

## 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

2002 Ph.D.; Integrative Biology, University of California, Berkeley; *The effects of introduced trout and ultraviolet radiation on anurans in the Sierra Nevada*, Co-advisors: Dr. M Power and Dr. D Wake

1992 Bachelor of Arts; Biology; University of California, Santa Barbara

### 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

### Anti-Racism Statement

The Vredenburg Laboratory is committed to being a safe, supportive, anti-racist, and anti-sexist environment in which students from diverse racial, ethnic, gender, sexual orientations, socio-economic, and other backgrounds are equally and inclusively supported in their education and training. We strive to eliminate unconscious biases, micro-aggressions, and other forms of unintended discrimination or sexism through sustained communication, empathy, continuous learning and understanding. The Vredenburg Laboratory is a safe and supportive environment for all students including LGBTQ+ and underrepresented minority groups. In 2023 Vredenburg completed *Advancing Inclusive Mentoring (AIM)* at San Francisco State University, as part of the California State University AIM program. This program provides content and discussion about positive and inclusive mentoring practices and requires the creation of a mentor mentee compact, a best practice in mentoring students.

### Honors and Awards

2022 Scientific Review Board; *Revive & Restore; Morris Animal Foundation*  
2019-2020 Fulbright Scholar: Morocco  
2019-2020 Fulbright Scholar: Spain  
2019 Best Paper in Herpetology. American Society of Ichthyologists and Herpetologists (ASIH)  
2012 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  
2002 Honorable Mention, Stoye Award, American Society of Ichthyologists and Herpetologists  
2002 Best Student Paper, Society for Int and Comp Biol, Div of Ecol and Evol, Anaheim, California, USA  
2001 Carl Hubbs Best Student Paper, Desert Fishes Council, Death Valley, California, USA

2000 Graduate Fellowship Award, Museum of Vertebrate Zoology, University of California Berkeley  
1999 Integrative Biology Research Grant, University of California Berkeley  
1999-2001 Research Fellowship Award, USGS Biological Resources Division / National Park Service  
1999 Seed Grant Award, Declining Amphibian Population Task Force / WCU Species Survival Commission  
1998 Outstanding Graduate Student Instructor Award – University of California Berkeley  
1998 Wilhelm Martens Award, Museum of Vertebrate Zoology, University of California Berkeley  
1998 Theodore Roosevelt Memorial Award, American Museum of Natural History  
1998 Sigma Xi Student Grant-in-aid Award, Berkeley Chapter  
1997 Mildred E Mathias Award, University of California Natural Reserve System  
1997 Gompertz Award, Museum of Vertebrate Zoology, Dept of Integrative Biology, UC Berkeley  
1992 Antarctica Service Medal, National Science Foundation  
1992 Antarctica Service Medal, United States Department of the Navy

#### **Courses Taught at San Francisco State University**

Ecology (Biol 482)  
Evolution and Natural History of Vertebrates (Biol 470)  
Herpetology (Biol 475GW)  
Skills in Scientific Writing (Graduate; Biol 716)  
Seminar: Advances in Ecology and Systematic Biology (Graduate; Biol 862)  
Seminar: Current topics in Disease Ecology/Amphibian Conservation (Graduate; Biol 881)

#### **Research Grants**

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)  
2021-2022 San Francisco State University Faculty Research Award: *The global amphibian pandemic: the role of skin microbes in survival of susceptible hosts.* \$12,000; Vredenburg (PI)  
2019-2020 Fulbright Research Scholarship: *A global amphibian pandemic: Unravelling pathogen invasion history and present-day dynamics in Morocco and Spain.* \$55,000; Vredenburg (PI)  
2019-2020 US Department of Defense: *Acquisition of a Digital Droplet PRC Platform for Pathogen Detection* A. Swei (PI), VT Vredenburg (co-PI), R Sehgal (co-PI) Award #: W911NF1910524; \$130,699  
2016-2021 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); \$276,000; Vredenburg (PI)  
2015-2019 NSF; *Collaborative Proposal: A Biotic Inventory of Terrestrial Vertebrates, Spiders, and Haemosporidian Parasites of Sulawesi, Indonesia*; J. McGuire (PI), VT Vredenburg (Senior Personnel)  
2015-2019 US Fish and Wildlife Service; *Wyoming toad bioaugmentation, immunization and susceptibility trials*; \$67,000; Vredenburg (PI)  
2013-2016 NSF; *Microbial mechanisms of communal egg-laying in slender salamanders (genus Batrachoseps)*; \$595,000 (Vredenburg co-PI with Dr. Andrew Zink, PI)  
2016-2017 US Fish and Wildlife Service; *Plethodontids and disease: Determining the fungal infection status of Arboreal and Ensatina Salamanders in California*; \$10,000; Vredenburg (PI)  
2012-2015 USDA Forest Service; *Restoring the Endangered Sierra Nevada Yellow-legged Frog, Rana sierrae, to the Tahoe Basin (Desolation Wilderness)*; \$360,000; Vredenburg (PI)  
2012-2014 The Presidio Trust; *The future of Mountain Lake*; \$24,000; Vredenburg (PI)  
2013-2015 Save the Redwoods League; *Communal nesting among slender salamanders (Batrachoseps gregarius) in Giant Sequoia forests: implications for vectoring fungal disease and mutualistic bacteria*; \$15,000; Vredenburg PI with Dr. Andrew Zink, also PI)  
2013-2014 Disney Worldwide Conservation Fund; *Andes to Amazon Conservation*; A Catenazzi (PI), VT Vredenburg (co-PI); \$29,000  
2012-2014 Save the Redwoods League; *Delineating past, present and future effects of a fungal epidemic*

