WINTER PERFORMANCE OF AN OUTDOOR BIOFLOC PRODUCTION SYSTEM FOR CHANNEL CATFISH

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Bartholomew W. Green

USDA Agricultural Research Service
Harry K. Dupree Stuttgart National Aquaculture Research Center
PO Box 1050, Stuttgart, AR 72160

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BFT Production System

- **Most biofloc systems are located in the tropics**
- **Increasing interest in biofloc systems at sub-tropical to temperate latitudes**
  - **Outdoor systems in particular**
- **To be viable at temperate latitudes, data gaps related to system and fish performance over the winter must be addressed**

So, what happens during winter?

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Objectives

To quantify changes in water quality and ammonia biotransformation capacity and channel catfish performance throughout the winter.

- **Waters used for this experiment were retained from a just-completed freshwater BFT experiment that evaluated different levels of solids control**
- **Retained waters had high or low total suspended solids (TSS) concentrations**
  - **High TSS concentration in BFT can affect negatively culture animal performance**
  - **Removal of solids to 200–400 mg/L TSS is recommended**
- **Furthermore, waters used in the present experiment themselves will be retained for a follow-on study to evaluate re-use of BFT water during a second growing season**

Experimental Design

- **Completely randomized design**
- **Low (153.3 ± 39.5 mg/L) and high (790.0 ± 48.4 mg/L) TSS**
- **3 replicates/treatment**
- **6 HDPE-lined tanks (18.6 m^2, 15.7 m^3)**
- **1.865 kW (2.5 hp) regenerative blower per 3 tanks**
- **DO/Temp monitored continuously by data logger**
- **Bi-weekly DIN, DIP, T Alk, TSS, chlorophyll *a*, & am pH**

Channel Catfish (*Ictalurus punctatus*)

	Low TSS	High TSS
Initial Weight (g/fish):	**560.8 ± 5.8**	**611.3 ± 22.9**
Stocking Rate:	**12.6 fish/m^2**	
Initial Biomass (kg/m^3):	**7.8 ± 0.2**	**8.2 ± 0.5**
Stock Date:	**14-15 November**	
Harvest Date:	**16 April**	
Duration:	**152 d**	
Feed:	**32% protein fed to apparent satiation when water T ≥ 16 °C**	

