



LOW-SALINITY TOXICITY TESTS WITH THE MYSID SHRIMP (AMERICAMYSIS BAHIA) AND DRINKING WATER FACILITY CONCENTRATES: IS SALINITY STRESS AN ISSUE?

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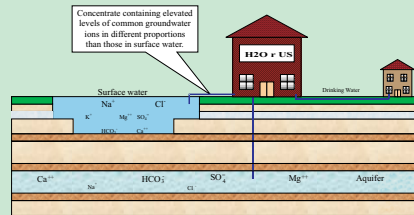


Abstract

Facilities in the State of Florida that discharge concentrates or "reject waters" produced through the use of membrane technologies, cooling water condensate, or other methods, may be required by the State to perform toxicity tests with their effluent using the mysid shrimp, *Americamysis bahia*, due to the high conductivity of these concentrates. The State requires the concentrates to be minimally salinity adjusted prior to toxicity testing, potentially leading to some tests being conducted at salinities as low as 8 part per thousand (ppt) (effluent "salinity" plus 7-ppt artificial sea salts).

The Florida Department of Environmental Protection conducted a study to determine if properly salinity-acclimated mysids were stressed by the low salinity, potentially decreasing the toxic effect thresholds. Standard reference toxicant tests were performed using sodium dodecyl sulfate (SDS) and pentachlorophenol (PCP) with mysids that had been salinity acclimated to 7 ppt or left at their culture salinity of 20 ppt. SDS and PCP were selected as reference toxicants because it was believed that the toxicity of these compounds would be least affected by changes in salinity when compared to other reference toxicants such as metal salts; however, the toxicity of SDS demonstrated a positive relationship to salinity, though not significant at the $p=0.05$ level.

Test results indicated no statistically significant decrease ($p=0.05$) in 96-hr LC50's in the 7 ppt salinity tests when compared to the 20 ppt salinity tests, for either compound.



