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Professional Preparation

Humboldt State University	Marine Fisheries (cum laude)	BS, 1986
University of Florida	Fisheries and Aquatic Sciences	MS, 1990
UC Santa Barbara	Biological Sciences	PhD, 1995

Appointments

2010-present	Professor, School of Forest Resources and Conservation, University of Florida
2008-present	Associate Director, School of Forest Resources and Conservation, University of Florida
2008	Associate Chair, Department of Fisheries and Aquatic Sciences, University of Florida
2007-2010	Research Foundation Professor, University of Florida
2004-2009	Associate Professor, Department of Fisheries and Aquatic Sciences, University of Florida
1998-2004	Assistant Professor, Department of Fisheries and Aquatic Sciences, University of Florida
1996-1998	Research Assistant Professor, Department of Fisheries and Aquatic Sciences, University of Florida

Research Narrative

Aquatic resources are threatened worldwide. More intensive land use, growing populations requiring water for drinking and irrigation, and pollution from urban, industrial and agricultural activities have disrupted the water cycle and transformed ecosystems. In addition, the quality and security of aquatic resources are stressed by extreme events such as hurricanes, monsoonal flooding, and droughts that may be intensified by climate change. These threats are particularly evident in Florida where aquatic systems provide significant commercial and recreational opportunities. In fact, stakeholders have raised serious concerns about our water and associated resources.

The overarching goals of my individual and collaborative research efforts are to develop and transfer into management a mechanistic understanding of the effects of nutrient enrichment in aquatic systems, with a major focus on spring-fed rivers and associated estuaries along Florida's central Gulf coast. Achieving these goals involves attaining several inter-related objectives that stem from long-term, large-scale sampling programs implemented by my colleagues and me a decade ago. The patterns documented by these regional programs that

regularly sample over 100 stations spanning more than 100 kilometers of coastline provide a spatial and temporal context for designing, implementing and interpreting interdisciplinary experiments that elucidate ecological processes shaping the structure and function of aquatic ecosystems.

My initial investigations focused on nitrate contamination, the preeminent target for managers in Florida because it was credited with promoting algal blooms resulting in detrimental accumulations of organic matter or eutrophication. Empirical data gathered along 150 km of coastline from north of Tampa Bay to the Steinhatchee River suggested, however, a stronger link between algal abundance and phosphorus. Complementary experimental work clearly indicated that phosphorus limits algal production throughout much of the region. Recently, collaborative investigations confirmed that nitrate is unlikely to be the sole cause of nuisance algae in Florida's springs. In fact, much of the nitrate emanating from springs is either removed by bacterial denitrification or discharged into the shallow, coastal waters of the Gulf of Mexico.

These findings are compelling from scientific and managerial perspectives. Documenting interactions between nitrate and phosphorus during transport and transformation in spring-fed rivers and coastal waters has stimulated scientific investigations designed to link biogeochemical and ecological processes. Demonstrating the significance of phosphorus has led to more holistic management. Water resource agencies around the state have now adapted their strategic planning process to focus on *both* nitrogen and phosphorus. The water management districts and other resource management agencies appreciate the need to understand processes operating in aquatic systems, including feedbacks. In addition, there is a growing recognition that more intrusive engineering works, such as removing sediment or replanting vegetation, may be needed to restore degraded systems. Finally, managers are coming to grips with the inevitable uncertainty surrounding management of aquatic systems. My colleagues and I help them employ an adaptive approach grounded in ongoing evaluation and improvement. In fact, the managers we work with regularly acknowledge the possibility that degraded systems may never be restored fully due to irreversible changes and feedback loops. Therefore, these managers see value in restoring and sustaining ecological processes or services, such as providing sufficient habitat and food for juveniles of valued species. My individual and collaborative research continues to provide the mechanistic understanding and broad context that motivates, guides and supports managers in these efforts.

