

US EPA ARCHIVE DOCUMENT

MAY 25 1990  
MIRD No. 405360-01

## DATA EVALUATION RECORD

1. **CHEMICAL:** Carbofuran  
Shaughnessey No. 090601
2. **TEST MATERIAL:** Carbofuran technical (98.6% a.i.)
3. **STUDY TYPE:** Mysid 28-day Life Cycle Test
4. **STUDY ID:** Ward, Timothy J. 1988. 28-day life cycle toxicity of carbofuran to mysids Mysidopsis bahia. Enseco Incorporated, Marblehead, MA for FMC Corporation, Princeton, NJ. MRID No. 405360-01.
5. **REVIEWED BY:**  
  
Clyde R. Houseknecht  
Wildlife Biologist  
EEB/EFED  
  
Signature: *Clyde R. Houseknecht*  
Date: *May 22, 1990*
6. **APPROVED BY:**  
  
Henry T. Craven, Head  
Review Section #4  
EEB/EFED  
  
Signature: *Henry T. Craven*  
Date: *5/25/90*
7. **CONCLUSIONS:**  
  
The 28-day LOEC (adult survival), NOEC and MATC of technical carbofuran to mysids were 0.98, 0.40 and 0.63 ug/l, respectively.
8. **RECOMMENDATIONS:** N/A



9. BACKGROUND: N/A
10. DISCUSSION OF INDIVIDUAL TESTS: N/A
11. MATERIALS AND METHODS:

A. Test Animals Mysids used in this test were obtained from laboratory cultures at Enseco and were less than 24 hours post-hatch. They were maintained in natural seawater at test conditions and were fed brine shrimp nauplii at least once per day.

B. Test System: One-hundred mysids were randomly distributed among two replicates (50 mysids per replicate) of each treatment seven days after the initiation of the flow-through system. Exposure vessels consisted of glass aquaria that were 52 cm long, 26 cm wide, and filled to a depth of 2-7 cm (fluctuating water depth was due to a self-starting siphon which drained each vessel to a depth of 2 cm after it filled to a depth of 7 cm). Maximum water volume in each exposure vessel was 9.5 l. Within each exposure vessel the 50 mysids were subdivided equally into five groups, and each group was separately placed in a cage that consisted of a 9 cm diameter glass petrie dish with a 9 cm high collar of Nitex screen. Culture vessels were arranged in a water bath that was placed in an environmental chamber.

Natural sea water was collected from Marblehead Harbor, Massachusetts. It was sand filtered, fiber filtered (5 microns), stored in 200-500 gallon polyethylene tanks and aerated. Test medium was formulated and delivered to each exposure vessel by a proportional diluter. The diluter was activated an average of 116 times per day. The volume exchange in each exposure chamber averaged more than 6 times per day.

After 13 days of exposure, the surviving mysids in each replicate were randomly reduced to 20, and were divide into 10 pairs each consisting of one male and one female. Each pair was placed in a separate cage (described above). Survivorship, the occurrence of abnormal behavior, and the number of young produced by each pair were determined each day. At the conclusion of the test, the dry weight of each surviving mysid was determined.

Aeration was not employed during the test and the photoperiod was set at 16 hours light and 8 hours dark. Dissolved oxygen concentration, pH, salinity, and temperature were measured at 24-hour intervals during the test.

Analytical determination of test material concentration was performed on duplicate composite samples.

C. Dosage: Nominal concentrations of carbofuran were 5.95, 3.01, 2.17, 1.33 and 0.56 ug/l. Mean measured concentrations

were 5.0, 2.2, 1.5, 0.98, and 0.40 ug/l.

D. Design: 28-day life cycle test.

E. Statistics: Cochran's Test was used to determine that variance of mean survival and reproductive data were homogeneous. Analysis of variance and Dunnett's technique were utilized to compare survival and reproduction data between organisms in controls and test concentrations.

12. REPORTED RESULTS: The author of the study reported that the most sensitive measure of toxicity was survival of parental generation mysids at the end of the exposure period. The lowest observed effect concentration (LOEC) determined during this test was 0.98 ug/l carbofuran. All concentrations of carbofuran above 0.98 ug/l caused complete mysid mortality within 48 hours. Throughout the 28-day exposure no sublethal behavioral effects were noted except that surviving mysids exposed to 1.5 and 2.2 ug/l carbofuran for 24 hours were immobilized and unable to maintain position in the water column. The exposure of mysids to 0.40 and 0.98 ug/l carbofuran did not increase the time to first brood or number of young produced per female, when compared with the controls. The no observed effect concentration (NOEC) determined during this 28-day life cycle toxicity test with mysids and carbofuran was 0.40 ug/l. The maximum acceptable toxicant concentration (MATC), expressed as the geometric mean of the LOEC and the NOEC was 0.63 ug/l.

