12-20-93

DP Barcode :D188790
PC Code No :059101
EEB Out : DEC 20 1993

To: Linda Propst
Product Manager 73
Special Review and Reregistration Division (7508W)

From: Anthony F. Maciorowski, Chief
Ecological Effects Branch/EFED (7507C)

Attached, please find the EEB evaluation of one study for the insecticide Chlorpyrifos:

Reg./File # :059101
Chemical Name :Chlorpyrifos
Type Product :Insecticide
Product Name :Dursban
Company Name :DowElanco
Purpose :Evaluation of mysid life-cycle study for rere-gistration purposes.
Action Code :627 Date Due:
Reviewer :Alvaro A. Yamhure Date in EEB:

GUID. LINE	STUDY TYPE	MRID NO.
72-4(b)	Aquatic invertebrate life-cycle	426649-01

EEB file

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

DEC 20 [illegible]

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

Subject: The Ecological Effects Branch (EEB) has evaluated the mysid life-cycle study MRID No. 426649-01 under DP Barcode D188790 for the chemical chlorpyrifos (chemical code 059101).

From: Anthony F. Maciorowski, Chief
Ecological Effects Branch
Environmental Fate and Effects Division
7507C

12/20/93

To: Linda Propst, PM 73
(Joanne Edwards)
Special Review and Reregistration Division
7508W

Please find herein attached the Ecological Effects Branch (EEB) review of the following Chlorpyrifos study:

Sved, D.W., K.R. Drottar, J.P. Swigert, and G.J. Smith. 1993. Chlorpyrifos: A Flow-Through Life-Cycle Toxicity Test with the Saltwater Mysid (*Mysidopsis bahia*). Project No. 103A-103C. Prepared by Wildlife International Ltd., Easton, MD. Submitted by DowElanco, Indianapolis, IN. EPA MRID No. 426649-01.

In this case, and barring any proof to the contrary, the data suggests that the results observed in the various treatment levels, other than the solvent control, are likely due to the toxicological properties of the pesticide rather than to the solvent which is an EPA-approved solvent because of its known very low level of toxicity when used for this type of testing. Therefore EEB will use the results of this test for risk evaluation purposes. EEB has rated this study as supplemental.

If we can be of further assistance, please contact Alvaro A. Yamhure of the EEB staff at (703) 305-6179.

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DP BARCODE: D188790 REREG CASE #

CASE: 818975 DATA PACKAGE RECORD DATE: 03/03/93
SUBMISSION: S436323 BEAN SHEET Page 1 of 1

* * * CASE/SUBMISSION INFORMATION * * *

CASE TYPE: REREGISTRATION ACTION: 627 GENERIC DATA SUBMISSION
CHEMICALS: 059101 Chlorpyrifos (ANSI) 100.00 %

ID#: 059101
COMPANY:
PRODUCT MANAGER: 73 LINDA PROPST 703-308-8165 ROOM: CS1 2L5
PM TEAM REVIEWER: JOANNE EDWARDS 703-308-8046 ROOM: CS1 2D6
RECEIVED DATE: 02/16/93 DUE OUT DATE: 05/17/93

* * * DATA PACKAGE INFORMATION * * *

DP BARCODE: 188790 EXPEDITE: N DATE SENT: 03/03/93 DATE RET.: / /
CHEMICAL: 059101 Chlorpyrifos (ANSI)
DP TYPE: 001 Submission Related Data Package
ADMIN DUE DATE: 06/01/93 CSF: N LABEL: N

ASSIGNED TO	DATE IN	DATE OUT
DIV : EFED	03/04/93	/ /
BRAN: EEB	03/04/93	12/21/93
SECT:	/ /	/ /
REVR :	/ /	/ /
CONTR:	/ /	/ /

* * * DATA REVIEW INSTRUCTIONS * * *

72-4B, LIFE CYCLE INVERTEBRATE
(42664901)

* * * ADDITIONAL DATA PACKAGES FOR THIS SUBMISSION * * *

DP BC	BRANCH/SECTION	DATE OUT	DUE BACK	INS	CSF	LABEL

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DATA EVALUATION RECORD

1. **CHEMICAL:** Chlorpyrifos.
Shaughnessey No. 059101.

2. **TEST MATERIAL:** 1) Dursban; chlorpyrifos, o,o-diethyl o-(3,5,6-trichloro-2-pyridinyl); AGR 284109; 99.7% active ingredient; a white crystalline solid.
2) Chlorpyrifos-2,6-^{14}C; Reference No. A903-87; 25.2 mCi/mmole specific activity; ≥99% radiochemical purity; a clear liquid.

3. **STUDY TYPE:** 72-4. Saltwater Mysid Life-Cycle Toxicity Test. Species Tested: *Mysidopsis bahia*.

4. **CITATION:** Sved, D.W., K.R. Drottar, J.P. Swigert, and G.J. Smith. 1993. Chlorpyrifos: A Flow-Through Life-Cycle Toxicity Test with the Saltwater Mysid (*Mysidopsis bahia*). Project No. 103A-103C. Prepared by Wildlife International Ltd., Easton, MD. Submitted by DowElanco, Indianapolis, IN. EPA MRID No. 426649-01.

5. **REVIEWED BY:**

Alvaro A. Yamhure
Aquatic Biologist, EEB/EFED
USEPA

Signature:
Date: 12/17/93

6. **APPROVED BY:**

Daniel Rieder,
Head Section 3
EEB/EFED

Signature:
Date:

7. **CONCLUSIONS:** Because it is unclear if the observed adverse reproductive effects on the mysids may have been influenced by the solvent (acetone) or produced by chlorpyrifos alone, because there was no mortality in the solvent control and because the test appears to be otherwise sound, we have rated this study as **supplementary.** The mean number of young produced per female in the solvent control (1.21) was less than required (3). Since the solvent control reproduction results are questionable, the MATC based on comparison to the dilution water control results was <4.6 ng a.i./l. This level of toxicity classifies **this chemical as very highly toxic** to the mysid reproductive cycle. [See also page 7, section 14(c) of this DER].

8. **RECOMMENDATIONS:** N/A.

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9. **BACKGROUND:**

10. **DISCUSSION OF INDIVIDUAL TESTS:** N/A.

11. **MATERIALS AND METHODS:**

A. **Test Animals:** Young mysids (<24 hours old) were obtained from in-house cultures. Brooding adults were held in the same dilution water as that used during the test for at least 14 days before juveniles were collected for testing.

