**Basic Information**

* **Project No. and Title:** [W3004: Marketing, Trade, and Management of Aquaculture and Fishery Resources](https://www.nimss.org/projects/16576)
* **Period Covered:** 10/01/2016 to 09/30/2017
* **Date of Report:** 05/24/2017
* **Annual Meeting Dates:** 03/21/2016 to 03/24/2017, in conjunction with the 2017 NAAFE (North American Association of Fisheries Economists) Forum

**Participants**

Current members present:

* Sherry Larkin (slarkin@ufl.edu) – University of Florida
* Kwamena Quagrainie (kquagrai@purdue.edu) – Purdue University
* Hirotsugu Uchida (uchida@uri.edu) – University of Rhode Island
* Diego Valderrama (d.valderrama@uniandes.edu.co) – Universidad de los Andes [new location]

Absent members:

* Terry Hanson (hansontr@auburn.edu) – Auburn University
* Bob Pomeroy (robert.pomeroy@uconn.edu) – University of Connecticut
* John Bovay (john.bovay@uconn.edu) – University of Connecticut
* Hui Jiang (hgong@uguam.uog.edu) – University of Guam
* PingSun Leung (psleung@hawaii.edu) – University of Hawaii
* Ron Hardy (rhardy@idaho.edu) – University of Idaho
* Quinn Weninger (weninger@iastate.edu) – Iowa State University
* Frances Homans (fhomans@umn.edu) – University of Minnesota
* Peter Allen (pallen@cfr.msstate.du) – Mississippi State University
* Ben Posadas (ben.posadas@msstate.edu) – Mississippi State University
* Quentin Fong (qsfong@alaska.edu) – University of Alaska

Notes: Rich Kazmierczak (rkazmierczak@agcenter.lsu.edu) – Louisiana State University [retired],

Matt Freeman ([matt.freeman@gulfcouncil.org](file:///C%3A%5CUsers%5Csherr%5CDropbox%20%28UFL%29%5Cmatt.freeman%40gulfcouncil.org)) – Gulf of Mexico Fishery Management Council [new location]

Potential members recruited (guests):

* Gil Sylvia (gil.sylvia@oregonstate.edu) – Oregon State University
* Andrew Ropicki ([andrew.ropicki@ag.tamu.edu](file:///C%3A%5CUsers%5Csherr%5CDropbox%20%28UFL%29%5Candrew.ropicki%40ag.tamu.edu)) – Texas A&M AgriLife
* Jim Anderson (james.anderson@ufl.edu) – University of Florida
* Frank Asche (frank.asche@ufl.edu) – University of Florida
* Keith Criddle (kcriddle@alaska.edu) – University of Alaska
* Sara Sutherland (sara.sutherland@usu.edu) – Utah State University
* Eric Edwards (eric.edwards@usu.edu) – Utah State University
* Tracy Yandle (tyandle@emory.edu) – Emory University
* Dan Holland (dan.holland@noaa.gov) – NOAA Fisheries
* Robby Fonner (robby.fonner@noaa.gov) – NOAA Fisheries
* Akbar Marvasti ([akbar.marvasti@noaa.gov](file:///C%3A%5CUsers%5Cslarkin%5CDropbox%20%28UFL%29%5Cakbar.marvasti%40noaa.gov)) – NOAA Fisheries
* Larry Perruso (larry.perruso@noaa.gov) – NOAA Fisheries
* Christopher Liese (christopher.liese@noaa.gov) – NOAA Fisheries
* Scott Crosson (scott.crosson@noaa.gov) – NOAA Fisheries
* Dan Williard ([dwillard@edf.org](file:///C%3A%5CUsers%5Cslarkin%5CDropbox%20%28UFL%29%5Cdwillard%40edf.org)) – Environmental Defense Fund
* Vishwanie Maharaj ([vishwanie.maharaj@wwfus.org](file:///C%3A%5CUsers%5Cslarkin%5CDropbox%20%28UFL%29%5Cvishwanie.maharaj%40wwfus.org)) – World Wildlife Fund

**Brief Summary of Minutes of Annual Meeting**

The business meeting was called to order by Sherry Larkin, Interim Chair (May 22, 2017):

Two members that were officers have relocated in the past year and, until they officially transfer or revise an Appendix E, new officers are needed. The following assignments were agreed upon until new elections at the 2018 annual meeting to carry the group through termination in 2019.

