## RESEARCH INTERESTS

Paleoecology, Climate Change, Environmental Reconstruction, and Stable Isotope Biogeochemistry

# EDUCATION

### University of California, Santa Cruz

September 2003- October 2010

Doctor of Philosophy, Earth Science

Advisor: Dr. Paul L. Koch

Committee: Drs. Dave Casper, Jim Estes, Hilde Schwartz, and Jim Zachos

Dissertation title: Insights to shark ecology and physiology with stable isotope analysis

### Dartmouth College

September 1998-June 2002

Bachelor of Arts, Cum Laude

Double major in Earth Sciences and Environmental Studies

Honor’s senior thesis title: Biomarker Evaluation of Anthropogenic/Agricultural Impacts on Popes Creek Estuary (Advisor: Dr. Meixun Zhao)

## PROFESSIONAL APPOINTMENTS

2016 – present **Assistant Professor**

University of Kentucky, Department of Earth and Environmental Sciences

2014 - 2016 **T.C. Chamberlin Fellow**

University of Chicago, Department of Geophysical Sciences

Mentors: Drs. Albert Colman and Michael Foote

2013 **Postdoctoral Research Associate**

University of Wyoming, Department of Geology & Geophysics

Mentor: Dr. Bryan Shuman

2010 - 2012 **Postdoctoral Research Associate**

University of Wyoming, Department of Geology & Geophysics

Mentor: Dr. Mark T. Clementz

## PUBLICATIONS

***Refereed Journal Articles*** (undergraduate† and graduate†† students mentored by SLK)

Hacohen-Domené A††, **Kim SL**, Galván-Magaña F, Gladis AL, Vázquez-Juarez R, Ramirez-Macías D, *in review*, Trophic and habitat structure of whale sharks (*Rhincodon typus*) in the Gulf of California: a combined approach with observation and stable isotope analysis. *Marine Biology Research.*

Zeichner S†, **Kim SL**, Colman AS, *in review*, Discrimination factors and incorporation rates for organic organic components in shark teeth. *Journal of Experimental Biology*.

# Fraser D††, Kim SL, Gorelick R, Clementz MT, *in review*, Paleo-seasonality reconstruction from oxygen isotope analysis of pronghorn (*Antilocapra americana*) enamel. *Oecologia.*

TomašovýchA, Kennedy JD, Betzner TJ, Bitler N, Edie S, **Kim SL**, Supriya K, White AE, Rahbek C,Huang S, Price TD, Jablonski D, *accepted*, Unifying latitudinal gradients in range size and richness across marine and terrestrial systems. *Proceedings of the Royal Society B.*

**Kim SL**, Shuman BN, Minckley TA, Marsicek JP, 2016, Biogeochemical change during climate change-driven primary forest succession: a paleoecological perspective from the Rocky Mountains. *Ecosystems*.

**Kim SL**, Eberle JJ, Bell DM, Fox D, and Padilla A, 2014, Evidence from shark teeth for a brackish Arctic Ocean in the Eocene greenhouse: Geology, p. 1–5, doi: 10.1130/G35675.1.

**Kim, SL**, Thewissen, JGM, Churchill MM, Suydam RS, Ketten DR, and Clementz MT, 2014, Unique Biochemical and Mineral Composition of Whale Ear Bones: Physiological and Biochemical Zoology, v. 87, no. 4, p. 576–584, doi: 10.1086/676309.

Hoen DK†, **Kim SL**, Hussey NE, Wallsgrove NJ, Drazen JC, and Popp BN, 2014, Amino acid 15N trophic enrichment factors of four large carnivorous fishes: Journal of Experimental Marine Biology and Ecology, v. 453, p. 76–83, doi: 10.1016/j.jembe.2014.01.006.

**Kim SL**, Tinker MT, Estes JA, and Koch PL, 2012, Ontogenetic and Among-Individual Variation in Foraging Strategies of Northeast Pacific White Sharks Based on Stable Isotope Analysis: PLoS ONE, v. 7, no. 9, p. 1–11, doi: 10.1371/journal.pone.0045068.

