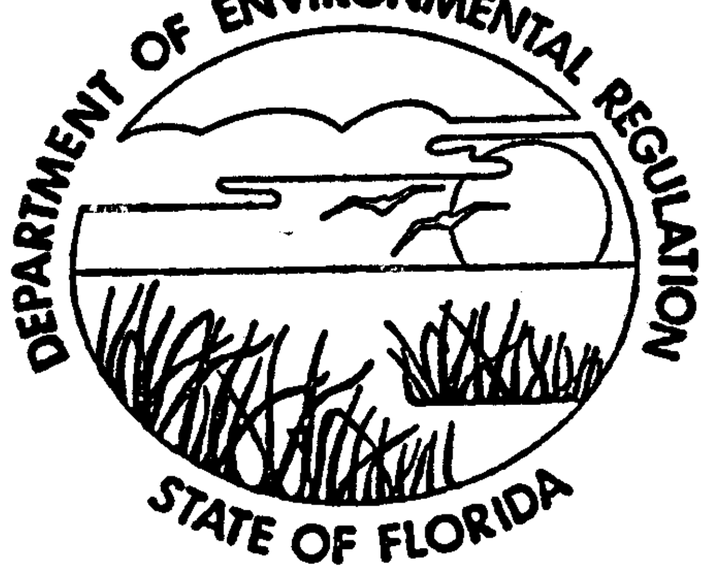


BIOASSAYS OF FLORIDA POWER AND LIGHT COMPANY

RIVIERA BEACH PLANT, COOLING WATER DISCHARGE

RIVIERA BEACH, PALM BEACH COUNTY, FLORIDA

NPDES #FL0001546

SAMPLED 7/6/87

SEPTEMBER 15, 1987

Biology Section
Division of Environmental Programs

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EXECUTIVE SUMMARY

Florida Power and Light, Riviera Beach, Palm Beach County, Florida NPDES #FL0001546, 7 to 9 July, 1987.

One static acute toxicity screening bioassay was performed on a sample of cooling water collected from the Florida Power and Light Riviera Beach Power Plant, using Mysidopsis bahia as the test organism. Results indicated that the sample was not toxic to the test organism during the 48 hour test. Since the sample was not toxic, chemical analyses were not performed.

INTRODUCTION

The Florida Power and Light Riviera Beach Power Plant is lcoated at 200 Broadway in Riviera Beach, Palm Beach County, Florida (Figure 1). The facility has a permitted discharge of 645 MGD of cooling water, which is obtained from adjacent Lake Worth (Intercoastal Waterway). The water is treated with low level chlorination prior to use as coolant in the power plant and is immediately discharged back into Lake Worth. The submerged outfall is located 300 ft offshore.

To evaluate the toxicity of this discharge, the Biology Section performed an acute toxicity screening bioassay on a sample of this cooling water in July, 1987. Results are presented in this report. Those involved in performing the test and in preparation of this report were: J. M. Faircloth, R. B. Frydenborg, K. M. Lurding, and M. L. Roll.