* Chair: Kwamena Quagrainie
* Vice-Chair: Hiro Uchida
* Secretary: Sherry Larkin

To help the group re-organize, and maintain connected, conference calls were suggested. It was agreed that quarterly conference calls should begin June 2017. The secretary will organize calls via Doodle Poll. The first call will be for current members only and will include discussion of ideas for future group activities and a brainstorming session on plans to formally recruit additional members.

Diego Valderrama reminded the group of the impact flyer that was created to highlight the significance of accomplishments of W2004 (2009-2014).

The new advisor (David Thompson, dathomps@ad.nmsu.edu, New Mexico State University) was announced. Hopefully he will be able to attend, and even join one of the conference calls in 2017-18.

The 2017 NAAFE Forum presentations (May 22-24) by W3004 members and interested guests were announced by W3004 objective:

Objective 1: Improve the development of seafood markets by focusing on analyses of new marketing themes, market niches, and alternative seafood products

* Session: Seafood Markets & Trade
	+ SP037 Hiro Uchida
	+ SP009 Kwamena Quagrainie

Objective 2: Enhance fishery and aquaculture production by developing decision support tools to integrate management and marketing

* Session: Aquaculture Model and Applications
	+ SP014 Diego Valderrama
* Session: Bioeconomic Models and Applications
	+ SP121 Keith Criddle
	+ SP125 Chris Anderson (not presented since had to withdraw)

Objective 3: Increase the organizational and institutional efficiency of the aquaculture and fishery sectors by analyzing the regulatory environment and developing ideas to support the sectors

* Session: Rights-based Management
	+ SP112 Sherry Larkin, Andrew Ropicki

Objective 4: Increase the organizational and institutional efficiency of the aquaculture and fishery sectors by analyzing the regulatory environment and developing ideas to support the sectors

* + Session: Small-Scale Fisheries
* SP124 Sherry Larkin, Liliana Alencastro
	+ Special Session: The Fishery Performance Indicators – Value for Fisheries Management, Impact Investing, and Recreational Fisheries
* SS160 Jim Anderson
* SS161 Frank Asche
* SS162 Jim Anderson
* SS166 Chris Anderson (not presented since had to withdraw)
	+ Session: Distribution and ITQs
* SP168 Sara Sutherland
* SP143 Eric Edwards

Note: The Special Session will include case studies on how the FPI’s have been applied and used. The resulting peer-reviewed paper was published in *PLos ONE*:

Anderson, J.L., C.M. Anderson, J. Chu, J. Meredith, F. Asche, G. Sylvia, M.D. Smith, D. Anggraeni, R. Arthur, A. Guttormsen, J.K. McCluney, T. Ward, W. Akpalu, H. Eggert, J. Flores, **M. A. Freeman**, D. S. Holland, G. Knapp, M. Kobayashi, **S. Larkin**, K. MacLauchlin, K. Schnier, M. Soboil, S. Tveteras, **H. Uchida**, and **D. Valderrama**. 2015. *The Fishery Performance Indicators: A management tool for triple bottom line outcomes*. *PLoS ONE* 10(5): e0122809.

The meeting ended with a call to engage these related projects and collaborators during the 2017 NAAFE Forum and beyond. Follow-up discussion revolved around the special session by Anderson/Asche/Anderson under Objective 4; the project is an extension of the working group of W3004 members held prior to the 2013 NAAFE Forum. That session developed primary data for the indicators and now the FPI project has more than 100 fisheries included and the database is being extended from commercial fisheries to aquaculture and recreational fisheries, which will require new or revised measures of key metrics in order to effectively incorporate for comparison.

The group proposed and agreed to hold the 2018 W3004 meeting in conjunction with the 19th Biennial IIFET (International Institute of Fisheries Economics and Trade) Conference in Seattle, which will be held July 16-20 (<https://www.facebook.com/events/1075451839231150/>). There was discussion about holding a W3004 workshop prior to the conference to again support the FPI project.