**Kim SL**, Martínez del Rio C, Casper D, and Koch PL, 2012, Isotopic incorporation rates for shark tissues from a long-term captive feeding study: Journal of Experimental Biology, v. 215, no. 14, p. 2495–2500, doi: 10.1242/jeb.070656.

Carlisle AB, **Kim SL**, Semmens BX, Madigan DJ, Jorgensen SJ, Perle CR, Anderson SD, Chapple TK, Kanive PE, and Block BA, 2012, Using Stable Isotope Analysis to Understand the Migration and Trophic Ecology of Northeastern Pacific White Sharks (*Carcharodon carcharias*): PLoS ONE, v. 7, no. 2, p. e30492, doi: 10.1371/journal.pone.0030492.t006.

**Kim SL**, Casper DR, Galván-Magaña F, Ochoa-Díaz R, Hernández-Aguilar SB, and Koch PL, 2012, Carbon and nitrogen discrimination factors for elasmobranch soft tissues based on a long-term controlled feeding study: Environmental Biology of Fishes, v. 95, no. 1, p. 37–52, doi: 10.1007/s10641-011-9919-7.

**Kim SL**, and Koch PL, 2012, Methods to collect, preserve, and prepare elasmobranch tissues for stable isotope analysis: Environmental Biology of Fishes, v. 95, no. 1, p. 53–63, doi: 10.1007/s10641-011-9860-9.

***Educational Publications***

Kretke KA, **Kim SL**, and Bresler M, 2010, Resonant Pendulums: An Inquiry-Based Physics Lab, *in* Hunter, L. and Metevier, A.J. eds., Santa Cruz, p. 171.

**Kim SL**, Stauffer H, Peach K, and Nelson K, 2010, The Tipping Point: Thresholds Between Earth's Physical Systems, *in* Hunter, L. and Metevier, A.J. eds., p. 237.

## GRANTS & FELLOWSHIPS

2011 Evolution and Paleoecology of White Sharks: An Isotopic Study. Sedimentary Geology

and Paleobiology Program; National Science Foundation (EAR-1053013). PI: Dr. Paul

Koch, primarily written by SLK

2008 Doctoral Student Sabbatical Fellowship, UC Santa Cruz

2008 Calibrating Isotopic Methods To Study Shark Ecology, Institute of Geophysics and

Planetary Physics

2007 Using biogeochemical proxies to understand the species abundance shift from *Isurus*

*hastalis* to *Carcharodon carcharias* in the Pisco Basin, Peru; Center for the Dynamics

and Evolution ofthe Land-Sea Interface

## 2006 A biogeochemical approach to study dietary changes of white sharks off the California

## coast from modern, historical, and archaeological vertebrae remains; **Dr. Earl H Myers &**

## **Ethel M. Myers Oceanographic and Marine Biology Trust Award**

2004 The isotopic ecology of modern sharks: groundtruthing for paleontological studies; East

Asia and Pacific Science Institute, National Science Foundation (OISE- 0513060**)**;

Shimizu, Japan with Dr. Sho Tanaka

**TECHNICAL EXPERIENCE**

**Isotope ratio mass spectrometry**

Elemental Analyzer, Thermal Conversion Elemental Analyzer, Gasbench, Gas Chromatography-Combustion with continuous flow isotope ratio mass spectrometers (IRMS; Delta V and Delta V+, Thermo Scientific) and Dual inlet IRMS (VG Optima, Fision Prisms III)

**Analytical techniques**

Bulk organic carbon, nitrogen, and oxygen in biological and sediment samples; inorganic carbon and oxygen in carbonates from biological apatite and aqueous solutions; inorganic oxygen in phosphate from biological apatite; hydrogen in volcanic glass and organic substrates; compound specific analysis of hydrogen, carbon, and nitrogen in amino acids, cholesterol, alkanes, and fatty acids

