PC 128997

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

MEMORANDUM

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

SUBJECT: Review of Fish Life Cycle Study for Tebuconazole (MRID No. 430096-01)

FROM: Anthony F. Maciorowski, Chief
Ecological Effects Branch
7507C

12/19/94

TO: Denise Greenway
Registration Division
7505C

The Ecological Effects Branch completed the review of a fish life cycle study. The study was submitted to support the registration of tebuconazole. The study is the following:

> Wheat, J., 1993. HWG 1608 (tebuconazole): Life-Cycle Chronic Toxicity to the Sheepshead Minnow (*Cyprinodon variegatus*) Under Flow-Through Conditions. MRID No. 430096-01.

The study is scientifically sound however, it is classified as supplemental because (1) water quality was variable throughout the study and (2) solvent control, survival was very low and length was different from the control. A new study will not be required. The results of the fish early life stage for the rainbow trout (MRID No. 407009-14) and the fathead minnow (MRID No. 420382-02) and this fish life cycle study provide sufficient information to characterize the chronic effects of tebuconazole on fish. In addition a mesocosm is in the process of review. The mesocosm will provide additional information on the effects to fish. The rainbow trout fish early life stage study showed that this species is more sensitive than the sheepshead and the fathead minnow.

The attached Data Evaluation Record will provide the necessary information for the classification of the study. If you have any questions please contact Harry Craven (305-5320) or Conchi Rodríguez (308-2805).

DP Barcode : ~~D196961~~
PC Code No : 128997
EEB Out : 12/20/94

Green

To: Denise Greenway
Product Manager
Registration Division (7505C)

From: Anthony F. Maciorowski, Chief
Ecological Effects Branch/EFED (H7507C)

Attached, please find the EEB review of...

Reg./File # :
Chemical Name : Tebuconazole
Type Product : Fungicide
Product Name : Folicur
Company Name : Miles Inc.
Purpose : Review of fish life cycle study

Action Code : 116 Date Due : 3/24/94
Reviewer : Conchi Rodríguez Date In EEB: 11/30/93

EEB Guideline/MRID Summary Table: The review in this package contains an evaluation of the following:

GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT
71-1(A)			72-2(A)			72-7(A)		
71-1(B)			72-2(B)			72-7(B)		
71-2(A)			72-3(A)			122-1(A)		
71-2(B)			72-3(B)			122-1(B)		
71-3			72-3(C)			122-2		
71-4(A)			72-3(D)			123-1(A)		
71-4(B)			72-3(B)			123-1(B)		
71-5(A)			72-3(F)			123-2		
71-5(B)			72-4(A)			124-1		
72-1(A)			72-4(B)			124-2		
72-1(B)			72-5	430096-01	S	141-1		
72-1(C)			72-6			141-2		
72-1(D)						141-5		

Y=Acceptable (Study satisfied Guideline)/Concur
P=Partial (Study partially fulfilled Guideline but additional information is needed
S=Supplemental (Study provided useful information but Guideline was not satisfied)
N=Unacceptable (Study was rejected)/Nonconcur

DATA EVALUATION RECORD

1. **CHEMICAL:** Tebuconazole. Shaughnessey No. 128997.

2. **TEST MATERIAL:** BAY HWG-1608 (Folicur technical); α-[2-(4-Chlorophenyl)ethyl]-α-(1,1-dimethylethyl)-1H-1,2,-triazole-1-ethanol; Batch No. 0-79-01530; 96.4% purity; a white powder.

3. **STUDY TYPE:** 72-5. Fish Full Life-Cycle Toxicity Test. Species Tested: Sheepshead Minnow (*Cyprinodon variegatus*).

4. **CITATION:** Wheat, J. 1993. HWG 1608 (tebuconazole): Life-Cycle Chronic Toxicity to the Sheepshead Minnow (*Cyprinodon variegatus*) Under Flow-Through Conditions. Laboratory ID No. J9104001. Prepared by Toxikon Environmental Sciences, Jupiter, FL. Submitted by Miles Incorporated, Kansas City, MO. EPA MRID No. 430096-01.