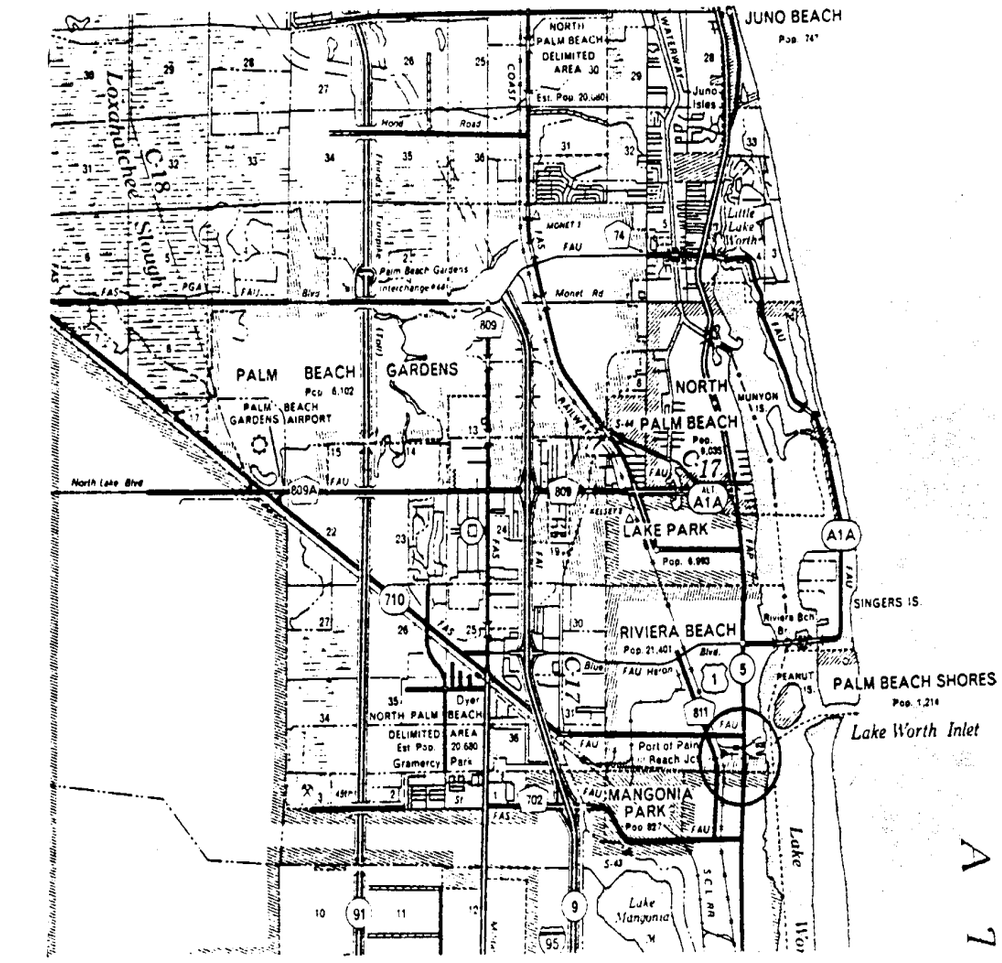


Figure 1. Portion of Palm Beach County, including the location of the Florida Power and Light Riviera Beach Power Plant.

METHODS AND MATERIALS

Test methods used to conduct this static bioassay are extensively described by Peltier and Weber (1985) and the FDER Biology Section (1985). The organism selected for this study is among those recommended by Peltier and Weber (1985), the U.S. EPA (1978), and the FDER Biology Section (1985). The life history and maintenance procedures used to culture the organism are detailed below.

History and Maintenance of Bioassay Organisms

Mysidopsis bahia (mysid shrimp) - In June, 1987 approximately 100 adult mysid shrimp were obtained from the laboratory of Cosper Environmental Services in New York. The mysids are cultured under a 16:8 hour light-dark cycle in 15 gallon all-glass aquaria equipped with recirculating seawater treated by undergravel filtration and aeration. The mysid shrimp are cultured at a salinity of approximately 20 ppt. Seawater, used for culturing the test organisms and as diluent in the bioassays, is prepared by mixing artificial sea salts (Forty Fathoms® or equivalent) and deionized water to obtain a final salinity of 20 to 30 ppt. The mysids are fed twice daily and once daily on weekends with freshly hatched Artemia (brine shrimp) and are kept at a constant temperature of 23° ± 2°C. Adult or large juvenile mysids were used in this test.

To ensure the uniform sensitivity of this test organism to toxic substances, the Biology Section conducts a monthly standard reference toxicant bioassay using sodium lauryl sulfate as the reference toxicant.

Test Methods

Methods used to perform acute toxicity bioassays are described by Peltier and Weber (1985) and the FDER Biology Section (1985). Some of the methods described below are more specific than those of Peltier and Weber. These will be noted in more detail.