- disease on the amphibian communities in coastal redwood*; \$15,000; Vredenburg (PI)
- 2012-2013 Hagey Venture Fund, California Academy of Sciences; *Museum collections hold a key to today's conservation crisis: tracking the African origin and spread of the amphibian fungal pathogen *Batrachochytrium dendrobatidis**; D. Blackburn (PI), VT Vredenburg (Co-PI); \$30,000
- 2012-2013 National Science Foundation: *Collaborative Research (RAPID): Testing Intervention Strategies to Change the Outcome of Disease-caused Mass-mortality Events in a Declining Amphibian*; \$40,000; Vredenburg (PI)
- 2011-2012 The Rufford Small Grants Foundation, Grants for Nature Conservation; *Conservation of montane forest anurans in Southeastern Peru*; C Catenazzi (PI), VT Vredenburg (Co-PI); \$10,000
- 2011-2013 National Science Foundation; *The effects of climate change and fungal disease on Andean montane frogs*; \$260,000; Vredenburg (PI)
- 2011-2012 US Fish and Wildlife Service, Wildlife Without Borders-Amphibians in Decline; *Can we prevent a chytridiomycosis epidemic in the Philippines?* \$30,000; Vredenburg (PI)
- 2007-2012 National Science Foundation; *After the crash: factors allowing host persistence following outbreaks of a highly virulent disease*; \$400,000; Vredenburg (PI)
- 2008-2011 CALFED-Bay Delta Program; *Climate change impacts to San Francisco Bay-Delta wetlands: Links to pelagic food webs and predictive responses based on landscape modeling*; T Parker (PI), VT Vredenburg (Co-PI); \$450,000

**Publications** (number of citations to Vredenburg peer-reviewed studies; *Google Scholar 2024*)

	Citations	h-index	i10-index	Most Cited Papers:
All	11,814	46	87	Wake & Vredenburg 2008 <i>PNAS</i> : 2,307
Since 2019	4764	39	77	Vredenburg et al. 2010 <i>PNAS</i> : 752

**Vance Vredenburg ORCID:** 0000-0002-9682-1190; <https://orcid.org/0000-0002-9682-1190>

**In Review**

- Steigerwald E, Chen J, Oshiro J, **Vredenburg** VT, Catenazzi A, Koo MS. Small is big: A new conservation paradigm for amphibians. *Scientific Reports*
- Bernardo-Cravo AP, Loyau A, Karakoç C, Haver M, **Vredenburg** VT, Chatzinotas A, DS Schmeller. *In Review*. Climate and introduced fish influence amphibian skin microbiome in mountain lakes. *Scientific Reports*
- Womack, MC, SM Strobel, J Phillips, J. Parreiras, VT **Vredenburg**, and MH Wake. Organisms have gravity. *Journal of Experimental Biology*.

**2024**

110. 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>
109. 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, Piovio-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>

**2023**

108. Ghose SL, Yap TA, Byrne AQ, Sulaeman H, Rosenblum EB, Chan-Alvarado A, Chaukulkar S, Greenbaum E, Koo MS, Kouete MT, Lutz K, McAlouse 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/fcosc.2023.1069490
107. García-Sánchez, J.C., Arredondo-Centeno, J., Segovia-Ramírez, M.G. Tenorio Olvera, A.M., Parra-Olea G., **Vredenburg**, V.T., Rovito, S.M. 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>

106. Bates, KA, Friesen, J, Loyau A, Butler H, **Vredenburg** VT, Laufer J, Chatzinotas A, Schmeller DS. Environmental and Anthropogenic Factors Shape the Skin Bacterial Communities of a Semi-Arid Amphibian Species. *Microb Ecol* 86, 1393–1404 (2023). <https://doi.org/10.1007/s00248-022-02130-5>

## 2022

105. Womack MC, E Steigerwald, DC Blackburn, DC Cannatella, A Catenazzi, J Che, M. Koo, JA McGuire, S Ron, C Spencer, VT **Vredenburg**, RD Tarvin. 2022. State of Amphibia 2020: Five Years of Amphibian Research, Diversity and Resources." *Ichthyology & Herpetology*, **110(4)**:638-661 (2022). <https://doi.org/10.1643/h2022005>
104. Schmeller, D.S., Cheng, T., Shelton, J. C. Lin, A Chan- Alvarado, A Bernardo-Cravo, L Zoccarato, T Ding, A Yu, Y Lin, A Swei, MC Fisher, VT **Vredenburg**, A Loyau. 2022. Environment is associated with chytrid infection and skin microbiome richness on an amphibian rich island (Taiwan). *Sci Rep* **12**, 16456 (2022). <https://doi.org/10.1038/s41598-022-20547-3>
103. García-Sánchez, JC, J Arredondo-Centeno, MG Segovia-Ramírez, M, AM Tenorio Olvera, G Parra Olea, VT **Vredenburg**, and SM Rovito. Factors Influencing Bacterial and Fungal Skin Communities of Montane Salamanders of Central Mexico. *Microb Ecol* (2022). <https://doi.org/10.1007/s00248-022-02049-x>
102. Knapp RA, Joseph MB, Smith TC, Hegeman EE, **Vredenburg** VT, Erdman Jr JE, Boiano DM, Jani AJ, Briggs CJ. 2022. Effectiveness of antifungal treatments during chytridiomycosis epizootics in populations of an endangered frog. *PeerJ* **10**:e12712 <https://doi.org/10.7717/peerj.12712>