5. **REVIEWED BY:**

Conchi Rodríguez
Biologist
Ecological Effects Branch
Environmental Fate and Effects Division

Signature: Conchi Rodríguez
Date: 12/16/94

6. **APPROVED BY:**

Harry Craven
Supervisory Biologist
Ecological Effects Branch
Environmental Fate and Effects Division

Signature: Harry Craven 12/16/94
Date:

7. **CONCLUSIONS:** This study is scientifically sound. It is classified as supplemental. The information may be useful in risk assessment. A new study is not required. Water quality parameters (i.e., salinity and temperature) were highly variable throughout the test period. Solvent control survival was low (24%) in one of the solvent control replicates. The MATC of BAY HWG-1608 for *Cyprinodon variegatus* is >19.0 and <43.6 µg ai/l based mean measured concentrations (geometric mean MATC = 28.8 µg ai/l). The most sensitive endpoint was fish length.

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

9. **BACKGROUND:**

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

11. **MATERIALS AND METHODS:**

A. **Test Animals:** Sheepshead minnow (*Cyprinodon variegatus*) embryos were obtained by stripping eggs from 25 adults females and fertilizing the eggs with the sperm of 5 adult males. The adults were obtained from two commercial suppliers (Aquatic BioSystems, Fort Collins, CO and TRAC Labs, Gulf Breeze, FL) and were maintained at the testing facility for 43 days before hormone injection. During the first four weeks, the fish were treated with a dilute formalin solution and nitrofurazone. No treatment was administered during the 15 days before injection. The embryos were less than 24 hours old post-fertilization at test initiation.

B. **Test System:** Two proportional vacuum-siphon diluter systems each with a 50% dilution factor were used to deliver the test solutions to the test vessels. A 2-l diluter system with 24-l glass tanks was used for the F_0 and F_1 phases of the study. The test vessels had a solution volume of 15 l and a solution depth of 13 cm. The diluter provided 6.5 volume additions per day to each test vessel during the F_0 phase and 6.3 volume additions per day during the F_1 phase of the study. A 4-l system with 53-l glass tanks was used for the reproductive phase of the study. The test vessels had a solution volume of 40 l and a solution depth of 23 cm. The diluter provided 4.1 volume additions per day to each test vessel.

For the incubation period of the F_0 and F_1 phases of the study, incubation cups were used to contain the embryos. The cups were 60-mm diameter glass tubes with 355-μm mesh screen and were stationary in the replicate tanks. A self-starting siphon provided a fluctuating level of test solution.

After hatching, all fish were transferred to screen retention chambers within each test vessel. The retention chambers were constructed of a petri dish bottom (150 mm x 10 mm) with a Nitex screen collar (20-cm high).

For the reproductive phase of the study, the spawning chambers were each constructed of two, 3-gallon high

density polyethylene, white pails with screen bottoms. The pail containing adult fish had a 7-mm plastic screen mesh bottom and was placed into the second pail which had 355-µm screen mesh bottom. The spawning chambers were suspended by the sides of the tanks above the bottom to allow passage of incoming test solutions.

The test chambers were randomly positioned in a water bath. The test system was maintained under a 16-hour light/8-hour dark photoperiod with 15-minute dawn/dusk simulation periods. Light intensity was 430-957 lux. From test day 43 to test termination, all test solutions were aerated.

The dilution water was natural saltwater from a shallow well. The saltwater was carbon treated and adjusted to a salinity of 20 parts per thousand (ppt) with carbon-treated, aerated laboratory freshwater. The dilution water was aerated and filtered (20 µm) prior to use. The water was also UV sterilized prior to use in the F_0 and F_1 phases of the study.

Stock solutions were prepared monthly by weighing 8.16 g of BAY HWG-1608 into 100 ml of triethylene glycol (TEG). An appropriate amount of stock solution was pumped to the chemical mixing chamber of each diluter at each cycle to provide 200 µg ai/l, the highest nominal concentration tested. This test solution was proportionally diluted to provide the remaining test concentrations.

