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# Kathleen M. Fisch, Ph.D.

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## EDUCATION

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**Ph.D., Ecology**, University of California, Davis, 2011

**B.A., Integrative Biology**, University of California, Berkeley, 2006

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## PROFESSIONAL APPOINTMENTS

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### Computational Biologist, Medical Genomics

September 2014 – present

*University of California–San Diego, Department of Medicine, Center for Computational Biology & Bioinformatics*

- Whole genome interpretation and reporting in the context of personalized medicine.
- Apply computational genomics and systems biology approaches to study biological problems.
- Develop computational tools in Python and R.
- Perform next-generation sequencing analyses on several platforms including RNA-seq, ChIP-seq, DNA methylation, whole-genome sequencing and whole-exome sequencing.
- Collaborate with multiple research groups to analyze and interpret experimental data.

### Research Associate, Computational Biology

January 2013 – September 2014

*The Scripps Research Institute, Department of Molecular & Experimental Medicine*

- Apply computational genomics and systems biology approaches to study biological problems.

- Projects include:

#### *Personalized Genomic Medicine*

- Develop and implement integrative oncogenomic analyses and clinical reports for cancer patients in an N of 1 personalized genomic medicine trial.
- Use the molecular profile of the patient's tumor to identify drug therapies targeting aberrant gene expression, tumor mutations and dysregulated pathways.

#### *Systems Biology of Osteoarthritis*

- Perform integrative next generation sequencing analyses (RNA-seq, miRNA-seq, DNA methylation) on human knee articular cartilage for normal and osteoarthritic samples.
- Apply systems biology approaches to build a multidimensional molecular profile of osteoarthritis and aging.

#### *Next generation sequencing analysis pipeline development ('omics pipe')*

- Develop an open-source, modular computational platform that automates best practice multi-omics data analysis pipelines on compute clusters and in the cloud.
- Website: [https://bitbucket.org/sulab/omics\\_pipe](https://bitbucket.org/sulab/omics_pipe)

*Additional Collaborations:* Kidney transplant rejection GWAS; Methylation signatures of autophagy; circadian rhythmicity of chondrocytes; regulation of human aminoacyl-tRNA synthetases

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**PROFESSIONAL APPOINTMENTS CONTINUED**


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**Postdoctoral Fellow, CA Sea Grant Delta Science Program** June 2011 – January 2013

*Genetics Division, Institute for Conservation Research, San Diego Zoo Global*

- Wrote individual-based forward-time computer simulations in Python and R to model population dynamics and genomics.
- Used generalized linear mixed models to estimate the heritability of phenotypic traits.
- Developed and implemented SNP genotyping to examine hybridization among three species.
- Managed two federally-funded and one state-funded research projects.

**Postdoctoral Researcher**

March-June 2011

*University of California-Davis, Genomic Variation Laboratory*

- Developed and implemented the delta smelt hatchery genetic management and monitoring plan, which included genotyping for pedigree determination, minimal kinship selection and monitoring neutral genetic variation.
- Investigated the historical population genetics of delta smelt with microsatellite analysis.
- Managed two federally-funded research projects.

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**RESEARCH GRANTS AWARDED**


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**California Sea Grant Delta Science Program**, Principal Investigator, “Saving San Francisco Bay-Delta native fishes: Hatchery management and reintroduction strategies.” Awarded \$167,739 for 2011-2013.

**US Bureau of Reclamation**, Co-Principal Investigator “Delta smelt refugial population genetic management and monitoring.” (Co-P.I. B. May) Awarded \$771,599 for 2010-2015.

**US Fish and Wildlife Service**, Principal Writer, “Genetic population structure of the threatened delta smelt.” (P.I.: B. May) Awarded \$344,000 for 2007-2012.

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**PEER-REVIEWED PUBLICATIONS**


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**Fisch, K.\***, Meissner, T.\*, Gioia, L., Ducom, J., Carland, T., Loguercio, S., & A. Su. 2015. Omics Pipe: A community-based framework for reproducible multi-omics data analysis. *Bioinformatics* 31(11): 1724-1728. PMID: 25637560.