**Accomplishments – by Objective**

1. Improve the development of seafood markets by focusing on analyses of new marketing themes, market niches, and alternative seafood products
	1. One project examined whether price premiums often observed at the retail level are sufficiently transmitted to ex-vessel prices, that is, whether fishermen are benefiting from certification programs such as the Marine Stewardship Council (MSC). This was collaborative work with Cathy Roheim (University of Idaho, W2004 member) and produced a Master’s thesis paper that was published.
	2. Another project examined the overall ‘seascape’ of seafood certifications – meant to convey information that would increase demand by consumers – using the evolution of Theory of Change over the entire supply chain. The goal was to suggest what may come next that would mitigate many of the issues currently faced by various players along the supply chain. This was a collaborative work with Cathy Roheim, Simon Bush (Wageningen Univ., The Netherlands), Jim Sanchirico (UC Davis), and Frank Asche (UF). The paper was presented at the 2017 NAAFE Forum. This project also supported (partially) a PhD student from China, who analyzed the Chinese consumer market for sustainable seafood as part of his dissertation. Preliminary results from that study were also presented at the 2017 NAAFE Forum.
	3. A current project involves a survey of Connecticut residents’ interest in and demand for Connecticut aquaculture products—specifically, oysters, clams, and seaweed. The survey involves a choice experiment and participants will be given various information treatments about the health/nutrition and environmental benefits of (local) aquaculture. The survey will launch June 2017. This is collaborative work with Tessa Getchis and Anoushka Concepcion from Connecticut Sea Grant and Miriah Kelly from UConn Extension. External grants cover parts of the work, including supervision of an MS student. Findings will be submitted to *Agricultural and Resource Economics Review* later this year and presented at the 2018 IIFET, AERE, and/or NAREA meetings next year.
	4. Another study investigates the potential for local oysters to command a price premium over imports. A discrete choice experiment was administered to seafood restaurant chefs to examine how they value different attributes related to price, grow-out site, freshness, and supply constancy. This effort is a joint endeavor between W3004 members from the University of Hawaii at Manoa and the University of Alaska – Fairbanks.
	5. Invasive lionfish in the Caribbean are causing concern for the sustainability of reef systems, especially in affecting the supply of fresh fish upon which small island nations depend. One project, funded by the NOAA Saltonstall-Kennedy program, seeks to assess the viability of seeking to grow a commercial fishery for lionfish in the USVI. This is a collaborative effort with Emory University (Tracy Yandle) and Georgia Southern University (Jenn Sweeney-Tookes) and involves mapping fishing areas and assessing willingness to sell and buy lionfish. Surveying was completed during the summer of 2016 and several events are being held on the islands in mid-June 2017 to share the results and train fishermen and consumers on how to catch, handle, fillet, and cook lionfish.
2. Enhance fishery and aquaculture production by developing decision support tools to integrate management and marketing
	1. There are currently dozens of computer-based models being used to evaluate and implement Ecosystem-Based Fishery Management (EBFM)-inspired fisheries management policies (in fisheries throughout the world). All of these models rely on ad hoc and frankly indefensible assumptions for the role and behavior of fishermen, i.e., the top predator in most ecosystems. One recent paper from this project entitled, “Ecosystem-Based Fisheries Management under Rational Ecological-Economic Equilibrium” incorporates state-of-the-art principles for modeling economic behavior in regulated environments. The methodology introduced in the paper generates robust predictions of ecological and economic outcomes of management interest (harvests, discards across time and space) within competitive markets and importantly, under rational expectations equilibrium behavior of fishermen. This work represents a fundamental departure from currently available approaches and is expected to significantly advance EBFM.
	2. The production of Pacific white shrimp (*Litopenaeus vannamei*) in indoor facilities has gained a lot of interest in the Midwest and attracts premium prices. Fish farmers are benefiting from the local foods movement and consumers’ willingness to pay for locally grown food products. However, the economics of indoor shrimp production is not well understood and the current high prices are not sustainable. Workshops were conducted on indoor shrimp production with experts in the field speaking on various topics related to the subject. Then, a study was conducted to assess the profitability of indoor production of the marine shrimp in the Midwest, under different production scenarios that involved stocking size, market size, survival rate, and selling price.
	3. Working to advance aquaculture as a business involves research into different production systems with an attempt to increase efficiencies in production while decreasing cost of production. Working with a variety of aquaculture producers, three projects are investigating the economics of (i) indoor greenhouse aquaculture of tilapia and using the fish effluent to fertigate vegetable production; (ii) developing a new intensive production technology called the in-pond raceway system; and (iii) development of vaccines to reduce disease mortalities in the US farm-raised catfish industry. Graduate students are being funded to support each project and are presenting results in journals and at aquaculture association meetings.
	4. Traditional fishpond aquaculture in Hawai‘i has declined since global trade provided access to cheaper imports, but stakeholders in Hawai‘i hope to develop a local oyster farming industry. This study investigates the production economics of a fishpond-based oyster farm by 1) assessing profitability, 2) determining sensitive input parameters, and 3) using stochastic modeling to determine the likelihood of different economic outcomes. Findings showed a marginally negative profit, with the bulk of operating costs from labor. Decision reversal analysis indicated the model farm can be profitable with an increase in market price from US $1.25 to US $1.35 per oyster or a decrease in mortality rate from 50% to 45.9%.
