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- Summerfelt, S. T. (2011, May 15). *Technologies that eliminate escapees and minimize waste, while reclaiming water, salt, nutrients and heat in closed-containment systems*. Paper presented at the Second International Marine Conservation Congress. In: Special Session "Science Matters-Research to Implement Land-Based Closed Containment Systems for Salmonid Food Fish Production." Victoria, British Columbia, Canada.
- Summerfelt, S. T., Davidson, J., Waldrop, T., Good, C. (2011, June 8 - 9). *Effects of photoperiod manipulation on Atlantic salmon, Arctic char and Coho salmon performance, maturation and fillet attributes*. Paper presented at the Coldwater Fish Culture Workshop, Bayfield, Wisconsin.
- Summerfelt, S. T., Davidson, J., Waldrop, T., Good, C. (2011, May 10). *Rainbow trout and atlantic salmon performance in circular tank-based closed-containment systems*. Paper presented at the Aquaculture Canada 2011, Quebec City, Quebec, Canada.
- Summerfelt, S. T., Davidson, J., Waldrop, T., Good, C. (2011, June 8 - 9). *Rainbow trout production in flow-through and water recirculating systems*. Paper presented at the Coldwater Fish Culture Workshop, Bayfield, Wisconsin.
- Wolters, W., Burr, G.S., Schrader, K.K., Summerfelt, S.T. (2011, May 15). *Off-flavor characterization and depuration in Atlantic salmon cultured to food-size within closed-containment systems*. Paper presented at the Second International Marine Conservation Congress. In: Special Session "Science Matters-Research to Implement Land-Based Closed Containment Systems for Salmonid Food Fish Production." Victoria, British Columbia, Canada.

2010 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Davidson, J., Good, C., Welsh, C., Summerfelt, S. (2010, August 18-19). *Effects of ozone and water exchange rates on water quality and fish performance within replicated water reuse aquaculture systems culturing rainbow trout, *Oncorhynchus mykiss**. Paper presented at the Aquaculture Engineering Society Issues Forum, Roanoke, VA.
- Davidson, J., Good, C., Welsh, C., Summerfelt, S. (2010, June 13-17). *Effects of ozone and water exchange rates on water quality and rainbow trout performance in replicated water reuse aquaculture systems*. Paper presented at the WVII World Congress of the International Commission of Agriculture and Biosystems Engineering (CIGR), Quebec City, Canada.
- Davidson, J., Tood, C., Kenney, B., Barrows, R., Welsh, C., Summerfelt, S.T. (2010, August 2-22). *Comparing the effects of grain - versus fish meal-based diets on water quality and waste production within low exchange water reuse aquaculture systems culturing rainbow trout, *Oncorhynchus mykiss**. Paper presented at the Eighth International Conference on Recirculating Aquaculture, Roanoke, VA.
- Davidson, J. T., Summerfelt, S.T., Good, C., Welsh, C. (2010, March 1 - 5). *Accumulating nitrate-nitrogen and its potential impact on rainbow trout *Oncorhynchus mykiss* cultured in low and near-zero exchange recirculating aquaculture systems*. Paper presented at the Aquaculture 2010 Conference and Tradeshow, San Diego, CA.
- Davidson, J. T., Summerfelt, S.T., Good, C., Welsh, C. (2010, March 1 - 5). *Water quality in replicated recirculating aquaculture systems operated at high, low and near-zero water exchange with and without ozone*. Paper presented at the Aquaculture 2010 Conference & Tradeshow, San Diego, CA.
- Good, C., Vinci, B., Snekvik, K., Adams, I., Summerfelt, S., Dilly, S. (2010, March 1 - 5). *A comparison of the health, performance and welfare of juvenile chinook salmon *Oncorhynchus tshawytscha* raised in a pilot partial water reuse system versus a flow-through raceway*. Paper presented at the Aquaculture 2010 Conference and Tradeshow, San Diego, CA.
- Good, C., Vinci, B., Summerfelt, S., Snekvik, K., Adams, I., Dilly, S. (2010, August 20-22). *Comparing the health, performance and welfare of juvenile Chinook salmon (*Oncorhynchus Tshawytscha*) raised in a pilot partial water reuse system versus a flow-through raceway*. Paper presented at the Eighth International Conference on Recirculating Aquaculture, Roanoke, VA.
- Good, C., Waldrop, T., Baeverfjord, G., Hjelde, K., Kenney, P.B., Snekvik, K., Summerfelt, S. (2010, August 20-22). *A factorial study to investigate the effects of swimming speed and dissolved oxygen concentration on rainbow trout performance, health and welfare*. Paper presented at the

- Eighth International Conference on Recirculating Aquaculture, Roanoke, VA.
- Good, C., Waldrop, T., Baevefjord, G., Hjelde, K., Kenney, P.B., Snekvik, K., Summerfelt, S. (2010, March 1 - 5). *A factorial study to investigate the effects of swimming speed and dissolved oxygen concentration on rainbow trout performance, health, and welfare*. Paper presented at the Aquaculture 2010 Conference and Tradeshow, San Diego, CA.
- Good C., D., J., Kenney, B., Waldrop, T., Shepherd, B., Summerfelt, S. (2010, August 20-22). *Atlantic salmon (Salmo salar) growout in freshwater closed-containment systems: (1) Effects of high (20 mg/l) and low (10 mg/l) carbon dioxide concentrations and (2) Effects of strain and photoperiod manipulation*. Paper presented at the Eighth International Conference on Recirculation Aquaculture, Roanoke, VA.
- Sharrer, M., Rishel, K., Summerfelt, S.T. (2010, August 18-19). *Activated sludge adsorption of heavy metals in a membrane biological reactor operated for reclamation and reuse of recirculating aquaculture system wastewater*. Paper presented at the Aquacultural Engineering Society Issues Forum, Roanoke, VA.
- Sharrer, M. J., Rishel, K., Summerfelt, S.T. (2010, March 1 - 5). *Activated sludge adsorption of heavy metals in a membrane biological reactor operated for reclamation and reuse of recirculating aquaculture system wastewater*. Paper presented at the Aquaculture 2010 Conference and Tradeshow, San Diego, CA.
- Sharrer, M. J., Rishel, K., Summerfelt, S.T. (2010, August 20-22). *Coupled geotextile dewatering and activated sludge treatment of biosolids discharged from a recirculating aquaculture system*. Paper presented at the Eighth International Conference of Recirculating Aquaculture.
- Sharrer, M. J., Rishel, K., Taylor, A., Vinci, B.J., Summerfelt, S.T. (2010, August 20-22). *The cost and effectiveness of solids thickening technologies for treating backwash and recovering nutrients from intensive aquaculture systems*. Paper presented at the Eighth International Conference on Recirculating Aquaculture, Roanoke, VA.
- Sharrer, M. J., Tal, Y., Ferrier, D., Hankins, J.A., Summerfelt, S.T. (2010, March 1 - 5). *Membrane biological reactor treatment of a saline backwash flow from a recirculating aquaculture system*. Paper presented at the Aquaculture 2010 Conference and Tradeshow, San Diego, CA.
- Summerfelt, S. T., Davidson, J., Good, C., Waldrop, T. (2010, March 1 - 5). *Rainbow trout production in water recirculating systems*. Paper presented at the Aquaculture 2010 Conference and Tradeshow, San Diego, CA.
- Summerfelt, S. T., Gearheart, M., Watten, B. (2010, March 1 - 5). *Comparing carbon dioxide stripping column performance in freshwater and seawater*. Paper presented at the Aquaculture 2010 Conference and Tradeshow, San Diego, CA.
- Summerfelt, S. T., Good, C., Welsh, C., Davidson, J. (2010, March 1 - 5). *Water treatment process efficiencies in replicated recirculating systems operated with and without ozonation*. Paper presented at the Aquaculture 2010 Conference and Tradeshow, San Diego, CA.
- Wolters, W., Masters, A., Vince, B., Summerfelt, S. (2010, March 1 - 5). *Recirculating Systems for Atlantic salmon (Salmo salar) at the USDA ARS National Cold Water Marine Aquaculture Center (Franklin, Maine)*. Paper presented at the Aquaculture 2010 Conference and Tradeshow, San Diego, CA.

2009 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Aussanasuwannakull, A., Slider, S.D., Kenney, P.B., Summerfelt, S.T., Davidson, J., Welsh, C. (2009, January 17). *Characterizing Rainbow Trout (Oncorhynchus mykiss) Growth, Fillets Attributes and Sexual Maturity to 26 Months*. Paper presented at the West Virginia Aquaculture Forum, Moorefield, West Virginia.
- Colt, J., Rust, M., Summerfelt, S., Pfeiffer, T., Fivelstad, S. (2009, February 15 to 18). *Energy resource consumption of land based Atlantic salmon smolt hatcheries in the Pacific Northwest (USA)*. Paper presented at the Aquaculture America 2009 Exposition and Tradeshow, Seattle, WA.
- Davidson, J. T., Good, C., Welsh, C., Summerfelt, S.T. (2009, February 15 to 18). *Water quality and treatment efficiency in replicated recirculating systems operated at low flushing conditions with and without ozone*. Paper presented at the Aquaculture America 2009 Exposition and Tradeshow, Seattle, WA.
- Good, C. (2009, September 29). *Biosecurity in Salmonid Aquaculture*. Paper presented at the Invited

- Presentation during a 1 day private fish farmers meeting sponsored by Troutlodge, Veracruz, Mexico.
- Good, C. (2009, October 15). *Fish health management in water recirculation aquaculture*. Paper presented at the Scientific Seminar at the US Food & Drug Administration, Center for Veterinary Medicine, Rockville, MD.
- Good, C., Davidson, J., Welsh, C., Snekvik, K., Summerfelt, S. (2009, February 15 to 18). *Assessing the health of rainbow trout *Oncorhynchus mykiss* in low-exchange recirculating systems operated with or without ozonation*. Paper presented at the Aquaculture America 2009 Exposition and Tradeshow, Seattle, WA.
- Good, C., Davidson, J., Welsh, C., Snekvik, K., Summerfelt, S. (2009, February 15 to 18). *The effects of high vs. low dissolved carbon dioxide on the health and performance of rainbow trout *Oncorhynchus mykiss* in low-exchange recirculating aquaculture systems*. Paper presented at the Aquaculture America 2009 Exposition and Tradeshow, Seattle, WA.
- Good, C., Davidson, J., Welsh, C., Snekvik, K., Summerfelt, S. (2009, September 27). *The effects of ozonation on water quality and the health and performance of rainbow trout *Oncorhynchus mykiss* in low exchange water recirculating aquaculture systems*. Paper presented at the World Aquaculture 2009, Veracruz Mexico.
- Good, C., Davidson, J., Welsh, C., Snekvik, K., Summerfelt, S. (2009, August 15 to 17). *The effects of ozonation on water quality and the health and performance of rainbow trout *Oncorhynchus mykiss* in low-exchange water recirculating aquaculture systems*. Paper presented at the Aquaculture Europe, Trondheim Norway.
- Good, C., Davidson, J., Welsh, C., Snekvik, K., Summerfelt, S. (2009, June 11). *Fish health and RAS: Evaluating Rainbow Trout Performance, Health and Welfare at The Freshwater Institute*. Paper presented at the Midwest Recirculating Aquaculture Systems Workshop, Bayfield, Wisconsin.
- Good, C., Davidson, J., Welsh, C., Snekvik, K., Summerfelt, S. (2009, August 15 to 17). *Health and performance of rainbow trout *Oncorhynchus mykiss* in low-exchange water recirculating aquaculture systems with high or low dissolved carbon dioxide*. Paper presented at the Aquaculture Europe, Trondheim Norway.
- Good, C., Davidson, J., Welsh, C., Snekvik, K., Summerfelt, S. (2009, October 15). *Recirculating Aquaculture and the Veterinarian's Role in Fish Health Management*. Paper presented at the US Food and Drug Administration's Center for Veterinary Medicine, Rockville, Maryland.
- Schrader, K. K., Summerfelt, S.T. (2009, February 15 to 18). *Geosmin production by *Nocardia* spp. and *Streptomyces* spp. from recirculating aquaculture systems for rainbow trout (*Oncorhynchus mykiss*) culture*. Paper presented at the Aquaculture America 2009 Exposition and Tradeshow, Seattle, WA.
- Sharrer, M. J., Rishel, K., Summerfelt, S.T. (2009, February 15 to 18). *A comparison of two aluminum based coagulants for phosphorus precipitation and suspended solids removal using inclined belt filter technology to dewater recirculating aquaculture effluent*. Paper presented at the Aquaculture America 2009 Exposition and Tradeshow, Seattle, WA.
- Summerfelt, S. T. (2009, January 12 to 15). *Filtration to capture wastes, reduce discharge, reclaim water and exclude escapees*. Paper presented at the Food & Water Watch - Clean, Green & Sustainable Aquaculture Summit I: RAS, Washington, DC.
- Summerfelt, S. T. (2009, January 17). *Freshwater Institute research highlights*. Paper presented at the West Virginia Aquaculture Forum, Moorefield, West Virginia.
- Summerfelt, S. T. (2009, June 10 to 11). *Overview of Recirculating Aquaculture Systems in the United States (Keynote Presentation)*. Paper presented at the Midwest Recirculating Aquaculture Conference, Bayfield, Wisconsin.
- Summerfelt, S. T. (2009, June 10 to 11). *Overview of Water Reuse for Intensive Fish Culture; Carrying Capacity, Water Quality & Treatment Efficiency; Culture Tank Design & Management; Fish Harvest Technologies; Best Waste Management Practices for RAS's; Solids Dewatering; Biofiltration/Nitrification Design Overview; Fluidized Sand Biofilter Design & Management; Ozonation and UV Disinfection; and Fully Recycle Systems Design Example*. Paper presented at the Midwest Recirculating Aquaculture Conference, Bayfield, Wisconsin.
- Summerfelt, S. T. (2009, September 29). *Production System Research at the Conservation Fund Freshwater Institute*. Paper presented at the USDA ARS Leadership Visit and Seminar, National Center for Cool and Cold Water Aquaculture, Leetown, WV.

- Summerfelt, S. T., Good, C., Welsh, C., Davidson, J. (2009, October 15). *Water quality and treatment process efficiencies in replicated recirculating systems operated with and without ozonation*. Paper presented at the Scientific Seminar at the US Food and Drug Administration, Center for Veterinary Medicine, Rockville, MD.
- Summerfelt, S. T., Good, C., Welsh, C., Davidson, J. (2009, August 15 to 17). *Water quality and treatment process efficiencies in replicated recirculating systems operated with and without ozonation*. Paper presented at the Aquaculture Europe, Trondheim Norway.
- Summerfelt, S. T., Pfeiffer, T., Schiro, D. (2009, February 15 to 18). *Processes to improve energy efficiency during pumping and aeration of recirculating water in circular tank systems*. Paper presented at the Aquaculture America 2009 Exposition and Tradeshow, Seattle, WA.
- Summerfelt, S. T., Pfeiffer, T., Schiro, D. (2009, October 1 to 3). *Processes to improve energy efficiency during pumping and aeration of recirculating water in circular tank systems*. Paper presented at the US Trout Farmers Association Annual Meeting, Harrisburg, Pennsylvania.
- Summerfelt, S. T., Pfeiffer, T., Schiro, D. (2009, January 17). *Sidewall-box airlift pump provides large flows for aeration, CO₂ stripping, and water rotations in large dual-drain circular tanks*. Paper presented at the West Virginia Aquaculture Forum, Moorefield, West Virginia.
- Summerfelt, S. T., Sharrer, M.J., Tsukuda, S. M., Gearheart, M. (2009, February 15 to 18). *Treatment of recirculating water using UV irradiation only or combination of ozonation and UV irradiation*. Paper presented at the Aquaculture America 2009 Exposition and Tradeshow, Seattle, WA.
- Summerfelt, S. T., Sharrer, M.J., Tsukuda, S.M., Gearheart, M. (2009, August 15 to 17). *Process requirements for achieving full-flow disinfection using ozonation and uv irradiation*. Paper presented at the Aquaculture Europe, Trondheim Norway.
- Summerfelt, S. T., Sharrer, M.J., Tsukuda, S.M., Gearheart, M. (2009, October 15). *Process requirements for achieving full-flow disinfection using ozonation and uv irradiation*. Paper presented at the Scientific Seminar at the US Food and Drug Administration, Center for Veterinary Medicine, Rockville, MD.
- Summerfelt, S. T., Waldrop, T., Davidson, J., Good, C. (2009, June 10 to 11). *Rainbow Trout Production in Water Recirculating Systems*. Paper presented at the Midwest Recirculating Aquaculture, Bayfield, Wisconsin.