C. **Dosage:** Two-hundred-three day, flow-through, full life-cycle toxicity test. Based on the results of previous toxicity testing, five nominal concentrations (12.5, 25.0, 50.0, 100, and 200 µg ai/l) were selected for this study. A dilution water control and a solvent control were also included. The concentration of TEG in the solvent control and all exposure solutions was 20.55 µl/l.

D. **Design:** Two replicate aquaria were provided per treatment. For the F_0 phase of the study, each aquarium contained two replicate incubation/retention chambers (i.e., 4 chambers/treatment). Embryos (<24 hours post-fertilization) were impartially placed, five at a time, into each incubation cup until each cup contained 50 embryos (i.e., 200 eggs/treatment). Survival of embryos was recorded daily until hatching was complete.

After hatching, all fish were transferred into retention chambers within the same test chamber. Survival and sublethal effects were monitored daily. On day 33, all fish were photographed for length measurements. On day 58, all fish in the replicates of each treatment were pooled and 25 fish were indiscriminately selected, photographed for length measurements and released into their respective tank. The fish were maintained in this system until day 113 when the reproductive phase of the study began. The remaining fish were sacrificed for length and weight measurements and then shipped frozen to Miles Incorporated for residue analysis.

For the reproduction phase of the study, fish were transferred from the first diluter system into the corresponding replicate tank of the second diluter system. The first reproductive session was initiated with the selection of sexually mature adult fish (generally 2 males and 5 females) and placement of these fish into a spawning chamber. Four spawning sessions were conducted, each lasting 14 days. The first pail of the spawning chamber contained the adult fish with mesh screen which allowed the eggs to pass through to the second pail with mesh screen to retain the spawned eggs. Spawning chambers were removed daily and checked for newly spawned eggs. Any eggs present were removed and counted. After each spawning session, the fish were removed and returned to the first diluter system for holding. In an attempt to lower the variability in egg production, it was decided to run the fourth spawning session using fish from previous spawnings. At the end of the spawning sessions, the fish were sacrificed for length and weight measurements and were submitted for residue analysis.

The F_1 phase of the study was initiated on day 163 in the first diluter system. Where possible, 25 embryos, obtained during the period between spawning sessions 3 and 4, were distributed to each of two embryo incubation chambers per replicate tank (i.e., 50 embryos/replicate, 100 embryos/treatment). For three days following initiation, each embryo chamber was placed in a solution of 10% formalin in seawater for 10 minutes. It was decided that this treatment was necessary to control disease. Survival was recorded until hatching was complete. Approximately two weeks after hatching, all fish were transferred into screen retention chambers within the same test chamber. Survival and sublethal effects were monitored daily.

On day 28, all fish were sacrificed for length and weight measurements and then shipped frozen to Miles Incorporated for residue analysis.

During the F_0 and F_1 phases of the study, fish were fed live, fatty-acid supplemented brine shrimp nauplii, two to three times daily. During the reproduction phase of the study, the fish were fed frozen adult brine shrimp at least twice daily.

Temperature was measured hourly in one replicate of the dilution water control in the first diluter system. In addition, the diurnal temperature range of the water bath was measured. The diurnal temperature range of both replicates of the dilution water control was measured in the second diluter system. Salinity was measured daily in the dilution water control of both systems. Dissolved oxygen concentrations (DO) and pH were measured at the initiation of each phase and weekly thereafter in all test solutions.

One day prior to test initiation and weekly thereafter, water samples were collected from all replicates and analyzed using high pressure liquid chromatography to measure actual exposure concentrations.

E. **Statistics:** Several statistical analyses (two-tail Fisher's exact test, two-tail Chi-square test of independence, nested analysis of variance (ANOVA), or a Student's t-test) were conducted to compare dilution water control and solvent control responses, responses between chambers within each replicate tank, or responses between replicates within each treatment group. The decision to pool control data for a given variable was based on consistent pattern of biological and statistical findings.

