Grear D, Halstead B, Johnso P, Kleeman P, Koo M, Koppl C, Lauder J, Padgett-Flohr G, Piovia-Scott J, Pope K, Westphal M, **Vredenburg** VT, Wiseman K, Kupferberg S. 2024 *Chytrid infections exhibit historical spread and contemporary seasonality in a declining stream-breeding frog. R. Soc. Open Sci.* 11: 231270.

<https://doi.org/10.1098/rsos.231270>

Ghose SL, Yap TA, Byrne AQ, Sulaeman H, Rosenblum EB, Chan-Alvarado A, Chaukulkar S, Greenbaum E, Koo MS, Kouete MT, Lutz K, McAloose D, Moyer AJ, Parra E, Portik DM, Rockney H, Zink AG, Blackburn DC and **Vredenburg** VT (2023) Continent-wide recent emergence of a global pathogen in African amphibians. *Front. Conserv. Sci.* 4:1069490. doi: 10.3389/fcsc.2023.1069490

García-Sánchez, J.C., Arredondo-Centeno, J., Segovia-Ramírez, M.G. Tenorio Olvera, A.M., Parra-Olea G., **Vredenburg**, V.T., Rovito, S.M. 2023. Factors Influencing Bacterial and Fungal Skin Communities of Montane Salamanders of Central Mexico. *Microb Ecol* 86, 670–686 (2023).

<https://doi.org/10.1007/s00248-022-02049-x>

Lambert, M. R., Womack, M. C., Byrne, A. Q., Grundler, M. R., Hernandez-Gomez, O., Noss, C. F., Rothstein, A. P., Blackburn, D. C., Collins, J. P., Crump, M. L., Koo, M. S., Nanjappa, P., Rollins-Smith, L., **Vredenburg**, V. T., and E. B. Rosenblum. 2020. Response to Scheele et al.: The amphibian chytrid crisis remains data deficient. *Science* 367. DOI:10.1126/science.aay1838

Byrne, AQ, VT **Vredenburg**, et al. 2019. Cryptic diversity of a widespread global pathogen reveals new threats for amphibian conservation. *Proc. Natl. Acad. Sci. U. S. A.* 2019 116 (41) 20382-20387
<https://doi.org/10.1073/pnas.1908289116>

Vredenburg VT, et al. 2019. Pathogen invasion history elucidates contemporary host pathogen dynamics. *PLoS ONE* 14(9): e0219981. <https://doi.org/10.1371/journal.pone.0219981>

Flechas SV, et al, and, **Vredenburg** VT, Amézquita A, Woodhams DC (2019) Microbiota and skin defense peptides may facilitate coexistence of two sympatric Andean frog species with a lethal pathogen. *ISME J* 2019 Feb;13(2):361-373. doi: 10.1038/s41396-018-0284-9.

Ellison S, Knapp RA, Sparagon W, Swei A, **Vredenburg** VT. 2019. Reduced skin bacterial diversity correlates with increased pathogen infection intensity in an endangered amphibian host. *Mol Ecol.* 2019;28:127–140. <https://doi.org/10.1111/mec.14964>

Publications (most cited)

Wake, DB, and VT **Vredenburg** 2008 Are we in the midst of the sixth mass extinction? A view from the world's amphibians *Proceedings of the National Academy of Sciences* 105:11466-11473

Vredenburg, VT, RA Knapp, T Tunstall, and CJ Briggs 2010 Dynamics of an emerging disease drive large-scale amphibian population extinctions *Proceedings of the National Academy of Sciences* 107:9689-9694

Briggs, CJ, RA Knapp, and VT **Vredenburg** 2010 Enzootic and epizootic dynamics of the chytrid fungal pathogen of amphibians *Proceedings of the National Academy of Sciences* 107:9695-9700

Harris, RN, RM Brucker, JB Walke, MH Becker, CR Schwantes, DC Flaherty, BA Lam, DC Woodhams, CJ Briggs, VT **Vredenburg**, KPC Minbiole 2009 Skin microbes on frogs prevent morbidity and mortality caused by a lethal skin fungus *The ISME Journal* 3:818-824

Cheng, TL, S Rovito, DB Wake and VT **Vredenburg** 2011 Coincident mass extinction of neotropical amphibians with the emergence of the fungal pathogen *Batrachochytrium dendrobatidis* 2011 *Proceedings of the National Academy of Sciences* 108(23):9502-9507

Rachowicz, LJ, RA Knapp, JAT Morgan, MJ Stice, VT **Vredenburg**, JM Parker and CJ Briggs 2006 Emerging infectious disease as a proximate cause of amphibian mass mortality *Ecology* 87(7): 1671-1683

Vredenburg, VT 2004 Reversing introduced species effects: Experimental removal of introduced fish leads to rapid recovery of declining frog *Proceedings of the National Academy of Sciences* 101(20):7646-7650