**Facilities**

University of Chicago, Department of Geophysical Sciences, T.C. Chamberlin Fellow; Facility Directors: Drs. Albert Colman and Gerard Olack (Jan. 2014 – present)

University of Wyoming, Department of Renewable Resources, Postdoctoral Research Associate;

Facility Directors: Craig Cook and Dr. David Williams (2010 – 2013)

Carnegie Institution for Science Geophysical Laboratory, Visiting Researcher; Director: Dr. Marilyn Fogel (2009)

University of California, Santa Cruz, Department of Earth and Planetary Sciences, Graduate

Student Researcher; Facility Directors: Drs. Paul Koch, Ralph Kudela, Matt McCarthy, Christina

Ravelo, and Jim Zachos (2004 – 2010)

Stanford University, Department of Environmental Earth System Science, Technician; Director:

Dr. Page Chamberlain (2002)

**INVITED SEMINARS**

2016 Eocene climate, ecology, and environment: snapshots from shark teeth. Center for Evolutionary Biology, EvMorph Seminar Series, University of Chicago.

2015 Ecological dynamics in modern and ancient sharks: insights from stable isotope analysis. Department of Geology, University of Cincinnati.

2014 The ecological plasticity of Lamniformes: ancient sand tiger and modern white sharks. Watson Seminar Series, Field Museum of Natural History.

2013 Beyond the slashing jaws of shark week: past and present ecology. Human Ecology Forum seminar, College of the Atlantic.

2013 Evidence of a sand tiger shark nursery in Eocene Lake Arctica. Department of Geology and Geophysics, University of Wyoming.

2013 Surprising diet and habitat preferences for modern and ancient sharks. Geology and Environmental Policy and Decision Making Program, University of Puget Sound.

2013 Ecological plasticity in sharks: Examples in modern and ancient Lamniformes. Department of Geophysics, University of Chicago.

2012 The ecological plasticity of sharks: past and present. Geological Science Department, Michigan State University.

2012 Where do sharks go and why? Insights from tagging data and stable isotope analysis.

GeoEarth Department, University of North Carolina- Charlotte.

2011 The dietary patterns of white sharks in the northeast Pacific Ocean. Zoology and Physiology Department, University of Wyoming.

## SELECTED CONFERENCE ACTIVITY

2015 Zeicher SS, Kim SL, Colman AS. Eocene high latitude temperature gradients over time and space based on δ18O values of fossil shark teeth. American Geophysical Union Fall Meeting (poster), San Francisco, CA.

2015 Kerr TJ, Peek SL, Vietti LA, **Kim SL**, Clementz MT. The Junior Paleontologist Program: Challenges and solutions to designing and implementing an education museum activity booklet for a broad demographic. Society of Vertebrate Paleontology (poster), Dallas, TX.

2014 **Kim SL**. Ecological dynamics of sharks based on stable isotope analysis. Midwest Geobiology Symposium (talk), Chicago, IL.

2013 **Kim SL**, Shuman BN, Chen J, Williams DG, and Macdonald CJ. A comparison of n-alkane and n-acid isotopic composition in plants, soils, and lake sediment from the Big Horn Mountains in Wyoming. Geological Society of America (invited talk), Denver, CO.

2013 Williams DG, Chen J, **Kim SL**, Macdonald CJ, and Shuman BN. Lipid biomarker records of ecohydrological response to global change: variation in the isotope composition of n-alkanes in plants exposed to elevated CO2 and warming. Geological Society of America (invited talk), Denver, CO.

2013 **Kim SL**, Eberle JJ, Bell DM, Fox DA, and Padilla A. Evidence for a sand tiger shark nursery in the Eocene Arctic Ocean. Geological Society of America (talk), Denver, CO.