2008 Proceedings, Papers, Abstracts and Oral Presentations

- Davidson, J. T. (2008, December 3 to 5). *The effects of aquaculture production noise on the growth, physiology and survival of rainbow trout*. Paper presented at the Northeast Aquaculture Conference and Exposition, Portland, Maine.
- Davidson, J. T., Good, C., Welsh, C., Brazil, B., Summerfelt, S.T. (2008, February 9 to 12). *Water quality and treatment efficiency in recirculating systems operated under high feed and low flushing conditions*. Paper presented at the Aquaculture America 2008 Conference and Exposition, Lake Buena Vista, Florida.
- Davidson, J. T., Good, C., Welsh, C., Brazil, B., Summerfelt, S.T. (2008, July 23-24). *Water quality and treatment efficiency in replicated recirculating systems for salmonids operated under (1) high feed and low flushing conditions or (2) low flushing with or without ozonation*. Paper presented at the Aquaculture Engineering Society Issues Forum, Roanoke, VA.
- Davidson, J. T., Good, C., Welsh, C., Summerfelt, S.T. (2008, December 3 to 5). *Ozonation for water quality improvements in low exchange salmonid recirculating systems*. Paper presented at the Northeast Aquaculture Conference and Exposition, Portland, Maine.
- Good, C. (2008, February 27 - 28). *Investigating the health and welfare of rainbow trout in recirculating and flow-through aquaculture systems*. Paper presented at the Invited Presentation In: Recirculation of Water in Aquaculture. Hosted by NOFIMA, Sunndalsora, Norway.
- Good, C. (2008, July 25 - 27). *Recirculating aquaculture and the Veterinarian's role in fish health management*. Paper presented at the 7th International Recirculating Aquaculture Conference, Roanoke, VA.
- Good, C. (2008, May 5-9). *Recirculating aquaculture system culture environment and water quality; Biosecurity and fish health in recirculating aquaculture systems*. Paper presented at the Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Campbell River, British Columbia, Canada.

- Good, C. (2008, July 28 - August 1). *Recirculating aquaculture system culture environment and water quality; Biosecurity and fish health in recirculating aquaculture systems*. Paper presented at the Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Shepherdstown, WV.
- Good, C., Davidson, J., Welsh, C., Brazil, B., Snekvik, K., Summerfelt, S.T. (2008, July 25 - 27). *Performance and health assessments of rainbow trout *Oncorhynchus mykiss* in replicated recirculating systems and operated at (1) low vs. high makeup rates, (2) low vs. high CO₂ concentrations and (3) with or without ozonation at low makeup rates*. Paper presented at the 7th International Recirculating Aquaculture Conference, Roanoke, VA.
- Good, C., Davidson, J., Welsh, C., Snekvik, K., Summerfelt, S.t. (2008, February 9 to 12). *Evaluating the health of rainbow trout *Oncorhynchus mykiss* in recirculating systems operated under high feed and low flushing conditions*. Paper presented at the Aquaculture America 2008 Conference and Exposition, Lake Buena Vista, Florida.
- Good, C., Waldrop, T., Keener, L., Barrows, F., Summerfelt, S.T. (2008, February 9 to 12). *A factorial study assessing production, fin condition, and fillet quality of rainbow trout *Oncorhynchus mykiss* reared at two different densities and fed fishmeal - or grain - based diets*. Paper presented at the Aquaculture America 2008 Conference and Exposition, Lake Buena Vista, Florida.
- Good, C. M., Thorburn, M.A., Stevenson, R.M.W. (2008). Factors associated with the incidence of bacterial gill disease in salmonid lots reared in Ontario, Canada government hatcheries. *Preventative Veterinary Medicine*, 83, 297-307.
- Sharrer, M. J., Rishel, K., Summerfelt, S.T. (2008, February 9 to 12). *Evaluation of solids thickening technologies (gravity thickening cone, geotextile filter and belt filter) for treating backwash from recirculating aquaculture systems*. Paper presented at the Aquaculture America 2008 Conference and Exposition, Lake Buena Vista, Florida.
- Sharrer, M. J., Rishel, K., Summerfelt, S.T. (2008, July 25 - 27). *Evaluation of solids thickening technologies (gravity thickening cone, geotextile filter and belt filter) for treating backwash from recirculating aquaculture systems*. Paper presented at the 7th International Recirculating Aquaculture Conference.
- Sharrer, M. J., Rishel, K., Summerfelt, S.T. (2008, December 3 to 5). *Improving solids dewatering processes for aquaculture*. Paper presented at the Northeast Aquaculture Conference and Exposition, Portland, Maine.
- Sharrer, M. J., Rishel, K., Summerfelt, S.T. (2008, July 25 - 27). *Membrane biological reactor technology for reclamation and reuse of wastewater when operated at high and low nutrient loading conditions*. Paper presented at the 7th International Recirculating Aquaculture Conference, Roanoke, VA.
- Sharrer, M. J., Rishel, K., Summerfelt, S.T. (2008, December 3 to 5). *Membrane biological reactor technology for reclamation and reuse of wastewater when operated at high and low nutrient loading conditions*. Paper presented at the Northeast Aquaculture Conference and Exposition, Portland, Maine.
- Summerfelt, S. T. (2008, May 5 - 9). *Carrying capacity and treatment efficiency; Culture tank design; fish harvest technologies; Best management practices for recirculating aquaculture systems; Biofiltration for ammonia control; Fluidized-sand biofilters; Moving bed biofilters; Ozonation and UV disinfection; Recirculating system design example*. Paper presented at the Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Campbell River, British Columbia, Canada.
- Summerfelt, S. T. (2008, July 28 - August 1). *Carrying capacity and treatment efficiency; Culture tank design; fish harvest technologies; Best management practices for recirculating aquaculture systems; Biofiltration for ammonia control; Fluidized-sand biofilters; Moving bed biofilters; Ozonation and UV disinfection; Recirculating system design example*. Paper presented at the Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Shepherdstown, WV.
- Summerfelt, S. T. (2008, September 18 - 20). *Development of sustainable land-based aquaculture production systems*. Paper presented at the US Trout Farmers Association Midwest Aquaculture Conference, Milwaukee, Wisconsin.
- Summerfelt, S. T. (2008, February 27-28). *Recycle system designs used in North America for Atlantic salmon smolt production*. Paper presented at the Invited Presentation In: Recirculation of Water

- in Aquaculture. Hosted by NOFIMA, Sunndalsora, Norway.
- Summerfelt, S. T., Davidson, J., Wilson, G., Waldrop, T. (2008, July 25 - 27). *Advances in fish harvest technologies for circular tanks*. Paper presented at the 7th International Recirculating Aquaculture Conference, Roanoke, VA.
- Summerfelt, S. T., Davidson, J., Wilson, G., Waldrop, T. (2008, December 3 to 5). *Advances in fish harvest technologies for circular tanks*. Paper presented at the Northeast Aquaculture Conference and Exposition, Portland, Maine.
- Summerfelt, S. T., Pfeiffer, T., Schiro, D. (2008, July 25 - 27). *Sidewall-box airlift pump provides large flows for aeration, CO₂ stripping and water rotation in large dual-drain circular tanks*. Paper presented at the 7th International Recirculating Aquaculture Conference, Roanoke, VA.
- Summerfelt, S. T., Pfeiffer, T., Schiro, D. (2008, September 18 -20). *Sidewall-box airlift pump provides large flows for aeration, CO₂ stripping and water rotation in large dual-drain circular tanks*. Paper presented at the US Trout Farmers Association Midwest Aquaculture Conference, Milwaukee, Wisconsin.
- Summerfelt, S. T., Sharrer, M., Tsukuda, S., Gearheart, M. (2008, February 9 to 12). *Process requirements for achieving full-flow disinfection using ozonation and UV irradiation*. Paper presented at the Aquaculture America 2008 Conference and Exposition, Lake Buena Vista, Florida.
- Summerfelt, S. T., Sharrer, M., Tsukuda, S., Gearheart, M. (2008, July 25 - 27). *Process requirements for achieving full-flow disinfection using ozonation and UV irradiation*. Paper presented at the 7th International Recirculating Aquaculture Conference, Roanoke, VA.
- Summerfelt, S. T., Sharrer, M., Tsukuda, S., Gearheart, M. (2008, December 3 to 5). *Process requirements for ozonation and ultraviolet irradiation disinfection in recycle systems*. Paper presented at the Northeast Aquaculture Conference and Exposition, Portland, Maine.
- Summerfelt, S. T., Vinci, B.J. (2008, February 9 to 12). *Better management practices for recirculating systems*. Paper presented at the Aquaculture America 2008 Conference and Exposition, Lake Buena Vista, Florida.
- Summerfelt, S. T., Waldrop, T., Gearheart, M., Davidson, J., Brazil, B., Barrows, F. (2008, February 9 to 12). *Waste production and oxygen consumption by rainbow trout *Oncorhynchus mykiss* fed fishmeal-or grain-based diets*. Paper presented at the Aquaculture America 2008 Conference and Exposition, Lake Buena Vista, Florida.
- Summerfelt, S. T., Waldrop, T., Wilson, G. (2008, February 9 to 12). *Airlift fish pumps used to harvest circular tanks*. Paper presented at the Aquaculture America 2008 Conference and Exposition, Lake Buena Vista, Florida.
- Terjesen, B. F., Ulgenes, Y., Fjaera, S.O., Summerfelt, S.T., Brunsvik, P., Baeverfjord, G., Nerland, S., Takle, H., Norvik, O.C., Kittelsen, A. (2008, July 23-24). *RAS research facility dimensioning and design: A special case compared to planning production systems*. Paper presented at the Aquaculture Engineering Society Issues Forum, Roanoke, VA.
- Timmons, M. B., Ebeling, J.M., Vinci, B.J., Summerfelt, S.T., Hankins, J.A., Wheaton, F.W. (2008, July 25 - 27). *Teaching recirculating technology: a NRAC success story*. Paper presented at the 7th International Recirculating Aquaculture Conference, Roanoke, VA.
- Vinci, B. J. (2008, May 5-9). *Overview of recirculating aquaculture system engineering; Water supply and quality; Mass balances and loading-growth; Gas conditioning; Solids control; Piping system and pumping systems; Partial reuse system design example*. Paper presented at the Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Campbell River, British Columbia, Canada.
- Vinci, B. J. (2008, July 28 - August 1). *Water supply and quality; Mass balances and loading-growth; Gas conditioning; Solids control; Piping systems and pumping systems; Partial reuse system design example*. Paper presented at the Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Shepherdstown, WV.
- Waldrop, T. (2008, July 28 - August 1). *Routine maintenance and emergency response in recirculating aquaculture systems*. Paper presented at the Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Shepherdstown, WV.
- Watten, B. J., Mudrak, V.A., Echevarria, C., Sibrell, P.L., Summerfelt, S.T., Boyd, C.E. (2008, July 25 - 27). *Effect of HRT and PCO₂ on the performance of a fluidized bed limestone reactor designed for alkalinity enhancement at the Warm Springs Regional Fisheries Center*. Paper presented at

the 7th International Recirculating Aquaculture Conference, Roanoke, VA.
Wolters, W., Masters, A., Vinci, B.J., Summerfelt, S.T. (2008, July 23-24). *Recirculating system design, loading and water quality and Atlantic salmon grow-out performance at the USDA National Cold Water Marine Aquaculture Center (Franklin, ME)*. Paper presented at the Aquaculture Engineering Society Issues Forum, Roanoke, VA.

2007 Proceedings, Papers, Abstracts and Oral Presentations

- Davidson, J. T., Helwig, N., Summerfelt, S.T. (2007, February 26 to March 2). *Fluidized sand biofilters remove ammonia and biochemical oxygen demand from an intensive aquaculture effluent*. Paper presented at the Aquaculture 2007, San Antonio, TX.
- Davidson, J. T., Waldrop, T. (2007, July 9 - 13). *Routine maintenance and emergency response in recirculating aquaculture systems*. Paper presented at the TCF-Freshwater Institute's short course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Good, C. M. (2007, July 9 - 13). *Biosecurity and fish health in recirculating aquaculture systems*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Good, C. M. (2007, December 5-9). *Biosecurity and fish health in recirculating aquaculture systems*. Paper presented at the The Freshwater Institute's Short Course on *Water Reuse for Intensive Fish Culture*, Shepherdstown, West Virginia.
- Good, C. M., Bebak, J., Vinci, B.J., Summerfelt, S.t. (2007, October 9). *Engineering for Biosecurity*. Paper presented at the Invited Seminar, Danish Institute of Fisheries Research, Hirtshals, Denmark.
- Good, C. M., Davidson, J.W., Welsh, C., Summerfelt, S.T. (2007, March 27). *The histopathological effects of low make-up water exchange rate on rainbow trout (*Oncorhynchus mykiss*) in recirculating aquaculture systems*. Paper presented at the Northeast Farmed Fish Health Management Workshop Abstract Book, Washington County Community College, Calais, Maine.
- Rishel, K. L., Sharrer, M.J., Summerfelt, S.T. (2007, February 26 to March 2). *Geotextile tubes for aquaculture biosolids dewatering*. Paper presented at the Aquaculture 2007, San Antonio, TX.
- Sharrer, M. J., Summerfelt, S.T. (2007, March 27). *Ozonation and ultraviolet irradiation provide synergy for inactivation bacteria in a recirculating system*. Paper presented at the Northeast Farmed Fish Health Management Workshop Abstract Book, Washington County Community College, Calais, Maine.
- Summerfelt, S. T. (2007, July 9 - 13). *Best management practices for recirculating aquaculture systems*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Summerfelt, S. T. (2007, July 9 - 13). *Biofiltration for ammonia control*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Summerfelt, S. T. (2007, July 9 - 13). *Carrying capacity and treatment efficiency*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Summerfelt, S. T. (2007, July 9 - 13). *Culture tank design*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Summerfelt, S. T. (2007, October 9). *Design, management, and applications of fluidized-sand biofilters*. Paper presented at the Invited Seminar, Danish Institute of Fisheries Research, Hirtshals, Denmark.
- Summerfelt, S. T. (2007, July 9 - 13). *Fish harvest technologies*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Summerfelt, S. T. (2007, July 9 - 13). *Fluidized-sand biofilters*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Summerfelt, S. T. (2007, July 9 - 13). *Overview of recirculating aquaculture system engineering*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Summerfelt, S. T. (2007, December 5-9). *Overview of recirculating aquaculture system engineering; Carrying capacity and treatment efficiency examples; Culture tank design; fish harvest technologies; Best management practices for recirculating aquaculture systems; Biofiltration for ammonia control; Fluidized-sand biofilters; Ozonation and UV disinfection; Recirculating system design example*. Paper presented at the The Freshwater Institute's Short Course on *Water Reuse*

- for *Intensive Fish Culture*, Shepherdstown, West Virginia.
- Summerfelt, S. T. (2007, July 9 - 13). *Ozonation and UV disinfection*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Summerfelt, S. T. (2007, July 9 - 13). *Recirculating system design example*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Summerfelt, S. T. (2007, October 8). *Recirculating systems and effluent treatment processes for the Atlantic salmon broodstock development program at the new USDA National Cold Water Marine Aquaculture Center*. Paper presented at the Invited Seminar, Danish Institute of Fisheries Research, Hirtshals, Denmark.
- Summerfelt, S. T., Clingerman, J., Mazik, P., Bebak-Williams, J. (2007, February 26 to March 2). *Trout's carbon dioxide avoidance behavior used to improve fish transfer*, San Antonio, TX.
- Summerfelt, S. T., Sharrer, M.J., Tsukuda, S., Gearheart, M. (2007, October 9). *Process requirements for achieving full-flow disinfection using ozonation and UV irradiation*. Paper presented at the Invited Seminar, Danish Institute of Fisheries Research, Hirtshals, Denmark.
- Summerfelt, S. T., Vinci, B.J. (2007, February 26 to March 2). *Modeling and computer aided design of partial water reuse systems*. Paper presented at the Aquaculture 2007, San Antonio, TX.
- Vinci, B. J. (2007, July 9 - 13). *Gas conditioning*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Vinci, B. J. (2007, July 9 - 13). *Mass balances and loading-growth*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Vinci, B. J. (2007, July 9 - 13). *Partial reuse system design example*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Vinci, B. J. (2007, July 9 - 13). *Piping systems and pumping systems*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Vinci, B. J. (2007, February 26 to March 2). *Seroa; water reuse utilizing circular dual-drain tanks: model and design application*. Paper presented at the Aquaculture 2007, San Antonio, TX.
- Vinci, B. J. (2007, July 9 - 13). *Solids Control*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Vinci, B. J. (2007, July 9 - 13). *Water supply and quality*. Paper presented at the TCF Freshwater Institute's Short Course on Water Reuse for Intensive Fish Culture, Dubois, WY.
- Vinci, B. J. (2007, December 5-9). *Water supply and quality; Mass balances and loading-growth; Gas conditioning; Solids control; Piping systems and pumping systems; Partial reuse system design example*. Paper presented at the The Freshwater Institute's Short Course on *Water Reuse for Intensive Fish Culture*, Shepherdstown, West Virginia.
- Waldrop, T. (2007, December 5-9). *Routine maintenance and emergency response in recirculating aquaculture systems*. Paper presented at the The Freshwater Institute's Short Course on *Water Reuse for Intensive Fish Culture*, Shepherdstown, West Virginia.