Sampling Methods and Test Dates

One static acute toxicity screening bioassay was performed on a sample of cooling water collected from the outfall line of the Florida Power and Light Riviera Beach power plant. The test was performed from 1030 hours on 7 July to 1104 hours on 9 July, 1987.

Separate samples were obtained for chemical and biological testing. Samples for metal analyses were preserved with HNO_3. Samples for organic chemical analyses and for the bioassays were unpreserved. The samples were collected by Mr. William J. Thiel of DER's Southeast Florida District Office at 1035 hours on 6 July, 1987, using standard wastewater sampling procedures. The samples were iced and transported to the DER laboratory in Tallahassee for analyses within 24 hours of collection.

Test Temperature

Upon arrival of the iced (4°C) bioassay sample in the Tallahassee laboratory, the containers were placed in warm water and the temperature of the sample allowed to rise to 23° ± 2°C. Although this temperature may be different than the temperature of the sample during collection, it is the temperature range to which the test organisms are acclimatized and is the range recommended in the above referenced bioassay protocols. This avoids stressful effects caused by exposure to unusually cold or warm samples.

Saltwater Test

Saltwater for the control was prepared from artificial sea salts (Forty Fathoms® or equivalent), mixed with deionized water until a salinity of approximately 30 ppt was achieved. The 100% sample was characterized by an ambient salinity of 34.5 ppt.

The concentration series selected for this study is presented in Table 1. Two replicates of each test concentration and of the control were used to test with Mysidopsis bahia. Immediately prior to the bioassay, a suitable number of mysids were transferred by net from the appropriate salinity aquarium to a culture dish for observation and selection of individuals for the tests. Individual mysid shrimp were siphoned using a glass tube, carefully examined for injury, and transferred to wide mouth quart jars, each containing 500 ml of the appropriate concentration. For each concentration, the mysid shrimp were pre-acclimated to within 4 ppt salinity. Five organisms were loaded per test chamber, giving ten per concentration. Based on the recommendations of EPA (1978), the mysids were fed brine shrimp (Artemia) nauplii at the rate of approximately 10 to 20 nauplii per mysid per day to minimize cannibalism.

Test Parameters

Dissolved oxygen (YSI Model 57 oxygen meter), pH (Corning Model 7 pH meter with Orion Ross® combination electrode), temperature (NBS calibrated glass thermometer), and the number of live organisms were recorded for each test concentration at 0 hours, 24 hours, and 48 hours. Total alkalinity (measured as $CaCO_3$ using HACH Chemical Company reagents) was recorded at the beginning of the test for the control and the 100% effluent concentration. The salinity (YSI Model 33 S-C-T meter) of each test concentration was recorded at the beginning and end of the test. All instruments were calibrated daily according to manufacturer's recommendations. Ammonia concentrations, including the total and unionized fraction (expressed in mg/l as N and as NH_3, respectively), were recorded in the control and the 100% effluent test concentration at the beginning of the test. Total ammonia concentrations were determined using an Orion® specific ion probe and an Orion Ionalyzer®. The unionized fraction was then calculated based on the total ammonia concentration, and the pH, temperature, and salinity of the sample. These values were recorded on the bioassay data form and are presented in Table 2.

Table 1. Concentration Series and Volumes Used for This Static Bioassay.

Mysidopsis bahia (mysid shrimp)

Concentration	Dilution Water	Sample	Total Volume
Control	500 ml	--------	500 ml
100.0%	-------	500 ml	500 ml

Table 2. Data recorded during 48 hour, *Mysidopsis bahia*, static acute toxicity bioassay of Florida Power and Light, Riviera Beach Power Plant, NPDES #FL0001546, 7 to 9 July, 1987.