Unfiltered concentrate samples									
Facility	Sample Date	Salinity (ppt)	Temp (°C)	Hardness (mg/L)	Alkalinity (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)
1	4/14/2003	11.0	24.0	100	100	100	100	100	100
2	4/14/2003	11.0	24.0	100	100	100	100	100	100
3	4/14/2003	11.0	24.0	100	100	100	100	100	100
4	4/14/2003	11.0	24.0	100	100	100	100	100	100
5	4/14/2003	11.0	24.0	100	100	100	100	100	100
6	4/14/2003	11.0	24.0	100	100	100	100	100	100
7	4/14/2003	11.0	24.0	100	100	100	100	100	100
8	4/14/2003	11.0	24.0	100	100	100	100	100	100
9	4/14/2003	11.0	24.0	100	100	100	100	100	100
10	4/14/2003	11.0	24.0	100	100	100	100	100	100
11	4/14/2003	11.0	24.0	100	100	100	100	100	100
12	4/14/2003	11.0	24.0	100	100	100	100	100	100
13	4/14/2003	11.0	24.0	100	100	100	100	100	100
14	4/14/2003	11.0	24.0	100	100	100	100	100	100
15	4/14/2003	11.0	24.0	100	100	100	100	100	100
16	4/14/2003	11.0	24.0	100	100	100	100	100	100
17	4/14/2003	11.0	24.0	100	100	100	100	100	100
18	4/14/2003	11.0	24.0	100	100	100	100	100	100
19	4/14/2003	11.0	24.0	100	100	100	100	100	100
20	4/14/2003	11.0	24.0	100	100	100	100	100	100
21	4/14/2003	11.0	24.0	100	100	100	100	100	100
22	4/14/2003	11.0	24.0	100	100	100	100	100	100
23	4/14/2003	11.0	24.0	100	100	100	100	100	100
24	4/14/2003	11.0	24.0	100	100	100	100	100	100
25	4/14/2003	11.0	24.0	100	100	100	100	100	100
26	4/14/2003	11.0	24.0	100	100	100	100	100	100
27	4/14/2003	11.0	24.0	100	100	100	100	100	100
28	4/14/2003	11.0	24.0	100	100	100	100	100	100
29	4/14/2003	11.0	24.0	100	100	100	100	100	100
30	4/14/2003	11.0	24.0	100	100	100	100	100	100
31	4/14/2003	11.0	24.0	100	100	100	100	100	100
32	4/14/2003	11.0	24.0	100	100	100	100	100	100
33	4/14/2003	11.0	24.0	100	100	100	100	100	100
34	4/14/2003	11.0	24.0	100	100	100	100	100	100
35	4/14/2003	11.0	24.0	100	100	100	100	100	100
36	4/14/2003	11.0	24.0	100	100	100	100	100	100
37	4/14/2003	11.0	24.0	100	100	100	100	100	100
38	4/14/2003	11.0	24.0	100	100	100	100	100	100
39	4/14/2003	11.0	24.0	100	100	100	100	100	100
40	4/14/2003	11.0	24.0	100	100	100	100	100	100
41	4/14/2003	11.0	24.0	100	100	100	100	100	100
42	4/14/2003	11.0	24.0	100	100	100	100	100	100
43	4/14/2003	11.0	24.0	100	100	100	100	100	100
44	4/14/2003	11.0	24.0	100	100	100	100	100	100
45	4/14/2003	11.0	24.0	100	100	100	100	100	100
46	4/14/2003	11.0	24.0	100	100	100	100	100	100
47	4/14/2003	11.0	24.0	100	100	100	100	100	100
48	4/14/2003	11.0	24.0	100	100	100	100	100	100
49	4/14/2003	11.0	24.0	100	100	100	100	100	100
50	4/14/2003	11.0	24.0	100	100	100	100	100	100
51	4/14/2003	11.0	24.0	100	100	100	100	100	100
52	4/14/2003	11.0	24.0	100	100	100	100	100	100
53	4/14/2003	11.0	24.0	100	100	100	100	100	100
54	4/14/2003	11.0	24.0	100	100	100	100	100	100
55	4/14/2003	11.0	24.0	100	100	100	100	100	100
56	4/14/2003	11.0	24.0	100	100	100	100	100	100
57	4/14/2003	11.0	24.0	100	100	100	100	100	100
58	4/14/2003	11.0	24.0	100	100	100	100	100	100
59	4/14/2003	11.0	24.0	100	100	100	100	100	100
60	4/14/2003	11.0	24.0	100	100	100	100	100	100
61	4/14/2003	11.0	24.0	100	100	100	100	100	100
62	4/14/2003	11.0	24.0	100	100	100	100	100	100
63	4/14/2003	11.0	24.0	100	100	100	100	100	100
64	4/14/2003	11.0	24.0	100	100	100	100	100	100
65	4/14/2003	11.0	24.0	100	100	100	100	100	100
66	4/14/2003	11.0	24.0	100	100	100	100	100	100
67	4/14/2003	11.0	24.0	100	100	100	100	100	100
68	4/14/2003	11.0	24.0	100	100	100	100	100	100
69	4/14/2003	11.0	24.0	100	100	100	100	100	100
70	4/14/2003	11.0	24.0	100	100	100	100	100	100
71	4/14/2003	11.0	24.0	100	100	100	100	100	100
72	4/14/2003	11.0	24.0	100	100	100	100	100	100
73	4/14/2003	11.0	24.0	100	100	100	100	100	100
74	4/14/2003	11.0	24.0	100	100	100	100	100	100
75	4/14/2003	11.0	24.0	100	100	100	100	100	100
76	4/14/2003	11.0	24.0	100	100	100	100	100	100
77	4/14/2003	11.0	24.0	100	100	100	100	100	100
78	4/14/2003	11.0	24.0	100	100	100	100	100	100
79	4/14/2003	11.0	24.0	100	100	100	100	100	100
80	4/14/2003	11.0	24.0	100	100	100	100	100	100
81	4/14/2003	11.0	24.0	100	100	100	100	100	100
82	4/14/2003	11.0	24.0	100	100	100	100	100	100
83	4/14/2003	11.0	24.0	100	100	100	100	100	100
84	4/14/2003	11.0	24.0	100	100	100	100	100	100
85	4/14/2003	11.0	24.0	100	100	100	100	100	100
86	4/14/2003	11.0	24.0	100	100	100	100	100	100
87	4/14/2003	11.0	24.0	100	100	100	100	100	100
88	4/14/2003	11.0	24.0	100	100	100	100	100	100
89	4/14/2003	11.0	24.0	100	100	100	100	100	100
90	4/14/2003	11.0	24.0	100	100	100	100	100	100
91	4/14/2003	11.0	24.0	100	100	100	100	100	100
92	4/14/2003	11.0	24.0	100	100	100	100	100	100
93	4/14/2003	11.0	24.0	100	100	100	100	100	100
94	4/14/2003	11.0	24.0	100	100	100	100	100	100
95	4/14/2003	11.0	24.0	100	100	100	100	100	100
96	4/14/2003	11.0	24.0	100	100	100	100	100	100
97	4/14/2003	11.0	24.0	100	100	100	100	100	100
98	4/14/2003	11.0	24.0	100	100	100	100	100	100
99	4/14/2003	11.0	24.0	100	100	100	100	100	100
100	4/14/2003	11.0	24.0	100	100	100	100	100	100