	5. The overall goal of a rather unique sub-project (for W3004) is to develop a methodology for assessing the socioeconomic impacts of aquatic animal diseases and estimate the adverse economic impacts. Specifically, one project aims to measure forgone (i) output or sales by businesses within the economic region affected by the disease outbreaks; (ii) personal income including wages and salaries and proprietors' income or income from self-employment from fish farming and related businesses; (iii) employment in fish farming and related businesses; (iv) contribution made to the value of fish products at each stage of harvesting, processing and distribution; and (v) tax revenues associated with harvesting, processing and distribution of fish products. The project is a result of an international working group built upon an existing relationship with FAO (Food and Agriculture Organization of the United Nations) to assist with methodology selection and to conduct a socioeconomic assessment baseline study of the impacts of Epizootic ulcerative syndrome, which is a type of fungal infection, affecting aquaculture production in Zambia and Zimbabwe. The group held a three-day workshop in Durban, South Africa on October 24-26, 2017 was attended by 28 participants coming from the African continent, Italy, Sri Lanka, Bosnia and Herzegovina, Norway, Canada and United States (including a W3004 member).
3. Increase the organizational and institutional efficiency of the aquaculture and fishery sectors by analyzing the regulatory environment and developing ideas to support the sectors
	1. A recently completed project investigated the effect of information on health benefits and risks of consuming seafood. An experimental auction method was used to actual consumers to collect data. Key findings include that consumers react more readily to health risk information (e.g., mercury contamination in swordfish) while almost no reaction to health benefit information (e.g., omega-3 in salmon). The paper was recently published in AJAE. This was a collaborative work with Cathy Roheim (U of ID) and Robert Johnston (Clark U in MA). The sequel paper is currently under development led by a PhD student as part of his dissertation. Preliminary results of that second paper was presented at 2017 NAAFE Forum.
	2. An Aquaculture tour was conducted that connected foodservice professionals with Indiana fish producers. This is important because much of the fish produced in Indiana is sold live to ethnic markets, direct to consumers on farms, and in limited amounts, to the food service sector. With the increasing emphasis on eating local foods and knowing where your food comes from as part of a healthy lifestyle, there was an opportunity to increase awareness and improve perception of the aquaculture industry in Indiana foodservice businesses. The tour provided chefs and culinary professionals the opportunity to interact with fish producers at their farms to learn about aquaculture practices and products in Indiana. The tour resulted in new business contacts and markets for the aquaculture industry.
	3. An ongoing project is examining the impact of foodborne disease outbreaks in the context of oyster farming. Oyster farmers face two kinds of foodborne disease-related risks: an outbreak risk in his own farm, and negative influence they face through markets when an outbreak occurs in a neighboring farm. This project focuses on the latter risk, and asks what oyster farmers can do to shield themselves from such adverse impacts. Data collection is scheduled to begin in June 2017.
	4. Improving the regulation of quota-managed commercial fisheries is a universal goal. Theoretical and empirical evidence of the impacts of flexibility provisions in multiple-species catch shares fisheries is currently unavailable. Regulators are nonetheless implementing flexibility provision in quota-managed fisheries without knowledge of their implications. The paper titled “Quota flexibility in multi-species fisheries” fills an important gap that will improve the design of catch-share regulatory systems.
4. Improve the understanding of how infrastructure investment, location, and sector organization affects the stability of both the aquaculture and capture fishery industries.
	1. Fishery Performance Indicators: the paper based on the first round of FPI implementation began under W2004, led by collaborators Jim Anderson (UF, past member) and Chris Anderson (UW, past member), was published in online journal *PLoS One*.
	2. Developing the economic impact of recreational and commercial shellfish sector is a top priority in the northeast U.S. region. IMPLAN is being used for this analysis. A project has already completed two surveys of shellfish commissions to obtain the numbers of permits, associated product sales, and agency budgets for managing recreational shellfishing. Preliminary economic impact estimates of employment, output and value added have been generated and are now being reviewed.
	3. Workshops were conducted on aquaponics to practitioners. Aquaponics has significant appeal because of the sustainable aspect of producing vegetables from the waste product from the fish, lending itself to diversified, small-scale, local niche producers. The practice of aquaponics is technically difficult as it combines two separate rearing strategies of aquaculture and hydroponics. The 1-day workshop brought together hydroponics practitioners and experts in food safety of vegetables, fish production, pest control in aquaponics, sustainable horticultural systems, hydroponic crops, greenhouse structures, and economics and marketing. The presenters provided latest research results in their various fields relating to issues associated with aquaponics. As a result, current and potential aquaponics practitioners were educated on structures for an aquaponics operation including greenhouses; potential fish and vegetable combinations and their requirements; pest control in green houses; types of aquaponics production systems; economics of aquaponics; marketing of fish and vegetable products; and food safety and handling of produce. Aquaponics practitioners also had the opportunity to network and benefit from one-on-one interactions with the scientists.