B. **Test System:** A continuous-flow diluter was used to prepare and distribute the test solutions. The diluter was adjusted so that each chamber received approximately 16 volume additions every 24 hours. The aquaria were conditioned with test solution for 11 days prior to test initiation.

Prior to pairing for reproduction, the test compartments (12-cm diameter and 19-cm high) were glass culture dishes with nylon screen collars. During the reproduction portion of the study, mysid pairs were housed in compartments (5.5-cm diameter and 12-cm high) constructed of glass petri dishes and nylon screen. All compartments were located in Teflon®-lined 25-l chambers. The solution volume ranged from 6.3 to 9 l. The chambers were indiscriminately positioned in a temperature-controlled water bath set to maintain 27 ±1°C.

The laboratory environment was maintained on a 16-hour light photoperiod with 30-minute dawn and dusk simulations. The light intensity during the test was approximately 320 lux.

A radiolabeled primary stock solution (0.025 mg/ml) was prepared by diluting the radiolabeled test material in acetone. The primary stock of chlorpyrifos (0.050 mg/ml) was also prepared in acetone. One radiolabeled working stock was prepared for each exposure level by combining aliquots of the two primary stocks and diluting with acetone. The five stocks were pumped to the diluter and mixed with saltwater to achieve the desired concentrations. Test concentrations were adjusted for the purity of the nonradiolabeled test material.

Natural seawater, collected at Indian River Inlet, DE, was diluted with well water, aerated, and filtered before use as test dilution water. The salinity and pH of the dilution water at test initiation was 25 parts per thousand (ppt) and 8.0, respectively.

C. **Dosage:** Thirty-five-day, life-cycle chronic test. Based on acute toxicity data, five nominal concentrations (5, 10, 20, 40, and 80 ng a.i./l), a solvent control, and a dilution water control were used. The concentration of acetone in the solvent control and exposure groups was 0.04 ml/l.

D. **Design:** Mysids were indiscriminantly counted into small cups until each cup contained 15 individuals. The cups were indiscriminately assigned and dipped into each of two compartments per test chamber to release the mysids. Two replicate chambers were used, for a total of 60 individuals per treatment. After 14 days of exposure, the sex of the mysids was determined by microscopic examination. Up to 10 male and female pairs were maintained in each chamber in separate compartments. Additional males were maintained in a separate compartment to serve as replacements for males which had died. Additional females and sexually immature mysids were discarded.

The mysids were fed live brine shrimp nauplii enriched with a fatty acid supplement three times daily during the test.

Observations of mortality and behavior first generation mysids were made daily throughout the test. After pairing, the number of second generation mysids produced and their development and behavior were observed daily. The second generation mysids were discarded after observation. At test termination, the length and dry weight of each surviving first generation mysid were determined.

The dissolved oxygen concentration (DO), salinity, temperature, and pH were measured in each replicate daily. The temperature of a dilution water control chamber was monitored continuously.

Water samples from each replicate were collected at test initiation and at weekly intervals during the study (test days -1, 0, 7, 14, 21, 28, and 35). Total ^{14}C in each sample was determined using liquid scintillation counting (LSC).

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E. **Statistics:** The following endpoints were analyzed statistically: the number of surviving adult mysids, the number of young produced by each first generation mysid, and the length and weight of surviving mysids at the end of the test.

Survival data were analyzed using Fisher's Exact test. Treatment groups with significantly affected survival were excluded from further analysis. Reproduction and growth data were tested for normality and homoscedasticity using the chi-square test and Bartlett's test, respectively. Bonferroni's T-test was used to determined significant differences between the exposure groups and the control.

12. **REPORTED RESULTS:** The mean measured concentrations were 4.6, 10, 20, 43, and 73 ng a.i./l (Table 6, attached).

Survival of mysids was evaluated both prior to pairing (days 0-14) and after pairing (days 14-35). Prior to pairing, mortality in the dilution water and solvent controls was 8.2 and 3.3%, respectively (Table 8, attached). Mortality in the 4.6 ng a.i./l treatment was 3.3% and was not considered to be treatment related. Above 4.6 ng a.i./l, mortality increased with increasing concentration. Sublethal effects were observed at concentrations ≥20 ng a.i./l.

Mysids were sexed and paired on day 14. Mortality in the dilution water and solvent controls during the reproductive phase of the test was 23 and 15%, respectively (Table 9, attached). Mortality at 4.6 ng a.i./l was not considered treatment related. There were concentration dependent increases in mortality at all test concentrations ≥10 ng a.i./l.

Reproduction was first observed on day 19 in replicate B of the dilution water control (Table 10, attached). The total number of young produced in the dilution water control was 151 resulting in 7.35 young per female or 0.477 young per reproduction day (Table 11, attached). Reproduction in the solvent control and lowest test concentration was much lower than the dilution water control. "The difference in production between the two control groups suggested that the solvent had an adverse effect upon reproduction. Therefore, all statistical comparisons were made between the treatment groups and the solvent control group." Reproduction was not significantly affected at 4.6 and 10 ng a.i./l. There was no reproduction at 20, 43, and 73 ng a.i./l.

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Adult mysid lengths and weights were summarized in Table 12 (attached). When compared to the solvent control group, there were no apparent effects upon the lengths of either sex in any treatment with surviving mysids. Male mysids in the 10 ng a.i./l treatment group had significantly smaller mean weight than did males in the solvent control. Male weight at 4.6 ng a.i./l was not significantly affected. Female weights in the treatments were not significantly different from those of the solvent control. "Insufficient numbers of mysids survived until test termination in order to evaluate effects upon the mean weights of mysids in the 20, 43, and 73 ng/l test concentrations." No mysids in the 43 and 73 ng a.i./l treatments survived the reproduction phase of the test.

During the test, the DO was ≥60% of saturation (4.2-7.3 mg/l). The pH values ranged from 7.6 to 8.0 and the temperature was 26.0-27.1°C. The salinity was 24-29 ppt.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** There were no apparent treatment related effects upon survival, reproduction, or growth of mysids exposed to 4.6 ng a.i./l chlorpyrifos. The no-observed-effect concentration (NOEC) and lowest-observed-effect concentration (LOEC) were 4.6 and 10 ng a.i./l, respectively. The maximum acceptable toxicant concentration (MATC) was >4.6 and <10 ng a.i./l. The geometric mean MATC was 6.8 ng a.i./l.