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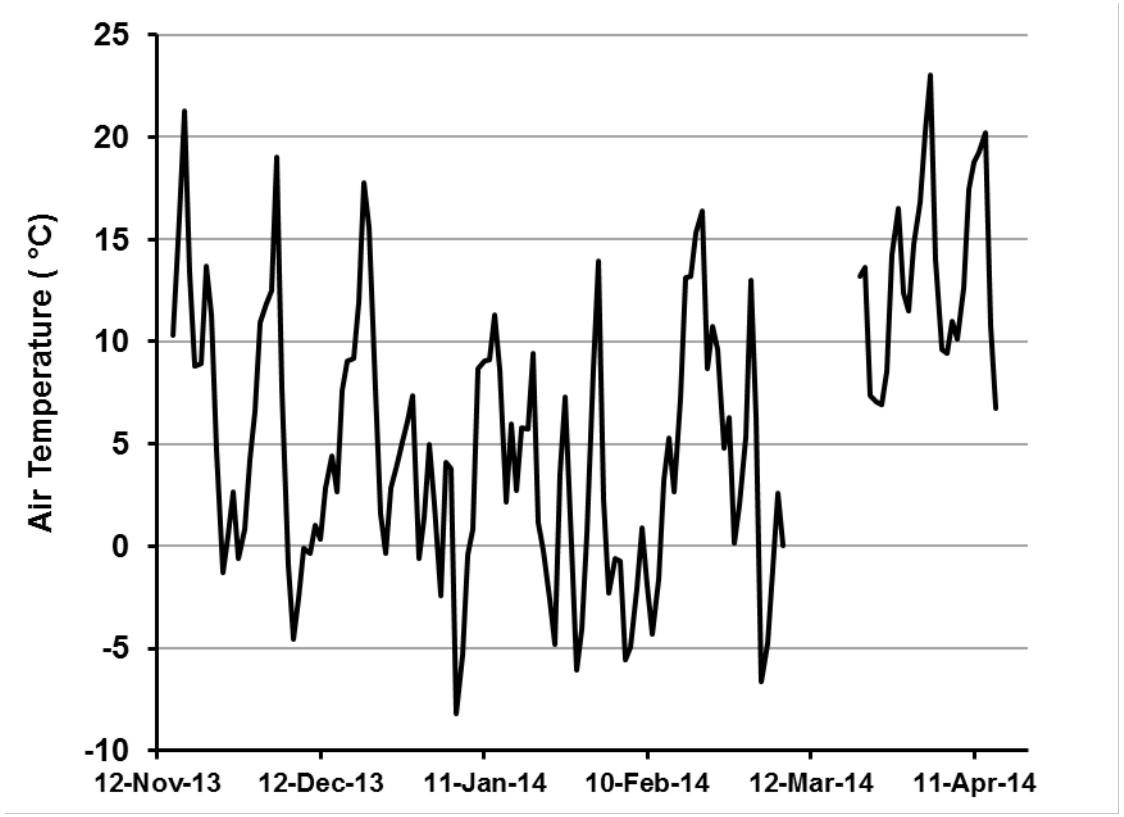
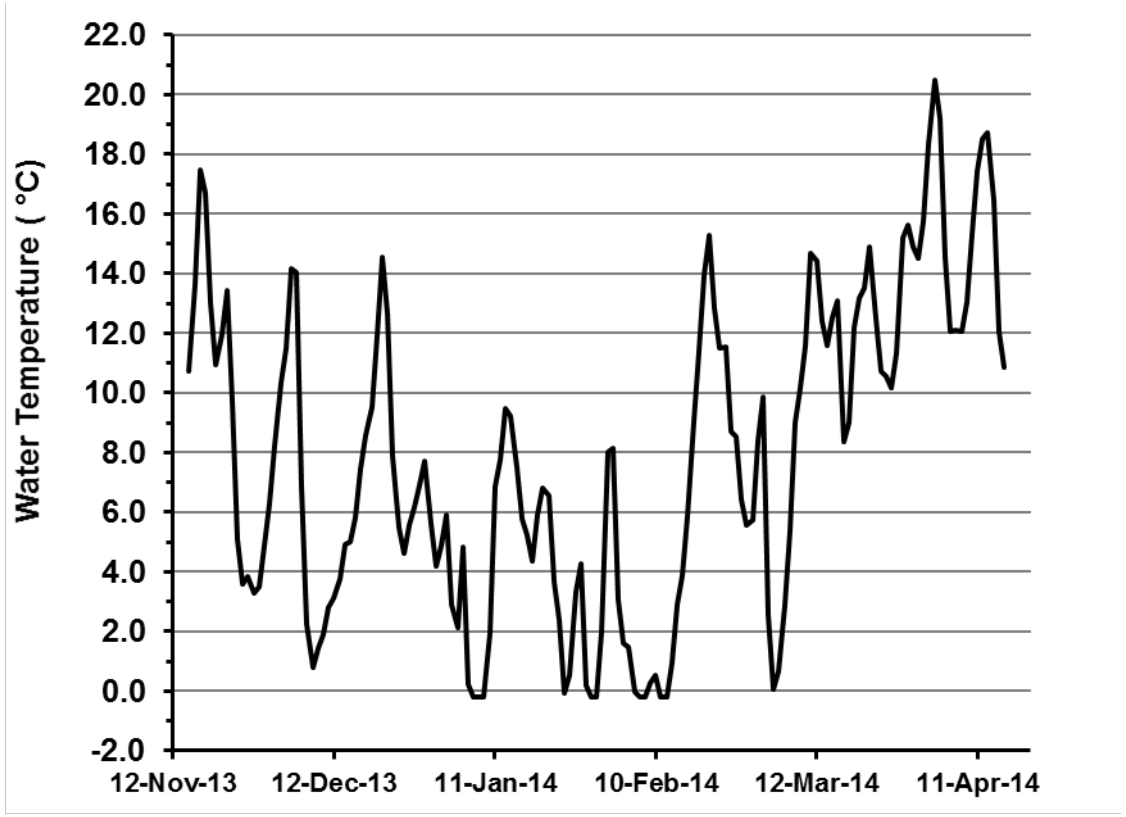
Temperature