Meissner, T.\*, **Fisch, K.\***, Gioia, L. & A. Su. 2015. OncoRep: An N-of-1 reporting tool to support genome-guided treatment for breast cancer patients using RNA-sequencing. *BMC Medical Genomics* 8(24): 1-8. PMID: 25989980.

**Fisch, K.**, Kozfkay, C., Ivy, J., Ryder, O., & R. Waples. 2015. Fish hatchery genetic management techniques: Integrating Theory with Implementation. *North American Journal of Aquaculture: HaMAR Special Section* 77(3): 343-357.

LaCava, M., **Fisch, K.**, Nagel, M., Lindberg, J., May, B. & A. Finger. 2015. Spawning behavior of cultured delta smelt (*Hypomesus transpacificus*) in a conservation hatchery. *North American Journal of Aquaculture* 77(3): 255-266.

Wei, N., Shi, Y., Truong, L., **Fisch, K.**, Xu, T., Gardiner, E., Fu, G., Hsu, Y., Kishi, S., Su, A., Wu, X., Yang, X. 2014. Oxidative stress diverts tRNA synthetase to nucleus for protection against DNA

Updated: September 10, 2015

damage. *Molecular Cell* 56(2): 323-332.

**Fisch, K.**, Mahardja, B., Burton, R. & B. May. 2014. Hybridization between delta smelt and two other species within the family Osmeridae in the San Francisco Bay-Delta. *Conservation Genetics* 15: 489-494.

**Fisch, K.**, Ivy, J., Burton, R. & B. May. 2013. Evaluating the performance of captive breeding techniques for conservation hatcheries: A case study of the delta smelt captive breeding program. *Journal of Heredity* 104(1): 92-104. PMID: 23125405.

Lindberg, J., Tigan, G., Ellison, L., Rettinghouse, T., Nagel, M. & **K. Fisch**. 2013. Aquaculture methods for a genetically managed population of endangered delta smelt. *North American Journal of Aquaculture* 75(2): 186-196.

**Fisch, K.**, Henderson, J., Burton, R. & B. May. 2011. Population genetics and conservation implications for the endangered delta smelt in the San Francisco Bay-Delta. *Conservation Genetics* 12(6): 1421-1434.

Israel, J., **Fisch, K.**, Turner, T., & R. Waples. 2011. Conservation of native Bay-Delta fishes: past experience and future considerations for artificial propagation of Chinook salmon, delta smelt, and green sturgeon. *San Francisco Estuary & Watershed Science* 9(1): 1-20.

**Fisch, K.**, Petersen, J., Pedroia, J., Baerwald, M. & B. May. 2009. Characterization of 24 microsatellite loci in delta smelt, *Hypomesus transpacificus*, and their cross-species amplification in two other smelt species of the Osmeridae family. *Molecular Ecology Resources* 9(1): 405-408. PMID: 21564663.

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## MANUSCRIPTS IN REVIEW & IN PREPARATION

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Kim, S., Klann, J., Remedios, K., Metz, P., **Fisch, K.**, Cantor, J., Synder, A., Lopez, J., Ablack, J., Ngio, S., Basu, S., Mack, L., Zheng, Y., Lu, L., Bui, J., Chang, A., Shevach, E., Ginsberg, M., Petrich, B. & J. Chang. *In Review*. Integrin activation controls regulatory T cell-mediated peripheral tolerance. Submitted to *Nature Immunology* in February 2015.

Banno, A., Garcia, D., Van Baarsel, E., Metz, P., **Fisch, K.**, Widjaja, C., Kim, S., Lopez, J., Chang, A., Geurink, P., Florea, B., Overkleeft, H., Ovaa, H., Bui, J., Yang, J. & J. Chang. *In Review*. Downregulation of 26S proteasome catalytic activity promotes epithelial-mesenchymal transition. Submitted to *The Journal of Clinical Investigation* in March 2015.

