

# Malte Willmes

Institute of Marine Sciences, University of California  
Santa Cruz, Santa Cruz, California, USA  
National Marine Fisheries Service, Southwest Fisheries  
Science Center, Santa Cruz, California, USA

+1 5305747914  
Malte.Willmes@gmail.com  
[www.maltewillmes.com](http://www.maltewillmes.com)  
[github.com/MalteWillmes](https://github.com/MalteWillmes)

## Research overview

I am an interdisciplinary researcher with a background in geochemistry, ecology, and archaeology. At the core of my research is the development and application of geochemical tracers to reconstruct life history patterns and habitat use of different fish species in response to long-term climatic and landscape scale changes. I have studied different biological archives (otoliths, fin rays, scales, bones, teeth) and has applied a suite of geochemical tools ( $^{87}\text{Sr}/^{86}\text{Sr}$ ,  $\delta^{18}\text{O}$ ,  $\delta^{34}\text{S}$ , trace elements) to reconstruct movements across salinity and temperature gradients for several threatened and endangered fishes including Chinook Salmon, White Sturgeon, and Delta and Longfin Smelt. My research is used to provide a long-term perspective for fish management and conservation in the San Francisco Estuary.

## Academic appointments

2021-ongoing	Assistant Project Scientist, Institute of Marine Sciences, UC Santa Cruz, and National Marine Fisheries Service, Southwest Fisheries Science Center
2019 – 2021	Postdoc, Institute of Marine Sciences, UC Santa Cruz, and NOAA Fisheries Collaborative Program
2017 – 2019	Delta Science Fellowship
2016 – 2019	Postdoc, Moyle Fish Ecology Laboratory and Hobbs lab, UC Davis

## Education and Training

2011 – 2015	PhD Earth Sciences The Australian National University, Canberra, Australia
2008 – 2010	MSc. Geoscience Westfälische Wilhelms-Universität Münster, Germany
2005 – 2008	BSc. Geoscience Westfälische Wilhelms-Universität Münster, Germany

## Awards and Research Grants

2021-2023	“The effects of climate change on the life history of spring-run Chinook Salmon through time”, Delta Science Program (698,320 USD)
2021-2022	“Genotypic and phenotypic diversity in Yuba River Spring-run Chinook Salmon”, NOAA Office of Habitat Conservation (99,653 USD)
2017-2019	Delta Science Fellowship (216 000 USD)
2019	INQUA Conference 2019 travel grant, National Academy of Sciences (700 USD)
2018	UC Davis Postdoc Travel Grant (400 USD)
2018	UC Davis Open Access Fund for publication 2018 (1000 USD)
2018	UC Davis-ICPMS 2018 Exploratory Research Program (2000 USD)
2018	Best Speaker award at the UC Davis Postdoctoral Research Symposium (400 USD)
2017, 2019	Poster award at the UC Davis Postdoctoral Research Symposium (300 USD)
2013	Scholarship for the SPATIAL course, National Science Foundation (3000 USD)
2013	AFAS ACT Science & Technology Fellowship (5000 AUD)
2012	ANU Vice-Chancellor’s HDR travel grant (1000 AUD)
2011	ANU PhD Scholarship for international students (3 years)

## **Mentorship**

Year	Name	Level	School
2020-present	Rachel Fichman	MS	UC Davis, USA
2018-2019	Jamie Sweeny	MS	UC Davis, USA
2018-2019	Kate Mathison	BA, Hons	Griffith University, Australia
2015-present	Research mentor and supervisor to 8 Junior Specialists at the Otolith Geochemistry and Fish Ecology Laboratory, UC Davis, USA		

## **Academic Service**

Reviewer for the Journal of Fish Biology, Marine Ecology Progress Series, Marine and Freshwater Research, Rapid Communications in Mass Spectrometry, Science Advances, Scientific Reports, International Journal of Osteoarchaeology, G-Cubed, Geostandards and Geoanalytical Research, PLOS ONE, American Journal of Physical Anthropology, Frontiers in Ecology

## **Memberships**

American Fishery Society, Western Division, European Association of Geochemistry, Salmon Restoration Federation, The Wildlife Society, American Quaternary Association

## **Core skills**

Languages	German (native speaker), English (written and spoken fluently), French (beginner)
Analytical	Experience in working in a clean-lab environment and with hazardous substances Experience in the operation and application of mass spectrometers (Laser ablation ICP-MS, Neptune and Nu Multi-collector ICP-MS, Thermal ionization ICP-MS, Quadrupole ICP-MS, SIMS)
Technical	R for statistical analysis, GIS software (ESRI ArcGIS, QGIS, GeoNode), Iolite, ImageJ, Web design (HTML, CSS, GoogleEarth API)
Field	Salmon carcass surveys in Putah Creek, CA(2018-2019) Boat based fish monitoring surveys in the San Francisco Estuary, CA (2015-2019) Geologic mapping and sample collection for Isoscapes 2012-2015
Qualifications	Wilderness First Aid (WFA) qualification (2015, 2018) Science communication workshop (2012, 2017, 2018) Graduate of the Leaders for the Future Program, UC Davis (2017-2018)