Dichotomous data were analyzed using a one-tailed Fisher's exact test and a one-tailed Chi-Square test of independence. Where there was sufficient variability across chambers, dichotomous data were analyzed using a nested analysis of variance (ANOVA). Continuous data were analyzed using an ANOVA with Dunnett's comparison test. Homogeneity of variance across treatments was compared using Levene's test at $p<0.01$. Arcsine or log transformations were applied, as necessary, to the dichotomous or continuous data, respectively, to improve the homogeneity of variance. If the p value was still less than 0.01, a nonparametric Dunnett's

test was conducted, otherwise a parametric analysis was performed on the transformed data.

12. **REPORTED RESULTS:** Mean measured concentrations were 9.2, 19.0, 43.6, 96.7, and 196.9 µg ai/l for the F_0 phase; 9.2, 21.9, 49.0, 98.6, and 196.0 µg ai/l for the reproductive phase, and 9.6, 18.4, 46.9, 97.8, and 192 µg ai/l for the F_1 phase. These values represent 73-99% of nominal concentrations (Tables 2, 16, and 24, attached). No undissolved test material was observed in the test chambers during the study.

Hatching success (%) of F_0 embryos exposed to concentrations of BAY HWG-1608 was not significantly different from that of the pooled control (Table 3, attached). Hatching success of the control and the solvent control was 86.5% and 89.0%, respectively. F_0 survival on day 58 (number surviving on day 58 divided by total hatched) was significantly reduced at 196.9 µg ai/l when compared to the pooled control (Table 4, attached). Survival of the control and solvent control survival on day 58 was 93.6% and 89.3%, respectively. F_0 survival on day 177 (number of fish alive on day 177 divided by the number of fish present after culling on day 58) was significantly reduced at 196.9 µg ai/l when compared to the pooled control (Table 5, attached). Survival of the control and solvent control on day 177 was 76% and 56%, respectively.

Due to the significant survival effects, the 196.9 µg ai/l exposure group was not included in the growth analyses. F_0 length on day 33 was significantly reduced at 96.7 µg ai/l when compared to the pooled control (Table 6, attached). F_0 growth (i.e., length and weight) on days 58 and 177 was not significantly reduced at any exposure concentration when compared to the pooled control or to the solvent control (Tables 7, 8, 9, and 10, attached).

The residue in tissues of F_0 sheepshead minnow generally increased with concentrations of test material in water. The mean tissue residue ranged from 0.12 mg/kg for fish in the lowest test level to 12.87 mg/kg for fish in the highest test level.

The exposure solutions showed no significant effect on the reproductive parameters when compared to the control data (Tables 17 and 18, attached). For spawning sessions 1 and 2, reproductive data at 9.2 µg ai/l was substantially lower than the pooled control. However, this difference was not statistically significant and was not confirmed by the results at higher exposure concentrations.

Hatching success (%) of F_1 embryos exposed to 18.4 µg ai/l was significantly reduced when compared to that of the pooled control and the solvent control (Table 25, attached). However, this difference was regarded as spurious. There were no significant differences at any other exposure concentration. Hatching success of the control and the solvent control was 93.7% and 100%, respectively. F_1 survival at the exposure concentrations were higher than the solvent control at 28 days post-hatch (Table 26, attached). Survival of the control and solvent control on day 28 post-hatch was 95.5% and 86.0%, respectively. F_1 growth (i.e., length and weight) at 28 days post-hatch was significantly reduced at 97.8 µg ai/l when compared to the pooled control (Tables 27 and 28, attached).

The residue in F_1 sheepshead minnow tissues generally increased with concentrations of the test material in water. The mean tissue residue ranged from 0.31 mg/kg for fish in the lowest test level to 2.96 mg/kg for fish in the highest test level.

During the F_0 phase of the study, the test solutions had a temperature range of 26.1-33.6°C, a pH range of 7.9-8.4, a salinity range of 16-22 ppt, and a DO range of 2.4-6.6 mg/l. During this phase, the DO was reduced in the solvent control and all BAY HWG-1608 solutions due to bacterial growth as a result of the solvent. Aeration was initiated on day 43 to maintain acceptable DO levels.