Akagi, R., **Fisch, K.**, Alvarez-Garcia, O., Teramura, T., Muramatsu, Y., Saito, M., Sasho, T., Su, A. & M. Lotz. *In Review*. Dysregulated circadian rhythm pathway in human osteoarthritis: NR1D1 and BMAL1 suppression alters TGF- $\beta$  signaling in chondrocytes. Submitted to *Arthritis & Rheumatology* in November 2014.

Alvarez-Garcia, O., **Fisch, K.**, Akagi, R., Su, A. & M. Lotz. *In Review*. Differential DNA methylation and reduced expression of critical transcription factors in human OA cartilage. For submission to *Arthritis & Rheumatology* in March 2015.

**Fisch, K.**, Saito, M., Akagi, R., Teramura, T., Alvarez-Garcia, O., Duffy, S., Grogan, S., D'Lima, D., Su, A. & M. Lotz. *In preparation*. Integrative omics profiling reveals dysregulated transcriptional regulation in osteoarthritis. For submission in April 2015.

\*Indicates joint first authorship.

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**TECHNICAL REPORTS**


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Nagel, M., Finger, A., Ellison, L., Tigan, G., Lindberg, J., May, B. & **K. Fisch**. 2013. Delta smelt captive refuge population update. *Interagency Ecological Program Newsletter* 26(1): 53-55.

**Fisch, K.**, Mahardja, B., Rettinghouse, T., Ellison, L., Tigan, G., Lindberg, J. & B. May. 2012. Delta smelt captive refugial population--2011 Season Summary. *Interagency Ecological Program Newsletter* 25(1): 9-10.

**Fisch, K.**, Mahardja, B., Rettinghouse, T., Ellison, L., Tigan, G., Lindberg, J. & B. May. 2010. Captive Breeding Plan for the Endangered Delta Smelt Refugial Population: Genetic Management and Fish Rearing Modifications for 2010. *Interagency Ecological Program Newsletter* 23(3): 13-20.

**Fisch, K.**, Rettinghouse, T., Ellison, L., Tigan, G., Lindberg, J. & B. May. 2009. Delta smelt refugial population development and genetic management—2009 season summary. *Interagency Ecological Program Newsletter* 22(3): 3-9.

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**AWARDS & HONORS**


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<b>Delta Science Program Postdoctoral Fellowship</b> , California Sea Grant	<b>2011-2013</b>
<b>Semi-finalist</b> , United States Presidential Management Fellows Program	<b>2011</b>
<b>Block Grant Award</b> , Graduate Group in Ecology, UC Davis, \$8,939	<b>2008</b>
<b>Inductee</b> , Phi Sigma Biological Sciences Honor Society	<b>2008</b>

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**RESEARCH EXPERIENCE**


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**Graduate Student Researcher**

July 2007-March 2011

*University of California—Davis, Genomic Variation Laboratory*

Investigated the population genetics of an endangered fish species with microsatellite analysis; Performed complex statistical analyses including pedigree analysis, population structure analysis (Bayesian inference and MCMC methods), bottleneck detection, relatedness simulations, and estimation of effective population size; Developed a genetic management and monitoring plan to maintain genetic variation and minimize average coancestry in a conservation hatchery; Developed 24 microsatellite markers for delta smelt; Wrote peer-reviewed journal articles and presented results orally to scientific audiences.

**Laboratory Assistant**

January 2007-June 2007

*University of California—San Diego, Muscle Physiology Laboratory*

Measured sarcomere lengths in human muscle tissue; Performed statistical analyses to determine the effects of aging on sarcomere length.

**Research SCUBA Diver**

July 2006-January 2007

*Merkel and Associates, Inc., San Diego, Ca*

Conducted underwater visual transect surveys to detect the presence of the invasive algae species, *Caulerpa taxifolia*, along the coast of Southern California (San Diego to Santa Barbara); Gained experience planning and conducting ecological surveys, investigations and field projects in species specific management and marine habitat restoration.