## 2021

101. Haver, M, G Le Roux, J Friesen, A Loyau, VT **Vredenburg**, DS Schmeller. 2021. The role of abiotic variables in an emerging global amphibian fungal disease in mountains. *Science of The Total Environment* 152735. <https://doi.org/10.1016/j.scitotenv.2021.152735>
100. Cowgill M, AG Zink, W Sparagon, T Yap, H Sulaeman, MS Koo, VT **Vredenburg**. 2021. Social behavior, community composition, pathogen strain and host symbionts influence fungal disease dynamics in salamanders. *Front. Vet. Sci.* <https://doi.org/10.3389/fvets.2021.742288>
99. Koo MS, **Vredenburg** VT, Deck JB, Olson DH, Ronnenberg KL and Wake DB (2021) Tracking, Synthesizing, and Sharing Global Batrachochytrium Data at AmphibianDisease.org. *Front. Vet. Sci.* **8**:728232. doi: 10.3389/fvets.2021.728232
98. Ellison, S., Knapp, R. & **Vredenburg**, VT. 2021. Longitudinal patterns in the skin microbiome of wild, individually marked frogs from the Sierra Nevada, California. *ISME COMMUN.* **1**, 45 (2021). <https://doi.org/10.1038/s43705-021-00047-7>
97. Martínez, AE, Parra, E, Gomez, JP and **Vredenburg**, VT. 2021. Shared predators between primate groups and mixed species bird flocks: the potential for forest-wide eavesdropping networks. *Oikos*. <https://doi.org/10.1111/oik.08274>
96. Ritchie, KL, **Vredenburg**, VT, Chaukulkar, S, Butler H, Zink, A. 2021. Social group size influences pathogen transmission in salamanders. *Behav Ecol Sociobiol* **75**, 136 (2021) <https://doi.org/10.1007/s00265-021-03057-6>.
95. Uetz P, Koo MS, Aguilar R, Brings E, Catenazzi A, Chang AT, Chaitanya R, Freed P, Gross J, Hammermann M, Hosek J, Lambert M, Sergi Z, Spencer CL, Summers K, Tarvin R, **Vredenburg** VT, Wake DB. 2021. A Quarter Century of Reptile and Amphibian Databases. *Herpetological Review* **52(2)**:246-255.

## 2020

94. Greer JA, A Swei, VT **Vredenburg**, AG Zink. Parental Care Alters the Egg Microbiome of Maritime Earwigs. *Microb Ecol* **80**, 920–934 (2020). <https://doi.org/10.1007/s00248-020-01558-x>
93. Olivares-Miranda M, **Vredenburg** VT, García-Sánchez JC, Byrne AQ, Rosenblum EB, Rovito SM. 2020. Fungal infection, decline and persistence in the only obligate troglodytic Neotropical salamander. *PeerJ* **8**:e9763 <https://doi.org/10.7717/peerj.9763>
92. Sette, C.M., **Vredenburg**, V.T. & Zink, A.G. Differences in Fungal Disease Dynamics in Co-occurring Terrestrial and Aquatic Amphibians. *EcoHealth* **17**, 302–314 (2020). <https://doi.org/10.1007/s10393-020-01501-z>
91. Lambert MR, MC Womack, AQ Byrne, MR Grundler, O Hernandez-Gomez, CF Noss, AP Rothstein, DC Blackburn, JP Collins, ML Crump, MS Koo, P Nanjappa, L Rollins-Smith, VT **Vredenburg**, and EB Rosenblum. 2020. Response to Scheele et al.: The amphibian chytrid crisis remains data

deficient. *Science* 367. [DOI:10.1126/science.aay1838](https://doi.org/10.1126/science.aay1838)

90. Woodhams, D.C., Rollins-Smith, L.A., Reinert, L.K. Lam, B.A., Harris, R.N., Briggs, C.J. **Vredenburg**, V.T., Patel, B.T., Carpioli, R.M., Chaurand, P., Hunziker, P., & Bigler, L. 2020. Probiotics Modulate a Novel Amphibian Skin Defense Peptide That Is Antifungal and Facilitates Growth of Antifungal Bacteria. *Microb Ecol* **79**, 192–202 (2020). <https://doi.org/10.1007/s00248-019-01385-9>
89. Caballero-Díaz, C, Sánchez-Montes, H Butler, VT **Vredenburg**, and Í Martínez-Solano. 2020. The role of artificial breeding sites in amphibian conservation: A case study in rural areas in central Spain. *Herpetological Conservation and Biology* **15**(1) 87-104.
88. Bernardo-Cravo, AP, DS Schmeller, A Chatzinotas, VT **Vredenburg**, A Loyau. 2020. Environmental Factors and Host Microbiomes Shape Host–Pathogen Dynamics. *Trends in Parasitology* **36**(7) 616-633 <https://doi.org/10.1016/j.pt.2020.04.010>.