Publications

Books Chapters

Grober-Dunsmore, R., S.J. Pittman, C. Caldw, M.S. Kendall and T.K. Frazer. 2009. A landscape ecology perspective for the study of ecological connectivity across tropical marine seascapes. Pp. 493-530. *In*: I. Nagelkerken (ed.), *Ecological connectivity among tropical coastal ecosystems*. Springer, New York. 615 pp. [ISBN: 978-90-481-2405-3; e-ISBN 978—90-481-2406-0]

- Mattson, R.A., T.K. Frazer, J.A. Hale, S.B. Blitch and L. Ahijevych. 2007. The Florida Big Bend. pp. 170–205. *In*: L. Handley, D. Altsman and R. DeMay (eds.), Seagrass status and trends in the northern Gulf of Mexico: 1940–2002: U.S. Geological Survey Scientific Investigations Report 2006–5287 and U.S. Environmental Protection Agency 855–R–04–003, 267 pp. [available online: <http://pubs.usgs.gov/sir/2006/5287/>]
- Haddock, S.H.D. and J.N. Heine. 2005. Scientific blue-water diving. California Sea Grant, La Jolla, California. 50 pp. [Contributing authors – L.P. Madin, T.K. Frazer and L.B. Quetin]
- Moline, M.A., H. Claustre, T.K. Frazer, J. Grzyski, O. Schofield and M. Vernet. 2000. Changes in phytoplankton assemblages along the Antarctic Peninsula and potential implications for the Antarctic food web. pp. 263–271. *In*: W. Davison, C. Howard-Williams and P. Broady (eds.), Antarctic ecosystems: models for a wider ecological understanding. Cambridge University Press.
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- Quetin, L.B., R.M. Ross, T.K. Frazer and K.L. Haberman. 1996. Factors affecting distribution and abundance of zooplankton, with an emphasis on Antarctic krill, *Euphausia superba*. pp. 357–371. *In*: R.M. Ross, E.E. Hofmann and L.B. Quetin (eds.), Foundations for ecological research west of the Antarctic Peninsula. Antarctic Research Series, Volume 70, American Geophysical Union.

Refereed Publications

- Duarte, C.M., R. Martinez, Y.T. Prairie, T.K. Frazer, M.V. Hoyer, S.K. Notestein and D.E. Canfield. In Press. Rapid accretion of dissolved organic carbon in the springs of Florida: the most organic-poor natural waters. *Biogeosciences* [doi:10.5194/bgd-7-5253-2010]
- Wright, D.D., T.K. Frazer and J.R. Reinfelder. In Press. The influence of river plume dynamics on trace metal accumulation in calanoid copepods. *Limnology and Oceanography*
- Heffernan, J.B., M.J. Cohen, T.K. Frazer, R.G. Thomas, T.J. Rayfield, J. Gulley, J.B. Martin, J.J. Delfino and W.D. Graham. 2010. Nitrogen dynamics in a spring-fed Florida river. *Limnology and Oceanography*. 55(1):249-263.
- Heffernan, J.B., D.M. Liebowitz, T.K. Frazer, J.M. Evans and M.J. Cohen. 2010. Algal blooms and the nitrogen-enrichment hypothesis in Florida springs: evidence, alternatives, and adaptive management. *Ecological Applications* 20(3):816-829.
- Tetzlaff, J.C., W.E. Pine III and T.K. Frazer. 2009. Comparison of bioenergetics parameters from two spring-fed riverine largemouth bass populations. *The Open Fish Science Journal* 2:1-14 [ISSN: 1874-401X/09]