**Researcher**

April-June 2006

*Monteverde Institute, Monteverde, Costa Rica*

Conducted a research project on the gastrointestinal microbiology of mantled howler monkeys in relation to anthropogenic disturbances in Guanacaste, Costa Rica; Microscopic examination and identification of parasites from fecal samples; Field work tracking, sampling and making behavioral observations of howler monkeys in remote tropical dry forests; Wrote a manuscript reporting the results; gave symposium presentation

**Data Analyst**

September 2005- March 2006

*University of California–Santa Cruz, Long Marine Laboratory*

Analyzed and compared sea otter movement, behavioral and geospatial data from Adak, Alaska using geospatial data, GIS and JMP statistical software; Conducted field work radio-tracking sea otters in Monterey Bay, CA.

**Undergraduate Researcher**

May 2004-March 2006

*University of California-Berkeley, Museum of Vertebrate Zoology Evolutionary Genetics Laboratory*

Utilized GIS to extract geospatial data; Simulated and analyzed data for independent research project.

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**TEACHING & MENTORING EXPERIENCE**


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**Certified Core Adjunct Faculty,** *Department of Mathematics & Natural Sciences, National University,* March 2011-present. Courses Taught: BIO100/A: Survey of Bioscience & Laboratory (22 terms); SCI300: Geography (3 terms); EES335: Environmental Science; BIO480: Upper-division Genetics; BIO163: Majors General Biology 3-Anatomy & Physiology

**Adjunct Faculty,** *School of Mathematics, Science and Engineering, Southwestern College,* Spring-Fall Semesters 2015, Spring-Fall Semesters 2014; Fall Semester 2013; Spring-Fall Semesters 2012. Courses Taught: BIOL101: General Biology Laboratory; BIOL180: Human Heredity, Evolution & Society (6 terms)

**Guest Lecturer,** *University of California, San Diego,* Winter 2015. Courses Taught: BIOM262: Quantitative Methods in Genetics (Graduate-level)

**Adjunct Faculty,** *Biology Department, San Diego City College,* Spring Semester 2013. Courses: BIOL210B: Majors General Biology II

**Adjunct Faculty,** *Biology Department, University of San Diego,* Spring Semester 2012. Courses Taught: BIO350: Invertebrate Zoology & Laboratory

**Graduate Students Mentored:** Dan Pearson, M.S. National University 2013

**Research Advisor, Academic Internship Program,** *University of California, San Diego,* Winter 2015; Summer 2009-Summer 2010.

**Preparing Professional Faculty Program,** *The Center for Teaching Development, University of California, San Diego,* Winter-Spring 2011.

**Undergraduate Research Mentor,** *University of California, San Diego,* Fall 2009-Summer 2010.

**Course Coordinator, Ecology 290: Software & Concepts for Applied Ecological Genetics, Faculty mentor: Dr. Holly Ernest, University of California, Davis, Spring 2008.**

**Divemaster/Assistant SCUBA Instructor, Sport Chalet, Inc., Long Beach, CA, 2004-2007.**

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## INVITED ORAL PRESENTATIONS

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**Fisch, K.** “Developing a Community-based Framework for Next Generation Sequencing Analyses.” October 1, 2014. UC San Diego: San Diego Bioinformatics Users Series, La Jolla, CA.

**Fisch, K. & A. Su.** “Integrative Omics Profiling of Osteoarthritis.” June 18, 2014. NIH NIA Studies of Joint Aging and Osteoarthritis Program Project Group Meeting, La Jolla, CA.

**Fisch, K. & A. Su.** “Omics Profiling of Osteoarthritis.” October 2, 2013. NIH NIA Studies of Joint Aging and Osteoarthritis Program Project Group Meeting, La Jolla, CA.