During the reproduction phase of the study, the test solutions had a temperature range of 22.0-29.9°C, a pH range of 8.0-8.3, a salinity range of 16-26 ppt, and a DO range of 4.8-6.9 mg/l.

During the F_1 phase of the study, the test solutions had a temperature range of 20.6-30.7°C, a pH range of 8.1-8.3, a salinity range of 15-20 ppt, and a DO range of 5.9-7.7 mg/l.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:**
Based upon growth (length at day 33) of the F_0 and F_1 sheepshead minnows as the most sensitive biological endpoint, the maximum acceptable toxicant concentration (MATC) was >43.6 and <96.7 µg ai/l with a geometric mean of the MATC of 64.9 µg ai/l. The NOEC was 43.6 µg ai/l.

"Although there was some variability in results such as the percent survival for control groups at day 177 of the F_0 generation, reproduction and wet weight of the F_0 and F_1 generation, the study clearly shows that BAY HWG-1608 is

neither cumulatively nor reproductively toxic at concentrations tested in this study."

Quality Assurance and Good Laboratory Practice Compliance Statements were included in the report, indicating that the study was conducted in accordance with USEPA Good Laboratory Practice Standards (40 CFR Part 160). The dates and types of quality assurance audits performed were also included in the report.

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

A. **Test Procedure:** The test procedures were generally in accordance with the SEP except for the following:

The SEP states that 50 embryos should be distributed to each of four replicate chambers at test initiation. In this test, two egg cups were used per aquarium (two aquaria per concentration) and therefore constitutes a nested design rather than individual replicates.

Water quality parameters were highly variable during the study. Throughout the study, the test solutions had a salinity of 15-26‰, a temperature of 20.6-33.6°C, and a DO range of 2.4-7.7 mg/l.

F_0 survival in the solvent control was 56% at the end of F_0 phase. Only 6 out of 25 fish (24%) survived in replicate B of the solvent control. In addition, F_0 growth was substantially reduced in replicate B, of the solvent control, at test termination.

The light intensity used during the test (430-957 lux) was greater than recommended by the SEP (10-100 lux).

B. **Statistical Analysis:** Hatchability, survival, and reproduction data were not analyzed since significant reductions were visually evident. The reviewer used an ANOVA and Bonferroni's test to analyze juvenile and adult growth.

C. **Discussion/Results:** Water quality parameters (i.e., salinity and temperature, oxygen) were highly variable throughout the test period. Mean temperature for the F_0 generation, ranged from 28.5 (day 103) to 32.44 °C (day 50) during the period of the study. Mean temperature, for the F_1 generation, ranged from 25.65 (day 35) to 28.88 °C (day 16). Salinity, in the F_0 generation, generally ranged from 17 to 22‰ . During the reproduction session there was a big jump in

salinity because of a malfunction in the saltwater system. Dissolved oxygen was low at day 43 and aeration was initiated. Since this is a long study, the deviations in the water quality parameters might not have an influence in the overall results of the study.

Survival in one replicate of the solvent control was very low at the end of the study (24%). In a period of 83 days the survival was reduced to 24 %. The mortality in the solvent control does not have a big influence in the results of the study since the solvent control mortality in the F1 generation was not different from the control.

During the reproduction session, female survival was low. This lead to variability in the number of eggs produced per female reproductive day.

Residues of tebuconazole were found in the fish in all the concentrations. The mean residues at the lowest concentration (9.6 µg/l) was 0.12 mg/kg. The mean residue at the highest concentration (196.9 µg/l)was 12.87 mg/kg.

For all analyzed parameters, the reviewer obtained results similar to those of the author (pages 1, 8, 15, 21, and 22 of printouts, attached), with the following exceptions: 1) F_1 weight at test termination was statistically reduced at 9.2 and 96.7 µg ai/l when compared to the solvent control (page 29 of printouts, attached); and 2) F_1 length at test termination was statistically reduced at 43.6 and 96.7 µg ai/l when compared to the solvent control (page 30 of printouts, attached). The reduction in F_1 weight at 9.2 µg ai/l is probably not biologically significant. The results of the reviewer's verification of the author's conclusions gives the MATC as >19.0 and <43.6 µg ai/l mean measured concentrations which is more conservative than the author's.