## **Selected Presentations**

2021	Invited speaker at the Salmonid Restoration Federation meeting (virtual)
2021	Invited speaker at the Delta Science Program workshop – Monitoring Steelhead populations in the San Joaquin Basin
2020	Guest lecturer at “Stable Isotopes in Archaeology and Biological Anthropology (BIAN8009), ANU, Australia. Public lecture at CreekSpeak, Putah Creek Council, Winters, California.
2019	Invited speaker at the Dating, Isotopes and Human Evolution workshop, Brisbane, Australia. Public lecture at Science Uncorked, Bodega Bay, California.
2018	Organizer of the two-part workshop “Chemical archives beyond otoliths” at the international Otolith Symposium, Taiwan and National American Fishery Society Meeting, Atlantic City.
2018	Invited talk at the Interagency Ecological Program (IEP) Workshop, Folsom, California
2017	Invited speaker at the Environmental Futures Seminar Series, Griffiths University, Brisbane, Australia.
2013-2015	Guest lecturer in Geochronology and Isotope geochemistry for Archaeological Sciences, Research School of Earth Sciences, ANU, Australia.

## Selected Reports

4. Lewis, LS, **Malte Willmes**, Christian Denney, Christina Parker, Micah Bisson, Arthur Barros, James Hobbs. 2019. Interdisciplinary Studies on Longfin Smelt in the San Francisco Bay Estuary. Report to the California Department of Water Resources, Contract No. 4600011196, 130 pp.
3. James A. Hobbs, Christian Denney, Levi Lewis, **Malte Willmes**, Wilson Xieu, Andrew Schultz, Oliver Burgess. 2019. Chapter 4 - Exploring life history diversity of Delta Smelt during a period of extreme environmental variability. In A.A. Schultz, editor. Directed Outflow Project Technical Report 1. U. S. Bureau of Reclamation, Bay-Delta Office, Mid-Pacific Region, Sacramento, CA. Technical Report, August 2019, 402 pp.
2. James A. Hobbs, Christian Denney, Levi Lewis, **Malte Willmes**, Wilson Xieu, Andrew Schultz, Oliver Burgess. 2019. Chapter 5 - Environmental and ontogenetic drivers of growth in a critically-endangered species. In A.A. Schultz, editor. Directed Outflow Project Technical Report 1. U. S. Bureau of Reclamation, Bay-Delta Office, Mid-Pacific Region, Sacramento, CA. Technical Report, August 2019, 402 pp.
1. Lewis, LS, **Malte Willmes**, Christian Denney, Christina Parker, Micah Bisson, Arthur Barros, James Hobbs. 2018. Interdisciplinary Studies on Longfin Smelt in the San Francisco Bay Estuary. Report to the California Department of Water Resources, Contract No. 4600011196, 44 pp.