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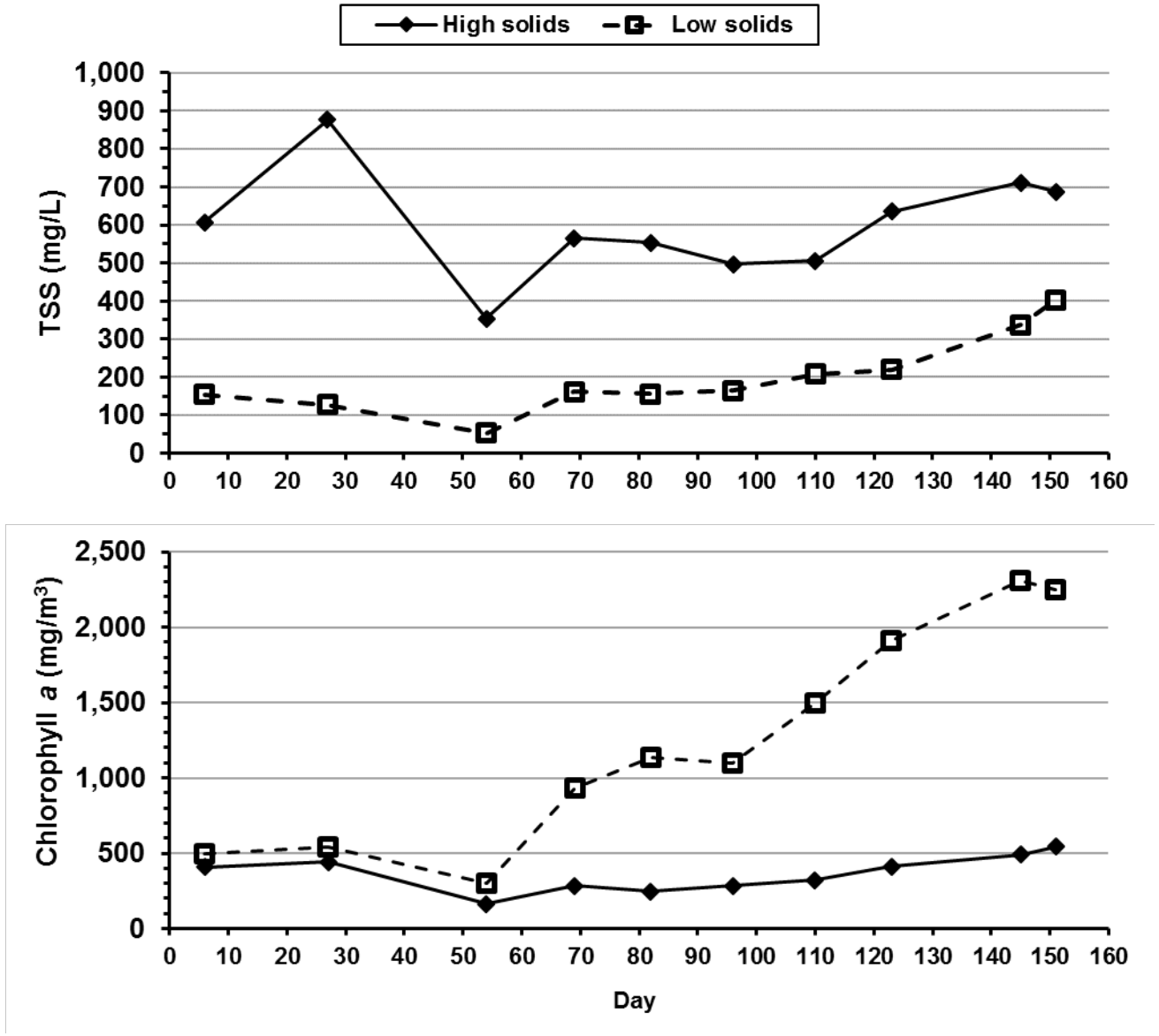
Treatment	(mg/L)			
	NH_4-N	NO_2-N	NO_3-N	PO_4-P
Low TSS				
Initial	0.01	0.29	70.97	20.34
Final	0.08	0.90	58.18	14.01
Pooled SE	0.03	0.11	6.89	1.41
Pr > F	0.119	0.016	0.014	0.034
High TSS				
Initial	0.00	0.01	95.18	33.08
Final	0.01	0.14	90.51	28.67
Pooled SE	0.04	0.06	8.97	2.43
Pr > F	0.046	0.173	0.685	0.185

Treatment	Chl *a* (mg/m^3)	(mg/L) TSS	(mg/L) T Alk	pH
Low TSS				
Initial	493.5	153.3	132.0	8.19
Final	2,251.7	403.3	67.7	7.59
Pooled SE	369.6	11.8	16.8	0.03
Pr > F	0.077	0.002	0.089	0.004
High TSS				
Initial	409.7	606.7	176.6	8.14
Final	541.6	687.8	91.6	7.59
Pooled SE	65.6	140.9	18.2	0.08
Pr > F	0.091	0.705	0.030	0.010