2006 Proceedings, Papers, Abstracts and Oral Presentations

- Bullock, G. L., Schill, W.B. (2006). The Effect of Disinfectant Strategies on Transmission of *Aeromonas salmonicida* and *Yersinia ruckeri* in a Recirculating Aquaculture System. *International Journal of Recirculating Aquaculture*, 7(June 2006), 1-11.
- Bullock, G. L., Schill, W.S. (2006). Establishment of *Aeromonas salmonicida* and *Yersinia ruckeri* in Fluidized Sand Biofilters of a Recycle Culture System and Subsequent Transmission of These Pathogens to Newly Stocked Salmonids. *International Journal of Recirculating Aquaculture*, 7, 1-11.
- Davidson, J., Frankel, A., Ellison, W., Summerfelt, S., Ford, F., Popper, A.N., Mazik, P., Bebak-Williams, J. (2006, July 20-23). *Minimizing noise in fiberglass aquaculture tanks: Noise reduction potential of various retrofits*. Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Davidson, J., Frankel, A., Ellison, W., Summerfelt, S., Ford, F., Mason, B., Coffinberger, D., Popper, A.N., Bebak-Williams, J. (2006, February 13-16). *Minimizing noise in fiberglass aquaculture tanks: Noise reduction potential of various tank retrofits*. Paper presented at the Aquaculture America 2006, Las Vegas Nevada.
- Davidson, J., Helwig, N., Summerfelt, S.T. (2006, July 20-23). *Fluidized sand biofilters used to remove*

- ammonia, biochemical oxygen demand and suspended solids from an aquaculture effluent.* Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Davidson, J., Wysocki, E., Smith, M., Popper, A.N., Frankel, A., Ellison, W., Welch, T., Ford, F., Bebak-Williams, J.,. (2006, February 13-16). *The effect of aquaculture noise on the growth, survival, and disease resistance of rainbow trout.* Paper presented at the Aquaculture America 2006, Las Vegas, NV.
- Ebeling, J. M. (2006, February 13-16). *K.I.S.S. Keep it Simple for the Students. Special Education Session at Aquaculture America.* Paper presented at the Aquaculture America 2006.
- Ebeling, J. M., Rishel, K.L. (2006, July 20-23). *Performance evaluation of geotextile tubes.* Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Ebeling, J. M., Rishel, K.L., Sibrell, P.L. (2006, July 20-23). *The screening and evaluation of alum and polymer combinations as coagulation/flocculation aids.* Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Ebeling, J. M., Timmons, M.B., Bisogni, J.J. (2006, February 13-16). *Review of autotrophic and heterotrophic bacterial control of ammonia-nitrogen in zero-exchange production systems: stoichiometry and experimental verification.* Paper presented at the Aquaculture America 2006, Las Vegas, NV.
- Ebeling, J. M., Timmons, M.B., Bisogni, J.J. (2006). *A review of photoautotrophic, autotrophic, and heterotrophic bacterial control of ammonia in zero-exchange production systems.* Paper presented at the Aquaculture America 2006, Las Vegas, NV.
- Ebeling, J. M., Timmons, M.B., Welch, C.F., Rishel, K.L. (2006, February 13-16). *Utilization of a zero-exchange, mixed-cell raceway for the production of marine shrimp.* Paper presented at the Aquaculture America 2006, Las Vegas, NV.
- Ebeling, J. M., Welch, C.F., Rishel, K.L. (2006, July 20-23). *Performance evaluation of the Hydrotech belt filter in intensive recirculating aquaculture systems.* Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Ebeling, J. M., Welch, C.F., Rishel, K.L. (2006, February 13-16). *Performance Evaluation of the Hydrotech Belt Filter System for Aquaculture Waste Management.* Paper presented at the Aquaculture America 2006, Las Vegas, NV.
- Ebeling, J. M., Welch, C.F., Timmons, M.B. (2006, February 13-16). *So which one is it: photoautotrophic, autotrophic, or heterotrophic bacterial controlling the ammonia-nitrogen?* Paper presented at the Aquaculture America 2006, Las Vegas, NV.
- Ebeling, J. M., Wheaton, F.W. (2006, February 13-16). *In-situ Development of Performance Characteristic Curves for Biofilters.* Paper presented at the Aquaculture America 2006, Las Vegas, NV.
- Rishel, K. L., Ebeling, J.M. (2006, February 13-16). *The screening and evaluation of alum and polymer combinations as coagulation/flocculation aids to treat intensive aquaculture effluents.* Paper presented at the Aquaculture America 2006, Las Vegas, NV.
- Rishel, K. L., Ebeling, J.M., Schwartz, M.F. (2006, February 13-16). *Performance evaluation of Geotextile tubes for aquaculture waste management.* Paper presented at the Aquaculture America 2006, Las Vegas, NV.
- Sharrer, M., Hankins, J.A., Ferrier, D., Tal, Y., Summerfelt, S.T. (2006, July 20-23). *Membrane biological reactor treatment of a saline backwash flow from a recirculating aquaculture system.* Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Sharrer, M., Summerfelt, S.T.,. (2006, July 20-23). *Ozonation and UV irradiation provide synergy for inactivating bacteria in a coldwater recirculating system.* Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Summerfelt, S. R. (2006, April 13, 2006). *Improving technologies in controlled, intensive aquaculture systems.* Paper presented at the CRIS Project Seminar for BARD/MARD Deligation, ARS National Center of Cool and Cold Water Aquaculture, Leetown, WV.
- Summerfelt, S. T. (2006, September 20-23, 2006). *Developments in fish harvest technologies.* Paper presented at the PennAqua 2006, Pennsylvania Department of Agriculture, Mechanicsburg, PA.
- Summerfelt, S. T. (2006). *Improving technologies in controlled, intensive aquaculture systems.* Paper presented at the 2005-2006 Seminar Program, Center of Marine Biotechnology, University of Maryland, Baltimore MD.
- Summerfelt, S. T. (2006, July 20-23). *Keynote Presentation - Achieving economies of scale in controlled intensive aquaculture systems.* Paper presented at the 6th International Recirculating

- Aquaculture Conference, Roanoke, VA.
- Summerfelt, S. T., Bebak-Williams, J., Waldrop, T., Goodrick, B., (2006, February 13-16). *Evaluation of a percussive stunning system for slaughter of 0.9 kg rainbow trout*. Paper presented at the Aquaculture America 2006, Las Vegas Nevada.
- Summerfelt, S. T., Clingerman, J., Bebak-Williams, J. (2006, February 13-16). *Fish transfer between tanks based on a carbon dioxide avoidance response*. Paper presented at the Aquaculture America 2006, Las Vegas Nevada.
- Summerfelt, S. T., Sharrer, M., Marshall, C., Obaldo, O. (2006, July 20-23). *Controlling water velocity across large "Cornell-type" dual-drain culture tanks*. Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Summerfelt, S. T., Smith, D., Gearheart, M., Watten, B.J. (2006, July 20-23). *Comparing carbon dioxide stripping column performance in freshwater and seawater*. Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Summerfelt, S. T., Vinci, B.J., Bebak-Williams, J. (2006, July 20-23). *Unit process engineering for water quality control and biosecurity in marine water recirculating systems*. Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.
- Vinci, B. J. (2006, April 5, 2006). *Getting the phosphorus out of traditional treatment systems*. Paper presented at the Maine Aquaculture Association Hatchery Effluent Workshop, Eddington, ME.
- Vinci, B. J., Summerfelt, S.T. (2006, September 20-23, 2006). *Salmon smolt production in partial water reuse systems at White River NFH*. Paper presented at the PennAqua 2006, Pennsylvania Department of Agriculture, Mechanicsburg, PA.
- Wysocki, L. E., Davidson, J., Smith, M.E., Popper, A.N., Frankel, A., Ellison, W., Bebak-Williams, J. (2006, July 20-23). *The effect of aquaculture noise on hearing sensitivity, growth, and survival of rainbow trout*. Paper presented at the 6th International Recirculating Aquaculture Conference, Roanoke, VA.

2005 Proceedings Papers, Abstracts and Oral Presentations

- Bebak-Williams, J. (2005, July 18-22). *Fish health management and biosecurity for recirculation aquaculture systems*. Paper presented at the 11th Annual Freshwater Institute-Cornell University Recirculating Aquaculture Systems Short Course, Hubbs-Seaworld Research Center, San Diego, CA.
- Bebak-Williams, J., Welch, T., Starliper, C., Baya, A., Garner, M. (2005, June 13-17). *Coldwater disease outbreak at a West Virginia rainbow trout (*Oncorhynchus mykiss*) farm: An unusual presentation*. Paper presented at the 30th Annual Eastern Fish Health Workshop, Shepherdstown, WV.
- Brazil, B. L., Summerfelt, S. T., Sharrer, M.J. (2005, March 2-4, 2005). *Review of ozone applications in aquaculture. In: Ozone IV: Applications of Ozone as an Antimicrobial Agent in the Food and Agriculture Industries*. Paper presented at the International Ozone Association - Pan American Group, Quincy, MA, Fresno, CA.
- Davidson, J., Summerfelt, S.T. (2005, January 17 - 20). *Simultaneous solids and ammonia removal within fluidized sand biofilter columns using dissolved chitosan as a flocculant*. Paper presented at the Aquaculture America 2005 - World Aquaculture Society, Baton Rouge, LA, New Orleans, LA.
- Draghi, A., Bebak-Williams, J., Tsongalis, G.J., West, A.B., Popov, V.L., Frasca Jr., S. (2005, June 13 - 17). *Localization by in situ hybridization of a chlamydia-like 16S ribosomal RNA gene sequence within branchial epithelial cells of cultured Arctic char (*Salvelinus alpinus*) with epitheliocystis*. Paper presented at the 30th Annual Eastern Fish Health Workshop, Shepherdstown, WV.
- Ebeling, J. M. (2005, March 8, 2005). *Aquaculture Effluent Waste Management and Treatment. In: Stormwater and Aquaculture Effluent Technology Fair*. Paper presented at the Sponsored by; NOAA Beaufort Lab and Duke University Marine Lab, Beaufort, NC.
- Ebeling, J. M., Rishel, K.L. (2005, August 31 - Sept 2). *Performance Evaluation of the Hydrotech Belt Filter Using Coagulation/Flocculation Aids (Alum/Polymers) for the Removal of Suspended Solids and Phosphorus from Intensive Recirculating Aquaculture Microscreen Backwash Effluent*. Paper presented at the Animal Agriculture and Processing: Managing Environmental Impacts, St Louis, MO.
- Ebeling, J. M., Rishel, K.L. (2005, January 17 - 20, 2005). *Screening of commercially available polymers*

- as flocculation aids for the removal of suspended solids from microscreen backwash water in intensive recirculating aquaculture systems.* Paper presented at the *Aquaculture America 2005 Abstracts, New Orleans, LA*, World Aquaculture Society, Baton Rouge, LA.
- Ebeling, J. M., Rishel, K.L., Sibrell, P.L. (2005, January 17 - 20). *Utilization of chemical coagulation-flocculation aids for the removal of total suspended solids and phosphorus from the discharge of microscreens in intensive recirculating aquaculture system.* Paper presented at the *Aquaculture America 2005*.
- Ebeling, J. M., Rishel, K.L., Sibrell, P.L.,. (2005, Aug 31 - Sept 2). *Evaluation of coagulation-Flocculation Aids for the Removal of Suspended Solids from Intensive Recirculating Aquaculture Effluent Discharge.* Paper presented at the *Animal Agriculture and Processing: Managing Environmental Impacts*, St Louis, MO.
- Ebeling, J. M., Rishel, K.L., Sibrell, P.L.,. (2005, August 31 - September 2). *Utilization of chemical coagulation-flocculation aids for the removal of total suspended solids and phosphorus from intensive recirculating aquaculture microscreen backwash effluent.* Paper presented at the *Proceeding of the Animal Agriculture and Processing: Managing Environmental Impacts*, St Louis, MO.
- Ebeling, J. M., Rishel, K.L., Welsh, C.F., Timmons, M.B. (2005, January 17 - 20). *Impact of the carbon / nitrogen ratio on water quality in zero-exchange shrimpp production systems.* Paper presented at the *Aquaculture America 2005*, New Orleans, LA.
- Ebeling, J. M., Schwartz, M.F., Rishel, K.L., Summerfelt, S.T. (2005, August 31 - September 2). *Dewatering aquaculture biosolids with geotextile bags.* Paper presented at the *Proceeding of the Animal Agriculture and Processing: Managing Environmental Impacts*, St Louis, MO.
- Ebeling, J. M., Timmons, M.B., Welch, C.F., Rishel, K.L. (2005, October 19-21). *Design and operation of a zero-exchange mixed-cell.* Paper presented at the *2nd International Sustainable Marine Fish Culture Conference and Workshop*, HBOI, Fort Pierce, FL.
- Ebeling, J. M., Timmons, M.B., Welsh, C.F., Rishel, K.L. (2005, January 17 - 20). *Experiences with a zero-exchange mixed-cell raceway for the production of marine shrimp in an inland site.* Paper presented at the *Aquaculture America 2005*, New Orleans, LA.
- Ebeling, J. M., Welch, C.F., Rishel, K.L., Timmons, M.B. (2005, October 19-21). *Stoichiometry of photoautotrophic, autotrophic, and heterotrophic bacterial removal of ammonia-nitrogen and impact of the C/N ratio on water quality in zer-exchange shrimp production systems.* Paper presented at the *2nd International Sustainable Marine Fish Culture Conference and Workshop*, HBOI, Fort Pierce, FL.
- Ebeling, J. M., Welsh, C.F., Rishel, K.L. (2005, January 17 - 20). *Performance evaluation of the Hydrotech belt filter using coagulation / flocculation aids (alum / polymers) for the removal of suspended solids and phosphorus from intensive recirculating aquaculture microscreen backwash effluent.* Paper presented at the *Aquaculture America 2005 - World Aquaculture Society*, Baton Rouge, LA, New Orleans, LA.
- Schwartz, M. F., Ebeling, J.M., Rishel, K.L., Summerfelt, S.T. (2005, January 17 - 20). *Dewatering aquaculture biosolids with geotextile bags.* Paper presented at the *Aquaculture America 2005*, New Orleans, LA.
- Schwartz, M. F., Ebeling, J.M., Rishel, K.L., Welsh, C.F. (2005, August 31- Sept 2). *Dewatering aquaculture biosolids with geotextile bags.* Paper presented at the *Animal Agriculture and Processing: Managing Environmental Impacts*, St Louis, MO.
- Sharrer, M. J., Summerfelt, S.t. (2005, March 2-4, 2005). *Ozone inactivation of bacteria in a recirculating salmonid culture system.* In: *Ozone IV: Applications of Ozone as an antimicrobial Agent in the Food and Agriculture Industries, Fresno, California.* Paper presented at the *International Ozone Association-Pan American Group*, Quincy, MA.
- Sharrer, M. J., Summerfelt, S.T., Hankins, J.A. (2005, October 19-21). *Membrane biological reactor treatment for reclaiming a saline recirculating system backwash flow.* Paper presented at the *2nd International Sustainable Marine Fish Culture Conference*, Harbor Branch Oceanographic Institute - Fort Pierce, FL.
- Sharrer, M. J., Summerfelt, S.T., Hankins, J.A. (2005, Aug 31 - Sept 2). *Membrane biological reactor treatment of a saline backwash flow from a recirculating aquaculture system.* Paper presented at the *Proceeding of the Animal Agriculture and Processing: Managing Environmental Impacts*, St Louis, MO; *Water Environmental Federation*, Alexandria, VA.