**Publications – Journal Articles**

Aboagye, D. L., and **P. J. Allen**. In press. “Effects of acute and chronic hypoxia on acid-base regulation, hematology, ion, and osmoregulation of juvenile American paddlefish.” *Journal of Comparative Physiology B*. doi: 10.1007/s00360-017-1104-7.

Amankwah, A., **K. K. Quagrainie**, and P. V. Preckel. 2016. Demand for Improved Fish Feed in the Presence of a Subsidy: A Double Hurdle Application in Kenya. *Agricultural Economics* 47(6): 633-643.

Camp, E., R. Ahrens, K. Lorenzen, and **S. Larkin**. 2017. “Trade-offs between Socioeconomic and Conservation Management Objectives in Stock Enhancement of Marine Recreational Fisheries.” *Fisheries Research* 186(2): 446–459.

Chen, J. Q., M. C. Haws, **Q. S. Fong**, and **P. S. Leung**. 2017. “Economic feasibility of producing oysters using a small-scale Hawaiian fishpond model.” *Aquaculture Reports* 5: 41–51.

Chen, J. Q., M. C. Haws, **Q. S. Fong**, and **P. S. Leung**. 2017. “Locally Grown Oysters in Hawai‘i: Chef Preference and Local Premium?” *Journal of World Aquaculture Society*. doi: 10.1111/jwas.12430

Danaher, J. J., J. M. Pickens, J. L. Sibley, J.A. Chappell, **T. R. Hanson**, and C. E. Boyd. 2016. “Tomato seedling growth response to different water sources and a substrate partially replaced with dewatered aquaculture effluent.” *International Journal of Recycling of Organic Waste in Agriculture*, DOI 10.1007/s40093-016-0114-x

Darko, F. A., **K. K. Quagrainie**, and S. Chenyambuga. 2016. Consumer Preferences for Farmed Tilapia in Tanzania: A Choice Experiment Analysis. *Journal of Applied Aquaculture* 28(3): 131-143.

Gorospe, K.D., W. Michaels, **R. Pomeroy**, C. Elvidge, P. Lynch, S. Wongbusarakum and R. E. Brainard. 2016. “The mobilization of science and technology fisheries innovations towards an ecosystem approach to fisheries management in the Coral Triangle and Southeast Asia.” *Marine Policy* 74: 143–152.

Liu, S., C. Courtwright, Y. Wang, **T. R. Hanson**. 2016. “Chemical Treatments to Reduce Off-Flavor in Farm-Raised Channel Catfish (*Ictalurus punctatus*) Fillet.” *Journal of Food Processing and Preservation* DOI: 10.1111/jfpp.12886

Liu, S., T. Liao, S. T. McCrummen, **T. R. Hanson** and Y. Wang. 2017. “Exploration of volatile compounds causing off-flavor in farm-raised channel catfish (*Ictalurus punctatus*) fillet*.” Aquaculture International* 25: 413-422.

Li, Y., Y. Wang, C. E. Boyd, **T. R. Hanson** and S. Liu. 2016. “Evaluation and Optimization of Chemical Treatments for Reducing Yellow Discoloration of Channel Catfish (*Ictalurus Punctatus*) Fillets During Cold Storage.” *Journal of Aquatic Food Product Technology* DOI: 10.1080/10498850.2015.1099068.