13. STUDY AUTHOR'S CONCLUSION/QUALITY ASSURANCE MEASURES: F M C Corporation certifies that this study complies with Good Laboratory Practice regulations as published by the U.S. Environmental Protection Agency, Office of Pesticide Programs in 40 CFR Part 160.

14. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:

A. Test Procedures:

With two minor exceptions listed below, the procedures used in this study are in accord with those recommended in the Standard Guide for Conducting Life-cycle Toxicity Tests with Saltwater Mysids published by the American Society for Testing and Materials.

- o Not all test concentrations were at least 50% of the next highest concentration.
- o The temperature of the test solutions fell slightly outside of the desired range on test days 14 and 15.

B. Statistical Analysis: In those instances where adequate raw data were presented, the EEB reviewer confirmed the statistical analyses provided in the report.

C. Discussion/Results: See 14D.(2) below.

D. Adequacy of the Study:

(1) Classification: Supplementary

(2) Rationale: Raw data were not provided to allow the reviewer to confirm survivorship and reproductive parameters.

(3) Repairability: This study can be upgraded to core if raw data for survivorship and reproduction are provided and reported results are corroborated by EEB.

15. COMPLETION OF ONE-LINER: Yes, May 22, 1990.

Table 1. Concentration of carbofuran measured during toxicity test with mysids, *Mysidopsis bahia*, conducted during July 22-August 19, 1987<sup>a</sup>.

Date of sample collection - day of test	Measured Concentration (µg/l) <sup>b</sup>											
	Control (nominal = 0.00 µg/l)		Nominal = 0.56 µg/l		Nominal = 1.33 µg/l		Nominal = 2.17 µg/l		Nominal = 3.01 µg/l		Nominal = 5.95 µg/l	
	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
7-22-87 Day 0	ND	ND	0.40	0.48	0.98	0.93	1.6	1.7	2.1	2.1	4.6	4.9
7-26-87 Day 4	ND	ND	0.44	0.40	0.90	0.94	1.2	1.5	2.2	2.4	4.9	5.5
7-29-87 Day 7	ND	ND	0.37	0.44	0.98	0.98						
8-1-87 Day 10	ND	ND	0.34	0.48	1.0	1.1						
8-5-87 Day 14	ND	ND	0.35	0.48	0.93	0.89						
8-8-87 Day 17	ND	ND	0.39	0.47	0.92	0.94						
8-12-87 Day 21	ND	ND	0.36	0.30	0.91	1.0						
8-19-87 Day 28	ND	ND	0.41	0.44	1.1	1.2						
Mean	ND		0.40		0.98		1.5		2.2		5.0	
Standard deviation	--		0.06		0.08		0.2		0.1		0.4	

<sup>a</sup>Replicates were each composite samples collected from both exposure tanks at each concentration. Samples were not collected for analysis after complete mortality occurred at any test concentration.

<sup>b</sup>The detection limit is 0.1 µg/l carbofuran.

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Table 2. Summary of water quality parameters measured during toxicity test with carbofuran and mysids, Mysidopsis bahia, conducted during July 22-August 19, 1987<sup>a</sup>