- Summerfelt, S. T. (2005, Jul 18-22). *Culture tank design; Culture tank desing examples; Biofiltration for ammonia control; Fluidized-sand biofilters; Biofilter design examples; Carrying capacity examples; Ozonation and UV disinfection; BMP's for recirculating systems; Emergency response*. Paper presented at the 11th Annual Cornell-Freshwater Institute Recirculating Aquaculture Systems Short Course, Hubb-Seaworld Research Center, San Diego, CA.
- Summerfelt, S. T. (2005, January 17 - 20). *Design and management of conventional fluidized-sand biofilters*. Paper presented at the *Aquaculture America 2005*, New Orleans, LA.
- Summerfelt, S. T. (2005, June 21). *Water recirculating systems for salmonid production*. Paper presented at the Fisheries Committee Meeting, Pennsylvania Fish & Boat Commission - Harrisburg, PA.
- Summerfelt, S. T., Bebak-Williams, J., Waldrop, T., Goodreick, B. (2005, July 3-6 2005). *Evaluation of a percussive stunning system for slaughter of 0.4-1.4 kg rainbow trout*. Paper presented at the Aquaculture Canada, St Johns, Newfoundland Canada.
- Summerfelt, S. T., Clingerman, J., Bebak-Williams, J. (2005, December 6-8). *Carbon Dioxide avoidance response by rainbow trout provides stimulus for self-fish transfer between tanks*. Paper presented at the 56th Annual Northwest Fish Culture Conference, Boise, Idaho.
- Summerfelt, S. T., Davidson, J., Brazil, B. (2005, January 17 - 20). *Dissolved organic carbon production in recirculating salmonid culture systems*. Paper presented at the *Aquaculture America 2005*, New Orleans, LA.
- Summerfelt, S. T., Sharrer, M., Gearheart, M., Vinci, B.J., Gillette, K. (2005, December 6-8). *Evaluation of two 8,000 L/min partial water reuse systems used for Atlantic salmon smolt production at the White River National Fish Hatchery*. Paper presented at the 56th Annual Northwest Fish Culture Conference, Boise, Idaho.
- Summerfelt, S. T., Sharrer, M.J. (2005, January 17 - 20). *Ozone inactivation of bacteria in a recirculating salmonid culture system*. Paper presented at the *Aquaculture America 2005*, New Orleans, LA.
- Summerfelt, S. T., Sharrer, M.J., Hankins, J.A. (2005, January 17 - 20). *Membrane biological reactor treatment of a recirculating system backwash flow for water reclamation*. Paper presented at the *Aquaculture America 2005*, New Orleans, LA.
- Summerfelt, S. T., Smith, D., Gearheart, M., Watten, B.J. (2005, October 19-21). *Comparing carbon dioxide stripping across forced-ventilated cascade columns in freshwater and seawater*. Paper presented at the 2nd International Sustainable Marine Fish Culture Conference, Harbor Branch Oceanographic Institute, Fort Pierce, FL.
- Vinci, B. J. (2005, July 18-22). *Engineering design concepts; Solids capture; Gas transfer and dissolved gas conditioning; CO₂ stripping design example; Source water development; Waste management*. Paper presented at the 11th Annual Cornell-Freshwater Institute Recirculating Aquaculture Systems Short Course, Hubbs-Seaworld Research Center, San Diego, CA.
- Wolters, W. R., Summerfelt, S.T., Vinci, B.J., Masters, A., Brazil, B.L. (2005, October 19-21). *Facilities and program development at USDA. ARS National Coldwater Marine Aquaculture Center in Franklin, ME*. Paper presented at the 2nd International sustainable Marine Fish Culture Conference, Harbor Branch Oceanographic Institute, Fort Pierce, FL.

2004 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Bebak-Williams, J. (2004, July 26-30). *Fish health management and biosecurity concepts for recirculation aquaculture systems*. Paper presented at the 10th Annual Cornell-Freshwater Institute Recirculating Aquaculture Systems Short Course, Shepherdstown, WV.
- Bebak-Williams, J. (2004, September 9-10). *Prevention and control of the parasitic gill copepod, *Salmincola* sp.* Paper presented at the PennAqua 2004, Harrisburg, PA.
- Campbell, P. J., & Bebak-Williams, J. (2004, March 1-3). *Development Of SPF Production Units Through Biosecurity Education And Health Certification*. Paper presented at the Aquaculture America 2004, Honolulu, HI.
- Davidson, J., S.T. Summerfelt. (2004, July 22-24). *Solids removal from a coldwater recirculating system - comparison of a swirl separator to a radial-flow settler*. Paper presented at the Proceedings of the 5th International Conference on Recirculating Aquaculture, Virginia Cooperative Extension, Virginia Tech, Blacksburg, VA.
- Davidson, J. T., Summerfelt, S. T., Bebak-Williams, J., & Waldrop, T. (2004, March 1-3). *Commercial Scale Grow-Out Of Arctic Char *Salvelinus Alpinus* Using Recirculating System Technology*.

- Paper presented at the Aquaculture America 2004, Honolulu, HI.
- Ebeling, J. M. (2004, July 26-30). *Overview of Recirculating Aquaculture System Engineering; Water Quality Laboratory; Gas Transfer Laboratory; System Monitoring and Control*. Paper presented at the 10th Annual Cornell-Freshwater Institute Recirculating Aquaculture Systems Short Course, Shepherdstown, WV.
- Ebeling, J. M., & Joiner, J. A. (2004, March 1-3). *Hydraulic Characterization of a Mixed-Cell Raceway*. Paper presented at the Aquaculture America 2004, Honolulu, HI.
- Ebeling, J. M., Joiner, J.A., Labatut, R.A., Timmons, M.B. (2004, July 22-24). *Hydraulic Characterization of a Mixed-Cell Raceway*. Paper presented at the Proceedings of the 5th International Conference on Recirculating Aquaculture, Virginia Cooperative Extension, Virginia Tech, Blacksburg, Virginia.
- Ebeling, J. M., Rishel, K. L., & Ogden, S. (2004, March 1-3). *Evaluation of Chemical Coagulation-Flocculation Aids With Standard Jar Tests For The Removal Of Suspended Solids And Phosphorus From Intensive Recirculating Aquaculture Microscreen Backwash Effluent*. Paper presented at the Aquaculture America 2004, Honolulu, HI.
- Ebeling, J. M., Rishel, K. L., & Ogden, S. (2004, March 1-3). *Preliminary Performance Evaluation Of The Hydrotech Belt Filter Using Coagulation / Flocculation Aids (Alum And Ferric Chloride) For The Removal Of Suspended Solids And Phosphorus From Intensive Recirculating Aquaculture Microscreen Backwash Effluent*. Paper presented at the Aquaculture America 2004, Honolulu, HI.
- Ebeling, J. M., Rishel, K.L., Sibrell, P.L., Ogden, S.R. (2004, July 22-24). *Evaluation of Commercially Available Polymers as Chemical Coagulation-Flocculation Aids for the Removal of Suspended Solids from Intensive Recirculating Aquaculture Effluent Discharge*. Paper presented at the Proceedings of the 5th International Conference on Recirculating Aquaculture, Virginia Cooperative Extension, Virginia Tech, Blacksburg, Virginia.
- Ebeling, J. M., Rishel, K.L., Welsh, C.F. (2004, July 22-24). *Impact of the carbon/nitrogen ratio on water quality in zero-exchange shrimp production systems*. Paper presented at the Proceedings of the 5th International Conference on Recirculating Aquaculture, Virginia Cooperative Extension, Virginia Tech, Blacksburg, Virginia.
- Ebeling, J. M., & Vernon, N. (2004, March 1-3). *Survival And Growth Of Juvenile Marine Shrimp L. Vannamei In Low-Salinity Spring Water In West Virginia*. Paper presented at the Aquaculture America 2004, Honolulu, HI.
- Ebeling, J. M., Welch, C.F.,. (2004, July 22-24). *Evaluation of Settling Cones for Solids Management in Zero-Exchange Production Systems*. Paper presented at the Proceedings of the 5th International Conference on Recirculating Aquaculture, Virginia Cooperative Extension, Virginia Tech, Blacksburg, Virginia.
- Ebeling, J. M., & Welsh, C. F. (2004, March 1-3). *Production Of Marine Shrimp L. Vannamei Juveniles In A Prototype Tray/Cage System At Low Salinity In A Recirculating System*. Paper presented at the Aquaculture America 2004, Honolulu, HI.
- Julian, T. R., Timmons, M. B., & Vinci, B. J. (2004, March 1-3). *Modeling Alkalinity, Ph, And Carbon Dioxide Levels In Recirculating Aquaculture Systems*. Paper presented at the Aquaculture America 2004, Honolulu, HI.
- Labatut, R. A., Timmons, M.B., Ebeling, J.M. (2004, July 22-24). *Simulation of a mixed-cell raceway using computational fluid dynamics*. Paper presented at the Proceedings of the 5th International Conference on Recirculating Aquaculture, Virginia Cooperative Extension, Virginia Tech, Blacksburg, VA.
- Schwartz, M. F., Ebeling, J.M., Summerfelt, S.T. (2004, July 22-24). *Geotextile tubes for aquaculture waste management*. Paper presented at the Proceedings of the 5th International Conference on Recirculating Aquaculture, Virginia Cooperative Extension, Virginia Tech, Blacksburg, Virginia.
- Summerfelt, S. T. (2004, November 8-11, 2004). *Design and management of conventional fluidized-sand biofilters. In: Design and selection of Biological Filter for Freshwater and Marine*. Paper presented at the Aquacultural Engineering, Honolulu, HI - Oceanic Institute, Waimanalo, HI.
- Summerfelt, S. T. (2004, September 9-11). *Recirculating aquaculture system design*. Paper presented at the PennAqua 2004, PA Department of Agriculture, Harrisburg, PA.
- Summerfelt, S. T. (2004, November 8-11, 2004). *Review of design and operation of conventional fluidized-sand biofilters. In: Design and Selection of Biological Filters for Freshwater and Marine Applications*, Honolulu, HI. Oceanic Institute, Waimanalo, HI.

- Summerfelt, S. T. (2004, July 26-30). *Water quality and treatment efficiency in recirculating systems; Culture tank design; Biofiltration for ammonia control; Fluidized-sand biofilters; Coldwater biofilter design overview; Ozonation and UV disinfection; Trout and char growout system designs*. Paper presented at the 10th Annual Cornell-Freshwater Institute Recirculating Aquaculture Systems Short Course, Shepherdstown, WV.
- Summerfelt, S. T., Davidson, J., Helwig, N. (2004, July 22-24). *Evaluation of a full-scale CycloBio™ fluidized-sand biofilter in a coldwater recirculating system*. Paper presented at the Proceedings of the 5th International Conference on Recirculating Aquaculture, Virginia Cooperative Extension, Virginia Tech, Blacksburg, VA.
- Summerfelt, S. T., Vinci, B.J. (2004, April 25-28). *Water treatment processes to achieve the controlled environment*. Paper presented at the 60th Annual Northeast Fish and Wildlife Conference, Annapolis, Maryland.
- Summerfelt, S. T., Waldrop, T. (2004, September 9-11). *Recirculating aquaculture system management*. Paper presented at the PennAqua 2004, PA Department of Agriculture, Harrisburg, PA.
- Timmons, M. B. H., J.L. Ebeling, J.M. (2004, November 8-11, 2004). *Application of Microbead Filters. In: Design and Selection of Biological Filters for Freshwater and Marine Applications*, Honolulu, Hawaii, Oceanic Institute, Waimanalo, HI.
- Tsukuda, S. M., Ebeling, J.M., Solomon, C. (2004, March 21 - 24). *Real-time Monitoring of Recirculating Sand and Peat Filters*. Paper presented at the Tenth National Symposium on Individual and Small Community Sewage Systems Proceedings, Sacramento, CA.
- Vinci, B. J. (2004, March 1-3). *Computer Spreadsheets For Aquaculture Systems Design*. Paper presented at the Aquaculture 2004, Honolulu, HI.
- Vinci, B. J. (2004, July 26-30). *Engineering design concepts; Solids capture; Gas transfer and dissolved gas conditioning; CO2 stripping design example; Source water development; Waste management*. Paper presented at the 10th Annual Cornell-Freshwater Institute Recirculating Aquaculture Systems Short Course, Shepherdstown, WV.
- Vinci, B. J. (2004, March 1-3). *Land-Based Aquaculture Effluent Treatment In The Northeast US*. Paper presented at the Aquaculture 2004, Honolulu, HI.
- Vinci, B. J., Creaser, D., Summerfelt, S.T., Gillette, K. (2004, April 25-28). *Application of natural rearing system criteria to water reuse system design at the White River National Fish Hatchery*. Paper presented at the 60th Annual Northeast Fish and Wildlife Conference, Ocean City, MD.
- Watten, B. J., Schwartz, M.F., Sibrell, P.L. (2004, July 22-24). *Evaluation of pulsed limestone bed reactors for alkalinity control*. Paper presented at the Proceedings of the 5th International Conference on Recirculating Aquaculture, Virginia Cooperative Extension, Virginia Tech, Blacksburg, VA.

2003 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Bebak-Williams, J. (2003, February 10). *U.S. Aquaculture and the role of veterinarians*. Paper presented at the Cornell University Veterinary School Lecture, Ithaca, NY.
- Bebak-Williams, J. (2003, February 18-21). *Aquatic Animal Health Update: FI Research*. Paper presented at the Aquaculture America 2003, Louisville, KY.
- Bebak-Williams, J. (2003, October 29 - November 1). *Infectious and metabolic disease in cold water recirculation facilities*. Paper presented at the Aquaculture Canada 2003, Victoria, B.B.
- Bebak-Williams, J. (2003, October 16-18). *Trout farm biosecurity*. Paper presented at the U.S. Trout Farmers Association Annual Meeting, Shepherdstown, WV.
- Bebak-Williams, J., Baya, A., & Semmens, K. (2003, April 7-11). *Fish health certification and the WV salmonid industry*. Paper presented at the National Aquaculture Extension Conference, Tucson, AZ.
- Bebak-Williams, J., Baya, A., & Semmens, K. (2003, January 18th). *Fish Health Certification in West Virginia*. Paper presented at the WV Aquaculture Forum, Jackson's Mill, WV.
- Bebak-Williams, J., Vinci, B. J., & Summerfelt, S. T. (2003, November 3-5). *Engineering for Biosecurity*. Paper presented at the Aquacultural Engineering Society Issues Forum, Seattle, WA.
- Brazil, B. L., Ebeling, J. M., & Summerfelt, S. T. (2003, February 18-21). *Treatment of solids thickening basin effluent using aerobic reactors*. Paper presented at the Aquaculture America 2003, Louisville, Kentucky.