Manning, D. and **H. Uchida. 2016**. “Are Two Rents Better than None? When Monopolies Correct Ill-defined Property Rights.” *Marine Resource Economics* 31(2): 141-164.

Morcom, S., D. Yang, **R. S. Pomeroy**, and P. A. Anderson. In press. “Marine Ornamental Aquaculture in the Northeast U.S.: The State of the Industry.” *Aquaculture Economics and Management* http://dx.doi.org/10.1080/13657305.2016.1206994.

Navy, H., T. H. Minh, and **R. Pomeroy**. 2016. “Assessing the Impacts of Climate Change on Snakehead Fish Value Chains in the Lower Mekong Basin of Cambodia and Vietnam.” *World Aquaculture* 47(4): 52-55.

**Pomeroy, R.** 2016. “A Research Framework for Traditional Fisheries: Revisited.” *Marine Policy* 70: 153-163.

**Pomeroy, R**., A. Ferrer, and J. Pedrajas. 2017. “An Analysis of Livelihood Projects and Programs for Fishing Communities in the Philippines.” *Marine Policy* 81: 250-255.

**Posadas, B.** **C.**, and B. K. A. Posadas, Jr. 2017. “Economic Impacts of the Opening of the Bonnet Carre Spillway to the Mississippi Oyster Fishery.” *Journal of Food Distribution Research* 48(1): 42-45.

**Pomeroy, R**., J. Parks, K. Courtney, and N. Mattich. 2016. “Improving Marine Fisheries Management in Southeast Asia: Results of a Regional Fisheries Stakeholder Analysis.” *Marine Policy* 65: 20-29.

Rhodes, M. A., Y. Zhou, G. P. Salze, **T. R. Hanson,** and D. A. Davis. 2016. “Development of plant-based diets and the evaluation of dietary attractants for juvenile Florida pompano *Trachinotus carolinus L.*” *Aquaculture Nutrition*, 1-11. doi: 10.1111/anu.12474.

Rosales, M., *R. Pomeroy*, I. J. Calabio, M. Batong, K. Cedo, N. Escara, V. Facunla, A. Gulayan, M. Narvadez, M. Sarahadil, and M. A. Sobrevega. 2017. “Value Chain Analysis and Small-Scale Fisheries Management.” *Marine Policy* 83: 11-17.

Saavedra-Díaz, L. M. R. Pomeroy, and A. A. Rosenberg. 2016. “Managing Small-Scale Fisheries in Colombia.” *Maritime Studies* 15(6): 98-118.

Singh, R., and **Q. Weninger**. 2016. “Cap-and-Trade under Transactions Costs and Factor Irreversibility” *Economic Theory*, DOI 10.1007/s00199-016-0991-2.

Stemle, A., **H. Uchida**, and C. A.Roheim. 2016. “Have Dockside Prices Improved after MSC Certification? Analysis of Multiple Fisheries.” *Fisheries Research* 182: 116-123.

**Uchida, H.**, C. A. Roheim, and R. J. Johnston. 2017. “Balancing the Health Risks and Benefits of Seafood: How Does Available Guidance Affect Consumer Choices?” *American Journal of Agricultural Economics*. doi:10.1093/ajae/aax025.

**Uchida, H.** 2017. “TURFs, collective fishery management, and fishery cooperatives.” *Bulletin of Marine Science* 93(1): 83-99.

**Valderrama, D.** and K. A. H. Fields. 2016. “Flawed evidence supporting the Metabolic Theory of Ecology may undermine goals of ecosystem-based fishery management: The case of invasive Indo-Pacific lionfish in the western Atlantic.” *ICES Journal of Marine Science*. https://doi.org/10.1093/icesjms/fsw223.

**Valderrama, D.,** L.A. Velasco, and N. Quiroz. 2016. “Economic assessment of hatchery production of Argopecten nucleus spat to support the development of scallop aquaculture in the wider Caribbean.” *Aquaculture Reports* 4: 169-177.

Zhou, X. and **T. Hanson**. 2017. “Economic optimization of super-intensive biosecure recirculating shrimp production systems.” *Aquaculture International* doi 10.1007/s10499-017-0129-y.