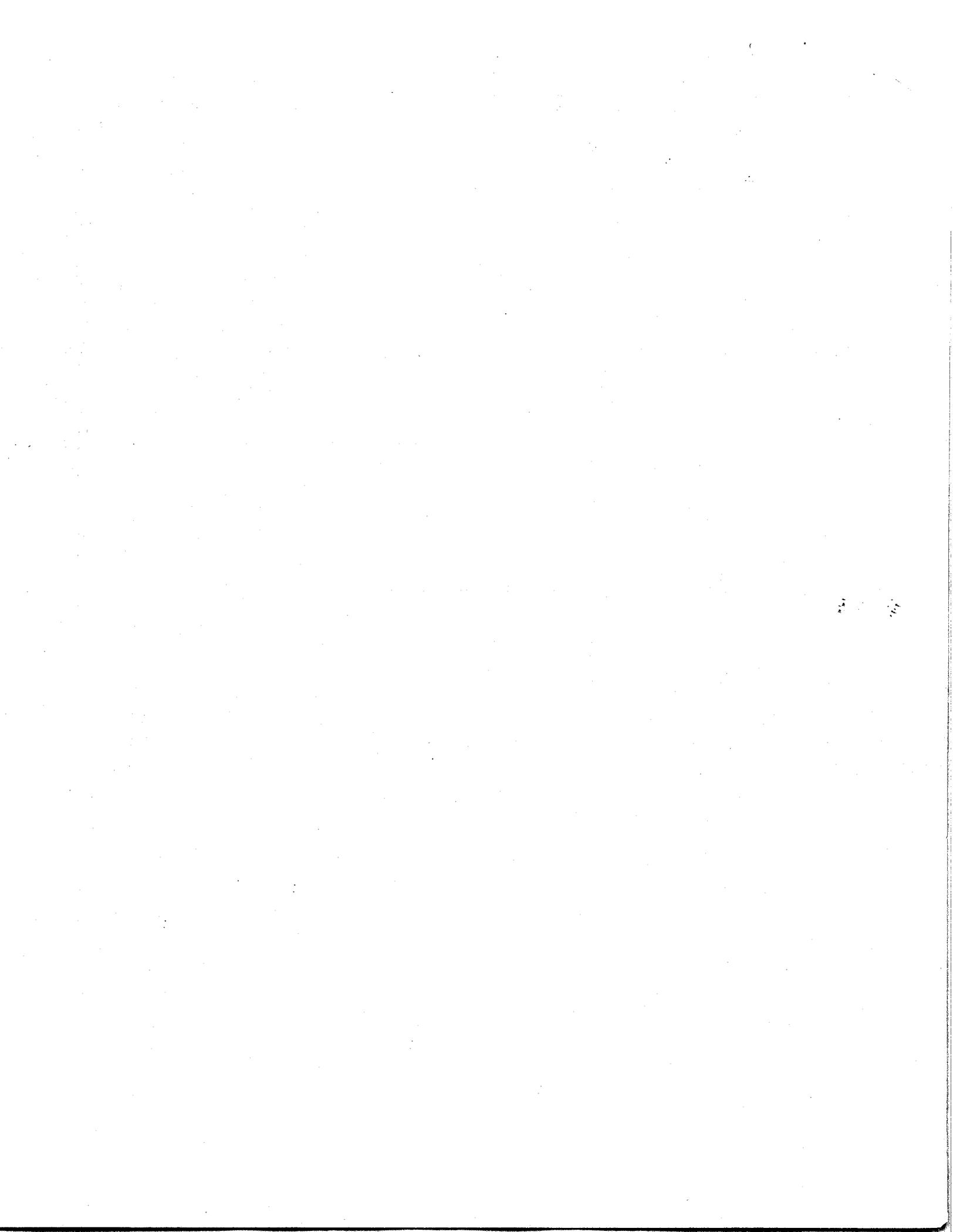
Mean measured concentration of carbofuran (µg/L)	Dissolved oxygen concentration (ppm)	pH	Temperature (°C)	Salinity (‰)
Control	5.8 ± 0.7	8.0 ± 0.1	26.7 ± 0.5	29.5 ± 0.7
0.40	5.7 ± 0.7	8.0 ± 0.1	26.7 ± 0.4	29.4 ± 0.7
0.98	5.7 ± 0.7	8.0 ± 0.1	26.8 ± 0.5	29.4 ± 0.7
1.5	5.8 ± 0.7	8.0 ± 0.1	27.1 ± 0.5	28.0 ± 0.0
2.2	5.8 ± 0.6	8.0 ± 0.1	27.1 ± 0.4	28.0 ± 0.0
5.0	6.0 ± 0.5	8.0 ± 0.1	27.4 ± 0.2	28.0 ± 0.0

<sup>a</sup>Values presented are the mean (standard deviation).

Table 3. Summary of survival, reproduction and growth of Mysidopsis bahia exposed to carbofuran technical for 28 days.

	Survival (%) Days 0-13	Survival (%) Days 14-28	Number of young/female	Dry weight (mg)
Control	90.0	77.5	23.0	0.992 ± 0.220
0.40	95.0	70.0	25.9	1.119 ± 0.240
0.98	93.0	65.0*	18.8	1.063 ± 0.331
1.50	0	0	0	0
2.2	0	0	0	0
5.0	0	0	0	0

\*Significantly different from control (P < 0.05).