- Brazil, B. L., Vinci, B. J., & Summerfelt, S. T. (2003, June 16-18). *Fish culture system design for the future*. Paper presented at the Propagated Fish in Resource Management, Boise, ID.
- Bullock, G. L. (2003, April 21-25). *Establishment of Aeromonas salmonicida and Yersinia ruckeri in fluidized sand biofilters of a recycle culture system and subsequent transmission of these pathogens to newly stocked salmonids*. Paper presented at the 28th Annual Eastern Fish Health Workshop, Gettysburg, PA.
- Campbell, P. J. (2003, July 22). *Fish Health Management*. Paper presented at the Teachers Workshop, National Center for Cool and Cold Water Aquaculture, Leetown, WV.
- Campbell, P. J. (2003, May 20). *Optimization of Production at a Rainbow Trout Farm*. Paper presented at the USDA ARS Cooperators Conference, Leetown, WV.
- Danley, M. L., Mazik, P. M., & Hankins, J. A. (2003, February 18-21). *Safe levels of carbon dioxide for Appalachian salmonid culture*. Paper presented at the Aquaculture America, Louisville, KY.
- Danley, M. P., Kenney, B., Mazik, P. M., Kiser, R., & Hankins, J. A. (2003, February 18-21). *Harvest of arctic char Salvelinus alpinus with carbon dioxide: effects on muscle pH and rigor index*. Paper presented at the Aquaculture America 2003, Louisville, KY.
- Ebeling, J. M. (2003, February 18-21). *Process control and monitoring options*. Paper presented at the World Aquaculture Society Annual Meeting, Louisville, KY.
- Ebeling, J. M., Sibrell, P. L., Ogden, S., & Summerfelt, S. T. (2003, February 18-21). *Evaluation of Chemical Coagulation-Flocculation Aids for the Removal of Phosphorus from Recirculating Aquaculture Effluent*. Paper presented at the World Aquaculture Society Meeting, Louisville, KY.
- Hankins, J. A. (2003, June 2-4). *Berkeley County West Virginia Source Water Assessment and Protection Efforts: A Case Study*. Paper presented at the USEPA National Source Water Protection Conference, Washington DC.
- Hankins, J. A. (2003, February 18-21). *Non-traditional water resources and sustainable aquaculture development in Appalachia*. Paper presented at the Book of Abstracts: Aquaculture America 2003, Louisville, Kentucky.
- Nelson, C. D., Mazik, P. M., & L., D. M. (2003, February 18-21). *Effects of nitrite and CO₂ in rainbow trout Oncorhynchus mykiss: survival and physiological responses*. Paper presented at the Aquaculture America 2003 Book of Abstracts, Louisville, KY.
- Noble, A. C., Garner, M. M., & Nordhausen, R. W. (2003). *Histological and Ultrastructural Lesions Associated With Chronic Diarrhea in Arctic Char*. *28th Annual Eastern Fish Health Workshop, Book of Abstracts*, 54.
- Savage, T. M., Rimmer, M., & Summerfelt, S. T. (2003, February 18-21). *Farming arctic char in recirculating systems using a mine water supply at West Virginia Aqua LLC*. Paper presented at the Aquaculture America 2003, Louisville, KY.
- Sharrer, M., Summerfelt, S. T., Bullock, G., & Gleason, L. (2003, November 3-5). *Dissolved ozone destruction and bacteria inactivation using ultra violet irradiation in a recirculating salmonid culture system*. Paper presented at the Aquacultural Engineering Society Issues Forum, Seattle, WA.
- Summerfelt, S. T. (2003, May 20). *Improving Production Technologies in Large Systems*. Paper presented at the USDA ARS Cooperators Meeting, Leetown, WV.
- Summerfelt, S. T. (2003, October 16-18). *Utilizing intensive recirculating system technology in trout production*. Paper presented at the U.S. Trout Farmers Association Annual Meeting, Shepherdstown, WV.
- Summerfelt, S. T. (2003, July 14-18). *Water quality and treatment efficiency in recirculating systems; Culture tank design; Biofiltration for ammonia control; Fluidized-sand biofilters; Coldwater biofilter design overview; Ozonation and UV disinfection; Trout and char growout system designs*. Paper presented at the 9th Annual Cornell-Freshwater Institute Recirculating Aquaculture Systems Short Course, Nanaimo, British Columbia.
- Summerfelt, S. T., & Davidson, J. T. (2003, November 3-5). *Solids flushing, mixing, and water velocity profiles within large (10 m³ and 150 m³) circular 'Cornell-type' dual-drain tanks used for salmonid culture*. Paper presented at the Aquacultural Engineering Society Issues Forum, Seattle, WA.
- Summerfelt, S. T., Davidson, J. T., Waldrop, T., & Sharrer, M. (2003, February 18-21). *A portable and relatively low cost airlift fish pump and fish sorting box for harvesting large circular tanks*.
- Summerfelt, S. T., & Sharrer, M. (2003, November 3-5). *Design implication of biofilter carbon dioxide production within recirculating salmonid culture systems*. Paper presented at the Aquacultural

- Engineering Society Issues Forum, Seattle, WA.
- Summerfelt, S. T., & Timmons, M. B. (2003, February 18-21). *Partial-reuse systems as an alternate to traditional raceway systems for trout culture*. Paper presented at the Aquaculture America 2003, Louisville, KY.
- Summerfelt, S. T., & Vinci, B. J. (2003). Best Waste Management Practices for Recirculating Systems. *Aquaculture Effluents: An Update on EPA Regulations and BMPs*, 111-133.
- Summerfelt, S. T., & Vinci, B. J. (2003, February 18-21). *Dissolved gas conditioning for mine water utilization*. Paper presented at the Aquaculture America 2003, Louisville, KY.
- Vinci, B. J., Creaser, D., Summerfelt, S. T., & Gillette, K. (2003, November 3-5). *Design of partial water reuse systems at White River National Fish Hatchery for the production of Atlantic salmon smolt for restoration stocking*. Paper presented at the Aquacultural Engineering Society Issues Forum, Seattle, WA.
- Vinci, B. J., Summerfelt, S. T., & Creaser, D. (2003, February 18-21). *Carbon dioxide control*. Paper presented at the Aquaculture America 2003, Louisville, Kentucky.
- Vinci, B. J., Summerfelt, S. T., & Creaser, D. (2003, October 16-18). *Influent water treatment options for aquaculture facilities*. Paper presented at the U.S. Trout Farmers Association Annual Meeting, Shepherdstown, WV.
- Vinci, B. J., Summerfelt, S. T., & Creaser, D. (2003, April 13-16). *State of the art influent water treatment technologies for fisheries facilities*. Paper presented at the 59th Annual Northeast Fish and Wildlife Conference, Newport, RI.
- Vinci, B. J., Summerfelt, S. T., Creaser, D., & Gillette, K. (2003, April 13-16). *Partial water reuse system design for fisheries facilities*. Paper presented at the 59th Annual Northeast Fish and Wildlife Conference, Newport, RI.
- Watten, B. J., Sibrell, P. L., Montgomery, G., & Tsukuda, S. (2003, November 3-5). *Modification of pure oxygen absorption equipment for concurrent stripping of carbon dioxide*. Paper presented at the Aquacultural Engineering Society Issues Forum, Seattle, WA.
- Watten, B. J., Summerfelt, S. T., Rodreques, M., & Sharrer, M. (2003, February 18-21). *Monitoring dissolved gas concentrations based on head-space partial pressures*. Paper presented at the Aquaculture America 2003, Louisville, Kentucky.

2002 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Barbash, P., Fletcher, J., Carta, A., Millard, M., Summerfelt, S. T., Bebak-Williams, J., et al. (2002). Reductions in micro-organisms by filtration and ozonation of a creek water supply at the Northeast Fishery Center. *Fisheries Bioengineering Symposium IV*, 9.
- Bebak-Williams, J. (2002, September 23-25). *Aquatic Animal Health Update: WV Research*. Paper presented at the US Trout Farmers Association 48th Annual Meeting, Circus-Circus, Reno, NV.
- Bebak-Williams, J. (2002, October 24-26th). *Biosecurity for recirculating systems*. Paper presented at the PennAqua 2002, State College, PA.
- Bebak-Williams, J. (2002, September 27th). *Fish Health Management in Recirculating Aquaculture Systems*. Paper presented at the PA Fish and Boat Commission Trout Summit, Harrisburg, PA.
- Bebak-Williams, J., Baya, A., & Semmens, K. (2002, January 12). *Fish health certification in West Virginia: Results of year one*. Paper presented at the Aquaculture Forum, Days Inn, Flatwoods, WV.
- Bebak-Williams, J., Noble, A. C., Baya, A., Cooke, P., Hetrick, F., McAllister, P. E., et al. (2002, March 18-22, 2002). *Status of attempts to isolate and characterize a rickettsia-like organism (RLO) from Artic char (Salvelinus alpinus)*. Paper presented at the 26th Annual Eastern Fish Health Workshop, Charleston, SC.
- Bullock, G. L., & Schwartz, M. F. (2002). Impact of treatment regimens and bacterial pathogens on biofilters in recirculation culture systems. *The Fourth International Conference on Recirculating Aquaculture*, 95-100.
- Chen, S., Summerfelt, S. T., Losordo, T., & Malone, R. (2002). Recirculating Systems, Effluents, and Treatments. *Aquaculture and the Environment in the United States*, 119-140.
- Danley, M. L., Mazik, P. M., Kenney, B., Kiser, R., & Hankins, J. A. (2002, April 18-20). *Growth and physiological responses of rainbow trout *Oncorhynchus mykiss* Kamloop, to elevated carbon dioxide: chronic and acute challenges*. Paper presented at the 36th Annual Meeting of the

- American Fisheries Society California-Nevada Chapter, Granlibakken Resort and Conference Center, Tahoe City, California.
- Davidson, J. T., Waldrop, T., & Summerfelt, S. T. (2002, January 27-30). *Growth performance comparison of a Tree Rivers/Yukon Gold hybrid arctic char and Yukon Gold arctic char salvelinus alpinus at 12-14°C*. Paper presented at the Aquaculture America 2002, Town and Country Resort, San Diego, California.
- Ebeling, J. M., Sibrell, P. L., Summerfelt, S. T., & Schwartz, M. F. (2002). *Evaluation of chemical coagulation-flocculation aids and acid mine drainage residual for the sequestering of phosphorus from intensive recirculating aquaculture effluent discharge*. Paper presented at the The Fourth International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Blacksburg, VA.
- Ebeling, J. M., & Summerfelt, S. T. (2002). Performance evaluation of a full-scale intensive recirculating aquaculture system's waste discharge treatment system. *The Fourth International Conference on Recirculating Aquaculture*, 506-515.
- Hankins, J. A. (2002, November 20-21). *Aquaculture Development: Issues of concern from the environmental NGO community*. Paper presented at the USDA ARS and CSREES Joint National Aquaculture Program Planning Workshop, St. Louis, MO.
- Hankins, J. A. (2002, October 11). *Aquaculture program and activities review*. Paper presented at the West Virginia AquaVision 2002 Workshop, Shepherdstown, WV.
- Hankins, J. A. (2002, October 24-26). *Intensive aquaculture systems development and technology transfer resulting from USDA/ARS supported research*. Paper presented at the PennAqua 2002: Challenges and Opportunities for Aquaculture Development in Pennsylvania, State College, PA.
- Hankins, J. A. (2002, October 25). *Why good infrastructure is important: The strategic and intrinsic value of water to West Virginia*. Paper presented at the West Virginia Conference on the Environment, University of Charleston, Charleston, WV.
- Summerfelt, S. T. (2002, January 29). *Char production systems at the Freshwater Institute*. Paper presented at the Aquaculture America 2002, Aquacultural Engineering Society Workshop, Town and Country Resort, San Diego, CA.
- Summerfelt, S. T. (2002, July 22-26). *Fluidized-sand biofilter design, culture tank design, water quality and treatment efficiency in recirculating systems, solids control, and ozonation and UV filtration*. Paper presented at the 8th Annual Cornell-Freshwater Institute Aquaculture Water Reuse Systems Short Course, Shepherdstown, WV.
- Summerfelt, S. T., Bebak-Williams, J., Fletcher, J., Carta, A., & Creaser, D. (2002). Description of the surface water filtration and ozone treatment system at the Northeast Fishery Center. *American Fisheries Society Bioengineering Symposium IV*, 8.
- Summerfelt, S. T., Davidson, J. T., Waldrop, T., & Vinci, B. J. (2002). *Evaluation of full-scale carbon dioxide stripping columns in a coldwater recirculating system*. Paper presented at the The Fourth International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Blacksburg, VA.
- Summerfelt, S. T., Fletcher, J., Carta, A., & Creaser, D. (2002, August 18-22). *Description of surface water filtration and ozone treatment system in operation at the Northeast Fishery Center*. Paper presented at the Fisheries Bioengineering Symposium IV, Baltimore, Maryland.
- Summerfelt, S. T., & Vinci, B. J. (2002). *Best waste management practices for coldwater recirculating systems*. Paper presented at the The Fourth International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Blacksburg, VA.
- Summerfelt, S. T., & Vinci, B. J. (2002, May 7). *Best Waste Management Practices for Recirculating Aquaculture Systems*. Paper presented at the Recirculating Aquaculture Workshop, University of Bonn, Bonn, Germany.
- Summerfelt, S. T., Wilton, G., Roberts, D., & Savage, T. M. (2002). *Developments in recirculating systems for arctic char culture in North America*. Paper presented at the The Fourth International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Blacksburg, VA.
- Summerfelt, S. T., Wilton, G., Roberts, D., Savage, T. M., & Fonkalsrud, K. (2002, September 17-20). *Developments in recirculating systems for arctic char culture in North America*. Paper presented at the Aquaculture Canada 2002, Charlottetown, Prince Edward Island, Canada.

2001 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Bebak, J. (2001, January 23). *Session moderator for: Health, Disease and Therapeutants*. Paper presented at the Aquaculture 2001, Lake Buena Vista, FL.
- Bebak, J., McAllister, P. E., Boston, R., & Smith, G. (2001, January 21-25). *Infectious disease outbreaks: Fish density and pathogen concentration*. Paper presented at the Aquaculture 2001, Book of Abstracts, Lake Buena Vista, FL.
- Bebak-Williams, J. (2001, March 21-24). *Veterinary epidemiological perspective in aquaculture*. Paper presented at the Wisconsin Aquaculture Conference, Madison, WI.
- Cipriano, R. C., & Bullock, G. (2001, April 23-26). *Evaluation of commercially prepared transport systems for non-lethal detection of Aeromonas salmonicida in salmonid fish*. Paper presented at the 26th Annual Eastern Fish Health Workshop, Shepherdstown, WV.
- Danley, M. L., Mazik, P. M., Kenney, P. B., Kiser, R., & Hankins, J. A. (2001, January 21-25). *Chronic exposure to carbon dioxide: Growth, physiological stress responses, and fillet quantity in rainbow trout*. Paper presented at the Aquaculture 2001-Book of Abstracts, Lake Buena Vista, FL.
- Ebeling, J. M. (2001, January 23). *Biofiltration*. Paper presented at the Aquacultural Engineering Society Workshop: Intensive Finfish Systems and Technologies, Shepherdstown, WV.
- Ebeling, J. M., Tsukuda, S., Hankins, J. A., & Solomon, C. (2001, April 22-25). *Evaluation and real time monitoring of a recirculating sand and peat filters*. Paper presented at the The Third NSF International Symposium and Technology Expo on Small Drinking Water and Wastewater Systems, Crystal Gateway Marriott, Washington, DC.
- Ebeling, J. M., & Wheaton, F. W. (2001, Jan. 21-24). *Nitrification kinetics and performance characteristic curves for a bubble-washed bead filter*. Paper presented at the Aquaculture 2001-Book of Abstracts, Lake Buena Vista, FL.
- Hankins, J. A. (2001, Mar 5-7). *Application of biotechnology to high yield aquaculture systems*. Paper presented at the Biotechnology-Aquaculture Interface: The Site of Maximum Impact Workshop, USDA/ARS and Oceanic Institute, Shepherdstown, WV.
- Malone, R. F., Wu, Q., & Ebeling, J. M. (2001, Jan. 21-24). *In defense of the bioclarification strategy: Mitigating the impact of solids accumulation on nitrification rates*. Paper presented at the Aquaculture 2001-Book of Abstracts, Lake Buena Vista, FL.
- Morton, F. M., Starliper, C. E., & Bebak-Williams, J. (2001, April 21). *Furunculosis epidemics in Arctic char: Effects of density and culling*. Paper presented at the 76th Annual West Virginia Academy of Sciences, West Liberty State College, West Liberty, WV.
- Schill, W. B., Bullock, G., & Burchard, E. (2001, April 23-26). *Development of oxytetracycline resistance in rainbow trout (Oncorhynchus mykiss) gut flora and biofilter flora in a recirculating system*. Paper presented at the 26th Annual Eastern Fish Health Workshop, Shepherdstown, WV.
- Starliper, C. E. (2001, April 23-26). *A disease in Arctic char caused by Serratia liquefaciens*. Paper presented at the 26th Annual Eastern Fish Health Workshop, Shepherdstown, WV.
- Starliper, C. E. (2001, March 12-14). *A technique for isolation of bacteria from freshwater bivalves*. Paper presented at the 2nd Symposium Freshwater Mollusk Conservation Society, Pittsburgh, PA.
- Summerfelt, S. T. (2001, January 21-25). *A bottom-center drain designed to flush dead fish*. Paper presented at the Aquaculture 2001, Book of Abstracts, Lake Buena Vista, FL.
- Summerfelt, S. T. (2001, July 17-20). *Fluidized-sand biofilter design, culture tank design, stocking and harvesting, ozonation and UV filtration, system overview, and coldwater system designs*. Paper presented at the 7th Annual Cornell-Freshwater Institute Aquaculture Water Reuse Systems Short Course, Shepherdstown, WV.
- Summerfelt, S. T. (2001, January 23). *Organizer and Editor of Presentation Notebook*. Paper presented at the Aquaculture 2001, Aquacultural Engineering Society Workshop, Intensive Fin-Fish Systems and Technologies, Disney Coronado Springs Resort, Orlando, FL.
- Summerfelt, S. T. (2001, January 25). *Organizer and Editor of Presentation Notebook*. Paper presented at the Aquaculture 2001, Aquacultural Engineering Society Special Session International Recirculating Systems, Disney Coronado Springs Resort, Orlando, FL.
- Summerfelt, S. T. (2001, November 11-14). *Ozonation and UV irradiation - An introduction and examples of current applications*. Paper presented at the Aquacultural Engineering Society's 2001 Issues Forum, Clarion Hotel and Conference Center, Shepherdstown, WV.
- Summerfelt, S. T. (2001, August 21). *Recirculating Systems and Waste Management*. Paper presented at