2013 Caldwell S, Bertog, JL, **Kim SL**, Clementz MC. Paleoenvironmental interpretation through oxygen isotopes in phosphate from *Barosaurus* indicates increasing aridity at the Aaron Scott Quarry (Morrison Formation, Jurassic Period). Geological Society of America Southeastern Section Meeting (poster), San Juan, Puerto Rico.

## 2012 Biogeochemical methods to study ectotherm ecology and physiology (symposium chair), World Congress of Herpetology and Joint Meeting of Ichthyologists and Herpetologists.

2012 Brown SC, **Kim SL**, Bizzaro JJ, Ebert DA. Interspecific and size related patterns of trophic separation in a central California skate assemblage revealed through stable isotope analysis. World Congress of Herpetology and Joint Meeting of Ichthyologists and Herpetologists (oral presentation), Vancouver, BC.

2011 **Kim, SL**. Ecology and evolution of *Cosmopolitodus hastalis and Carcharodon carcharias*. Society of Vertebrate Paleontology (poster), Las Vegas, NV.

2010 **Kim SL**, Tinker MT, Estes JA, & Koch PL. Stable isotope analysis reveals specialists and generalists within California white sharks, 1936-2003. International White Shark Symposium (oral presentation), Honolulu, HI.

2009 Perry S†, **Kim S**, Mulks M, Casper D, Sinervo B, & Koch PL. The influence of hibernation on diet-to-blood fractionation factors for the California Mountain Kingsnake (*Lampropeltis zonata*). Joint Meeting of Ichthyologists and Herpetologists (poster), Portland, OR.

2002 **Kim S** & Zhao M. May 2002. Biomarker Analysis of Anthropogenic/Agricultural Impacts on Pope’s Creek Estuary. Christopher Reed Science Symposium sponsored by Sigma Xi (poster), Hanover, NH.

## TEACHING

**UC Santa Cruz** *(*\*Signifies development of syllabus & assignments*)*

Teaching assistant for Earth Catastrophes, Geologic Principles, Environmental Geology\*, Dinosaurs (3 quarters)\*, History of Life, Evolution of the Earth (3 quarters)\*, and Vertebrate Paleontology

**Univ. of Wyoming**

* Paleoecology Readings and Stable Isotope Readings (graduate seminar, Geology & Geophysics)
* Stable Isotope Ecology (graduate course, Dept. of Ecosystem Science & Management)
* Writing a Scientific Manuscript (graduate course, Geology & Geophysics)

**Guest lectures**

* Ichthyology with stable isotope techniques (Moss Landing Larine Lab, graduate students)
* Stable isotope mixing models- Simple arithmetic to a Bayesian framework (University of Puget Sound, undergraduate)
* The intersection of chemistry, geology, and biology with sharks (University of Wyoming, undergraduate)
* Early fish and shark evolution: preservation, cladistics, and paleoecology (University of Wyoming, undergraduate/graduate)
* Marine ecology with stable isotope analysis (College of the Atlantic, undergraduate)

**Field Course**

* Modern and Ancient Environments: Tropical Shallow-Marine Carbonates (co-taught with Prof. Susan Kidwell and Prof. Michael LaBarbera

## OUTREACH AND SERVICE

2014 T.C. Chamberlin Fellowship Committee at the University of Chicago

2014 NSF Review Panelist

2014 Mentor for Sarah Zeichner, a Mellon Mays Undergraduate Fellow at the University of Chicago

2013 Committee member for the dissertation of Ana Hacohen at **Centro Interdisciplinario de Ciencias Marinas (CICIMAR).** Trophic habitat use of the whale shark (*Rhincodon typus*) and the giant manta ray (*Manta birostris*) in the Mexican Caribbean

2012 Stoye Student Presentation judge in general ichthyology for the American Society of Ichthyology and Herpetology

2012 Internship for Ana Hacohen, PhD candidate from **CICIMAR**

2012 Stable isotope ecology course at **CICIMAR in Baja California Sur, Mexico co-taught with** Drs. Fogel, Graham, and Newsome for 45 undergraduate and graduate students from Mexico, Argentina, and Canada