## 2019

87. De León ME, Zumbado-Ulate H, García- Rodríguez A, Alvarado G, Sulaeman H, Bolaños F, & VT **Vredenburg**. 2019. Batrachochytrium dendrobatidis infection in amphibians predates first known epizootic in Costa Rica. *PLoS ONE* **14**(12): e0208969. <https://doi.org/10.1371/journal.pone.0208969>
86. Brown, C, LR Wilkinson, KK Wilkinson, T Tunstall, R Foote, BD Todd and VT **Vredenburg**. 2019. Demography, habitat, and movements of the Sierra Nevada yellow-legged Frog (*Rana sierrae*) in streams. *Copeia* **107**(4) 661–675. <https://doi.org/10.1643/CE-19-196>  
*\*Awarded 2019 Best Paper in Herpetology! American Society of Ichthyologists and Herpetologists (ASIH)*
85. Byrne, AQ, VT **Vredenburg**, A Martel, F Pasmans, RC Bell, DC Blackburn, CJ Briggs, RM Brown, MC Bletz, J Bosch, R Figueroa-Valenzuela, SL Ghose, JR Jaeger, AJ Jani, M Jirku, RA Knapp, DM Portik, CL Richards-Zawacki, H Rockney, T Stark, H Sulaeman, N T Tao, J Voyles, AW Waddle, Z Yuan, E B Rosenblum. 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>
84. **Vredenburg** VT, McNally SVG, Sulaeman H, Butler HM, Yap T, Koo MS, D Schmeller, C Dodge, T Cheng, G Lau, and CJ Briggs. (2019) Pathogen invasion history elucidates contemporary host pathogen dynamics. *PLoS ONE* **14**(9): e0219981. <https://doi.org/10.1371/journal.pone.0219981>
83. Zumbado-Ulate, H, A García-Rodríguez, VT **Vredenburg**, C Searle. 2019. Infection with *Batrachochytrium dendrobatidis* is common in tropical lowland habitats: Implications for amphibian conservation. *Ecology and Evolution* **9** (8):4917-4930. <https://doi.org/10.1002/ece3.5098>
82. Flechas SV, Acosta-González A, Escobar LA, Kueneman JG, Sánchez-Quitian ZA, Parra-Giraldo CM, Rollins-Smith LA, Reinert LK, **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
81. Woodhams, DC, Rollins-Smith, LA, Reinert, LK, Lam, BA, Harris, RN, Briggs, CJ, **Vredenburg**, VT, Patel, BT, Carpioli, RM, Chaurand, P, Hunziker, P, and Bigler, L 2019. Probiotics modulate a novel amphibian skin defense peptide that is antifungal and facilitates growth of antifungal bacteria. *Microb Ecol* (2019). <https://doi.org/10.1007/s00248-019-01385-9>
80. Ellison S, Knapp RA, Sparagon W, Swei A, VT **Vredenburg**. 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>

## 2018

79. Ellison, S, S Rovito, G Parra-Olea, C Vazquez-Almazan, SV Flechas, K Bi, and VT **Vredenburg**. 2018. The influence of habitat and phylogeny on the skin microbiome of amphibians in Guatemala and Mexico. *Microb Ecol* (2018). <https://doi.org/10.1007/s00248-018-1288-8>
78. Rios-Sotelo, G., Figueroa-Valenzuela, R., and V.T. **Vredenburg**. 2018. Retrospective survey reveals extreme rarity of amphibian fungal pathogen *Batrachochytrium dendrobatidis* in Japanese amphibians from 1890-1990s. *Herpetological Review* **49**(2): 247-252.
77. von May, R, A Catenazzi , R Santa-Cruz, VT **Vredenburg**. 2018. Microhabitat temperatures and prevalence of the pathogenic fungus *Batrachochytrium dendrobatidis* in lowland Amazonian frogs. *Tropical Conservation Science*. <https://doi.org/10.1177/1940082918797057>