Quality Assurance and Good Laboratory Practice Statements were included in the report, indicating that the study was conducted in accordance with U.S. EPA Good Laboratory Practice Standards set forth in 40 CFR Part 160. Characterization of the test substance was the responsibility of the sponsor. The dates and types of quality assurance audits were reported.

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

A. **Test Procedure:** Since there is no SEP for mysid life cycle tests at this time, ASTM recommended guidelines (1990) were used in the data validation process. This test cannot be considered scientifically sound because the solvent strongly affected reproduction and growth. The ASTM guidelines state that a test is not acceptable if the average number of young produced per female in the control during the test was less than 3. The mean number of young per female in the solvent control was 1.21 (Table 10, attached).

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The results of continuous temperature monitoring during the test should have been reported.

B. **Statistical Analysis:** The reviewer used computer programs (Toxstat 3.3 or Crunch 3) to analyze mysid survival, the number of young produced per reproductive day, and the length and weight of surviving mysids. Survival data were arcsine square-root transformed prior to analysis. For each parameter analyzed, the responses of the dilution water control and the solvent control were compared using a t-test or ANOVA. Responses of the exposed mysids were compared to those of the solvent control using two-way analysis of variance and Bonferroni's test.

Prior to pairing, mysid survival was significantly lowered at concentrations ≥20 ng a.i./l (printout 1, attached). At the end of the test, paired mysid survival in concentrations ≥10 ng a.i./l was significantly reduced (printout 2, attached).

Compared to the solvent control, reproduction in the two lowest concentrations, the only exposure levels with reproduction, was not significantly affected by exposure to chlorpyrifos (printout 3, attached). However, reproduction in the solvent control and two lowest exposures was significantly lower than in the dilution water control, indicating a significant deleterious effect from exposure to the solvent.

The results for male and female lengths and weights were the same as for reproduction (printouts 4-7, attached). Lengths and weights for surviving mysids in the 20 and 43 ng a.i./l treatments were not included in the analysis since only 1-2 mysids in each replicate of these levels survived the test and their inclusion would have led to an unbalanced ANOVA.

C. **Discussion/Results:** The authors stated in the text and showed in Table 10 (attached) that no mysids in the 43 ng a.i./l treatment survived until test termination. However, Table 12 (attached) presents growth data for this test level. According to the raw data (Appendix IX), length and weight of one male and two females in this test group were measured at test termination. Another discrepancy occurred in Appendix X (Changes to Protocols). It was stated that "The preferred solvent was changed from triethylene glycol to N,N-dimethyl formamide," when in fact, acetone was actually used.

The appearance of the data, as presented to EEB for evaluation, suggests that the presence of the solvent (acetone) may have affected mysid reproduction and growth; however, over the many years that EEB has reviewed hundreds of tests where acetone was used as a solvent EEB has never found acetone to have any significant toxicological properties on any of the organisms tested and we are therefore inclined to assigned the observed adverse effects to the test material.

In this case, and barring any proof to the contrary, the data suggests that the results observed in the various treatment levels other than the solvent control are likely due to the toxicological properties of the pesticide. EEB therefore will use the results of this test for risk evaluation purposes and therefore we rate this study as supplemental. (The possibility of chemical contamination of the test system remains a possibility).

The mean number of young produced per female in the solvent control (1.21) was less than required (3). The concentration of acetone used (0.04 ml/l) was not excessive in relation to the maximum amount allowed in the guidelines (0.1 ml/l). However, the laboratory should have determined the sensitivity of their laboratory-raised mysids to acetone exposure prior to the conduct of this study. Based on the responses of the solvent control mysids, the maximum acceptable toxicant concentration (MATC) was >4.6 and <10 ng a.i./l (geometric mean MATC = 6.8 ng a.i./l). Since the solvent control reproduction results were not considered acceptable, the MATC based on comparison to the dilution water control results was <4.6 ng a.i./l.

D. **Adequacy of the Study:**

(1) **Classification:** Supplemental.

(2) **Rationale:** The presence of the solvent appears to have adversely affected mysid reproduction and growth; however, this is not totally clear given our experience with acetone as a solvent and that the test is otherwise sound we feel compelled to accept the data as it stands. [The mean number of young produced per female in the solvent control (1.21) was less than required (3)].

(3) **Repairability:** No.

15. **COMPLETION OF ONE-LINER FOR STUDY:** Yes, 04-16-93.

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DATA EVALUATION RECORD

1. **CHEMICAL:** Chlorpyrifos.
Shaughnessey No. 059101.

2. **TEST MATERIAL:** 1) Dursban; chlorpyrifos, o,o-diethyl o-(3,5,6-trichloro-2-pyridinyl); AGR 284109; 99.7% active ingredient; a white crystalline solid.
2) Chlorpyrifos-2,6-^{14}C; Reference No. A903-87; 25.2 mCi/mmole specific activity; ≥99% radiochemical purity; a clear liquid.

3. **STUDY TYPE:** 72-4. Saltwater Mysid Life-Cycle Toxicity Test. Species Tested: *Mysidopsis bahia*.

4. **CITATION:** Sved, D.W., K.R. Drottar, J.P. Swigert, and G.J. Smith. 1993. Chlorpyrifos: A Flow-Through Life-Cycle Toxicity Test with the Saltwater Mysid (*Mysidopsis bahia*). Project No. 103A-103C. Prepared by Wildlife International Ltd., Easton, MD. Submitted by DowElanco, Indianapolis, IN. EPA MRID No. 426649-01.

5. **REVIEWED BY:**

Louis M. Rifici, M.S.
Associate Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature: Louis M Rifici
Date: 4/29/93

6. **APPROVED BY:**

Pim Kosalwat, Ph.D.
Senior Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature: P. Kosalwat
Date: 4/29/93

James J Goodyear, Ph.D.
~~Henry T. Craven, M.S.~~
Supervisor, EEB/EFED
USEPA

Signature:
Date: 12/20/93

7. **CONCLUSIONS:** This study is not scientifically sound. The presence of the solvent strongly affected mysid reproduction and growth. The mean number of young produced per female in the solvent control (1.21) was less than required (3). Since the solvent control reproduction results were not considered acceptable, the MATC based on comparison to the dilution water control results was <4.6 ng a.i./l.

8. **RECOMMENDATIONS:** N/A.

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9. **BACKGROUND:**

10. **DISCUSSION OF INDIVIDUAL TESTS:** N/A.

11. **MATERIALS AND METHODS:**

A. **Test Animals:** Young mysids (<24 hours old) were obtained from in-house cultures. Brooding adults were held in the same dilution water as that used during the test for at least 14 days before juveniles were collected for testing.

