James C. Liao

26 Oxford Street
Lauder Labs
Cambridge, MA 02138
617-496-7199
jliao@oeb.harvard.edu

Education: Harvard University, Cambridge, MA.
Department of Organismic and Evolutionary Biology
5th year Ph.D. candidate

Wesleyan University, Middletown, CT.
B.A. Biology 1996 *magna cum laude*

Publications:

Liao, J. C., Beal, D. N., Lauder, G.V., and Triantafyllou, M.S. (In Press). Fish exploiting vortices use less muscle. Science.

Liao, J. C., Beal, D. N., Lauder, G.V., and Triantafyllou, M.S. (2003). The Kármán gait; novel kinematics of rainbow trout swimming in a vortex street. J. Exp. Biol. 206, 1059-1073. *Cover article*.

Liao, J. C. (2002). Swimming in needlefish: anguilliform locomotion with fins. J. Exp. Biol. 205, 2875-2884.

Liao, J. and Lauder, G.V. (2000). Function of the heterocercal tail in white sturgeon: flow visualization during steady swimming and vertical maneuvering. J. Exp. Biol. 203, 3585-3594.

In Preparation:

Liao, J. C. Neuromuscular control of trout swimming in a vortex street: implications for energy economy during the Kármán gait.

Liao, J. C. The evolution of the caudal fin complex in beloniform fishes.

Published Abstracts:

Beal, D., Liao, J.C., Lauder, G.V., Hover, F.S., Triantafyllou, M.S. (2003). Passive energy extraction in the wake of bluff objects by fish. 13th International Symposium on Unmanned, Untethered Submersible Technology (co-authored).

Liao, J.C. (2003).The Kármán gait: a novel mode of fish locomotion in turbulent flow and its implications for energy economy. ASIH Program Abstracts.

Liao, J.C. (2003). How trout interact with Kármán vortices behind a cylinder: insights from kinematics, electromyography, and flow visualization. SICB Final Program and Abstracts, 15.2.

Liao, J., Beal, D. N., and Lauder, G.V. (2002). Novel body kinematics of a trout swimming in a von Kármán trail; can fish tune to vortices? Comparative Biochemistry and Physiology, Part A 132, A9.9.

Liao, J., Beal, D. N., Lauder, G.V., and Triantafyllou, M.S. (2002). Novel body kinematics of a trout swimming in a von Kármán trail; can fish tune to vortices? SICB Final Program and Abstracts, 42.5.

Liao, J. (2001). Locomotion in needlefish: anguilliform swimming with fins. SICB Final Program and Abstracts, 2.3.

Liao, J.C. and Lauder, G.V. (2000).Function of the heterocercal tail in sturgeon, *Acipenser transmontanus*. ASIH Program Abstracts.

Liao, J. And Lauder, G.V. (1999).Wake dynamics of the heterocercal tail in freely-swimming sturgeon *Acipenser transmontanus*. American Zoologist 39, 55A.

Selected Presentations:

The Kármán gait: implications for passive thrust generation in a vortex street (2003). University of California at Berkeley, Biomechanics Group.

Passive energy extraction in the wake of bluff objects by fish (2003). 13th International Symposium on Unmanned, Untethered Submersible Technology (team presentation).

*The Kármán gait: a novel mode of fish locomotion in turbulent flow and its implications for energy economy (2003). American Society of Ichthyologists and Herpetologists, Manaus, Brazil.

The Kármán gait; insights from kinematics, electromyography, and flow visualization (2003). Society of Integrative and Comparative Biology, Toronto, Canada.

The Kármán gait (2002). Division of Vertebrate Morphology Regional Meeting, Harvard University.

To surf or swim? How fish hold station via vortex exploitation (2003). University of Massachusetts.

Novel kinematics of a trout swimming in a vortex street (2002). University of Guelph, Ontario, Canada.

Novel kinematics of a trout swimming in a vortex street (2002). Society of Experimental Biology, University of Swansea, Wales.

Novel kinematics of a trout swimming in a vortex street (2002). Society of Integrative and Comparative Biology,Anaheim, CA.

Locomotion in needlefish: anguilliform swimming with fins (2001). Society of Integrative and Comparative Biology, Chicago, IL.

Function of the heterocercal tail in sturgeon, *Acipenser transmontanus* (2000). American Society of Ichthyologists and Herpetologists, La Paz, Mexico.

Wake dynamics of the heterocercal tail in freely-swimming sturgeon, *Acipenser transmontanus* (2000). Society of Integrative and Comparative Biology, Atlanta, GA.

Wake dynamics of the heterocercal tail in freely-swimming sturgeon, *Acipenser transmontanus* (1999). Division of Vertebrate Morphology Regional Meeting, Brown University.

* Received Frederick H. Stoye Award for General Ichthyology.

Professional Affiliations:

- Society for Integrative and Comparative Biology
- Society for Experimental Biology
- American Society of Ichthyologists and Herpetologists
- American Fisheries Society

Refereed Journals:

The Journal of Experimental Biology

Funding:

- Robert A. Chapman Memorial Scholarship Fund, Animal Locomotion, Harvard University ($10,000).
- Lerner-Gray Fund for Marine Research, AMNH ($1,500)
- Sigma Xi GIAR Award ($1000)
- Harvard University Graduate Student Council Travel Award ($700)
- Society for Integrative and Comparative Biology GIAR ($1,000)
- Putnam Expedition Grant, Harvard Museum of Comparative Zoology ($2,600)
- Bermuda Biological Station Grant in Aid of Research Award ($1600)
- Bermuda Biological Station for Research Scholarship ($2600)
- UC-Irvine Holcomb Scholarship for Marine Biology ($3000)

Teaching:

*Harvard University (1999, 2000, and 2003) *Patterns and Processes in Fish Diversity*. Teaching Fellow/ Guest lecturer "The Fishes of the Amazon: Unparalleled Diversity" and "Sensory Biology of Fishes"(Dr. Karel F. Liem).

Harvard University (2002-2003). *Vertebrate Paleontology*. Invited lecturer. "The Evolution of Actinopterygian fishes." (Dr. Farish Jenkins).

Harvard University (2001). *Advanced topics in Vertebrate Physiology and Anatomy*. Undergraduate/Graduate tutor. "Caudal and Pectoral Fin Complex in Beloniform fishes."

Bermuda Biological Station for Research (2001). *Biology of Fishes* Teaching assistant/ Guest lecturer "Feeding Mechanisms in Ray Finned Fishes" (Dr. Bruce B. Collette).

Organization for Tropical Studies, Cabo Blanco (2001, 2002). *Tropical Field Biology*. Resource faculty member, lecturer. "Fish Locomotion" and "The Diversity of Actinopterygian Fishes". (Dr. Deedra McClearn).

Harvard University (1999). *Structure and Physiology of Vertebrates*. Teaching Fellow in Anatomy (Dr. Andrew A. Biewener).

*Awarded Certificate of Excellence in Teaching, Derek Bok Center for Teaching and Learning (1999-2003)

Leadership positions/jobs:

- Graduate Student Representative, Dept. Organismic and Evolutionary Biology, Harvard University 2002-2003
- Foreign Student Representative, Graduate School of Arts and Sciences, Harvard University 2000-2002
- Non-resident undergraduate tutor in biology: Dunster House, Harvard University 2000-2003
- Fisheries Technician, Mote Marine Laboratory (1997-1998)
- Field Intern, Endangered Honeycreepers Project- USGS Bio Resources Division, Hawaii (1997)
- Marine Ecologist Intern, The School for Field Studies, British Columbia (1996)