76. Chaukulkar S, Sulaeman H, Zink AG, VT **Vredenburg**. 2018 Pathogen invasion and non-epizootic dynamics in Pacific newts in California over the last century. *PLoS ONE* 13(7): e0197710. <https://doi.org/10.1371/journal.pone.0197710>
  75. Martinez, A. E., Parra, E., Muellerklein, O., and VT **Vredenburg**. 2018. Fear-based niche shifts in neotropical birds. *Ecology* (2018), 10.1002/ecy.2217.
  74. Bird AK, SR Prado-Irwin, VT **Vredenburg** and AG Zink. 2018. Skin Microbiomes of California Terrestrial Salamanders Are Influenced by Habitat More Than Host Phylogeny. *Front. Microbiol.* 9:442. doi: 10.3389/fmicb.2018.00442
  73. Catenazzi A, Flechas SV, Burkart D, Hooven ND, Townsend J and VT **Vredenburg**. 2018. Widespread Elevational Occurrence of Antifungal Bacteria in Andean Amphibians Decimated by Disease: A Complex Role for Skin Symbionts in Defense Against Chytridiomycosis. *Front. Microbiol.* 9:465. doi: 10.3389/fmicb.2018.00465
  72. Yap TA, Koo MS, Ambrose RF, VT **Vredenburg**. 2018. Introduced bullfrog facilitates pathogen invasion in the western United States. *PLoS ONE* 13(4): e0188384. <https://doi.org/10.1371/journal.pone.0188384>
  71. Schmeller, DS, A Loyau, K Bao, W Brack, A Chatzinotas, F De Vleeschouwer, J Friesen, L Gandois, SV Hansson, M Haver, G Le Roux, J Shen, R Teisserenc, and VT **Vredenburg**. 2018. People, pollution and pathogens – Global change impacts in mountain freshwater ecosystems. *Science of the Total Environment* 622–623:756–763.
  70. Owens, MT, Additional Authors, VT **Vredenburg**, AG Zink, LA Kelley, CR Domingo, KD Tanner. 2018. Collectively Improving Our Teaching: Attempting Biology Department-wide Professional Development in Scientific Teaching. *CBE: Life Sci. Educ.* March 1; 17(1):ar2.
- 2017**
69. Yap, TA, Nguyen, NT, Serr, M, Shepak, A, and VT **Vredenburg**. 2017. *Batrachochytrium salamandrivorans* and the risk of a second amphibian pandemic. *EcoHealth* (2017) 14: 851. <https://doi.org/10.1007/s10393-017-1278-1>
  68. Burkart, D, Flechas, SV, **Vredenburg**, VT and Catenazzi, A. 2017. Cutaneous bacteria, but not peptides, are associated with chytridiomycosis resistance in Peruvian marsupial frogs. *Anim Conserv.* doi:10.1111/acv.12352
  67. Burkart, D., Flechas, S. V., **Vredenburg**, V.T. and Catenazzi, A. (2017), Cutaneous bacteria, but not peptides, are associated with chytridiomycosis resistance in Peruvian marsupial frogs. *Anim Conserv.* doi:10.1111/acv.12352
  66. Catenazzi A, Swei A, Finkle J, Foreyt E, Wyman L, **Vredenburg** VT. 2017. Epizootic to enzootic transition of a fungal disease in tropical Andean frogs: Are surviving species still susceptible? *PLoS ONE* 12(10): e0186478. **2017** doi:10.1371/journal.pone.0186478
  65. Prado-Irwin, SR, Bird, AK, Zink, AG, & **Vredenburg**, VT. 2017. Intraspecific variation in the skin-associated microbiome of *Ensatina*, the terrestrial ring-species salamander. *Microb Ecol.* 2017. doi:10.1007/s00248-017-0986-y
  64. Martínez, A. E., Parra, E., Collado, L. F. and **Vredenburg**, VT. 2017. Deconstructing the landscape of fear in stable multi-species societies. *Ecology*, 98: 2447–2455. doi:10.1002/ecy.1935
  63. Jaeger, JR, Waddle, AW, Rivera, R, Harrison DT, Ellison, S, Forrest, MJ, **Vredenburg**, VT, van Breukelen, F. 2017. *Batrachochytrium dendrobatidis* and the decline and survival of the Relict Leopard Frog. *EcoHealth*. doi:10.1007/s10393-017-1240-2
  62. Romansic JM, Johnson JE, Wagner RS, Hill RH, Gaulke CA, **Vredenburg** VT, Blaustein AR. 2017. Complex interactive effects of water mold, herbicide, and the fungus *Batrachochytrium dendrobatidis* on Pacific treefrog *Hyla regilla* hosts. *Dis Aquat Org* 123:227-238. <https://doi.org/10.3354/dao03094>
  61. Adams, AJ, SJ Kupferberg, MQ Wilber, AP Pessier, M Greffrud, S Bobzien, VT **Vredenburg**, and CJ Briggs. 2017. Extreme drought, host density, sex, and bullfrogs influence fungal pathogen infection in a declining lotic amphibian. *Ecosphere* 8(3):e01740. 10.1002/ecs2.1740
  60. De Leon, ME, VT **Vredenburg**, and J Piovio-Scott. 2017. Recent Emergence of a Chytrid Fungal Pathogen in California Cascades Frogs (*Rana cascadae*). *EcoHealth*. doi:10.1007/s10393-016-1201-1
  59. Familiar López, M, EA Rebollar, RN Harris, VT **Vredenburg**, and JM Hero. 2017. Temporal Variation of the Skin Bacterial Community and *Batrachochytrium dendrobatidis* Infection in the Terrestrial Cryptic Frog *Phyllorhina loveridgei*. *Frontiers in Microbiology* 8:2535. doi: 10.3389/fmicb.2017.02535

58. Cusi JC, AC Barboza, VT **Vredenburg**, R von May. 2017. New distribution records and conservation status of *Atelopus seminiferus* Cope, 1874: A Critically Endangered harlequin frog from northern Peru *Amphibian & Reptile Conservation* 11 (1), 17-24

#### 2016

57. Knapp, RA, GM Fellers, PM Kleeman, DAW Miller, VT **Vredenburg**, EB Rosenblum, and CJ Briggs. 2016. Large-scale recovery of an endangered amphibian despite ongoing exposure to multiple stressors *Proc. Natl. Acad. Sci. U. S. A.* 113, 11889-11894, doi:10.1073/pnas.1600983113 (2016).
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#### 2014

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35. Swei, A, JIL Rowley, D Rödder, MLL Diesmos, AC Diesmos, CJ Briggs, R Brown, TT Cao, TL Cheng, B Han, J Hero, DH Hoang, MD Kusriani, TTD Le, M Meegaskumbura, T Neang, SPHimmack, D Rao, NMM Reeder, SD Schoville, N Sivongxay, N Srei, M Stöck, B Stuart, L Torres, TAD Tran, TS Tunstall, D Vieites, and VT **Vredenburg** 2011 Is Chytridiomycosis an Emerging Infectious Disease in Asia? *PLoS ONE* 6(8): e23179
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33. Schoville, SD, TS Tunstall, VT **Vredenburg**, AR Backlin, DA Wood, RN Fisher 2011 Conservation genetics of evolutionary lineages of the endangered mountain yellow-legged frog, *Rana muscosa* (Amphibia: Ranidae), in southern California *Biological Conservation* 144:2031-2040
32. Reeder, NMM, TL Cheng, VT **Vredenburg**, and DC Blackburn 2011 Survey of the chytrid fungus *Batrachochytrium dendrobatidis* from montane and lowland frogs in eastern Nigeria *Herpetology Notes* 4:83-86
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## 2010