B. **Test System:** A continuous-flow diluter was used to prepare and distribute the test solutions. The diluter was adjusted so that each chamber received approximately 16 volume additions every 24 hours. The aquaria were conditioned with test solution for 11 days prior to test initiation.

Prior to pairing for reproduction, the test compartments (12-cm diameter and 19-cm high) were glass culture dishes with nylon screen collars. During the reproduction portion of the study, mysid pairs were housed in compartments (5.5-cm diameter and 12-cm high) constructed of glass petri dishes and nylon screen. All compartments were located in Teflon®-lined 25-l chambers. The solution volume ranged from 6.3 to 9 l. The chambers were indiscriminately positioned in a temperature-controlled water bath set to maintain 27 ±1°C.

The laboratory environment was maintained on a 16-hour light photoperiod with 30-minute dawn and dusk simulations. The light intensity during the test was approximately 320 lux.

A radiolabeled primary stock solution (0.025 mg/ml) was prepared by diluting the radiolabeled test material in acetone. The primary stock of chlorpyrifos (0.050 mg/ml) was also prepared in acetone. One radiolabeled working stock was prepared for each exposure level by combining aliquots of the two primary stocks and diluting with acetone. The five stocks were pumped to the diluter and mixed with saltwater to achieve the desired concentrations. Test concentrations were adjusted for the purity of the nonradiolabeled test material.

Natural seawater, collected at Indian River Inlet, DE, was diluted with well water, aerated, and filtered

12

before use as test dilution water. The salinity and pH of the dilution water at test initiation was 25 parts per thousand (ppt) and 8.0, respectively.

C. **Dosage:** Thirty-five-day, life-cycle chronic test. Based on acute toxicity data, five nominal concentrations (5, 10, 20, 40, and 80 ng a.i./l), a solvent control, and a dilution water control were used. The concentration of acetone in the solvent control and exposure groups was 0.04 ml/l.

D. **Design:** Mysids were indiscriminantly counted into small cups until each cup contained 15 individuals. The cups were indiscriminately assigned and dipped into each of two compartments per test chamber to release the mysids. Two replicate chambers were used, for a total of 60 individuals per treatment. After 14 days of exposure, the sex of the mysids was determined by microscopic examination. Up to 10 male and female pairs were maintained in each chamber in separate compartments. Additional males were maintained in a separate compartment to serve as replacements for males which had died. Additional females and sexually immature mysids were discarded.

The mysids were fed live brine shrimp nauplii enriched with a fatty acid supplement three times daily during the test.

Observations of mortality and behavior first generation mysids were made daily throughout the test. After pairing, the number of second generation mysids produced and their development and behavior were observed daily. The second generation mysids were discarded after observation. At test termination, the length and dry weight of each surviving first generation mysid were determined.

The dissolved oxygen concentration (DO), salinity, temperature, and pH were measured in each replicate daily. The temperature of a dilution water control chamber was monitored continuously.

Water samples from each replicate were collected at test initiation and at weekly intervals during the study (test days -1, 0, 7, 14, 21, 28, and 35). Total ^{14}C in each sample was determined using liquid scintillation counting (LSC).

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E. **Statistics:** The following endpoints were analyzed statistically: the number of surviving adult mysids, the number of young produced by each first generation mysid, and the length and weight of surviving mysids at the end of the test.

Survival data were analyzed using Fisher's Exact test. Treatment groups with significantly affected survival were excluded from further analysis. Reproduction and growth data were tested for normality and homoscedasticity using the chi-square test and Bartlett's test, respectively. Bonferroni's T-test was used to determined significant differences between the exposure groups and the control.

12. **REPORTED RESULTS:** The mean measured concentrations were 4.6, 10, 20, 43, and 73 ng a.i./l (Table 6, attached).

Survival of mysids was evaluated both prior to pairing (days 0-14) and after pairing (days 14-35). Prior to pairing, mortality in the dilution water and solvent controls was 8.2 and 3.3%, respectively (Table 8, attached). Mortality in the 4.6 ng a.i./l treatment was 3.3% and was not considered to be treatment related. Above 4.6 ng a.i./l, mortality increased with increasing concentration. Sublethal effects were observed at concentrations ≥20 ng a.i./l.

Mysids were sexed and paired on day 14. Mortality in the dilution water and solvent controls during the reproductive phase of the test was 23 and 15%, respectively (Table 9, attached). Mortality at 4.6 ng a.i./l was not considered treatment related. There were concentration dependent increases in mortality at all test concentrations ≥10 ng a.i./l.

Reproduction was first observed on day 19 in replicate B of the dilution water control (Table 10, attached). The total number of young produced in the dilution water control was 151 resulting in 7.35 young per female or 0.477 young per reproduction day (Table 11, attached). Reproduction in the solvent control and lowest test concentration was much lower than the dilution water control. "The difference in production between the two control groups suggested that the solvent had an adverse effect upon reproduction. Therefore, all statistical comparisons were made between the treatment groups and the solvent control group." Reproduction was not significantly affected at 4.6 and 10 ng a.i./l. There was no reproduction at 20, 43, and 73 ng a.i./l.

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Adult mysid lengths and weights were summarized in Table 12 (attached). When compared to the solvent control group, there were no apparent effects upon the lengths of either sex in any treatment with surviving mysids. Male mysids in the 10 ng a.i./l treatment group had significantly smaller mean weight than did males in the solvent control. Male weight at 4.6 ng a.i./l was not significantly affected. Female weights in the treatments were not significantly different from those of the solvent control. "Insufficient numbers of mysids survived until test termination in order to evaluate effects upon the mean weights of mysids in the 20, 43, and 73 ng/l test concentrations." No mysids in the 43 and 73 ng a.i./l treatments survived the reproduction phase of the test.

During the test, the DO was ≥60% of saturation (4.2-7.3 mg/l). The pH values ranged from 7.6 to 8.0 and the temperature was 26.0-27.1°C. The salinity was 24-29 ppt.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** There were no apparent treatment related effects upon survival, reproduction, or growth of mysids exposed to 4.6 ng a.i./l chlorpyrifos. The no-observed-effect concentration (NOEC) and lowest-observed-effect concentration (LOEC) were 4.6 and 10 ng a.i./l, respectively. The maximum acceptable toxicant concentration (MATC) was >4.6 and <10 ng a.i./l. The geometric mean MATC was 6.8 ng a.i./l.