**Fisch, K., Kozfkay, C., Ivy, J., Ryder, O., & R. Waples.** “Genetic Management and Monitoring of Conservation Hatcheries: Part I.” September 11, 2013. Hatcheries and Management of Aquatic Resources Symposium, American Fisheries Society Annual Meeting, Little Rock, AR.

**Fisch, K. & B. May.** “Delta smelt conservation genetics.” October 15, 2012. US Fish & Wildlife Service. Sacramento, CA.

**Fisch, K.** “Delta smelt population genetics and hybridization.” October 11, 2012. San Diego Zoo Institute for Conservation Research, Escondido, CA.

**Fisch, K.** “Fish hatchery modeling for California Central Valley fishes.” May 10, 2011. US Bureau of Reclamation Fish Propagation RPA Meeting, Sacramento, CA.

**Fisch, K., Burton, R. & B. May.** “Population genetics & hybridization of delta smelt.” November 17, 2010. Interagency Ecological Program BIG MT meeting, Rancho Cordova, CA.

**Fisch, K., Burton, R. & B. May.** “Conservation genetics of delta smelt.” October 14, 2010. NOAA/NMFS Northwest Fisheries Science Center Monster Seminar JAM Series, Seattle, WA.

**Fisch, K. & B. May.** “Genetic Techniques for Delta Smelt Population Monitoring & Analysis.” October 15, 2009. Interagency Ecological Program Workshop Series, Sacramento, CA.

**Fisch, K., Petersen, J., Baerwald, M., & B. May.** “Animal Genomics in Aquaculture.” October 13, 2009. UC Davis Center for Aquatic Biology & California Aquaculture Association Annual Meeting, Davis, CA.

**Fisch, K. & B. May.** “Delta Smelt Refugial Population Genetic Management.” April 7, 2009. USFWS Delta Smelt Hatchery Facility Planning Workshop, Sacramento, CA.

**Fisch, K., Baerwald, M., & B. May.** “The use of artificial propagation as a tool for native fish conservation in the western US: what we need to know for the preservation of Central Valley salmonids, delta smelt, and longfin smelt.” July 24, 2008. CALFED Science Program Workshop, Sacramento, CA.

**Fisch, K., Baerwald, M., & B. May.** “Establishment of a delta smelt refugial population: lessons from other species, challenges, and current status.” May 14, 2008. CALFED & UC Davis Center for Aquatic Biology & Aquaculture (CABA) Seminar, Davis, CA.

**Fisch, K.** & B. May. “Population genetics of delta smelt.” February 28, 2008. Interagency Ecological Program 2008 Annual Workshop, Pacific Grove, CA.

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## PRESENTATIONS & ABSTRACTS

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**Fisch, K.**, Akagi, R., Alvarez-Garcia, O., Teramura, T., Muramatsu, Y., Saito, M., Duffy, S., Grogan, S., Sasho, T., D’Lima, D., Su, A. & M. Lotz. “Integrative Omics Profiling Reveals Dysregulated Novel Pathways Mediated by microRNAs and DNA Methylation in Osteoarthritis.” November 17, 2014. American College of Rheumatology Annual Meeting, Boston, MA. (*oral presentation*)

Akagi, R., **Fisch, K.**, Alvarez-Garcia, Teramura, T., Muramatsu, Y., Saito, M., Sasho, T., Su, A. & M. Lotz. “Reduced Expression of Circadian Rhythm Genes in Human Osteoarthritis Cartilage: NR1D1 Suppression Alters Chondrocyte Response to IL-1 beta Stimulation.” November 17, 2014. American College of Rheumatology Annual Meeting, Boston, MA. (*poster presentation*)

**Fisch, K.**, Saito, M., Akagi, R., Alvarez-Garcia, O., Duffy, S., Teramura, T., Grogan, S., D’Lima, D., Su, A. & M. Lotz. “Building an Integrative Molecular Profile of Osteoarthritis: A Systems Biology Approach.” May 2, 2014. Systems to Synthesis Symposium, San Diego Center for Systems Biology, San Diego, CA. (*poster presentation*)