**Grants**

* + USDA-AFRI. 2011-15. “Long-term health effects, risk perceptions, and implications for agricultural markets: Modeling consumption patterns for aquacultured seafood.”
	+ David and Lucile Packard Foundation. 2015-16. “Assessment of the evolving markets for certification and sustainable seafood.”
	+ National Sea Grant. 2014-17. “Risk of food-borne diseases in farmed oysters: Economic analysis of consumer response and producers’ strategy.”
	+ Community fisheries management in the Upper Mekong River of Cambodia. 2017-2021 World Bank ($250,000)
	+ COREMAP-CTI Indonesia 2015-2017 World Bank ($250,000)
	+ Linking markets to sustainable fisheries management in the Philippines 2015-2018 USAID-Philippines ($1.400,000)
* “Evaluation of the economic feasibility and marketing potential of the new Hawai`i oyster industry” Sea Grant College Program Year 48 Research Project NA140AR4170071 - R/SS-11, terminated September 30, 2016.
* 2016-18 NAS/Gulf Research Program: “Synthesizing Spatial Dynamics of Recreational Fish and Fisheries to Inform Restoration Strategies: Red Drum in the Gulf of Mexico.” ($34,820 of $480,248); Investigator
* 2016 Environmental Defense Fund: “Potential Impacts of Proposed Modifications to the Gulf of Mexico Red Snapper IFQ Program.” ($8,880 of $20,000 total, subcontract via Texas A&M University); PI
* 2015-16 NOAA/ECS contract: “Measuring Technical Efficiency Gains in Southeast Fisheries.” ($10,000); PI
* 2015-17 NOAA/Saltonstall-Kennedy: “Assessing the Viability of the Commercial Lionfish Fishery in the U.S. Virgin Islands.” ($84,000 of $314,000 total, subcontract via Emory University); co-PI
* 2015-16 Gulf of Mexico Fishery Management Council (GMFMC): “Measuring Fleet Efficiency Gains from IFQ Programs using Social Network Analysis.” ($65,000); PI
	+ The Catfish Institute, $74,500, 4/1/17 – 4/30/18, 5%, Developing Catfish Reports for Processing and Feed Delivered
	+ USDA NIFA NNF, $243,500, 2/15/17 – 2/15/22, 5%, Aquaponics – A Sustainable Way Forward
	+ Alabama Catfish Producers Association (ALFA), $66,866, 3/1/17 – 6/30/18, 5%, Pond-to-Plate Project 2016-2017– Year 9 Field Trials to combat virulent Aeromonas hydrophila
	+ Alabama Department of Agriculture and Industries, $36,000, 2/13/17 – 2/12/18, 5%, Emerging Virulent Aeromonas hydrophila (vAh): Year 3
	+ USDA-NIFA-AFRI, $499,819, 10/1/2016 – 9/30/2019, 1%, Systems Modeling of Nitrogen Recycling in Multi-Trophic Aquaculture Production
	+ SRAC, $59,889, 1/1/2017 – 12/31/2017, 1%, Field-Testing of a Rapid LAMP Assay to Detect the Marine Parasite Amyloodinium ocellatum in Commercial Aquaculture Facilities
	+ AL & GA DNCR, $273,779, 10/1/2016 – 9/30/2018, 5%, Economic Value of Recreational Fishing on Lake Eufaula (AL)/Walter F George (GA)
	+ USDA-NIFA Aquaculture Program, $326,250, 10/1/2016 – 9/30/18, 8%, Improving Aquaculture’s Value Through Enhanced Nutrient Management
	+ AllTech, $25,000, 9/1/2016 – 6/30/2017, 2%, Use of Organic Minerals in Practical Diets for Nile Tilapia
	+ Alabama Catfish Producers Association (ALFA), $36,000, 3/1/16 – 6/30/17 5% Pond-to-Plate Project 2016-2017– Year 8 virulent Aeromonas hydrophila trials
	+ USDA-NIFA C.A.R.E. program, $199,832, 1/1/16 – 12/31/17, 5%, Breaking the Cycle: amending Aquafeeds to Mitigate Aeromonas hydrophila Outbreaks
	+ Southern Regional Aquaculture Center, $300,000, 5/15/15 – 5/14/17, 10%, Evaluation of Probiotic and Prebiotic Supplements with Catfish, Golden Shiners, Hybrid Striped Bass and Tilapia under Conditions of Commercial Production
	+ Southern Regional Aquaculture Center SRAC, $300,000, 3/1/15 – 2/28/17, 5%, Integrated Approaches to Reducing Individual Variability and Providing Year Round Harvest of Channel-Blue Hybrid Catfish