- Ortega-Retuerta, E., T.K. Frazer, C.M. Duarte, S. Ruiz, A. Tovar-Sanchez, J.M. Arrieta and I. Reche. 2009. Biogeneration of chromophoric dissolved organic matter by bacteria and krill in the Southern Ocean. *Limnology and Oceanography* 54(6):1941-1950.
- Tomasko, D.A., E. Hyfield-Keenan, L. De Brabandere, J.P. Montoya and T.K. Frazer. 2009. Assessment of water quality responses to sediment removal in Lake Hancock. *Florida Scientist* 72(4):346-366.
- Jacoby, C.A. and T.K. Frazer. 2009. Eutrophication: time to adjust expectations. *Science* 324:723-724.
- Grober-Dunsmore, R., V. Bonitor and T.K. Frazer. 2009. 1,000 feet above a coral reef: a seascape approach to designing marine protected areas. *Park Science* 26, online journal <http://www.nature.nps.gov/ParkScience/index.cfm?ArticleID=283&Page=1>.
- De Brabandere, L., M. J. Catalano, T.K. Frazer and M.S. Allen. 2009. Stable isotope evidence of ontogenetic changes in the diet of gizzard shad (*Dorosoma cepedianum*) with implications for biomanipulation of a shallow eutrophic lake. *Journal of Fish Biology* 74:105-119.
- Moline, M.A., T.K. Frazer, R. Chant, S. Glenn, C.A. Jacoby, J.R. Reinfelder, J. Yost, M. Zhou and O.M.E. Schofield. 2008. Biological responses in a dynamic, buoyant river plume. *Oceanography* 21:70-89.
- Frazer, T.K. and C.A. Jacoby. 2008. Estimating rates of microzooplankton grazing. *Oceanography* 21:79.
- Chant, R.J., J. Wilkin, W. Zhang, B.J. Choi, E. Hunter, R. Castelao, S. Glenn, J. Jurisa, O. Schofield, R. Houghton, J. Kohut, T.K. Frazer and M.A. Moline. 2008. Dispersal of the Hudson River plume on the New York Bight: synthesis of observational and numerical studies during LaTTE. *Oceanography* 21:148-161.
- Moline, M.A., N.J. Karnovsky, Z. Brown, G.J. Divoky, T.K. Frazer, C.A. Jacoby, J.J. Torres and W.R. Fraser. 2008. High latitude changes in ice dynamics and their impact on polar marine ecosystems. *Annals of the New York Academy of Sciences* 1134:267-319. [Book Series: Year in Ecology and Conservation Biology]
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- Lindberg, W.J., T.K. Frazer, K.P. Portier, F. Vose, J. Loftin, D. Murie, D.M. Mason, B. Nagy and M.K. Hart. 2006. Density-dependent habitat selection and performance by a large mobile reef fish. Ecological Applications 16:731–746.
- Lindberg, W.J., T.K. Frazer, K.P. Portier, F. Vose, J. Loftin, D. Murie, D.M. Mason, B. Nagy and M.K. Hart. 2006. Appendix A: procedures for using the fitted linear model to predict mean gag abundances. Ecological Archives A016-029-A1. [<http://www.esapubs.org/archive/appl/A016/029/appendix-A.htm>]
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- Hauxwell, J.A., C.W. Osenberg and T.K. Frazer. 2004. Conflicting management goals: manatees and invasive competitors inhibit restoration of a native macrophyte. *Ecological Applications* 14:571–586.
- Hale, J.A., T.K. Frazer, D.A. Tomasko and M.O. Hall. 2004. Changes in the distribution of seagrass species along Florida's central Gulf coast – Iverson and Bittaker revisited. *Estuaries* 27:36–43.
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- Glancy, T.P., T.K. Frazer, C.E. Cichra and W.J. Lindberg. 2003. Comparative patterns of occupancy by decapod crustaceans in seagrass, oyster, and marsh edge habitats in a northeast Gulf of Mexico estuary. *Estuaries* 26:1291–1301.
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- St. Mary, C.M., C.W. Osenberg, T.K. Frazer and W.J. Lindberg. 2000. Stage structure, density dependence and efficacy of marine reserves. *Bulletin of Marine Science* 66:675–690.
- Frazer, T.K., R.M. Ross, L.B. Quetin and J.P. Montoya. 1997. Turnover of carbon and nitrogen during growth of larval krill, *Euphausia superba* Dana: a stable isotope approach. *Journal of Experimental Marine Biology and Ecology* 212:259–275.
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- Frazer, T.K., W.J. Lindberg and G.R. Stanton. 1991. Predation on sand dollars by the gray triggerfish, *Balistes capriscus*, in the northeastern Gulf of Mexico. *Bulletin of Marine Science* 48:159–164.
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