2011 Development of Junior Geologist and National Fossil Day programs for the Univ. of Wyoming Geological Museum

2011 Wyoming State Science Fair Judge, Category: Environmental Management

2008- 2009 WEST, Workshops in Engineering and Science for Transfer Students; organize a 3-day

orientation for UC Santa Cruz transfer students who are majoring in science and engineering. An inquiry-based activity on resonant pendulums (2008) and global climate change (2009) designed to hone skills in critical thinking, scientific investigation, and communication.

2008 – 2009 EYH, Expanding Your Horizons Workshop; workshops to inspire young women to

pursue careers in science. Hands-on activity on the evolution, ecology, and conservation of sharks designed to inspire and introduce students to paleontology and marine biology.

2007 COSMOS, California State Summer School for Mathematics and Science; a residential summer program directed at talented and motivated high school students in California. Students participated in a broad range of activities and were exposed to various aspects of ecology.

2006 GROW, Graduate Researchers Outreach Workshops; provide local elementary-high school students with hands-on-activities within topics of geology, marine biology, and oceanography

2006 MESA, Mathematics, Engineering, Science, and Achievement: minority student outreach organized by graduate students at UCSC

**Journal referee**: *Functional* Ecology, *GSA Bulletin*, *Hydrobiologia, Journal of Fish Biology, Journal of Marine Biology, Limnology and Oceanography, Marine Ecology Progress Series, Physiological and Biochemical Zoology, PLOS ONE, Proceedings of the Royal Society – Biological Sciences, Rapid Communications in Mass Spectrometry, Science of the Total Environment, Zoology*

**Grant referee**: California Sea Grant, National Science Foundation

## AWARDS & HONORS

## 2012 Certificate of Completion in Teaching Laboratory Experiences, UC Santa Cruz

## Institute for Scientist and Engineering Educators

## 2010 Summer Graduate Fellowship for Exceptional TA Service, UC Santa Cruz

## Department of Earth and Planetary Sciences ($5750)

2010 International White Shark Symposium Travel Award ($860)

2009& 2010 Outstanding Teaching Assistant Award, UC Santa Cruz

2008 Center for the Dynamics and Evolution of the Land-Sea Interface Travel Award ($400)

**MEDIA COVERAGE**

2014 “Arctic shark teeth fossils may contain clues about climate adaptation.” *Eye on the*

*Arctic*. Radio Canada International.

2014 “Ancient Arctic sharks tolerated brackish water 50 millions years ago.” *Phys.org*.

2013 “Jump the shark week”. *Science… sort of*. Podcast interview (episode 180).

2012 Switek, Brian. “Great White Shark Diet Is More Than Seals.” *Wired.*

2012 “White Shark Diets Show Surprising Variability, Vary With Age and Among

Individuals.” *Science Daily.*

2012 “Great white sharks have varied menu, study says.” *Santa Cruz Sentinel*, *Los Angeles*

*Times* and *San Jose Mercury News.*

2012 Knight, Kathryn. “Shark carbon and nitrogen enrichment measured.” *Inside Journal of Experimental Biology*.

# 2010 “Shark week”. *Science… sort of* . Podcast interview (episode 25).

##### **PROFESSIONAL AFFILIATIONS & WORKSHOPS**

2014 Macroevolutionary Patterns, NESCent Academy, Durham, NC

2013 Management & Leadership, Earth Sciences Women’s Network, Providence, RI

2012 Preparing for an Academic Career in the Geosciences, On the Cutting Edge, Raleigh, NC

2012Networking & Communications**,** Earth Sciences Women’s Network, Madison WI

2010 Mineralogical Society of America

2005 Society of Vertebrate Paleontology

2005 American Elasmobranch Society

2005 American Society of Ichthyology and Herpetology

2004 Geological Society of America

2002 Sigma Xi