Meissner, T., **Fisch, K.**, Gioia, L & A. Su. “OncoRep: An N of 1 Reporting Tool to Support Genome-Guided Treatment for Breast Cancer Patients using RNA Sequencing.” May 2, 2014. Systems to Synthesis Symposium, San Diego Center for Systems Biology, San Diego, CA. (*poster presentation*)

**Fisch, K.**, Saito, M., Akagi, R., Alvarez-Garcia, O., Duffy, S., Grogan, S., D’Lima, D., Su, A. & M. Lotz. “Integrative Omics Profiling of Osteoarthritis.” April 25, 2014. Osteoarthritis Research Society International: World Congress on Osteoarthritis, Paris, France. (*poster presentation*)

**Fisch, K.**, Meissner, T., & A. Su. “Personalized Genomic Medicine: Computational Challenges & Solutions.” April 4, 2014. Scripps Translational Science Institute Research Meeting. (*oral presentation*)

**Fisch, K.**, Saito, M., Akagi, R., Alvarez-Garcia, O., Duffy, S., Grogan, S., D’Lima, D., Su, A. & M. Lotz. “Identification of Aberrant Pathways in Osteoarthritis Using RNA-seq.” October 29, 2013. American College of Rheumatology Annual Meeting, San Diego, CA. (*poster presentation*)

**Fisch, K.**, Saito, M., Akagi, R., Duffy, S., Su, A. & M. Lotz. “Transcriptome profiling of articular cartilage in Osteoarthritis” May 17, 2013. Systems-to-Synthesis Symposium, San Diego Center for Systems Biology, San Diego, CA. (*poster presentation*)

**Fisch, K.**, Ivy, J., Ryder, O., & R. Waples. “Saving San Francisco Bay-Delta native fishes: Hatchery management and reintroduction strategy modeling.” October 18, 2012. Bay-Delta Science Conference, Sacramento, CA. (*oral presentation*)

**Fisch, K.**, Ivy, J., Ryder, O., & R. Waples. ”Applying small population management to fish conservation hatcheries.” March 29, 2011. Small Population Management Scientific Advisory Group, Association of Zoos & Aquariums Mid-Year Meeting, Palm Springs, CA. (*oral presentation*)

**Fisch, K.**, Ivy, J., Ryder, O., Waples, R & B. May. “Saving San Francisco Bay-Delta native fishes: Hatchery Management & Reintroduction Strategies” September 19-21, 2011. State of the San Francisco Estuary Conference, Oakland, CA. (*poster presentation*)

**Fisch, K.,** Ivy, J., Ryder, O., Waples, R., & B. May." Hatchery genetic management techniques for endangered species." September 7, 2011. American Fisheries Society Annual Meeting, Seattle, WA.

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## PRESENTATIONS & ABSTRACTS CONTINUED

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**Fisch, K.** "Conservation genetics of the endangered delta smelt." May 9, 2011. Exit Seminar, Department of Animal Science, UC Davis, Davis, CA. (*oral presentation*)

**Fisch, K.,** Burton, R. & B. May. "Conservation genetics of delta smelt." September 28, 2010. San Francisco Bay-Delta Science Conference, Sacramento, CA. (*oral presentation*)

**Fisch, K.,** Burton, R. & B. May. "Conservation Genetics of Delta Smelt: Population Genetics, Hybridization & Captive Population Genetic Management." June 26, 2010. Society for the Study of Evolution Annual Meeting, Portland, OR. (*oral presentation*)

**Fisch, K.,** Burton, R. & B. May. "Genetic Structure of Delta Smelt in the San Francisco Estuary" May 25-26, 2010. Interagency Ecological Program 2010 Annual Workshop, Sacramento, CA. (*poster presentation*)

**Fisch, K.,** Lindberg, J., & B. May. "Delta Smelt Refugial Population Development & Genetic Management." September 3, 2009. American Fisheries Society Annual Meeting, Nashville, TN. (*oral presentation*)