## Publications (peer reviewed)

25. Griffin, J.M., Montañez, I.P., Glessner, J.J.G., Chen, J., **Willmes, M.**, 2021. Geologic variability of conodont strontium isotopic composition quantified by laser ablation multiple collection inductively coupled plasma mass spectrometry. [Palaeogeography, Palaeoclimatology, Palaeoecology, 568, 110308.](#)
24. **Willmes, M.**, Jacinto, E.E., Lewis, L.S., Fichman, R.A., Bess, Z., Singer, G., Steel, A., Moyle, P., Rypel, A.L., Fangue, N., Glessner, J.J.G., Hobbs, J.A., Chapman, E.D., 2021. Geochemical tools identify the origins of Chinook Salmon returning to a restored creek. [Fisheries, fsh.10516.](#)
23. Britton, K., Le Corre, M., **Willmes, M.**, Moffat, I., Grün, R., Mannino, M., Woodward S., Jaouen K., 2020. Sampling plants and malacofauna in  $^{87}\text{Sr}/^{86}\text{Sr}$  bioavailability studies: implications for isoscape mapping and reconstructing of past mobility patterns. [Frontiers in Ecology and Evolution Paleoecology, 8\(11\):579473.](#)
22. Moffat, I., Rudd, R., **Willmes, M.**, Mortimer, G., Kinsley, L., McMorrow, L., Armstrong, R.A., Aubert, M., Grün, R., 2020. Bioavailable Soil and Rock Strontium Isotope Data from Israel. [Earth System Science Data, 7, 1-16.](#)
21. Sweeney, J.K., **Willmes, M.**, Sellheim, K., Lewis, L.S., Hobbs, J.A., Fangue, N.A., Merz, J.E., 2020. Calcification and incorporation of trace elements in age-0 White Sturgeon fin rays with implications for the reconstruction of habitat use. [Environmental Biology of Fishes, 103, 1401–1418.](#)
20. Moffat, I., Joannes-Boyau, R., Kinsley, L., **Willmes, M.**, Grün, R., 2020. Strontium isotope investigation of human mobility based on teeth from cave T1. Chapter 4 in: Tell es-Safi/Gath II - Excavations and Studies, [Aren M. Maeir and Joe Uziel, Zaphon, Münster.](#)
19. Lewis, L.S., **Willmes, M.**, Barros, A., Crain, P.K., Hobbs, J.A., 2019. Newly discovered spawning and recruitment of threatened Longfin Smelt in restored and under-explored tidal wetlands. [Ecology, 101, ecy.2868.](#)
18. Hobbs, J.A., Lewis, L.S., **Willmes, M.**, Denney, C., Bush, E., 2019. Complex life histories discovered in a critically endangered fish. [Scientific Reports, 9\(1\):16772.](#)
17. **Willmes, M.**, Lewis, L.S., Davis, B.E., Loisel, L., James, H.F., Denney, C., Baxter, R., Conrad, J. L., Fangue, N.A., Hung, T-C, Armstrong, R.A., Williams, I.S., Holden, P., Hobbs, J.A., 2019. Calibrating temperature reconstructions from fish otolith oxygen isotope analysis for California's critically-endangered Delta Smelt. [Rapid Communications in Mass Spectrometry, 33, 1207-1220.](#)

16. Adams, S., Grün, R., McGahan, D., Zhao, J-X., Feng, Y., Nguyen, A., **Willmes, M.**, Quaresimin, M., Lobsey, B., Collard, M., Westaway, M.C., 2019. A strontium isoscape of north-east Australia for human provenance and repatriation. [Geoarchaeology, 34, 231- 251.](#)
15. James, H.F., **Willmes, M.**, Boel, C.A., Courtaud, P., Chancerel, A., Ciesielski, E., Desideri, J., Bridy, A., Wood, R., Moffat, I., Fallon, S., McMorrow, L., Armstrong, R.A., Williams, I.S., Kinsley, L., Aubert, M., Eggins, S., Frieman, C.J., Grün, R., 2019. Who's been using my burial mound? Radiocarbon dating and isotopic tracing of human diet and mobility at the collective burial site, Le Tumulus des Sables, southwest France. [Journal of Archaeological Science: Reports, 24, 955-966.](#)
14. Moncel, M-H., Fernandes, P., **Willmes, M.**, James H.F., Grün R., 2019. Rocks, teeth, and tools: New insights into early Neanderthal mobility strategies in South-Eastern France from lithic reconstructions and strontium isotope analysis. [PLOS One, 14, 4.](#)
13. **Willmes, M.**, Ransom, K.M., Lewis, L.S., Denney, C.T., Glessner, J.J.G., Hobbs J.A., 2018. IsoFishR: An application for reproducible data reduction and analysis of strontium isotope ratios ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) obtained via laser-ablation MC-ICP-MS. [PLOS One, 13, 9.](#)
12. Bataille, C.P., von Holstein, I.C.C., Laffoon, J.E., **Willmes, M.**, Liu, X., Davies, G.R., 2018. A bioavailable strontium isoscape for Western Europe: A machine learning approach. [PLOS ONE, 13, 5.](#)
11. **Willmes, M.**, Bataille, C.P., James, H.F., Moffat, I., McMorrow, L., Kinsley, L., Armstrong, R.A., Eggins, S., Grün, R., 2018. Mapping of bioavailable strontium isotope ratios in France for archaeological provenance studies. [Applied Geochemistry, 90, 75–86.](#)
10. **Willmes, M.**, Hobbs, J.A., Sturrock, A.M., Bess, Z., Lewis, L.S., Glessner, J.J.G., Johnson, R.C., Kurth, R., Kindopp, J., 2018. Fishery collapse, recovery, and the cryptic decline of wild salmon on a major California river. [Canadian Journal of Fisheries and Aquatic Sciences, 75, 11, 1836-1848.](#)
09. Sellheim, K., **Willmes, M.**, Hobbs, J.A., Glessner, J.J.G., Jackson, Z.J., Merz, J.E. 2017, Validating Fin Ray Microchemistry as a Tool to Reconstruct the Migratory History of White Sturgeon *Acipenser transmontanus*. [Transactions of the American Fisheries Society, 146, 5, 844-857.](#)
08. Goude, G., **Willmes, M.**, Wood, R., Courtaud, P., Leandri, F., Cesari, J., Grün, R. 2017, New insights into Mesolithic human diet in the Mediterranean from stable isotope analysis: The sites of Campu Stefanu and Torre d'Aquila, Corsica. [International Journal of Osteoarchaeology, 27,4, 707-714.](#)
07. **Willmes, M.**, Grün, R., Douka, K., Michel, V., Armstrong, R.A., Benson, A., Crégut-Bonnoure, E., Desclaux, E., Fang, F., Kinsley, L., Saos, T., Defleur, A.R., 2016. A comprehensive chronology of the Neanderthal site Moula-Guercy, Ardèche, France. [Journal of Archaeological Science: Reports, 9, 309-316.](#)
06. **Willmes, M.**, Glessner, J.J.G., Carleton, S.A., Gerrity, P.C., Hobbs, J.A., 2016.  $^{87}\text{Sr}/^{86}\text{Sr}$  isotope ratio analysis by laser ablation MC-ICP-MS in scales, spines, and fin rays as a non-lethal alternative to otoliths for reconstructing fish life history. [Canadian Journal of Fisheries and Aquatic Sciences, 73, 12, 1852-1860.](#)
05. **Willmes, M.**, Kinsley, L., Moncel, M.-H., Armstrong, R.A., Aubert, M., Eggins, S., Grün, R., 2016. Improvement of laser ablation in situ micro-analysis to identify diagenetic alteration and measure strontium isotope ratios in fossil human teeth. [Journal of Archaeological Science, 70, 102–116.](#)
04. Sturm, S., Kenkmann, T., **Willmes, M.**, Pösges, G., Hiesinger, H., 2015. The distribution of megablocks in the Ries crater, Germany: Remote sensing, field investigation, and statistical analyses. [Meteoritics & Planetary Science, 50, 141–171.](#)
03. **Willmes, M.**, McMorrow, L., Kinsley, L., Armstrong, R.A., Aubert, M., Eggins, S., Falguères, C., Maureille, B., Moffat, I., Grün, R., 2014. The IRHUM (Isotopic Reconstruction of Human Migration) database – bioavailable strontium isotope ratios for geochemical fingerprinting in France. [Earth System Science Data, 6, 117–122.](#)