- the Pennsylvania Fish and Boat Commission's Annual Fish Hatchery Managers Meeting, Lockhaven, PA.
- Summerfelt, S. T., Davidson, J. T., & Waldrop, T. (2001, January 21-25). *Cyclo-biofilter™ start-up and preliminary evaluation in a coldwater reuse system*. Paper presented at the Aquaculture 2001.
- Summerfelt, S. T., & Vinci, B. J. (2001, July 22-24). *Best waste management practices for recirculating systems*. Paper presented at the Aquacultural Waste Management Symposium, Roanoke, VA.
- Summerfelt, S. T., Watten, B. J., & Timmons, M. B. (2001, November 11-14). *Proceedings from the Aquacultural Engineering Society's 2001 Issues Forum*. Paper presented at the Clarion Hotel and Conference Center, Shepherdstown, WV.
- Timmons, M. B., & Summerfelt, S. T. (2001, January 23). *Culture tank engineering*. Paper presented at the Aquaculture 2001.
- Tsukuda, S., & Summerfelt, S. T. (2001, January 21-25). *Dynamic process control for intensive production systems*. Paper presented at the Aquaculture 2001.
- Vinci, B. J. (2001, July 17-20). *Solids control, gas transfer, carbon dioxide control, oxygenation, and waste management*. Paper presented at the 7th Annual Cornell-Freshwater Institute Aquaculture Water Reuse Systems Short Course, Shepherdstown, WV.
- Vinci, B. J., & Schmidt, T. W. (2001). Passive, periodic flushing technology for mine drainage treatment systems. *Proceedings of the Eighteenth Annual National Meeting of the American Society for Surface Mining and Reclamation*, 611-625.
- Vinci, B. J., Summerfelt, S. T., & Bergheim, A. (2001). Solids control. In *Proceedings of the Aquacultural Engineering Society Workshop on Intensive Fin-Fish Systems and Technologies at the meeting of the World Aquacultural Society* (pp. 27-46): World Aquaculture Society, Baton Rouge, LA.

2000 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Bebak, J. (2000, February 18-19). *Arctic charr: What is its potential?* Paper presented at the 12th Annual Minnesota Aquaculture Conference and Trade Show, Minnesota Aquaculture Association, Hinckley, MN.
- Bebak, J. (2000, February 18-19). *Biosecurity: What is it? How do you get started?* Paper presented at the 12th Annual Minnesota Aquaculture Conference and Trade Show, Minnesota Aquaculture Association, Hinckley, MN.
- Bebak, J., Bullock, G., & Carson, M. C. (2000, February 2-5). *Oxytetracycline residues in a freshwater aquaculture system*. Paper presented at the Aquaculture America 2000, New Orleans, LA.
- Bebak, J., McAllister, P. E., Boston, R., & Smith, G. (2000, July 22-23). *The role of fish density in infectious disease outbreaks*. Paper presented at the Proceedings of the Third International Conference on Recirculating Aquaculture, Roanoke, VA.
- Bullock, G. L. (2000, September 6-8). *Oxytetracycline residues in a freshwater aquaculture system*. Paper presented at the Annual Meeting of the Fish Health Section, American Fisheries Society, Pensacola, FL.
- Bullock, G. L., Schill, W. B., & Burchard, E. (2000, April 10-14). *Transmission of Aeromonas salmonicida and Yersinia ruckeri in a salmonid recycle system by means of fluidized sand biofilters*. Paper presented at the 25th Annual Eastern Fish Health Workshop, Plymouth, MA.
- Bullock, G. L., Schill, W. B., & Burchard, E. (2000, July 22-23). *Transmission of furunculosis and enteric redmouth by means of fluidized-sand biofilters*. Paper presented at the The Third International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Bullock, G. L., & Schwartz, M. F. (2000, July 18-21). *Impact of treatment regimens and bacterial pathogens on biofilters in recirculation culture systems*. Paper presented at the The Third International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Carson, M. C., Patel, D., Bebak, J., & Bullock, G. (2000, September). *Determination of oxytetracycline residues in matrices (trout, biofilter sand, sediment, water) from a freshwater recirculating system*. Paper presented at the 114th AOAC International Annual Meeting, Philadelphia, PA.
- Hankins, J. A. (2000, July 22-23). *Perspective on the role of government, industry, and research in advancing the environmental compatibility and sustainability of aquaculture*. Paper presented at the The Third International Conference on Recirculating Aquaculture, Virginia Polytechnic

- Institute and State University, Roanoke, VA.
- Schill, W. B., & Bullock, G. (2000, March 18-22). *Development of oxytetracycline resistance in Rainbow Trout (*Oncorhynchus mykiss*) gut flora and sediment in a recirculating culture system*. Paper presented at the 27th Annual Eastern Fish Health Workshop, Charleston, SC.
- Schwartz, M. F., Bullock, G., Hankins, J. A., Summerfelt, S. T., & Mathias, J. (2000, July 22-23). *Effects of chloramine-T and hydrogen peroxide on nitrification in fluidized-sand biofilters for coldwater fish production*. Paper presented at the The Third International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Sibrell, P. L., Watten, B. J., Friedrich, A. E., & Vinci, B. J. (2000). ARD remediation with limestone in a CO₂ pressurized reactor. *Proceedings of the Fifth International Conference on Acid Rock Drainage, Denver CO, 1017-1026*.
- Summerfelt, S. T. (2000, July 11-14). *Solids control, fluidized-sand biofilter design, culture tank design, stocking and harvesting, ozonation and UV filtration, and coldwater system designs*. Paper presented at the 6th Annual Aquaculture Water Reuse Systems Short Course, Cornell University, Ithaca, NY.
- Summerfelt, S. T. (2000, September 6-7). *Understanding and treating carbon dioxide problems*. Paper presented at the British Trout Farming Conference, Sparsholt College Hampshire, Winchester, Hampshire, UK.
- Summerfelt, S. T., Davidson, J. T., & Timmons, M. B. (2000, July 22-23). *Hydrodynamics in the 'Cornell-type' dual-drain tank*. Paper presented at the The Third International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Summerfelt, S. T., Davidson, J. T., Waldrop, T., & Tsukuda, S. (2000, July 22-23). *A partial-reuse system for coldwater aquaculture*. Paper presented at the The Third International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Timmons, M. B., Helwig, N., & Summerfelt, S. T. (2000, July 22-23). *The Cyclone sand biofilter: A new design concept and field evaluation*. Paper presented at the The Third International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Tsukuda, S., Wallace, R., Summerfelt, S. T., & Hankins, J. A. (2000, July 22-23). *Development of a third generation acoustic waste feed monitor*. Paper presented at the The Third International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Vinci, B. J., & Summerfelt, S. T. (2000, May 2-6). *End of pipe treatment*. Paper presented at the AQUA 2000: Responsible Aquaculture in the New Millennium, Nice, France.
- Vinci, B. J., & Timmons, M. B. (2000, July 11-14). *Carbon dioxide control and computer spreadsheet tools*. Paper presented at the 6th Annual Aquaculture Water Reuse Systems Short Course, Cornell University, Ithaca, NY.
- Yeakle, B., & Starliper, C. E. (2000, April 15). *A susceptibility comparison of two strains of Arctic char and rainbow and brook trout to experimental challenge with the fish pathogen *Yersinia ruckeri**. Paper presented at the 75th Annual Meeting of the West Virginia Academy of Science, Fairmont State College, Fairmont, WV.

1999 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Bebak, J. (1999, August 18-20). *Arctic charr update*. Paper presented at the United States Trout Farmers Association Annual Meeting, Baltimore, MD.
- Bebak, J., Bullock, G., Hankins, J. A., & Summerfelt, S. T. (1999, October 26-29). *Effects of water temperature and vaccination on survival of two strains of Arctic charr*. Paper presented at the Aquaculture Canada '99, Victoria, B.C. Canada.
- Bebak, J., McAllister, P. E., Boston, R., & Smith, G. (1999, March 9-11). *The effect of fish density on the survival of rainbow trout fry during an infectious pancreatic necrosis (IPN) epidemic*. Paper presented at the 24th Annual Eastern Fish Health Workshop, Atlantic Beach, NC.
- Bullock, G. L., Blazer, V., Tsukuda, S., & Summerfelt, S. T. (1999, March 9-11). *Toxicity of chitosan acetate for rainbow trout (*Oncorhynchus mykiss*) cultured in a recycle system*. Paper presented at the 24th Annual Eastern Fish Health Workshop, Atlantic Beach, NC.
- McAllister, P. E., & Bebak, J. (1999, April 11-14). *Chronic, low-level exposure to infectious pancreatic necrosis virus (IPNV): An estimation of effects on early life stages of rainbow trout, *Oncorhynchus**

- mykiss*. Paper presented at the 55th Annual Northeast Fish and Wildlife Conference, Manchester, NH.
- McAllister, P. E., & Bebak, J. (1999, March 9-11). *Effects of chronic low-level exposure to infectious pancreatic necrosis virus (IPNV) on early life states of rainbow trout, Oncorhynchus mykiss*. Paper presented at the 24th Annual Eastern Fish Health Workshop, Atlantic Beach, NC.
- Noble, A. C., Wolf, J. C., Bullock, G., Smith, S. A., Tsukuda, S., & Bebak, J. (1999, March 9-11). *Case history: Gill pathologies associated with acute and chronic mortalities in Arctic charr (Salvelinus alpinus) cultured in a semi-closed recycle system*. Paper presented at the 24th Annual Eastern Fish Health Workshop, Atlantic Beach, NC.
- Schwartz, M. F., Vinci, B. J., & Watten, B. J. (1999). *Remediation of acid impaired waters: From idea to CRADA and beyond*. Paper presented at the The Appalachian Rivers II Conference.
- Spurgeon, A. B., Starliper, C. E., & Lidgerding, B. C. (1999, April 10). *Relative susceptibility of Nauyuk and Labrador Arctic charr to experimental challenge with bacterial pathogens: A comparison to rainbow and brook trout*. Paper presented at the 74th Annual Meeting of the West Virginia Academy of Science, National Conservation Training Center, Shepherdstown, WV.
- Starliper, C. E., Mathias, J., & Hickerson, J. (1999, March 17-19). *Interaction of freshwater unionids and salmonid fishes: relevance of bacterial contagion*. Paper presented at the The First Symposium of the Freshwater Mollusk Conservation Society, Chattanooga, TN.
- Summerfelt, S. T. (1999, June 22-26). *Biofilter design*. Paper presented at the 5th Annual Aquaculture Water Reuse Systems Short Course, Cornell University, Ithaca, NY.
- Summerfelt, S. T. (1999, May 12). *Dewatering methods*. Paper presented at the Trout Farm Waste Management Conference, North Carolina State University, Mountain Horticultural Crops Research and Extension Center, Asheville, NC.
- Summerfelt, S. T. (1999, June 22-26). *Nitrification*. Paper presented at the 5th Annual Aquaculture Water Reuse Systems Short Course, Cornell University, Ithaca, NY.
- Summerfelt, S. T. (1999, June 22-26). *Ozonation*. Paper presented at the 5th Annual Aquaculture Water Reuse Systems Short Course, Cornell University, Ithaca, NY.
- Summerfelt, S. T. (1999, February 10-12). *Ozonation and disinfection*. Paper presented at the Recirculation in Northern Climates Workshop, Canadian Aquaculture Institute and Recirc Today, Moncton, New Brunswick, Canada.
- Summerfelt, S. T. (1999, October 26-29). *Recirculating technologies typically used to culture cold water species*. Paper presented at the Aquaculture Canada '99, Victoria, B.C. Canada.
- Summerfelt, S. T. (1999, June 22-26). *Systems overview*. Paper presented at the 5th Annual Aquaculture Water Reuse Systems Short Course, Cornell University, Ithaca, NY.
- Summerfelt, S. T. (1999, May 12). *Trout waste characteristics*. Paper presented at the Trout Farm Waste Management Conference, North Carolina State University, Mountain Horticultural Crops Research and Extension Center, Asheville, NC.
- Summerfelt, S. T. (1999, May 12). *Waste capture*. Paper presented at the Trout Farm Waste Management Conference, North Carolina State University, Mountain Horticultural Crops Research and Extension Center, Asheville, NC.
- Summerfelt, S. T., Davidson, J. T., & Timmons, M. B. (1999, November 4-6). *Hydrodynamics in the 'Cornell-type' dual-drain tank*. Paper presented at the Aquacultural Engineering Society Issues Forum, Raleigh, NC.
- Summerfelt, S. T., Durant, M. D., Bullock, G., & Hankins, J. A. (1999, January 27-29). *Managing biofilm thickness in fluidized-sand biofilters using vertical mixing*. Paper presented at the Aquaculture America '99, Tampa, FL.
- Summerfelt, S. T., Piedrahita, R. H., & Vinci, B. J. (1999, February 10-12). *Dissolved gas management*. Paper presented at the Recirculation in Northern Climates Workshop, Canadian Aquaculture Institute and Recirc Today, Moncton, New Brunswick, Canada.
- Summerfelt, S. T., Timmons, M. B., & Watten, B. J. (1999, January 27-29). *Recirculating rearing techniques and issues*. Paper presented at the Aquaculture America '99, Proceedings of the Aquacultural Engineering Society Workshop on Advances and Research in Aquacultural Engineering/Recirculating Systems, Tampa, FL.
- Timmons, M. B., & Vinci, B. J. (1999, January 27-29). *Gas transfer kinetics, a refresher*. Paper presented at the Aquaculture America '99, Proceedings of the Aquacultural Engineering Society Workshop on Advances and Research in Aquacultural Engineering/Recirculating Systems, Tampa, FL.

Vinci, B. J., Piedrahita, R. H., & Summerfelt, S. T. (1999, January 27-29). *Carbon dioxide stripping options and design*. Paper presented at the Aquacultural Engineering Society Training Workshop, Aquaculture America '99, Tampa, FL.