30. Catenazzi, A, VT **Vredenburg**, and E Lehr 2010 *Batrachochytrium dendrobatidis* in the live frog trade of Telmatobius (Anura: Ceratophryidae) in the Tropical Andes *Diseases of Aquatic Organisms* 92:187-191
29. Blackburn, DC, B J Evans, AP Pessier, VT **Vredenburg** 2010 An enigmatic mass mortality event in the only population of the Critically Endangered Cameroon frog *Xenopus longipes* (Anura: Pipidae) *African Journal of Herpetology* 59:1-12
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27. 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
26. **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  
Reviews and other significant citations of Vredenburg et al 2010:
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24. 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
- 2008**
23. 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
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- 2007**
21. 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* *Proceedings of the National Academy of Sciences* 104(34): 13845-13850
20. 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
19. Finlay, JC and VT **Vredenburg** 2007 Introduced trout sever trophic connections in watersheds: consequences for a declining amphibian *Ecology* 88(9): 2187-2198
18. **Vredenburg**, VT, R Bingham, R Knapp, JAT Morgan, C Moritz, and D Wake 2007 Concordant molecular and phenotypic data delineate new taxonomy and conservation priorities for the endangered mountain yellow-legged frog (Ranidae: *Rana muscosa*) *Journal of Zoology* 271(4): 361-374
17. 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
16. Rollins-Smith, LA, DC Woodhams, LK Reinert, VT **Vredenburg**, CJ Briggs, PF Nielsen, and JM Conlon 2006 Antimicrobial Peptide Defenses of the Mountain Yellow-Legged Frog (*Rana muscosa*) *Developmental & Comparative Immunology* 30(9): 831-842
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15. 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
14. 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
13. 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
12. **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
11. Rachowicz, LJ and VT **Vredenburg** 2004 Transmission of *Batrachochytrium dendrobatidis* within and between amphibian life stages *Diseases of Aquatic Organisms* 61:75-83
10. **Vredenburg**, VT, T Tunstall, H Nguyen, J Romansic, S Schoville. 2001 *Hydromantes platycephalus* (Mt. Lyell Salamander) Behavior *Herpetological Review* 32:178
9. Macey, JR J Stasburg, J Brisson, VT **Vredenburg**, M Jennings, and A Larson 2001 Molecular phylogenetics of western North American frogs of the *Rana boylei* species group *Molecular Phylogenetics and Evolution* 19(1):131-143

8. **Vredenburg**, VT, T Tunstall, H Nguyen, J Romansic and S Schoville 2001 *Hydromantes platycephalus* (Mt Lyell salamander) *Herpetological Review* 32:178
7. **Vredenburg**, VT, and AP Summers. 2001. Field Identification of chytridiomycosis in *Rana muscosa* *Herpetological Review* 32:151-152
6. **Vredenburg**, VT 2000 Natural History Notes: *Rana muscosa* (mountain yellow-legged frog), conspecific egg predation *Herpetological Review* 31:170-171
5. **Vredenburg**, V T, Y Wang, and G Fellers 2000 Scientific meeting raises awareness of amphibian decline in Asia *FrogLog* 42: 2-3
4. Knapp, R A, V T **Vredenburg**, and K M Matthews 1998 Effects of stream channel morphology on golden trout spawning habitat and recruitment *Ecological Applications* 8(4):1104-1117
3. Knapp, RA, and VT **Vredenburg** 1996 A field comparison of the substrate composition of golden trout redds using two sampling techniques *North American Journal of Fisheries Management* 16:674-681
2. Knapp, RA, and VT **Vredenburg** 1996 Spawning by California golden trout: characteristics of spawning fish, seasonal and daily timing, redd characteristics, and microhabitat preferences *Transactions of the North American Fisheries Society* 125(4):519-531
1. Knapp, RA, PC Sikkell, and VT **Vredenburg** 1995 Age of clutches in nests and the with-in nest spawning-site preferences of three damselfish species (Pomacentridae) *Copeia* (1995):78-88

#### Book Chapters and other publications

- Catenazzi A, von May R, **Vredenburg**, VT (2013) Conservation of the high Andean frog *Telmatobius jelskii* along the Peru LNG pipeline in the regions of Ayacucho and Huancavelica, Peru. Chap. 17, in: Monitoring Biodiversity: Lessons from a Transandean megaproject. A. Alonso, F. Dallmeier and G. Servat (Eds.) Smithsonian Institution Press, Washington DC.
- Whittaker K, Koo MS, Wake DB, and **Vredenburg** VT. 2013 Global Declines of Amphibians. In: Levin S.A. (ed.) Encyclopedia of Biodiversity, second edition, Volume 3, pp. 691-699. Waltham, MA: Academic Press.
- Diesmos, M. L. D., Diesmos, A. C., Siler, C. D., **Vredenburg**, V. T., & Brown, R. M. 2012. Detecting the distribution of the chytrid fungus in the Philippines. *FrogLog*, 104, 48-49
- Vredenburg**, V. T., C. J. Briggs, and R. N. Harris. 2011. Host-pathogen dynamics of amphibian chytridiomycosis: The role of the skin microbiome in health and disease In *Fungal diseases: An emerging threat to human, animal and plant health*, edited by L. Olsen, E. R. Choffnes, D. A. Relman and L. Pray. Washington, D.C.: The National Academies Press IOM (Institute of Medicine). Pp. 342-355.
- Cheng, TL, S Rovito, DB Wake and VT **Vredenburg** 2011 Museum specimens reveal spread of pathogen and collapse of amphibians in Central America *Froglog* 101: 18-22
- A Swei, JJJ Rowley, D Rödder, MLL Diesmos, AC Diesmos, CJ Briggs, R Brown, TT Cao, TL Cheng, B Han, J Hero, DH Hoang, MD Kusriani, TTD Le, M Meegaskumbura, T Neang, SPHimmack, D Rao, NMM Reeder, SD Schoville, N Sivongxay, N Srei, M Stöck, B Stuart, L Torres, TAD Tran, TS Tunstall, D Vieites, and VT **Vredenburg**. 2012. Prevalence and distribution of chytridiomycosis throughout Asia *FroLog* 98: 22-24
- Vredenburg**, VT, M McDonald, & T Sayre (2010) *Amphibians and Climate Change* Natural Selections 6(1):10-12
- Vredenburg**, VT, MS Koo, and DB Wake 2008 Declines of amphibians in California In Hoffman, M (Ed), *Threatened Amphibians of the World* Lynx Ediciones, Barcelona, Spain, pp 126
- Vredenburg**, VT, G Fellers, and C Davidson 2005 The mountain yellow-legged frog (*Rana muscosa*) In Lannoo, MJ (Ed), Status and Conservation of US Amphibians University of California Press, Berkeley, California, USA, pp 563-566