02. Benson, A., Kinsley, L., **Willmes, M.**, Defleur, A., Kokkonen, H., Mussi, M., Grün, R., 2013. Laser ablation depth profiling of U-series and Sr isotopes in human fossils. [Journal of Archaeological Science, 40, 2991–3000.](#)
01. **Willmes, M.**, Reiss, D., Hiesinger, H., Zanetti, M., 2012. Surface age of the ice–dust mantle deposit in Malea Planum, Mars. [Planetary and Space Science, 60, 199–206.](#)

**Publications (currently in review)**

- Bell-Tilcock, M.N., Jeffres, C.A., Rypel, A.L., **Willmes, M.**, Armstrong, R.A., Holden, P., Moyle, P.B., Fangué, N.A., Katz, J.V.E., Sommer, T.R., Conrad, J.L., Johnson, R.C., 2021. Biogeochemical processes create distinct isotopic fingerprints to track floodplain rearing of juvenile salmon. PLOS One (in review).
- Barros, A., Hobbs, J.A., **Willmes, M.**, Parker, C., Bisson, M., Fangué, N.A., Rypel, A.L., Lewis, L.S., 2021. Spatial heterogeneity in the nursery value of wetlands for a threatened estuarine smelt: prey availability, preference, and feeding success. Marine Ecology Progress Series (in review).
- Xieu, W., Zhao, F., Fichman, R.A., Willmes, M., Hobbs, J.A., Hung, T-C., Ellison, L., Stevenson, T., Tigan, G., Schultz, A., Lewis, L.S., 2021. Experimental validation of otolith-based size and age reconstructions across multiple life stages of a critically endangered estuarine fish. PeerJ (in review).
- Lewis, L.S., Denney, C., **Willmes, M.**, Xieu, W., Fichman, R.A., Zhao, F., Hammock, B., Schultz, A., Fangué, N., Hobbs, J.A., 2021. Otolith-based evidence for spatial and environmental constraints effects on growth for a critically endangered estuarine fish. Marine Ecology Progress Series (in review).
- Fichman, R.A., Khen, A., **Willmes, M.**, Kuntz, J., Scott, A.R., Hobbs, J.A., Lewis, L.S., 2021. The clever strategies fishes use to survive in San Francisco’s dynamic estuary. Frontier for Young Minds (in review).