1998 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Balter, J. M., Hall, C., Snapp, G., & Summerfelt, S. T. (1998). Evaluation of an aerated floating plastic media biofilter within a recirculating system used to produce food-sized yellow perch. *The Second International Conference on Recirculating Aquaculture*, 397.
- Bebak, J. (1998, July 30-August 1). *Biosecurity/fish health management practices*. Paper presented at the Management Principles for Coldwater Fish Production, Shepherdstown, WV.
- Bebak, J. (1998). *The importance of biosecurity in intensive culture*. Paper presented at the The Second International Conference on recirculating Aquaculture, Roanoke, VA.
- Bebak, J. (1998, July 30-August 1). *Protozoal diseases of freshwater finfish*. Paper presented at the Management Principles for Coldwater Fish Production, Shepherdstown, WV.
- Bebak, J., Hankins, J. A., & Summerfelt, S. T. (1998, November 18-19). *Effects of water temperature on survival of the eggs and fry of two strains of Arctic charr (Salvelinus alpinus)*. Paper presented at the Northeast Aquaculture Conference & Expo, Maine Aquaculture and Innovation Center, Rockport, ME.
- Bebak, J., McAllister, P. E., Boston, R., & Smith, G. (1998, August 30-September 3). *The effect of fish density on the survival of rainbow trout fry during an infectious pancreatic necrosis (IPN) epidemic*. Paper presented at the Third International Symposium on Aquatic Animal Health, Baltimore, MD.
- Bebak, J., McAllister, P. E., & Smith, G. (1998, March 30-April 2). *Infectious pancreatic necrosis virus: Transmission from infectious to susceptible rainbow trout fry*. Paper presented at the 23rd Annual Eastern Fish Health Workshop, Plymouth, MA.
- Bullock, G. L. (1998, July 30-August 1). *Bacterial diseases of freshwater finfish*. Paper presented at the Management Principles for Coldwater Fish Production, The Freshwater Institute and Shepherd College, Shepherdstown, WV.
- Bullock, G. L. (1998, July 12-19). *Historical perspectives of fish health research in the United States-The Leetown experience. Keynote address for the United States*. Paper presented at the Russia-USA Symposium: Aquaculture and Fish Health, Rybnoe, Dmitrov Region, Moscow Province, Russia.
- Bullock, G. L. (1998, July 12-19). *Present status of three important gram negative bacterial diseases of cultured freshwater salmonids*. Paper presented at the Russia-USA Symposium: Aquaculture and Fish Health, Rybnoe, Dmitrov Region, Moscow Province, Russia.
- Bullock, G. L., & Starliper, C. E. (1998, July 12-19). *Current status of bacterial gill disease in cultured salmonids*. Paper presented at the Russia-USA Symposium: Aquaculture and Fish Health, Rybnoe, Dmitrov Region, Moscow Province, Russia.
- Hankins, J. A. (1998, July 30-August 1). *Aquaculture permitting issues*. Paper presented at the Management Principles for Coldwater Fish Production, The Freshwater Institute and Shepherd College.
- Jenkins, M. R., Fletcher, J., & Wade, E. M. (1998, February). *A potential economic impact of the development of non-traditional water resources by aquaculture*. Paper presented at the 3rd Annual Meeting of the Western Regional Science Association.
- Noble, A. C. (1998, July 30-August 1). *Options for treatment*. Paper presented at the Management Principles for Coldwater Fish Production, The Freshwater Institute and Shepherd College, Shepherdstown, WV.
- Schwartz, M. F., Bullock, G., Summerfelt, S. T., Hankins, J. A., & Mathias, J. (1998). Effect of chemotherapeutants on nitrification in fluidized-bed biofilters in a recycle rainbow trout culture system. *The Second International Conference on Recirculating Aquaculture*, 377.
- Starliper, C. E., Bullock, G., Hankins, J. A., & Mathias, J. (1998, March 30-April 2). *Relative susceptibility of Arctic char, Salvelinus alpinus, to experimental challenge with selective salmonid pathogenic bacteria*. Paper presented at the 23rd Annual Eastern Fish Health Workshop, Plymouth, MA.
- Starliper, C. E., Mathias, J., Villella, R., & Morrison, P. (1998, March 6-8). *Preliminary studies on the potential for bacterial pathogen contagion between native freshwater mussels and hatchery reared salmonid fish*. Paper presented at the Conservation, Captive Care & Propagation

- Freshwater Mussel Symposium, Columbus, OH.
- Starliper, C. E., Schill, W. B., & Mathias, J. (1998, March 30-April 2). *Evaluation of different serum-free broth media for growth of Renobacterium salmoninarum*. Paper presented at the 23rd Annual Eastern Fish Health Workshop, Plymouth, MA.
- Summerfelt, S. T. (1998, October 1-2). *ABC's of Hatchery Recirculation*. Paper presented at the Aquaculture Pacific Exchange Conference and Exposition, Campbell River, British Columbia, Canada.
- Summerfelt, S. T. (1998, June 24). *Fluidized-sand biofilter design*. Paper presented at the Cornell Water Reuse Short Course, Cornell University, Ithaca, NY.
- Summerfelt, S. T. (1998, July 16-19). *An integrated approach to aquaculture waste management in flowing water tank culture systems*. Paper presented at the Proceedings of the Second International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Summerfelt, S. T. (1998, June 24). *Nitrification review*. Paper presented at the Cornell Water Reuse Short Course, Cornell University, Ithaca, NY.
- Summerfelt, S. T. (1998, June 24). *Ozonation review*. Paper presented at the Cornell Water Reuse Short Course, Cornell University, Ithaca, NY.
- Summerfelt, S. T. (1998, July 30). *Production intensification and water reuse*. Paper presented at the Management Principles for Coldwater Fish Production, Freshwater Institute, Shepherdstown, WV.
- Summerfelt, S. T., Piedrahita, R. H., & Vinci, B. J. (1998, October 7-10). *Oxygenation and carbon dioxide control in water reuse systems*. Paper presented at the Aquaculture Europe '98, Bordeaux, France.
- Summerfelt, S. T., Timmons, M. B., & Watten, B. J. (1998, July 16-19). *Culture tank designs to increase profitability*. Paper presented at the Proceedings of the Second International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Timmons, M. B., & Summerfelt, S. T. (1998, July 16-19). *Application of Fluidized Sand Beds to Aquaculture*. Paper presented at the Second International Conference on Recirculating Aquaculture, Roanoke, VA.
- Timmons, M. B., & Summerfelt, S. T. (1998, July 16-19). *Application of fluidized-sand biofilters*. Paper presented at the The Second International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Tsukuda, S. M., Ebeling, J. M., & Watten, B. J. (1998, July 16-19). *Application of industrial monitoring and control for an experimental carbon dioxide stripper in a recirculating aquaculture system*. Paper presented at the Proceedings of the Second International Conference on Recirculating Aquaculture, Virginia Polytechnic Institute and State University, Roanoke, VA.
- Tsukuda, S. M., Summerfelt, S. T., Hankins, J. A., Noble, A. C., & Davidson, J. T. (1998, February 15-19). *Chitosan addition for improving aquaculture water quality*. Paper presented at the Aquaculture '98 Book of Abstracts, Las Vegas, NV.
- Vinci, B. J., Timmons, M. B., Watten, B. J., & Summerfelt, S. T. (1998, February 15-19). *Carbon dioxide control in intensive aquaculture*. Paper presented at the Aquaculture '98 Book of Abstracts, Las Vegas, NV.
- Watten, B. J., & Schwartz, M. F. (1998, April 23). *Feasibility of measuring total dissolved gas pressure, dissolved oxygen and carbon dioxide based on head-space partial pressures*. Paper presented at the Academia and Watershed Organizations Conference and Workshop, Fairmont, WV.
- Watten, B. J., Timmons, M. B., Vinci, B. J., & Summerfelt, S. T. (1998, July 16-19). *Comparative performance of biofilm reactor types: Application of steady-state biofilm kinetics*. Paper presented at the Proceedings of the Second International Conference on Recirculating Aquaculture.

1997 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Bebak, J. (1997, May 29). *Fish health management: The whole farm approach*. Paper presented at the Annual Conference and Convention, National Association of State Aquaculture Coordinators, Harrisburg, PA.
- Bullock, G. L., & Cipriano, R. C. (1997). *Detection of Aeromonas salmonicida by culture and*

- serodiagnostic assays following stress-induced furunculosis tests*. Paper presented at the 22rd Annual Eastern Fish Health Workshop, Book of Abstracts, Atlantic Beach, NC.
- Hankins, J. A. (1997). *History and update of USDA/ARS-funded aquaculture research at the Freshwater Institute*. Paper presented at the Annual Meeting of West Virginia Aquaculture Association, Parsons, WV.
- Jenkins, M. R., Fletcher, J., & Wade, E. M. (1997, February 19-23). *Economic analysis of non-traditional water resources for aquaculture in West Virginia*. Paper presented at the Linking Science to Sustainable Industry Development, Seattle, WA.
- Jenkins, M. R., & Wade, E. M. (1997, November 9-12). *A preliminary economic analysis of a low-cost, small-scale, natural gas powered, integrated recycle aquaculture-hydroponic system for tilapia*. Paper presented at the The Fourth International Symposium on Tilapia in Aquaculture, Orlando, FL.
- McAllister, P. E., & Bebak, J. (1997, June 3-4). *Infectious pancreatic necrosis virus: Detection, distribution, and environmental significance in stream water and effluent from salmonid fish hatcheries*. Paper presented at the Pathogens and Diseases of Fish in Aquatic Ecosystems: Implications in Fisheries Management, Pacific Northwest Fish Health Protection Committee Symposium, Portland, OR.
- Schwartz, M. F., Kretschmann, R., Summerfelt, S. T., & Adler, P. R. (1997, February 19-23). *Evaluation of turf-grass strips for phosphorus removal from an aquaculture effluent*. Paper presented at the Linking Science to Sustainable Industry Development, Seattle, WA.
- Shea, G. O., Timmons, M. B., Summerfelt, S. T., & Tsukuda, S. (1997, February 19-23). *Characterization of fluidized sand beds for warm water systems*. Paper presented at the Linking Science to Sustainable Industry Development, Seattle, WA.
- Starliper, C. E., Villella, R., Morrison, P., & Mathias, J. (1997, March 18-20). *Sampling the bacterial flora of freshwater mussels from the Ohio River*. Paper presented at the 22nd Annual Eastern Fish Health Workshop, Atlantic Beach, NC.
- Summerfelt, S. T. (1997). Aeration and oxygenation review. *The In-Land Aquaculture: Issues and Opportunities Workshop, Proceedings of the In-Land Aquaculture: Issues and Opportunities Workshop*, 35-44.
- Summerfelt, S. T. (1997). Biofiltration for ammonia control. *Proceedings of the In-Land Aquaculture: Issues and Opportunities Workshop*, 59-73.
- Summerfelt, S. T. (1997, January). *Selecting and evaluating solids capture units*. Paper presented at the Aquacultural Engineering Society workshop on Fundamentals of Design and Operation of Recirculating Aquaculture Systems, Fish Farming Expo VII, New Orleans, LA.
- Summerfelt, S. T. (1997, February 21). *Waste solids control in intensive aquaculture systems*. Paper presented at the Aquacultural Engineering Society Workshop on Design of Aquaculture Systems and Processes, Seattle, WA.
- Summerfelt, S. T., & Adler, P. R. (1997, January 14-18). *Development of an illuminated, attached-algae, fluidized reactor for treating phosphate in aquaculture effluents*. Paper presented at the World Aquaculture Society, New Orleans, LA.
- Summerfelt, S. T., Durant, M. D., Vinci, B. J., Timmons, M. B., & Watten, B. J. (1997, February 19-23). *Effect of chemical equilibrium on estimates of carbon dioxide stripping in packed columns*. Paper presented at the Linking Science to Sustainable Industry Development, Seattle, WA.
- Summerfelt, S. T., & Wade, E. M. (1997, November 9-12). *Recent advances in water treatment processes to intensify fish production in large recirculating systems*. Paper presented at the Proceedings of the Aquacultural Engineering Society Technical Sessions at the Fourth International Symposium on Tilapia in Aquaculture, Orlando, FL.
- Timmons, M. B., & Summerfelt, S. T. (1997, November 9-12). *Advances in circular culture tank engineering to enhance hydraulics, solids removal and fish management*. Paper presented at the Recent Advances in Aquacultural Engineering, Orlando, FL.
- Tsukuda, S. M., Hankins, J. A., Marshall, C. P., Bullock, G., & Sawyer, T. K. (1997, November 9-12). *Effects of sand size on fluidized-bed biofilter performance in cold water systems*. Paper presented at the Proceedings of the Aquacultural Engineering Society Technical Sessions at the Fourth International Symposium on Tilapia in Aquaculture, Orlando, FL.
- Vinci, B. J., & Timmons, M. B. (1997, February 19-23). *Pipe friction losses*. Paper presented at the Linking Science to Sustainable Industry Development, World Aquaculture Society Annual

Meeting, Seattle, WA.

Wade, E. M. (1997, February 19-23). *An economic analysis of the utilization of impaired mine water resources by aquaculture*. Paper presented at the Linking Science to Sustainable Industry Development., Seattle, WA.

1996 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Adler, P. R., Summerfelt, S. T., Glenn, D. M., & Takeda, F. (1996, February 14-17). *Evaluation of the effect of a conveyor production strategy on lettuce and basil productivity and phosphorus removal from aquacultural wastewater*. Paper presented at the Aquaculture America 1996 Book of Abstracts, Dallas, TX.
- Adler, P. R., Takeda, F., Glenn, D. M., Wade, E. M., & Summerfelt, S. T. (1996). *Conveyor production strategy enhances nutrient byproduct recovery from aquaculture wastewater*. Paper presented at the Successes and Failures in Commercial Recirculating Aquaculture Conference Proceedings.
- Bebak, J., Baumgarten, M., & Smith, G. (1996). *Bacterial gill disease: Risk factors in young rainbow trout (*Oncorhynchus mykiss* (Walbaum)) in North America*. Paper presented at the 21st Annual Eastern Fish Health Workshop, Virginia Institute of Marine Science, Gloucester Point, VA.
- Bebak, J., Baumgarten, M., & Smith, G. (1996). *Risk factors for bacterial gill disease in young rainbow trout in North America*. Paper presented at the AquaVet Conference Proceedings: 20th Anniversary 1977-1996, Marine Biological Laboratory, Woods Hole, MA.
- Brazil, B. L., Summerfelt, S. T., & Libey, G. S. (1996). *Application of ozone to recirculating aquaculture systems*. Paper presented at the Successes and Failures in Commercial Recirculating Aquaculture Conference, Ithaca, NY.
- Bullock, G. L., Cipriano, R. C., & Kretschmann, R. (1996, August 7-9). *Further studies on carriage of *Aeromonas salmonicida* in asymptomatic rainbow trout cultured in a recycle system*. Paper presented at the American Fisheries Society Fish Health Section Meeting, Madison, WI.
- Bullock, G. L., Cipriano, R. C., & Kretschmann, R. (1996, September 5-6). *Persistence of covert *Aeromonas salmonicida* infections among rainbow trout in a recycle system*. Paper presented at the 21st Annual Eastern Fish Health Workshop, Virginia Institute of Marine Science, Gloucester Point, VA.
- Bullock, G. L., Cipriano, R. C., & Kretschmann, R. (1996, November 14-17). *Use of the stress induced furunculosis test to detect *Aeromonas salmonicida* in asymptomatic rainbow trout cultured in a recycle system*. Paper presented at the Aquavet Conference Proceedings: 20th Anniversary 1977-1996, Marine Biological Laboratory, Woods Hole, MA.
- Bullock, G. L., Summerfelt, R. C., Noble, A., Weber, A. W., Durant, M. D., & Hankins, J. A. (1996). Effects of ozone on outbreaks of bacterial gill disease and numbers of heterotrophic bacteria in a trout culture recycle system. *Successes and Failures in Commercial Recirculating Aquaculture Conference Proceedings*, 598-610.
- Derrow II, R. W., Summerfelt, S. T., Mehrabi, A., & Hankins, J. A. (1996). *Design and testing of a second generation acoustic waste feed monitor, Northeast Regional Agricultural Engineering Service, Ithaca, NY*. Paper presented at the Successes and Failures in Commercial Recirculating Aquaculture Conference Proceedings, Ithaca, NY.
- Hankins, J. A., & Jenkins, M. R. (1996). *Non-traditional water resources for aquaculture*. Paper presented at the 43rd Annual U.S. Trout Farmer Association Meeting, Tannersville, PA.
- Hankins, J. A., Jenkins, M. R., Bacon, J. R., & Gempesaw, C. M., II. (1996). *Obtaining financing for small-scale aquaculture: Perspectives of financial lenders*. Paper presented at the Aquaculture America 1996, Arlington TX.
- Hankins, J. A., Jenkins, M. R., Bacon, J. R., & Gempesaw, C. M., II. (1996). *Production and marketing opportunities: The case of small-scale aquaculture in Appalachia*. Paper presented at the Aquaculture America 1996, Arlington Texas.
- Hankins, J. A., Summerfelt, S. T., Durant, M. D., Weber, A. W., & Summerfelt, S. R. (1996). *Effect of cohort size distribution on production and growth within a sequentially stocked and harvested rearing system*. Paper presented at the Aquaculture America 1996, Arlington, TX.
- Jenkins, M. R., Wade, E. M., & Hankins, J. A. (1996). *Evaluation of mine water resources in West Virginia for aquaculture development using GIS*. Paper presented at the Aquaculture America 1996, Arlington, TX.