Quality Assurance and Good Laboratory Practice Statements were included in the report, indicating that the study was conducted in accordance with U.S. EPA Good Laboratory Practice Standards set forth in 40 CFR Part 160. Characterization of the test substance was the responsibility of the sponsor. The dates and types of quality assurance audits were reported.

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

A. **Test Procedure:** Since there is no SEP for mysid life cycle tests at this time, ASTM recommended guidelines (1990) were used in the data validation process. This test cannot be considered scientifically sound because the solvent strongly affected reproduction and growth. The ASTM guidelines state that a test is not acceptable if the average number of young produced per female in the control during the test was less than 3. The mean number of young per female in the solvent control was 1.21 (Table 10, attached).

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The results of continuous temperature monitoring during the test should have been reported.

B. **Statistical Analysis:** The reviewer used computer programs (Toxstat 3.3 or Crunch 3) to analyze mysid survival, the number of young produced per reproductive day, and the length and weight of surviving mysids. Survival data were arcsine square-root transformed prior to analysis. For each parameter analyzed, the responses of the dilution water control and the solvent control were compared using a t-test or ANOVA. Responses of the exposed mysids were compared to those of the solvent control using two-way analysis of variance and Bonferroni's test.

Prior to pairing, mysid survival was significantly lowered at concentrations ≥20 ng a.i./l (printout 1, attached). At the end of the test, paired mysid survival in concentrations ≥10 ng a.i./l was significantly reduced (printout 2, attached).

Compared to the solvent control, reproduction in the two lowest concentrations, the only exposure levels with reproduction, was not significantly affected by exposure to chlorpyrifos (printout 3, attached). However, reproduction in the solvent control and two lowest exposures was significantly lower than in the dilution water control, indicating a significant deleterious effect from exposure to the solvent.

The results for male and female lengths and weights were the same as for reproduction (printouts 4-7, attached). Lengths and weights for surviving mysids in the 20 and 43 ng a.i./l treatments were not included in the analysis since only 1-2 mysids in each replicate of these levels survived the test and their inclusion would have led to an unbalanced ANOVA.

C. **Discussion/Results:** The authors stated in the text and showed in Table 10 (attached) that no mysids in the 43 ng a.i./l treatment survived until test termination. However, Table 12 (attached) presents growth data for this test level. According to the raw data (Appendix IX), length and weight of one male and two females in this test group were measured at test termination. Another discrepancy occurred in Appendix X (Changes to Protocols). It was stated that "The preferred solvent was changed from triethylene glycol to N,N-dimethyl formamide," when in fact, acetone was actually used.

16

This study is not scientifically sound. The presence of the solvent strongly affected mysid reproduction and growth. The mean number of young produced per female in the solvent control (1.21) was less than required (3). The concentration of acetone used (0.04 ml/l) was not excessive in relation to the maximum amount allowed in the guidelines (0.1 ml/l). However, the laboratory should have determined the sensitivity of their laboratory-raised mysids to acetone exposure prior to the conduct of this study. Based on the responses of the solvent control mysids, the maximum acceptable toxicant concentration (MATC) was >4.6 and <10 ng a.i./l (geometric mean MATC = 6.8 ng a.i./l). Since the solvent control reproduction results were not considered acceptable, the MATC based on comparison to the dilution water control results was <4.6 ng a.i./l.

D. **Adequacy of the Study:**

(1) **Classification:** Invalid.

(2) **Rationale:** The presence of the solvent strongly affected mysid reproduction and growth. The mean number of young produced per female in the solvent control (1.21) was less than required (3).

(3) **Repairability:** No.

15. **COMPLETION OF ONE-LINER FOR STUDY:** Yes, 04-16-93.

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Page ____ is not included in this copy.

Pages 18 through 25 are not included.

The material not included contains the following type of information:

____ Identity of product inert ingredients.

____ Identity of product impurities.

____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

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426649-01, chlorpyrifos, ~~mortality~~ Survival prior to pairing
File: a:42664901.dt1 Transform: NO TRANSFORM

t-test of Solvent and Blank Controls Ho:GRP1 MEAN = GRP2 MEAN

GRP1 (SOLVENT CRTL) MEAN =	0.9770	CALCULATED t VALUE =	0.6559
GRP2 (BLANK CRTL) MEAN =	0.9465	DEGREES OF FREEDOM =	2
DIFFERENCE IN MEANS =	0.0305		

TABLE t VALUE (0.05 (2), 2) = 4.303 NO significant difference at alpha=0.05
TABLE t VALUE (0.01 (2), 2) = 9.925 NO significant difference at alpha=0.01

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	1.435	0.239	95.753
Within (Error)	7	0.017	0.002	
Total	13	1.452		

Critical F value = 3.87 (0.05,6,7)
Since F > Critical F REJECT Ho:All groups equal

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	solvent contrl	0.977	0.977		
2	dilution contrl	0.947	0.947	0.610	
3	4.6	0.977	0.977	0.000	
4	10	0.905	0.905	1.441	
5	20	0.767	0.767	4.212	*
6	43	0.384	0.384	11.876	*
7	73	0.100	0.100	17.549	*

Dunnett table value = 2.82 (1 Tailed Value, P=0.05, df=7,6)

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	solvent contrl	2			
2	dilution contrl	2	0.141	14.4	0.030
3	4.6	2	0.141	14.4	0.000
4	10	2	0.141	14.4	0.072
5	20	2	0.141	14.4	0.210
6	43	2	0.141	14.4	0.593
7	73	2	0.141	14.4	0.877

426649-01, chlorpyrifos, ~~mortality~~ Survival after pairing
File: a:42664901.dt2 Transform: NO TRANSFORM

t-test of Solvent and Blank Controls Ho:GRPI MEAN = GRP2 MEAN

GRP1 (SOLVENT CRTL) MEAN =	0.8500	CALCULATED t VALUE =	1.2649
GRP2 (BLANK CRTL) MEAN =	0.7700	DEGREES OF FREEDOM =	2
DIFFERENCE IN MEANS =	0.0800		

TABLE t VALUE (0.05 (2), 2) = 4.303 NO significant difference at alpha=0.05
TABLE t VALUE (0.01 (2), 2) = 9.925 NO significant difference at alpha=0.01

Shapiro Wilks test for normality
Data PASS normality test at P=0.01 level. Continue analysis.

Bartletts test for homogeneity of variance
Data PASS homogeneity test at 0.01 level. Continue analysis.