Table 1. Results of 1997 salinity tolerance study with mysid shrimp, *Americamysis bahia*.

Date	Acclimation Rate	Duration of Exposure	Salinity (ppt)	Natural Survival (%)	Artificial Survival (%)
8/10/1997	No acclimation	48 hour	4	0	0
	No acclimation	48 hour	5	0	0
	No acclimation	48 hour	6	10	5
	No acclimation	48 hour	7	0	25
	No acclimation	48 hour	8	55	25
7/23/1997	No acclimation	48 hour	20	100	100
	Slow to 10 ppt	96 hour	4	90	100
	Slow to 10 ppt	96 hour	5	60	100
	Slow to 10 ppt	96 hour	6	80	100
	Slow to 10 ppt	96 hour	7	100	100
	Slow to 10 ppt	96 hour	8	95	100
7/28/1997	No acclimation	96 hour	20	100	100
	Slow to 10 ppt	96 hour	4	20	85
	Slow to 10 ppt	96 hour	5	50	80
	Slow to 10 ppt	96 hour	6	60	95
	Slow to 10 ppt	96 hour	7	85	100
	Slow to 10 ppt	96 hour	8	100	100
8/1/1997	No acclimation	96 hour	20	100	100
	Slow to 8 ppt	96 hour	4	80	90
	Slow to 8 ppt	96 hour	5	85	95
	Slow to 8 ppt	96 hour	6	95	95
	Slow to 8 ppt	96 hour	7	95	95
	Slow to 8 ppt	96 hour	8	95	95
8/1/1997	No acclimation	96 hour	20	100	100
	Rapid to 8 ppt	96 hour	4	40	60
	Rapid to 8 ppt	96 hour	5	60	95
	Rapid to 8 ppt	96 hour	6	95	95
	Rapid to 8 ppt	96 hour	7	100	100
	Rapid to 8 ppt	96 hour	8	100	100
8/2/1997	No acclimation	96 hour	20	100	100
	Slow to 8 ppt	48 hour	4	90	90
	Slow to 8 ppt	48 hour	5	95	95
	Slow to 8 ppt	48 hour	6	100	100
	Slow to 8 ppt	48 hour	7	95	95
	Slow to 8 ppt	48 hour	8	100	100
9/2/1997	No acclimation	48 hour	20	100	100
	Rapid to 8 ppt	48 hour	4	90	90
	Rapid to 8 ppt	48 hour	5	95	95
	Rapid to 8 ppt	48 hour	6	100	100
	Rapid to 8 ppt	48 hour	7	95	95
	Rapid to 8 ppt	48 hour	8	95	95
	No acclimation	48 hour	20	100	100

Slow acclimation - Not more than 5 ppt/24-hour period.
Rapid acclimation