- Jenkins, M. R., Yohn, C. W., Wade, E. M., & Hankins, J. A. (1996). *The role of small-scale aquaculture: The integration of aquaculture with small family farms in Appalachia*. Paper presented at the Aquaculture America 1996, Arlington, TX.
- McAllister, P. E., & Bebak, J. (1996). *Detection of infectious pancreatic necrosis virus in the environment: An appraisal of stream water and effluent from salmonid fish hatcheries*. Paper presented at the 21st Annual Eastern Fish Health Workshop.
- Noble, A. C. (1996, September 5-6). *Diseases encountered in rainbow trout reared in recirculating systems*. Paper presented at the 21st Annual Eastern Fish Health Workshop, Virginia Institute of Marine Science, Gloucester Point, VA.
- Noble, A. C. (1996). *Major diseases encountered in rainbow trout reared in recirculating systems*. Paper presented at the Successes and Failures in Commercial Recirculating Aquaculture Conference Proceedings, Ithaca, NY.
- Starliper, C. E., Schill, W. B., & Mathias, J. (1996). *Evaluation of different serum-free broth media for growth of Renibacterium salmoninarum*. Paper presented at the 21st Annual Eastern Fish Health Workshop, Plymouth, MA.
- Summerfelt, S. T. (1996). *Engineering design of modular and scaleable recirculating systems containing circular tanks, microscreen filters, fluidized-sand biofilters, cascade aerators and low-head or U-tube oxygenators*. Paper presented at the Successes and Failures in Commercial Recirculating Aquaculture Conference Proceedings.
- Summerfelt, S. T. (1996). *Practical solids removal in aquaculture effluents*. Paper presented at the 43rd Annual U.S. Trout Farmer Association Meeting, Tannersville, PA.
- Summerfelt, S. T., Adler, P. R., Glenn, D. M., & Kretschmann, R. (1996). *Aquaculture sludge removal and stabilization within created wetlands*. Paper presented at the 5th IAWQ Conference on Wetland Systems for Water Pollution Control, Vienna, Austria.
- Summerfelt, S. T., Adler, P. R., Glenn, D. M., & Kretschmann, R. (1996, May 15-18). *Aquaculture sludge treatment within constructed wetlands*. Paper presented at the Second National Workshop on Constructed Wetlands for Animal Waste Management, Fort Worth, TX.
- Summerfelt, S. T., Hankins, J. A., & Durant, M. D. (1996, February 14-17). *A pipe-lateral flow distribution mechanism for fluidized-sand biofilters*. Paper presented at the Aquaculture America 1996, Dallas, TX.
- Summerfelt, S. T., Hankins, J. A., Durant, M. D., & Goldman, J. N. (1996). *Evaluation of a modified pipe-lateral distribution mechanism for fluidized-sand biofilters*. Paper presented at the 69th Annual Conference and Exposition of the Water Environment Federation, Alexandria, VA.
- Summerfelt, S. T., Hankins, J. A., Weber, A. W., & Durant, M. D. (1996). *Effects of ozone on microscreen filtration and water quality in a recirculating trout culture system*. Paper presented at the Successes and Failures in Commercial Recirculating Aquaculture Conference Proceedings.
- Supitaningsih, I., Gempesaw, C. M., II, Bacon, J. R., Hankins, J. A., & Hicks, C. (1996). *The economics of a small scale trout production technology*. Paper presented at the World Aquaculture Society, U.S. Chapter Annual Meeting, Hilton Head, SC.
- Tsukuda, S. M., Watten, B. J., & Timmons, M. B. (1996, February 14-17). *Effect of spray tower geometry on gas transfer*. Paper presented at the Aquaculture America 1996, Dallas, TX.
- Vinci, B. J., Summerfelt, S. T., Timmons, M. B., & Watten, B. J. (1996). *Carbon dioxide control in intensive aquaculture: Design tool development*. Paper presented at the Successes and Failures in Commercial Recirculating Aquaculture Conference Proceedings, Ithaca, NY.
- Wade, E. M., & Fadel, J. G. (1996, February 14-17). *An economic feasibility study of white sturgeon caviar production using optimization modeling*. Paper presented at the Aquaculture America 1996 Book of Abstracts, Dallas, TX.
- Wade, E. M., Summerfelt, S. T., & Hankins, J. A. (1996). *Economies of scale in recycle systems*. Paper presented at the Successes and Failures in Commercial Recirculating Aquaculture Conference Proceedings, Ithaca, NY.
- Wade, E. M., Summerfelt, S. T., & Hankins, J. A. (1996). *Scales of economy in recycle systems*. Paper presented at the 43rd Annual U.S. Trout Farmer Association Meeting, Tannersville, PA.
- Watten, B. J., & Schwartz, M. F. (1996). *Carbon dioxide pretreatment of AMD for limestone diversion wells*. Paper presented at the Seventeenth Annual West Virginia Surface Mine Drainage Task Force Symposium, Morgantown, WV.

1995 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Adler, P. R., Summerfelt, S. T., Glenn, D. M., & Takeda, F. (1995). *Created wetlands for generating oligotrophic water*. Paper presented at the Aquaculture 95.
- Cipriano, R. C., Bullock, G., & Noble, A. (1995). *The nature of Aeromonas salmonicida carriage within asymptomatic rainbow trout (Oncorhynchus mykiss) maintained in a recirculating culture system using fluidized sand biofilters*. Paper presented at the Proceedings of the Eastern Fish Health Workshop.
- Durant, M. D., Summerfelt, S. T., & Hankins, J. A. (1995). *A field trial of a hydroacoustic waste feed control device in a flow-through tank fish production system with rainbow trout (Oncorhynchus mykiss)*. Paper presented at the Quality in Aquaculture, Special Publication No. 23, Ghent, Belgium.
- Hankins, J. A., & Heinen, J. (1995). *A comparison of two management strategies for intensive tank culture of rainbow trout, Oncorhynchus mykiss*. Paper presented at the Proceedings of Annual Meeting of the ASAS, Pittsburgh, PA.
- Hankins, J. A., Summerfelt, S. T., & Durant, M. D. (1995). *Impacts of feeding and stock management strategies upon fish production within water recycle systems*. Paper presented at the Aquacultural Engineering and Waste Management, Ithaca, NY.
- Heinen, J. M., Hankins, J. A., & Adler, P. R. (1995). *Water quality and waste production in a recirculating trout culture system with feeding of a higher-energy or a lower-energy diet*. Paper presented at the Aquaculture 95 Book of Abstracts.
- Noble, A. C., & Hankins, J. A. (1995). *A fish health and condition assessment used to evaluate the status of rainbow trout, Oncorhynchus mykiss, reared in a recirculating aquaculture system*. Paper presented at the The Annual Meeting of the ASAS, Pittsburgh, PA.
- Summerfelt, S. T. (1995). *Ozonation within a recirculating trout-culture system*. Paper presented at the The American Fisheries Society's Chemistry in Aquaculture Symposium, Western Carolina University, Cullowhee, NC.
- Summerfelt, S. T., Bullock, G., Noble, A., & Sawyer, T. K., et. al. (1995). *Research on ozonation within a recirculating trout-culture system*. Paper presented at the Aquaculture 95 Book of Abstracts.
- Watten, B. J., & Honeyfield, D. C. (1995). *Hydraulic characteristics of a rectangular mixed-cell rearing unit*. Paper presented at the Aquacultural Engineering and Waste Management, Ithaca, NY.
- Watten, B. J., & Schwartz, M. F. (1995). *Carbon dioxide pretreatment for enhanced rates of limestone dissolution*. Paper presented at the Mid-Atlantic Highlands Environment - Now and Tomorrow, Davis, WV.
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1994 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Adler, P. R., Summerfelt, S. T., Glenn, D. M., & Takeda, F. (1994, October 16-20). *Creation of wetlands capable of generating oligotrophic water*. Paper presented at the The 67th Annual Conference and Exposition, Chicago, IL.
- Adler, P. R., Summerfelt, S. T., Glenn, D. M., & Takeda, F. (1994, February 27-March 2). *Development of a mechanistic model for reuse of dilute nutrient effluents in plant production within thin-film reactors. Concept development and evaluation*. Paper presented at the American Water Works Association/Water Environment Federation's Water Reuse Symposium, Dallas, TX.
- Boyd, C. E., Watten, B. J., & Schwartz, M. F. (1994, August). *Feasibility of measuring dissolved carbon dioxide based on head-space partial pressures*. Paper presented at the Aquaculture Engineering Society Symposium, Halifax, N.S.
- Gempesaw, C. M., II, Bacon, J. R., Supitaningsih, I., & Hankins, J. A. (1994). *Economics of agricultural output diversification: The case of broiler, grain and aquaculture products*. Paper presented at the Socioeconomics of Aquaculture, Tungking Marine Laboratory Conference Proceedings.
- Hankins, J. A. (1994, January). *Manipulation of fish densities and rearing strategies to maximize production*. Paper presented at the AES workshop on Fundamentals of Design and Operation of Recirculating Aquaculture Systems at the Fish Farming Expo VII, New Orleans, LA.

- Hankins, J. A. (1994, November). *Recirculation system design options for the Appalachian region*. Paper presented at the Western Maryland Aquaculture Workshop, sponsored by Maryland Cooperative Extension, Keedysville, MD.
- Hankins, J. A., & Bullock, D. (1994, January). *A national overview of state regulatory approaches for aquaculture effluent discharges*. Paper presented at the World Aquaculture Society Annual Meeting, New Orleans, LA.
- Hankins, J. A., & Bullock, D. (1994, April). *An Overview of U.S. State Regulatory Approaches for Aquaculture Effluent Discharges*. Paper presented at the The Second International Symposium on Nutritional Strategies and Management of Aquaculture Waste, Aalborg, Denmark.
- Hankins, J. A., et. al. (1994, August). *Impact of ozonation on biofouling in a recirculating aquaculture system*. Paper presented at the Aquaculture Engineering Society Symposium, Halifax, N.S.
- Heinen, J. M., Hankins, J. A., & Watten, B. J. (1994). *Evaluation of recirculating fish culture systems utilizing cross-flow raceways, multi-stage oxygenators, microscreen particulate filters and fluidized-bed biofilters*. Paper presented at the Program and Abstracts, 22nd Annual Conference and Exposition of World Aquaculture Society, San Juan, Puerto Rico.
- Heinen, J. M., Weber, A. W., Noble, A., & Morton, J. D. (1994, January). *Formalin use in a recirculating trout culture system with a fluidized-bed sand biofilter*. Paper presented at the World Aquaculture Society Annual Meeting, New Orleans, LA.
- Noble, A. C., Herman, R. L., Noga, E. J., & Bullock, G. (1994, September). *Description of a recurrent amoeba gill infestation in rainbow trout (*Oncorhynchus mykiss*) cultured in a semi-closed recirculating system*. Paper presented at the International Symposium on Aquatic Animal Health, Seattle, WA.
- Summerfelt, S. T. (1994, June). *Solids removal options for aquaculture systems*. Paper presented at the Mid-Atlantic Aquaculture Conference, Fredericksburg, VA.
- Summerfelt, S. T., Adler, P. R., & Summerfelt, S. R. (1994, February 27-March 2). *Development of a mechanistic model for reuse of dilute nutrient effluents in plant production within thin-film reactors*. Paper presented at the American Water Works Association/Water Environment Federation Water Reuse Symposium, Dallas, TX.
- Summerfelt, S. T., Adler, P. R., & Summerfelt, S. R. (1994, January 14-18). *Development of a mechanistic model for reuse of dilute nutrient effluents in plant production within thin-film reactors. II. Equation development*. Paper presented at the World Aquaculture Society Annual Meeting Proceedings, Book of Abstracts, New Orleans, LA.
- Summerfelt, S. T., & al., e. (1994, August). *Ozone contacting utilizing a low-head oxygenator (LHO)*. Paper presented at the Aquacultural Engineering Society Symposium, Halifax, N.S.
- Summerfelt, S. T., & et. al. (1994, August). *Ozone as a filter aid*. Paper presented at the Aquacultural Engineering Society Symposium, Halifax, N.S.
- Summerfelt, S. T., Hankins, J. A., Heinen, J., Weber, A. W., & Morton, J. D. (1994, January). *Evaluation of the TRIANGEL microsieve filter in a water-reuse system*. Paper presented at the World Aquaculture Society 1994 Annual Meeting, New Orleans, LA.
- Summerfelt, S. T., Holland, K. H., & Hankins, J. A. (1994, January). *Hydroacoustic waste-feed controller*. Paper presented at the World Aquaculture Society 1994 Annual Meeting, New Orleans, LA.
- Summerfelt, S. T., Holland, K. H., Hankins, J. A., & Durant, M. D. (1994, April). *A hydroacoustic waste-feed controller for tank systems*. Paper presented at the Second International Symposium on Nutritional Strategies and Management of Aquaculture Waste, Aalborg, Denmark.
- Vinci, B. J., Watten, B. J., Timmons, M. B., & Hankins, J. A. (1994, January). *Evaluation of spraying towers for gas exchange*. Paper presented at the World Aquaculture Society Annual Meeting, New Orleans, LA.
- Watten, B. J. (1994, August). *Modification of a spray tower for concurrent commercial oxygen addition, nitrogen and carbon dioxide stripping*. Paper presented at the Aquaculture Engineering Society Symposium, Halifax, N.S.

1993 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Gempesaw, C. M., II, Bacon, J. R., Supitaningsih, I., & Hankins, J. A. (1993). *A financial simulation analysis of small scale trout production*. Paper presented at the Modeling and Simulation, Anaheim, CA.

1990-1993 PROCEEDINGS PAPERS, ABSTRACTS AND ORAL PRESENTATIONS

- Bacon, J. R., Gempesaw, C. M., II, Supitaningsih, I., & Hankins, J. A. (1993). *Risk management through integrating aquaculture with agriculture*. Paper presented at the Techniques for Modern Aquaculture, St. Joseph, MI.
- Bullock, G. L. (1993). *Treatment options for fish health management*. Paper presented at the Aquaculture in the Mid-Atlantic, Dover, DE.
- Gempesaw, C. M., II, Supitaningsih, I., Bacon, J. R., Heinen, J., & Hankins, J. A. (1993). *Economic analysis of an intensive aquaculture recirculating system for trout production*. Paper presented at the Techniques for Modern Aquaculture.
- Hankins, J. A. (1992). *Two management strategies for intensive tank culture of rainbow trout, *Oncorhynchus mykiss**. Paper presented at the Fish Farming Expo V, New Orleans, LA.
- Hankins, J. A. (1993). *Aquaculture waste management perspectives*. Paper presented at the Aquaculture and the Marine Environment: The shaping of public policy, Marine Biology Laboratory, Woods Hole, MA.
- Hankins, J. A. (1993). *Feeding strategies and considerations*. Paper presented at the Aquaculture in the Mid-Atlantic, Dover, DE.
- Hankins, J. A. (1993). *An introduction to fluidized bed biofilter concepts and operation*. Paper presented at the Aquaculture in the Mid-Atlantic, Dover, DE.
- Hankins, J. A., Heinen, J., & Watten, B. J. (1992). *A comparison of two management strategies for intensive tank culture of rainbow trout, *Oncorhynchus mykiss**. Paper presented at the Aquaculture '92, Orlando, FL.
- Heinen, J. M., Hankins, J. A., Noble, A., Bullock, G., Herman, R. L., & Weber, A. W. (1993). Evidence for development of resistance to bacterial gill disease in cultured rainbow trout. *World Aquaculture Society Annual Meeting, U.S. Aquaculture: Competing Within a Global Economy. Abstracts from WAS, US Chapter Annual Meeting, 22*.
- Heinen, J. M., Hankins, J. A., & Subramanyam, M. (1991). *Evaluation of low-pollution trout diet in tanks receiving water supersaturated with dissolved oxygen*. Paper presented at the 22nd Annual Conference and Exposition of World Aquaculture Society, San Juan, Puerto Rico.
- Heinen, J. M., Hankins, J. A., & Subramanyam, M. (1992). *Evaluation of four commercial diets for rainbow trout, *Oncorhynchus mykiss**. Paper presented at the Aquaculture '92, Orlando, FL.
- Heinen, J. M., Hankins, J. A., & Watten, B. J. (1992). *Modifications of equipment and operating procedures in a recirculating culture system for rainbow trout, *Oncorhynchus mykiss**. Paper presented at the Aquaculture '92, Orlando, FL.
- Leonard, E. L., Hankins, J. A., & Heinen, J. (1992). *Preliminary evaluation of commercial bacterial cultures for reducing fish fecal sludge*. Paper presented at the Aquaculture '92, Orlando, FL.
- Summerfelt, S. T., & Cleasby, J. L. (1993). *Hydraulics in fluidized-bed biological reactors*. Paper presented at the Techniques for Modern Aquaculture, St. Joseph, MI.
- Summerfelt, S. T., Hankins, J. A., Summerfelt, S. R., & Heinen, J. M. (1993). *Modeling continuous culture with periodic stocking and selective harvesting to measure the effect on productivity and biomass capacity of fish culture systems*. Paper presented at the Techniques for Modern Aquaculture, St. Joseph, MI.
- Vinci, B. J. (1992). *Dietary lysine requirement of atlantic salmon abstract*. Paper presented at the Cornell University 12th Annual Natural Resources Symposium, 4.
- Williams, R. C., Hughes, S. G., Meade, J. W., & Vinci, B. J. (1991). *Tunison water reuse system. (Poster session)*. Paper presented at the American Fisheries Society Annual Meeting, San Antonio, TX.