Shaughnessy No. D90601

Chemical Name CARBOFURAN

Chemical Class \_\_\_\_\_

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Study/Species/Lab/Access #	Chemical % a.i.	Results	Reviewer/Date	Validation Status
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14-Day Single Dose Oral LD50		LD50 = mg/kg ( <u>95% C.L.</u> )	Contr. Mort.(%)=	
Species:		Slope= # Animals/Level=	Age(Days)=	
Lab.:			Sex =	
Acc. #:		14-Day Dose Level mg/kg/(% Mortality)	( ) , ( ) , ( ) , ( ) , ( )	
Comments:				

14-Day Single Dose Oral LD50		LD50 = mg/kg ( <u>95% C.L.</u> )	Contr. Mort.(%)=	
Species:		Slope= # Animals/Level=	Age(Days)=	
Lab.:			Sex =	
Acc. #:		14-Day Dose Level mg/kg/(% Mortality)	( ) , ( ) , ( ) , ( ) , ( )	
Comments:				

8-Day Dietary LC50		LC50 = ppm ( <u>95% C.L.</u> )	Contr. Mort.(%)=	
Species:		Slope= # Animals/Level=	Age(Days)=	
Lab.:			Sex =	
Acc. #:		8-Day Dose Level ppm/(% Mortality)	( ) , ( ) , ( ) , ( ) , ( )	
Comments:				

8-Day Dietary LC50		LC50 = ppm ( <u>95% C.L.</u> )	Contr. Mort.(%)=	
Species:		Slope= # Animals/Level=	Age(Days)=	
Lab.:			Sex =	
Acc. #:		8-Day Dose Level ppm/(% Mortality)	( ) , ( ) , ( ) , ( ) , ( )	
Comments:				

96-hour LC50		LC50 = pp ( <u>95% C.L.</u> )	Contr. Mort.(%)=	
Species:		Slope= # Animals/Level=	Sol. Contr. Mort.(%)=	
Lab.:			Temperature =	
Acc. #:		96-Hour Dose Level pp/(% Mortality)	( ) , ( ) , ( ) , ( ) , ( )	
Comments:				

96-hour LC50		LC50 = pp ( <u>95% C.L.</u> )	Con. Mor(%)=	
Species:		Slope= # Animals/Level=	Sol. Con. Mor.(%)=	
Lab.:			Temp.=	
Acc. #:		96-Hour Dose Level pp/(% Mortality)	( ) , ( ) , ( ) , ( ) , ( )	
Comments:				

48-hour Invertebrate		LC50 = pp ( <u>95% C.L.</u> )	Con. Mort.(%)=	
Species:		Slope= # Animals/Level=	Sol. Con. Mort.(%)=	
Lab.:			Temp.=	
Acc. #:		96-Hour Dose Level pp/(% Mortality)	( ) , ( ) , ( ) , ( ) , ( )	
Comments:				

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Study/Species/Lab/ Accession #	Chemical & Active	Results				Reviewer/ Date	Validation Status
		Group	Dose(ppm)	Effectuated/Parameters	Mort.(%)		
Avian Reproduction, Species:		Control					
Lab:		Treatment I					
Acc. #:		Treatment II					
		Treatment III					
		Study Duration:					
		Comments:					

Field Study(Simulated/Actual)	Group	Rate(ai/a)	Treatment Interval	Total # Treatments	Mor.(%)		
Species:	Control						
Lab:	Treatment I						
Acc. #:	Treatment II						
	Treatment III						
	Crop/Site:				Study Duration:		
	Comments:						

Chronic fish,	Concentrations Tested (pp <sub>m</sub> )= _____
Species	MAIC = > _____ < _____ pp <sub>m</sub> .      Effectuated Parameter = _____
Lab:	Contr. Mort.(%)= _____      Sol. Contr. Mort.(%)= _____
Acc. #:	Comments:

Chronic invertebrate, 28-Day Mysid	Concentrations Tested (pp <sub>m</sub> )= <u>0.40, 0.98, 1.5, 2.2, 5.0</u> pp <sub>m</sub>
Species <u>MYSIDOPSIS</u>	MAIC => <u>0.63</u> pp <sub>m</sub> .      Effectuated Parameter(s) <u>ADULT SURVIVAL</u>
Lab: <u>BATHIA</u>	Contr. Mort.(%)= <u>22.5</u> Sol. Contr. Mort.(%)= <u>—</u> <u>CRA</u> <u>SUPP.</u>
Acc. #: <u>ONSICO, MARBLEHEAD, MA</u>	Comments: <u>SUPPLEMENTARY BECAUSE OF FAILURE TO PROVIDE ALL RAW DATA.</u> <u>5/24/90</u>
<u>405360-01</u>	

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