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	solvent contrl	2	0.850	1.174	1.174
2	dilution contrl	2	0.770	1.074	1.166
3	4.6	2	0.895	1.258	1.166
4	10	2	0.630	0.917	0.917
5	20	2	0.160	0.411	0.411

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
solvent contrl	1.174				
dilution contrl	1.166	0.093		2.02	k= 1, v= 5
4.6	1.166	0.093		2.14	k= 2, v= 5
10	0.917	2.967	*	2.19	k= 3, v= 5
20	0.411	8.805	*	2.21	k= 4, v= 5

s = 0.087
Note: df used for table values are approximate when v > 20.

Analysis of Variance File: chlorpyr Date: 04-14-1993

N's, means and standard deviations based on dependent variable: YARD Reproduction: Young / Reproductive day
* Indicates statistics are collapsed over this factor

Factors: T	R	N	Mean	S.D.
*	*	68	0.1956	0.2987
1	* = solvent con	19	0.0717	0.1309
2	* = dilution con	20	0.4765	0.3914
3	* = 4.6 ng a.i/l	20	0.0676	0.0978
4	* = 10 ng a.i/l	9	0.1177	0.2015
*	1	33	0.1373	0.2184
*	2	35	0.2507	0.3528
1	1	9	0.0589	0.1177
1	2	10	0.0832	0.1472
2	1	10	0.3059	0.3110
2	2	10	0.6470	0.4026
3	1	10	0.0941	0.1115
3	2	10	0.0412	0.0786
4	1	4	0.0000	0.0000
4	2	5	0.2118	0.2373

Fmax for testing homogeneity of between subjects variances: Not defined

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Analysis of Variance Dependent variable: YARD

Source	df	SS (H)	MSS	F	P
Between Subjects	67	5.9775			
T (TRT)	3	2.2514	0.7505	14.871	0.0000
R (REP)	1	0.2422	0.2422	4.800	0.0323
TR	3	0.4560	0.1520	3.012	0.0366
Subj w Groups	60	3.0279	0.0505		

Post-hoc tests for factor T (TRT)

Level	Mean
1	0.072
2	0.476
3	0.068
4	0.118

Comparison	Bon-ferroni	T-test	Dunnett
1 < 2	0.0000	0.0000	0.0100
1 > 3			
1 < 4			
2 > 3	0.0000	0.0000	N.A.
2 > 4	0.0012	0.0002	N.A.
3 < 4			N.A.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

Analysis of Variance File: chlorpy2 Date: 04-14-1993

Subgroup: SEX = 1 = male
N's, means and standard deviations based on dependent variable: LENGTH
* Indicates statistics are collapsed over this factor

Factors: T	R	N	Mean	S.D.
*	*	89	6.1112	0.5710
1	* = Solvent c.	25	5.8400	0.3764
2	* = dark dilution c	23	6.8087	0.3930
3	* = 4.6	25	5.8840	0.4007
4	* = 10	16	5.8875	0.4410
*	1	45	6.0933	0.4924
*	2	44	6.1295	0.6468
1	1	13	5.8615	0.4114
1	2	12	5.8167	0.3512
2	1	11	6.6000	0.4171
2	2	12	7.0000	0.2594
3	1	14	5.9429	0.4183
3	2	11	5.8091	0.3833
4	1	7	6.0286	0.3546
4	2	9	5.7778	0.4893

A total of 2 observations had missing data on a dependent variable or covariate or inappropriate factor level codes.

Fmax for testing homogeneity of between subjects variances: 3.56
Number of variances= 8 df per variance= 10.

Analysis of Variance Dependent variable: LENGTH

Source	df	SS (H)	MSS	F	P
Between Subjects	88	28.6888			
T (TRT)	3	15.1194	5.0398	33.241	0.0000
R (REP)	1	0.0019	0.0019	0.012	0.9114
TR	3	1.2868	0.4289	2.829	0.0432
Subj w Groups	81	12.2807	0.1516		

Post-hoc tests for factor T (TRT)

Level	Mean
1	5.840
2	6.809
3	5.884
4	5.887

Comparison	Bon-ferroni	T-test	Dunnett
1 < 2	0.0000	0.0000	0.0100
1 < 3			
1 < 4			
2 > 3	0.0000	0.0000	N.A.
2 > 4	0.0000	0.0000	N.A.
3 < 4			N.A.

For Dunnett's test only the P-values .05 and .01 are possible and only for comparisons with the control mean (level 1).

Analysis of Variance File: chlorpy2 Date: 04-14-1993

Subgroup: SEX = 2 = female
N's, means and standard deviations based on dependent variable: LENGTH
* Indicates statistics are collapsed over this factor

Factors: T	R		N	Mean	S.D.
*	*		54	6.4074	0.4412
1	*	= Solvent C.	16	6.2125	0.3364
2	*	= dilution C.	14	6.9143	0.3634
3	*	= 4.6	17	6.2059	0.2883
4	*	= 10.	7	6.3286	0.3251
*	1		29	6.4379	0.5074
*	2		25	6.3720	0.3565
1	1		8	6.1500	0.4036
1	2		8	6.2750	0.2659
2	1		9	6.9444	0.4246
2	2		5	6.8600	0.2510
3	1		9	6.2000	0.3464
3	2		8	6.2125	0.2295
4	1		3	6.4000	0.3000
4	2		4	6.2750	0.3775

A total of 3 observations had missing data on a dependent variable or covariate or inappropriate factor level codes.

Fmax for testing homogeneity of between subjects variances: 3.42
Number of variances= 8 df per variance= 5.

Analysis of Variance Dependent variable: LENGTH

Source	df	SS (H)	MSS	F	P
Between Subjects	53	10.3170			
T (TRT)	3	4.9387	1.6462	14.382	0.0000
R (REP)	1	0.0003	0.0003	0.003	0.9565
TR	3	0.1125	0.0375	0.328	0.8071
Subj w Groups	46	5.2655	0.1145		

Post-hoc tests for factor T (TRT)

Level	Mean
1	6.213
2	6.914
3	6.206
4	6.329

Comparison	Bon-ferroni	T-test	Dunnett
1 < 2	0.0000	0.0000	0.0100
1 > 3			
1 < 4			
2 > 3	0.0000	0.0000	N.A.
2 > 4	0.0032	0.0005	N.A.
3 < 4			N.A.

For Dunnett's test only the P-values .05 and .01 are possible and only for comparisons with the control mean (level 1).