This study is scientifically sound. It is classified as supplemental. A new is not required. The results of the fish early life stage for the rainbow trout (MRID No. 407009-14) and the fathead minnow (MRID No. 420382-02) and this fish life cycle study provide sufficient information to characterize the effects of tebuconazole on fish. Based on the conditions of this study the MATC of BAY HWG-1608 for *Cyprinodon variegatus* was >19.0 and <43.6 µg ai/l mean measured

concentrations (geometric mean MATC = 28.8 µg ai/l). The most sensitive parameter was length.

D. **Adequacy of the Study:**

(1) **Classification:** Supplemental

(2) **Rationale:** 1) Water quality parameters were highly variable (temperature, salinity and DO). 2) Survival of F_0 fish in replicate B of the solvent control was extremely low (24%) at terminal sacrifice. However, survival of the fish in the solvent control of the F1 generation was not low (86.0%). 3) Solvent control growth of F_0 fish at test termination was highly variable.

(3) **Repairability:** No.

15. **COMPLETION OF ONE-LINER FOR STUDY:** Yes; 22 March 1994.

Table 2. Mean Measured Concentrations of BAY HWG-1608 in Saltwater During the F0 Phase of a Full Life Cycle Toxicity Test with Sheepshead Minnow, Cyprinodon variegatus

Nominal Test Concentration (µg/L; ppb)	Rep	Mean Measured Test Concentration (µg/L; ppb) Replicate	Treatment	Percent of Nominal
Control	A	<1.3		
	B	<1.3	<1.3	---
Solvent Control	A	<1.3		
	B	<1.3	<1.3	---
12.5	A	9.4 (1.2)		
	B	9.0 (1.3)	9.2 (1.2)	74
25.0	A	19.1 (2.1)		
	B	18.9 (2.4)	19.0 (2.2)	76
50.0	A	42.8 (3.6)		
	B	44.5 (4.1)	43.6 (3.9)	87
100	A	96.0 (11.7)		
	B	97.4 (11.8)	96.7 (11.6)	97
200	A	195.6 (15.7)		
	B	198.3 (17.2)	196.9 (16.3)	99

NOTE: Values in parentheses are the standard deviations of the means.

Table 3. Hatching Success (Recent Hatch) of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 During a Full Life Cycle Toxicity Test

Treatment Group-Mean Measured Concentration (µg/L; ppb) Group	Number of Fished Hatched (% Hatch) [NDF[1]] Tank A Chamber 1	2	Mean	Tank B Chamber 1	2	Mean	Treatment Mean
Control	84	86	85.0 [1]	94	82	88.0 [0]	86.5
Sol. Control	96	82	89.0 [1]	86	92	89.0 [1]	89.0
Pooled Control							87.8
9.2	94	98	96.0 [2]	88	86	87.0 [0]	91.5
19.0	82	86	84.0 [3]	98	84	91.0 [0]	87.5
43.6	88	86	87.0 [1]	96	88	92.0 [1]	89.5
96.7	92	88	90.0 [0]	94	84	89.0 [1]	89.5
196.9	82	90	86.0 [3]	94	92	93.0 [1]	89.5

Note: Initial number = 50 for all chambers.

There were no significant differences from the pooled control using a one-tailed Chi-square, Fisher's exact test, or parametric Dunnett's means comparison procedure (P>.05).

[1]NDF = Number of deformed fish in the replicate.