Rachowicz, LJ, JM Hero, JAT Morgan, VT **Vredenburg**, J Taylor, CJ Briggs 2005 The novel and endemic pathogen hypothesis: explanations for the origin of an emerging infectious disease of wildlife *Conservation Biology* 19(5):1441-1448

Rachowicz, LJ and VT **Vredenburg** 2004 Transmission of *Batrachochytrium dendrobatidis* within and between amphibian life stages *Diseases of Aquatic Organisms* 61:75-83

Woodhams, DC, VT **Vredenburg**, M Simon, D Billheimer, B Shakhtour, Y Shyr, CJ Briggs, LA Rollins-Smith, RN Harris 2007 Symbiotic bacteria contribute to innate immune defenses of the threatened mountain yellow-legged frog, *Rana muscosa* *Biological Conservation* 138: 390-398

Briggs, C, VT **Vredenburg**, RA Knapp, and LJ Rachowicz 2005 Investigating the population-level effects of chytridiomycosis, a fungal disease of amphibians *Ecology* 86(12):3149-3159

Morgan, JAT, VT **Vredenburg**, LJ Rachowicz, RA Knapp, MJ Stice, T Tunstall, RE Bingham, JM Parker, JE Longcore, C Moritz, CJ Briggs, JW Taylor 2007 Population genetics of the frog killing fungus

Batrachochytrium dendrobatidis

- Knapp, RA, DM Boiano, and VT **Vredenburg** 2007. Removal of nonnative fish results in population expansion of a declining amphibian (mountain yellow-legged frog, *Rana muscosa*) *Biological Conservation* 135: 11-20
- Lam, BA, J B Walke, VT **Vredenburg**, and RN Harris 2010 Proportion of individuals with anti-*Batrachochytrium dendrobatidis* skin bacteria is associated with population persistence in the frog *Rana muscosa* *Biological Conservation* 143 (2010):529-531
- Reeder, NMM, AP Pessier, VT **Vredenburg**. 2012 A reservoir species for the emerging amphibian pathogen *Batrachochytrium dendrobatidis* thrives in a landscape decimated by disease. *PLoS ONE* 7(3): e33567
- Yap, T, M Koo, RF Ambrose, DB Wake and VT **Vredenburg**. 2015. Averting a biodiversity crisis. 2015. *Science*. Vol. 349 no. 6247 pp. 481-482 DOI: 10.1126/science.aab1052

Student Mentoring 2009-present

Undergraduates: Vredenburg as independent research mentor (108 completed)

Master's Students: Vredenburg as chair (32 students completed); as committee member (15 completed)

PhD Students: (SFSU does not have a PhD program) Vredenburg served as committee member (4 completed)

Featured Vredenburg Lab research

University Biology Textbooks: 1) Campbell, NA, & Reece, J B (2015) *Biology*, Benjamin Cummings, 8th edition pp650-651 (*This is the most commonly used Biology textbook in Introductory Biology Courses in the USA*); 2) Cain, ML, WD Bowman, and SD Hacker. (2015) *Ecology*, Sinauer Assoc. 3rd Edition, p 18.

Public Exhibits Natural History Museums: 1) California Academy of Sciences- >1.5 million people visits/year; 2) University of Kansas Biodiversity Institute and Natural History Museum; 3) Philippines National Museum of Natural History, Manila.

Public Outreach

Co-Founder of **AmphibiaWeb.org**: online research and conservation resource for all amphibians; average of 7.3 million successful queries/year by students, conservation scientists, and the general public since 2002; **Amphibian Disease Portal**: providing free access to published data; **NY Times**, (*Slow to Save Salamanders* by Carl Zimmer, *Toiling against a deadly disease to save a threatened frog* by Erica Rex, *Infection that devastates amphibians already in Europe could spread to U.S.* by James Gorman); **National Geographic Magazine**, *The Vanishing* by Jenny Holland; **GEO Magazine** (Germany), *Amphibians in Crisis* by Markus Wolff; **Nautilus Magazine**, *When Evolution is Infectious* by Moises Velasquez-Manoff; **Animal Planet**: *The Vanishing Frog* with Jeff Corwin; ABC-News; CNN; CBS Evening News; CBC Radio *Quirks and Quarks*; **National Public Radio**-Science Friday; WALO Radio Puerto Rico *in Spanish*; **National Science Foundation**- Science Nation :NPR KQED QUEST; **American Association of the Advancement of Science** (AAAS)- *Science Update*

Invited presentations/lectures/forums

AAAS – American Association for the Advancement of Science: Advancing Knowledge of Global Amphibian Decline with International Cooperation; The role of natural history museums (February 2016); **BAASICS** – Bay Area art & science interdisciplinary collaborative sessions (2015)

Ecological Society of America: The role of the skin microbiome in health and disease; California (2014)

California Academy of Sciences – *Fellows Lecture*, San Francisco, California (2012)

National Academy of Sciences / Institute of Medicine – *Forum on Microbial threats: Fungal Diseases*; Washington, DC (2012)