Analysis of Variance File: chlorpy2 Date: 04-14-1993
FILTER: None
Subgroup: SEX = 1 = male
N's, means and standard deviations based on dependent variable: WEIGHT
* Indicates statistics are collapsed over this factor

Factors: T	R		N	Mean	S.D.
*	*		89	0.6347	0.2079
1	*	= Solvent C.	25	0.5436	0.1160
2	*	= dilution C.	23	0.8870	0.1694
3	*	= 4.6	25	0.6088	0.1455
4	*	= 10.0	16	0.4550	0.0948
*	1		45	0.6118	0.1658
*	2		44	0.6582	0.2433
1	1		13	0.4846	0.0925
1	2		12	0.6075	0.1070
2	1		11	0.7709	0.1294
2	2		12	0.9933	0.1280
3	1		14	0.6714	0.1380
3	2		11	0.5291	0.1164
4	1		7	0.4786	0.0687
4	2		9	0.4367	0.1116

A total of 2 observations had missing data on a dependent variable or covariate or inappropriate factor level codes.

Fmax for testing homogeneity of between subjects variances: 4.04
Number of variances= 8 df per variance= 10.

Analysis of Variance Dependent variable: WEIGHT

Source	df	SS (H)	MSS	F	P
Between Subjects	88	3.8018			
T (TRT)	3	2.2045	0.7348	54.735	0.0000
R (REP)	1	0.0454	0.0454	3.384	0.0695
TR	3	0.4644	0.1548	11.531	0.0000
Subj w Groups	81	1.0875	0.0134		

Post-hoc tests for factor T (TRT)

Level	Mean
1	0.544
2	0.887
3	0.609
4	0.455

Comparison	Bon-ferroni	T-test	Dunnett
1 < 2	0.0000	0.0000	0.0100
1 < 3		0.0500	
1 > 4		0.0192	0.0500
2 > 3	0.0000	0.0000	N.A.
2 > 4	0.0000	0.0000	N.A.
3 > 4	0.0006	0.0001	N.A.

For Dunnett's test only the P-values .05 and .01 are possible and only for comparisons with the control mean (level 1).

Analysis of Variance File: chlorpy2 Date: 04-14-1993
FILTER: None
Subgroup: SEX = 2 = female
N's, means and standard deviations based on dependent variable: WEIGHT
* Indicates statistics are collapsed over this factor

Factors: T	R	N	Mean	S.D.
*	*	54	0.7181	0.2365
1	* = Solvent c.	16	0.5825	0.2058
2	* = dilution c.	14	1.0157	0.1551
3	* 4.6 mg/e	17	0.6641	0.0921
4	* 10.0 mg/e	7	0.5643	0.1476
*	1	29	0.7479	0.1980
*	2	25	0.6836	0.2747
1	1	8	0.6075	0.1861
1	2	8	0.5575	0.2338
2	1	9	0.9511	0.1244
2	2	5	1.1320	0.1446
3	1	9	0.7167	0.0610
3	2	8	0.6050	0.0872
4	1	3	0.6067	0.2272
4	2	4	0.5325	0.0776

A total of 3 observations had missing data on a dependent variable or covariate or inappropriate factor level codes.

Fmax for testing homogeneity of between subjects variances: 14.67
Number of variances= 8 df per variance= 5.

Analysis of Variance Dependent variable: WEIGHT

Source	df	SS (H)	MSS	F	P
Between Subjects	53	2.9638			
T (TRT)	3	1.7494	0.5831	25.867	0.0000
R (REP)	1	0.0036	0.0036	0.161	0.6900
TR	3	0.1738	0.0579	2.570	0.0651
Subj w Groups	46	1.0370	0.0225		

Post-hoc tests for factor T (TRT)

Level	Mean
1	0.582
2	1.016
3	0.664
4	0.564

Comparison	Bon-ferroni	T-test	Dunnett
1 < 2	0.0000	0.0000	0.0100
1 < 3			
1 > 4			
2 > 3	0.0000	0.0000	N.A.
2 > 4	0.0000	0.0000	N.A.
3 > 4			N.A.

For Dunnett's test only the P-values .05 and .01 are possible and only for comparisons with the control mean (level 1).

YOUNG PER ADULT REPRODUCTIVE DAY BY TREATMENT/REP

Obs.	TRT	REP	YARD
1	1	1	0.118
2	1	1	0.000
3	1	1	0.059
4	1	1	0.353
5	1	1	0.000
6	1	1	0.000
7	1	1	0.000
8	1	1	0.000
9	1	1	0.000
10	1	2	0.000
11	1	2	0.412
12	1	2	0.294
13	1	2	0.000
14	1	2	0.000
15	1	2	0.000
16	1	2	0.067
17	1	2	0.000
18	1	2	0.059
19	1	2	0.000
20	2	1	0.118
21	2	1	0.176
22	2	1	0.000
23	2	1	0.941
24	2	1	0.706
25	2	1	0.000
26	2	1	0.353
27	2	1	0.059
28	2	1	0.353
29	2	1	0.353
30	2	2	0.200
31	2	2	1.235
32	2	2	0.000
33	2	2	0.529
34	2	2	0.824
35	2	2	0.941
36	2	2	0.500
37	2	2	1.182
38	2	2	0.412
39	2	2	0.647
40	3	1	0.118
41	3	1	0.176
42	3	1	0.235
43	3	1	0.000
44	3	1	0.000
45	3	1	0.000
46	3	1	0.294
47	3	1	0.118
48	3	1	0.000
49	3	1	0.000
50	3	2	0.000
51	3	2	0.059
52	3	2	0.000
53	3	2	0.235
54	3	2	0.000
55	3	2	0.000
56	3	2	0.118
57	3	2	0.000
58	3	2	0.000
59	3	2	0.000
60	4	1	0.000
61	4	1	0.000
62	4	1	0.000
63	4	1	0.000
64	4	2	0.000
65	4	2	0.588
66	4	2	0.294
67	4	2	0.059
68	4	2	0.118