#### **Student Mentoring**

*Master's Students-Vredenburg as chair (completed 2009-present)*

32. Rinnah Clark
31. Conor Harrington
30. Bria Boose
29. Andrés Patino-Lopez
28. Oliver Coyle
27. Kurt Lutz

26. Adrienne Le; *Patterns of fungal infection in two threatened amphibian species, *Ambystoma macrodactylum* and *Hyllola regilla*, over the last century* (in prep to submit to journal)
25. Gordon Lau; *Do salamander life history traits correlate with susceptibility to fungal infections?* (in prep to submit to journal)
24. Alan Chan-Alvarado; *The skin microbiome of amphibians from Taiwan is influenced by pathogens and habitat* (Published in *Sci Rep* 2022)
23. Helen Butler; *Historical context of pathogen / host dynamics suggest recent invasion in the Pyrenees Mountains of a fungal pathogen* (Published *Behav Ecol Sociobiol, Herpetol Conserv, PLOS ONE*)
22. Hasan Suleaman; *Is an amphibian epidemic imminent in Indonesia?* (in prep to submit to journal)
21. Heidi Rockney; *Historical and present-day host/ pathogen dynamics of *Batrachochytrium dendrobatidis* and amphibians of Sulawesi, Indonesia* (in prep to submit to journal)
20. Shruti Chaukulkar; *Pathogen invasion and non-epizootic dynamics in Pacific newts in California over the last century.* (Published *PLOS ONE, Behav Ecol Sociobiol*)
19. Jordan Greer; *Parental care influences the microbiome structure and function of earwig eggs* (Dr.A Zink co-chair)(Published *Microb Ecol*)
18. Eliseo Parra; *Vocal mimicry of mixed-flock leader by a tracheophone suboscine bird* (in prep to submit to journal)
17. Mae Cowgill; *Sociality and disease across the *Batrachoseps* phylogeny* (Dr. A Zink co-chair)(Published *Front Vet Sci*)
16. Kendra Ritchie; *Sociality and disease dynamics in the salamanders *Batrachoseps attenuatus* and *Batrachoseps gregarius** (Dr.A Zink co-chair)(Published *Behav Ecol Sociobiol*)
15. Alicia Bird; *The role of parental care in disease transmission in a fungal pathogen/ amphibian host system* (Dr.A Zink co-chair)(Published *Front Microbiol, Microb Ecol*)
14. Sofia Prado-Irwin; *Skin microbial communities, and the role of parental care in the transmission and maintenance of the skin microbiome in *Ensatina* salamanders.* (Dr.A Zink co-chair)(Published *Fron. Microb, Microb Ecol*)
13. Sam McNally; *Tracking the spread of *Batrachochytrium dendrobatidis* through amphibians in California's Sierra Nevada* (Published *PLOS ONE*)
12. Silas Ellison; *The role of frog skin microbiome in health and disease* (Published *Microb Ecol, EcoHealth X2, ISME, Mol Ecol*)
11. Andrea Manzano; *Chytridiomycosis and the decline of the amphibian fauna in Ecuador* (in prep to submit to journal)
10. Carla Sette; *Reconstructing historical and contemporary disease dynamics: a case study using the California slender salamander* (Published *Biological Conservation, EcoHealth*; Dr.A Zink co-chair)
9. Jon Young; *The restoration of Mountain Lake: San Francisco's only natural lake* (in prep to submit to journal)
8. Angel Jacobo Conde; *The amphibian chytrid pathogen *Batrachochytrium dendrobatidis* in Guatemala* (in prep to submit to journal)
7. Danqing Shao; *Investigating the role of introduced American Bullfrogs in the spread chytridiomycosis disease in Chinese amphibians?* (in prep to submit to journal)
6. Raul Figueroa; *Was the fungal pathogen, *Batrachochytrium dendrobatidis*, spread throughout Asia by the amphibian food and pet trade?* (in prep to submit to journal)
5. Gabriela Rios-Sotelo; *Did the fungal pathogen *Batrachochytrium dendrobatidis* originate from Japan?* (Recent winner of Young Scientist Travel Award, EcoHealth 2012) (Published in *Herp Review*)
4. Celeste Dodge; *Effects of a fungal pathogen on the Yosemite Toad?* (In Review: *Biological Conservation*)
3. Tina Cheng; *The effects of chytridiomycosis disease on Central American salamanders* (published in *PNAS; PLOS ONE X 3, J Zoo Wildlife Med, Herp Notes*; Winner Ecological Society of America Best Student Paper Award 2011)
2. Meghan Bishop; *Habitat use and conservation of red-legged frogs in coastal California* (Published *Journal of Herpetology*); collaborative project with California Academy of Sciences, Dr. Robert Drewes.