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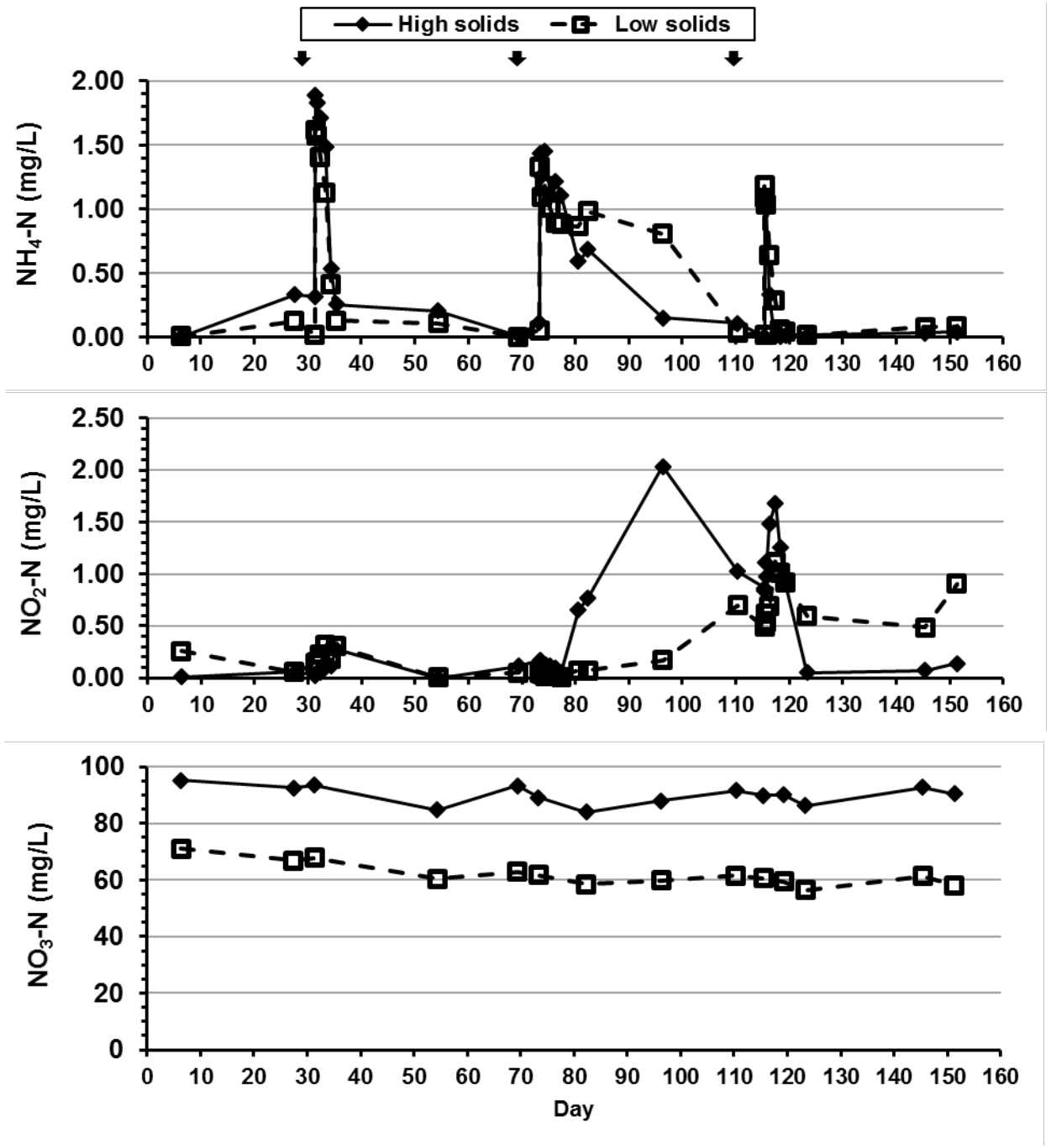
Ammonia Bio-transformation

- **Ammonium chloride added to tanks on three dates to increase TAN**
  - **1.5 mg/L TAN (16 December 2013)**
  - **1.25 mg/L TAN (27 January 2014; 10 March 2014)**
- **Water samples collected at 0 min, and after 15-60 min, 4 h (10 Mar only), 7-8 h, 24 h, 48 h, 72 h, 96 h, and 173 h (27 Jan 2014 only)**
  - **analyzed for TAN and NO_2-N; NO_3-N analyzed at beginning and end**