Data listing File: chlorpy2 Date: 04-14-1993

Obs.	TRT	REP	SEX	LENGTH	WEIGHT
1	1	1	1	5.2	0.44
2	1	1	1	6.1	0.62
3	1	1	1	6.1	0.60
4	1	1	1	5.3	0.31
5	1	1	1	6.0	0.49
6	1	1	1	5.7	0.49
7	1	1	1	5.5	0.48
8	1	1	1	6.3	0.57
9	1	1	1	5.8	0.38
10	1	1	1	5.9	0.44
11	1	1	1	5.6	0.40
12	1	1	1	6.0	0.49
13	1	1	1	6.7	0.59
14	1	1	2	6.5	0.67
15	1	1	2	6.4	0.63
16	1	1	2	6.7	0.59
17	1	1	2	6.2	0.58
18	1	1	2	6.2	0.99
19	1	1	2	6.0	0.59
20	1	1	2	5.5	0.47
21	1	1	2	5.7	0.34
22	1	2	1	6.1	0.55
23	1	2	1	6.0	0.60
24	1	2	1	5.6	0.75
25	1	2	1	5.9	0.48
26	1	2	1	5.8	0.75
27	1	2	1	5.6	0.78
28	1	2	1	6.2	0.70
29	1	2	1	5.6	0.50
30	1	2	1	6.3	0.55
31	1	2	1	6.0	0.55
32	1	2	1	5.0	0.53
33	1	2	1	5.7	0.55
34	1	2	2	6.4	0.61
35	1	2	2	6.4	0.65
36	1	2	2	6.6	0.80
37	1	2	2	6.3	0.53
38	1	2	2	6.2	0.49
39	1	2	2	6.0	0.05
40	1	2	2	5.8	0.55
41	1	2	2	6.5	0.78
42	2	1	1	6.8	0.81
43	2	1	1	6.5	0.76
44	2	1	1	5.9	0.59
45	2	1	1	6.1	0.59
46	2	1	1	6.7	0.90
47	2	1	1	6.9	1.03
48	2	1	1	6.7	0.73
49	2	1	1	7.3	0.87
50	2	1	1	6.7	0.75
51	2	1	1	6.9	0.74
52	2	1	1	6.1	0.71
53	2	1	2	7.8	1.05
54	2	1	2	6.6	0.93
55	2	1	2	7.1	1.02
56	2	1	2	7.2	1.05
57	2	1	2	7.0	0.85
58	2	1	2	7.0	1.08
59	2	1	2	6.7	0.82
60	2	1	2	6.3	1.03
61	2	1	2	6.8	0.73
62	2	2	1	7.5	1.00
63	2	2	1	6.9	0.99
64	2	2	1	6.7	0.89
65	2	2	1	6.8	1.01
66	2	2	1	6.8	0.99
67	2	2	1	7.1	0.93

68	2	2	1	7.5	1.34
69	2	2	1	7.0	0.87
70	2	2	1	6.9	0.92
71	2	2	1	7.0	0.98
72	2	2	1	6.8	0.89
73	2	2	1	7.0	1.11
74	2	2	2	6.5	0.98
75	2	2	2	7.1	1.22
76	2	2	2	6.8	1.14
77	2	2	2	7.1	1.32
78	2	2	2	6.8	1.00
79	3	1	1	5.9	0.52
80	3	1	1	5.8	0.57
81	3	1	1	5.7	0.51
82	3	1	1	6.5	0.67
83	3	1	1	5.7	0.77
84	3	1	1	6.1	0.68
85	3	1	1	6.1	0.63
86	3	1	1	6.4	0.95
87	3	1	1	5.2	0.53
88	3	1	1	6.4	0.71
89	3	1	1	6.0	0.66
90	3	1	1	5.1	0.53
91	3	1	1	6.2	0.88
92	3	1	1	6.1	0.79
93	3	1	2	6.0	0.72
94	3	1	2	6.3	0.72
95	3	1	2	6.2	0.64
96	3	1	2	6.3	0.69
97	3	1	2	5.9	0.75
98	3	1	2	6.5	0.81
99	3	1	2	6.2	0.72
100	3	1	2	6.8	0.78
101	3	1	2	5.6	0.62
102	3	2	1	6.4	0.49
103	3	2	1	6.0	0.75
104	3	2	1	6.5	0.65
105	3	2	1	5.4	0.42
106	3	2	1	5.5	0.57
107	3	2	1	5.6	0.55
108	3	2	1	5.7	0.39
109	3	2	1	5.7	0.53
110	3	2	1	5.9	0.63
111	3	2	1	5.9	0.46
112	3	2	1	5.3	0.38
113	3	2	2	6.3	0.54
114	3	2	2	6.4	0.60
115	3	2	2	6.1	0.44
116	3	2	2	6.6	0.71
117	3	2	2	6.0	0.62
118	3	2	2	6.1	0.68
119	3	2	2	5.9	0.58
120	3	2	2	6.3	0.67
121	4	1	1	6.1	0.52
122	4	1	1	5.7	0.36
123	4	1	1	6.2	0.42
124	4	1	1	6.4	0.53
125	4	1	1	6.3	0.55
126	4	1	1	6.1	0.46
127	4	1	1	5.4	0.51
128	4	1	2	6.1	0.40
129	4	1	2	6.7	0.57
130	4	1	2	6.4	0.85
131	4	2	1	6.4	0.51
132	4	2	1	5.8	0.27
133	4	2	1	5.6	0.52
134	4	2	1	5.8	0.35
135	4	2	1	5.2	0.54
136	4	2	1	4.9	0.27

137	4	2	1	6.3	0.49
138	4	2	1	5.9	0.44
139	4	2	1	6.1	0.54
140	4	2	2	6.4	0.47
141	4	2	2	6.2	0.63
142	4	2	2	5.8	0.47
143	4	2	2	6.7	0.56
144	5	1	1	5.6	0.37
145	5	1	2	6.2	0.56
146	6	1	1	5.7	0.48
147	6	2	2	6.5	0.60
148	6	2	2	6.3	0.55

Ecological Effects Branch One-Liner Data Entry Form

Chemical Chlorpyrifos Shaughnessy No. 059101 Pesticide Use Insecticide

INVERTEBRATE ACUTE TOXICITY	% AI	EC_{50} (95%CL) SLOPE	HRS/ TYPE	NOEC	STUDY/REVIEW DATES	MRID/ CATEGORY	LAB	RC
1.								
2.								
3.								
4.								
5.								
6.								
7.								

CHRONIC TOX.	% AI	MATC ~~LC_{50}~~	DAYS	AFFECTED PARA.	STUDY/REVIEW DATES	MRID/ CATEGORY	LAB	RC
1. Mysidopsis bahia	99.7	<4.6ngai/l*	35	Reproduction, growth	1993/1993	426649-01 Invalid	WIL	LMR
2.								
3.								

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COMMENTS: * ngai/l of mean measured concentration