**Fisch, K.,** Lindberg, J., Baskerville-Bridges, B., & B. May. "Delta smelt refugial population development and genetic management" October 2008. CALFED Science Conference, Sacramento, CA. (*poster presentation*)

**Fisch, K.** "Extinct in the wild: the saga of captive breeding." February 2008. Guest Lecturer for Conservation Biology Seminar Series, *University of California, Davis*. (*oral presentation*)

**Fisch, K.** "Delta smelt: A California species on the brink of extinction." November 2007. Guest Lecturer for Wildlife, Fish & Conservation Biology 10, *University of California, Davis*. (*oral presentation*)

**Fisch, K.** "Effects of anthropogenic disturbance on the gastrointestinal parasites of mantled howler monkeys, *Alouatta palliata*." June 2006. Monteverde Institute Research Symposium Monteverde, Costa Rica. (*oral presentation*)

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## PROFESSIONAL AFFILIATIONS

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International Society for Computational Biology

The American Society of Human Genetics

Osteoarthritis Research Society International

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## PROFESSIONAL SERVICE

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Reviewer, Journal of Heredity, 2011, 2014-present

Reviewer, Transactions of the American Fisheries Society, 2009, 2014

Student Poster Evaluator, Bay-Delta Science Conference, 2012



Reviewer, International Journal of Molecular Sciences, 2012  
 San Diego Science Festival, Nifty 50 Scientist, 2011  
 Reviewer, Canadian Journal of Fisheries and Aquatic Sciences, 2011  
 Session Chair, Society for the Study of Evolution Annual Meeting, 2010  
 Planning Committee, UC Davis Ecology Graduate Group Mardi Gras Charity Event, 2008  
 Teaching Assistant, UC Davis Ecology Graduate Group Odyssey Orientation Trip, 2008  
 Reviewer, Conservation Genetics, 2007  
 Reviewer, Aquaculture, 2007  
 Reviewer, Sustainability of the Arctic-Yukon-Kuskokwim Salmon Fisheries, 2007

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## RESEARCH SKILLS

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<b>Programming:</b>	Python, R, Bash, Linux/Unix, Torque, SGE, Amazon Web Services
<b>Computational Genomics:</b>	Next-generation sequencing analysis, sequencing pipeline development, RNA-seq, CHIP-seq, DNA methylation, miRNA-seq, whole-exome sequencing, whole-genome sequencing.
<b>Bioinformatics:</b>	Bioconductor, Biopython, GATK, Mutect, BWA, Tophat, Cufflinks, STAR, HTSeq, edgeR, DESeq2, limma, DEXSeq, BEDTools, IGV, Annovar, Samtools, Picard, Fastqc, Cytoscape, FusionCatcher, SPIA, WGCNA, minfi, etc.
<b>Systems Biology:</b>	Transcriptome analysis, network analysis, gene set enrichment analysis, pathway analysis, transcription factor analysis, gene regulatory network reconstruction, weighted gene correlation network analysis.
<b>Genetic Analysis:</b>	MCMCglmm, Convert, FSTAT, Genepop, Genetic Data Analysis, Microsatellite Toolkit, Structure, SPAGeDi, Arlequin, Genalex, NeEstimator, Cervus, Sequencher, ABI Genemapper, PMx, etc.
<b>Population Genetics:</b>	Pedigree analysis, population structure, effective population size, relatedness, bottleneck detection, generalized linear mixed models, Bayesian inference, Markov chain Monte Carlo methods, interspecies hybridization, heritability estimation
<b>Laboratory Techniques:</b>	DNA purification, Polymerase Chain Reaction (PCR), Polyacrylamide gel electrophoresis (PAGE), DNA quantification, Microsatellite multiplex PCR, Allele scoring, Capillary electrophoresis, SNP genotyping, DNA sequencing, Microsatellite development, primer design, SNPTyping assays