Concentration or %	Number of Live Organisms			Dissolved Oxygen (mg/l)			pH			Temperature (°C)			Salinity (ppt)	
	0	24	48	0	24	48	0	24	48	0	24	48	0	48
Mysidopsis bahia														
Control	5	5	5	7.2	6.2	6.2	8.3	8.3	8.2	23.1	18.8	18.6		
Control	5	5	5	7.2	6.2	6.2	8.3	8.3	8.2				30.0	29.2
100%	5	5	5	6.9	6.4	6.3	8.2	8.1	8.1	25.1	18.8	18.5		
100%	5	5	5	6.9	6.4	6.3	8.2	8.1	8.1				34.5	32.5

Control Water

NH_3(as NH_3)(mg/1) 0

Total Alkalinity 123 (mg/1 $CaOO_3$)

Total ammonia (as N)(mg/1) 0

Total Hardness (mg/1 $CaOO_3$)

100% Effluent

NH_3(as NH_3)(mg/1) 0

Total Alkalinity 127 (mg/1 $CaOO_3$)

Total ammonia (as N)(mg/1) 0

Total Hardness (mg/1 $CaOO_3$)

RESULTS AND DISCUSSION

The sample of cooling water discharge collected from the Florida Power and Light Riviera Beach Power Plant proved to be not acutely toxic to Mysidopsis bahia. No mortality was noted during the 48 hour static bioassay. Only a trace of residual chlorine (< 0.01 mg/l) and no ammonia were detected in the sample. Because the sample was not toxic, chemical analyses were not performed.

LITERATURE CITED

Florida Department of Environmental Regulation, Biology Section. 1985. Quality Assurance Manual for Performing Acute Toxicity Tests (Second Edition). FDER.

Peltier, W. and C. I. Weber. 1985. Methods for measuring the acute toxicity of effluents to aquatic organisms (Third Edition). Environmental Research Laboratory. Athens, Georgia. EPA-600/4-85-012. 217 p.

U.S. Environmental Protection Agency. 1978. Bioassay procedures for the Ocean Disposal Permit Program. Environmental Research Laboratory. Gulf Breeze, Florida. EPA-600/9-78-010. 121 p.

BIOASSAY DATA FORM

Facility/Toxicant FLA POWER & LIGHT — Test # 1 — Sample Collected: Date 7/6/87 Time 1035

Address 200 Broadway, Riviera Bch. FL — Type Screen — Test Beginning: Date 7/7/87 Time 1038

NPDES Number FL0001546 — Organism M. bahia — Test Ending: Date 7-9-87 Time 1104

Outfall Number

Test Concentration	Chamber Number	Live Organisms 0	24	48	Dissolved Oxygen (mg/l) 0	24	48	pH 0	24	48	Temperature °C 0	24	48	Salinity 0	48	Ammonia Total 0	48	Unionized 0	48
*Control	47	5	5	5	7.2	6.2	6.2	8.3	8.3	8.2	23.1	18.8	18.6	30		0.0		0	
Control	44	5	5	5	7.2	6.2	6.2	8.3	8.3	8.2				29.0	29.2				
100%	33	5	5	5	6.9	6.4	6.3	8.2	8.1	8.1	25.1	18.8	18.6						
100%	27	5	5	5	6.9	6.4	6.3	8.2	8.1	8.1				34.5	32.5	0.0		0	

M. bahia

RJR KMR KMR RBF MLR MLR RBF MLR MLR RBF MLR MLR RBF MLR RJR MLR

NOTES

Control Water

Total Alkalinity (mg/l $CaCO_3$) 123

Total Hardness (mg/l $CaCO_3$)

100% Sample

Total Alkalinity (mg/l $CaCO_3$) 127

Total Hardness (mg/l $CaCO_3$)

Age of Test Organisms JUVENILES

Weight

Instrument Calibrations:

	pH Meter:	D.O. Meter:	S-C-T Meter:
0 Hours	7 at 7.9 at 9	9.2 at 20°C	10 at 10.2 at 30
24 Hours	7 at 7.4 at 9	9.3 at 19°C	
48 Hours	~~7 at 7.4 at 9~~	9.2 @ 20°C	~~10.0 at 10.25~~ sat 30

Reviewed by

Date 9/14/87

* Controls Salinity adjusted to 30 ppt

a mysids acclimated to higher salinity by addition of sea salts to culture dish over a one hour period.