Mean Water Temperature

Spike Event	T (°C)
Dec (d 31)	7.6
Jan (d 73)	2.9
Mar (d 115)	11.6

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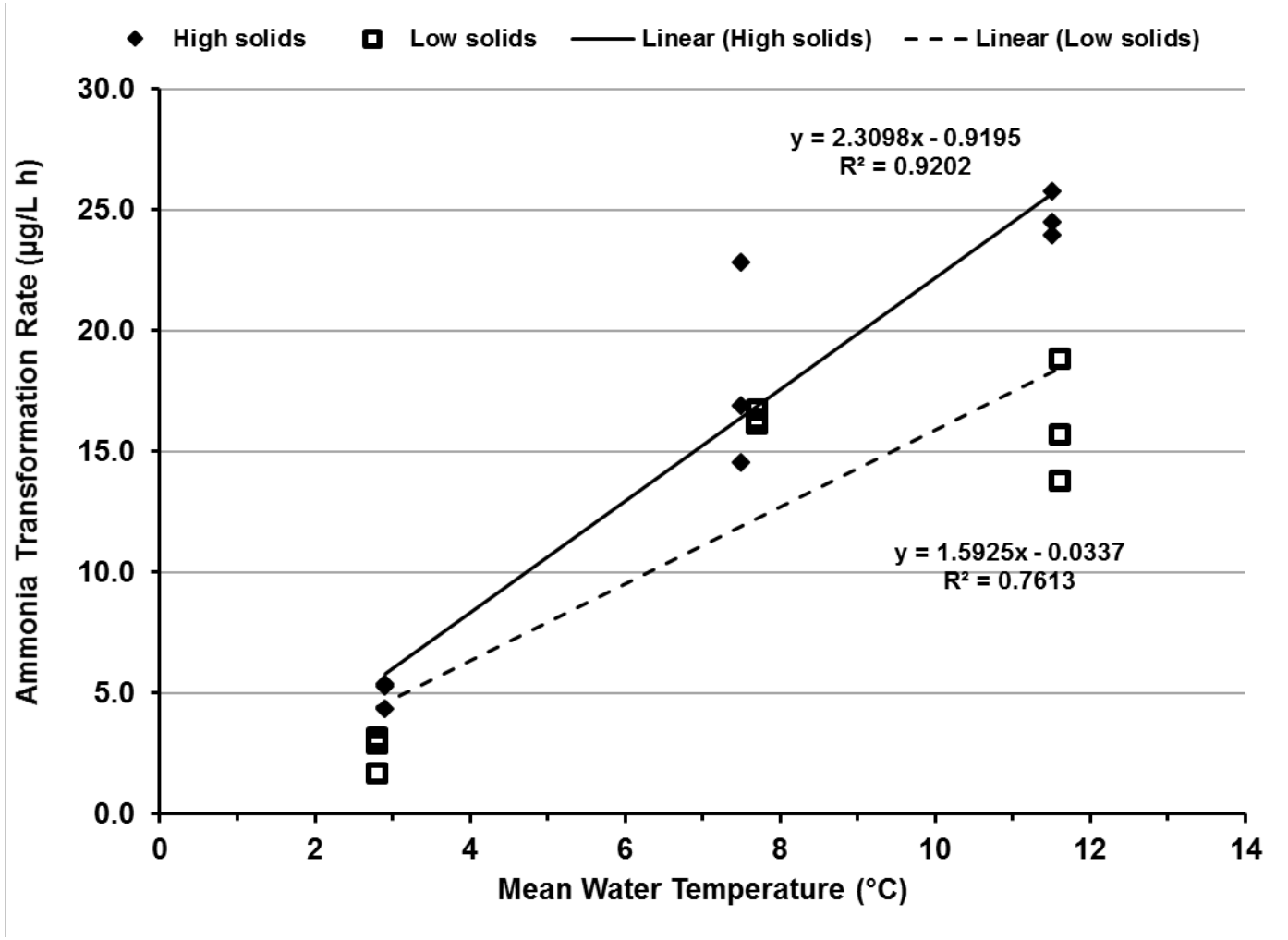

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Catfish Production

	Initial TSS Concentration		Pooled	
Variable	High	Low	SE	Pr > F
Initial Weight (g/fish)	611.3	560.8	16.6	0.098
Final Weight (g/fish)	598.8	579.1	24.4	0.599
Initial Biomass (kg/m^3)	8.2	7.8	0.4	0.490
Final Biomass (kg/m^3)	7.9	7.7	0.4	0.701
Net Fish Yield (kg/m^3)	-0.3	-0.1	0.1	0.146
Survival (%)	99.9	99.7	0.4	0.701

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Summary

- **low initial TSS concentration transitioned to a phytoplankton dominated system**
- **high initial TSS concentration remained a bacterially dominated system**
- **ability to bio-transform TAN was retained at low winter water temperatures and in the absence of sustained TAN input**
- **High biomasses of market-size channel catfish were maintained through the winter with high survival and in good condition**

- **Green (2015), Performance of a temperate-zone channel catfish biofloc technology production system during winter. Aquacultural Engineering 64, 60-67.**

Acknowledgment

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