1. Natalie Reeder; *A reservoir species for the emerging amphibian pathogen Batrachochytrium dendrobatidis thrives in a landscape decimated by disease*. [Nominated for the 2010 Western Association of Graduate Studies Distinguished Master's Thesis Award 2010; Published *PLoS ONE*]

*Master's Students-Committee Member (Completed)*

15. David Burkhart –The role of bacterial symbionts in survival of Peruvian frogs in the face of chytridiomycosis (Chair: A. Catenazzi) Southern Illinois University Carbondale
14. Marcel Talla; *Feeding ecology and breeding biology of a West African caecilian* (Chair: D. Blackburn) California Academy of Sciences
13. Daniella Reagan (Chair: C Davidson); *The cumulative effects of pesticides and disease on the Cascades Frog (Rana cascadae)*.
12. Kim Vincent (Chair: E Routman), *The effects of pesticides on Pacific chorus frog tadpoles*
11. Anthony Chazar (Chair: R Sehgal), *Effects of deforestation on the prevalence and diversity of blood parasites in two African rainforest birds*
10. Maria Tonione (Chair: E Routman), *Microsatellite variation in the hellbender, Cryptobranchus alleganiensis*
9. Jenny Carlson (Chair: R Seghal), *Evolution of blood pathogens in avian hosts*
8. Hazel Thwin (Chair: J Dumbaucher), **California Academy of Sciences**, *Ornithology of Myanmar*
7. Molly Dodge (Chair: R Sehgal), *Transmission of haemosporidian pathogens in resident and migrating birds*
6. Holly Archer (Chair: R Seghal), *Emerging infectious disease and blood parasite prevalence in countryside birds*
5. Stephen Micheletti (Chair: E Routman), *Population structure of Side-blotched Lizards (Uta stansburiana): Displaying adaptive dorsal coloration*
4. Alexandra Vasquez Ochoa; *El ensamblaje de anfibios en 13 localidades de la region Andina central oriental, Orinoquia y Amazonia de Colombia*; Pontificia Universidad la Javeriana, Bogota, Colombia
3. Tessa Margaret Page *Effects of lowered pH on the exoskeleton mineralogy of porcelain crabs* (Chair: J Stillman)
2. Greg Jongsma; *Diversity and biogeography of the frog genus Hylarana (Ranidae) across the sub-saharan Africa* (Chair: D Blackburn) California Academy of Sciences
1. Adria Rae Abigail R. Eda *Isolation, screening and identification of frog cutaneous bacteria for anti-Batrachochytrium dendrobatidis activity*; Ateneo de Manila University, Quezon City, Philippines

*PhD Students (SFSU does not have a PhD program)-Committee Member*

*In progress*

1. Emma Steigerwald. *Fungal pathogen Batrachochytrium dendrobatidis in high elevation areas of Peru*. University of California Berkeley. (Collaborative Paper in review *PNAS*)
2. Angélica Arenas Rodríguez *Emergence of the fungal pathogen Batrachochytrium dendrobatidis in frogs occurring at La Chingaza National Park, Colombia*. Pontificia Universidad Javeriana, Facultad de Ciencias, Doctorado en Ciencias Biológicas, Unidad de Ecología y Sistemática UNESIS, Laboratorio de Herpetología, Bogotá, Colombia (In preparation)
3. Sonia Ghose. *Continent-wide recent emergence of a global pathogen in African amphibians*. University of California Davis. (In Press 2023 in *Frontiers in Conservation Science*)
4. Amanda Pohlman. *Host-Pathogen Interactions in Chemically Defended Amphibians: Tradeoffs of Chytrid Resiliency*. Stanford University.

*Completed PhD students; Committee Member*

4. Julio César García Sánchez, Ph.D. *La capacidad antifúngica del microbioma bacteriano de salamandras cavernícolas de México*. Chair: Sean Rovito, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional, Unidad Irapuato, México. (Paper in review)
3. Tiffany Yap, Ph.D. *Modeling vulnerability to the invasion of Batrachochytrium salamandrivorans in North American amphibians*. University of California Los Angeles. (Published: Science, PLOS ONE, Front. Vet. Sci., EcoHealth)
2. Sandra Victoria Flechas, Ph.D. *Interactions between frog microbiota and Batrachochytrium dendrobatidis in Peru*. Chair A. Amezcua, Universidad de los Andes, Bogotá, Colombia.(Published: The ISME Journal, Herp

Review, EcoHealth, Anim Conservation, Frontiers in Microbiology)

1. Brooke Talley, Ph.D. *Ecology of Batrachochytrium dendrobatidis in amphibians of Illinois*. Chair K Lips, Southern Illinois University. (Published Biological Conservation 2015)

*Undergraduate students conducting research in Vredenburg Lab*

5-18 students per semester since 2009.

#### Featured Vredenburg Lab research

**University Biology Textbooks:** 1) Campbell, NA, & Reece, J B (2015) *Biology*, Benjamin Cummings, 8<sup>th</sup> 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. 3<sup>rd</sup> 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 the world's amphibians; with average of 7.3 million successful queries / year by students, conservation scientists, and the general public since 2002; helped create: **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 Qarks*; **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

**NAS** – National Academies of Sciences, Institute of Laboratory Animal Research (ILAR): Animal Welfare Challenges in Research and Education on Wildlife, Non-Model Animal Species, and Biodiversity (2022)

**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)