Table 4. Survival (Percent Survival) of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 on Day 58 (Date Population Culled to 25 Fish per Replicate) During a Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L; ppb)	Percent Survival (Number of Fish Alive/Total Hatch) Tank A Chamber 1	Tank A Chamber 2	Tank A Mean	Tank B Chamber 1	Tank B Chamber 2	Tank B Mean	Treatment Mean
Control	95.2 (40/42)	97.7 (42/43)	96.5	95.7 (45/47)	85.4 (35/41)	90.9	93.6
Sol. Control	93.8 (45/48)	90.2 (37/41)	92.1	93.0 (40/43)	80.4 (37/46)	86.5	89.3
Pooled Control							91.4
9.2	89.4 (42/47)	89.8 (44/49)	89.6	93.2 (41/44)	88.4 (38/43)	90.8	90.2
19.0	95.1 (39/41)	90.7 (39/43)	92.8	85.7 (42/49)	95.2 (40/42)	90.1	91.4
43.6	100.0 (44/44)	95.3 (41/43)	97.7	89.6 (43/48)	95.5 (42/44)	92.4	95.0
96.7	89.1 (41/46)	88.6 (39/44)	88.9	91.5 (43/47)	81.0 (34/42)	86.5	87.7
196.9	22.0 (9/41)	0.0 (0/45)	10.5	23.4 (11/47)	4.3 (2/46)	14.0	12.3*

Note: *Significantly different ($P<.05$) from the pooled control using a one-tailed Chi-square test, a Fisher's exact test, and a nonparametric Dunnett's means comparison procedure.

Table 6. Mean (Standard Deviation and n) Growth (Measured Photographically as Length in mm) of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 on Day 33 During a Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L: ppb)	Tank A Chamber 1	Tank A Chamber 2	Tank A Mean	Tank B Chamber 1	Tank B Chamber 2	Tank B Mean	Treatment Mean
Control	11.8 (1.8) (n=40)	11.1 (1.5) (n=42)	11.4	10.9 (1.6) (n=45)	11.2 (1.8) (n=36)	11.0	11.2
Sol. Control	11.0 (1.6) (n=45)	11.8 (1.6) (n=38)	11.4	11.1 (2.0) (n=40)	11.8 (1.9) (n=38)	11.5	11.4
Pooled Control							11.3
9.2	10.9 (1.1) (n=42)	11.2 (1.1) (n=44)	11.0	11.6 (1.2) (n=41)	12.2 (1.8) (n=40)	11.9	11.4
19.0	11.2 (1.3) (n=39)	11.0 (1.3) (n=43)	11.1	11.0 (1.5) (n=42)	11.3 (1.5) (n=40)	11.1	11.1
43.6	10.4 (1.4) (n=44)	11.4 (1.0) (n=41)	10.9	11.0 (1.2) (n=43)	11.2 (1.2) (n=42)	11.1	11.0
96.7	10.7 (1.9) (n=41)	10.2 (1.8) (n=41)	10.5	10.1 (2.1) (n=43)	10.7 (1.8) (n=38)	10.4	10.4*
196.9	9.6 (4.2) (n=12)	9.6 (2.6) (n=8)	9.6	11.3 (3.2) (n=11)	10.7 (2.8) (n=9)	11.0	10.3#

Note: *Significantly different ($P<.05$) from the pooled control using a one-tailed parametric Dunnett's means comparison procedure.

#Treatment level not included in statistical comparison to control because of survival effects.

Table 5. Survival (Percent Survival) of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 on Day 177 (Date Population F0 Population Terminated and Based Upon Culled Population) During a Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L; ppb)	Percent Survival (Number of Fish Alive/Total Hatch)		
	Tank A	Tank B	Treatment Mean
Control	68.0 (17/25)	84.0 (21/25)	76.0
Sol. Control	88.0 (22/25)	24.0 (6/25)	56.0
Pooled Control			66.0
9.2	56.0 (14/25)	52.0 (13/25)	54.0
19.0	96.0 (24/25)	72.0 (18/25)	84.0
43.6	92.0 (23/25)	64.0 (16/25)	78.0
96.7	36.0 (9/25)	92.0 (23/25)	64.0
196.9	11.1 (1/9)	7.7 (1/13)	9.1*

Note: Initial number = 25 per chamber, except for 196.9 µg/L, tank A, n=9 and tank B, n=13.

*Significantly different ($P<.05$) from the pooled control using a one-tailed Chi-square test and a Fisher's exact test.

Table 7. Mean (Standard Deviation and n) Growth (Measured as Length in mm) of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 on Day 58 During a full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L; ppb)	Mean Length						
	Tank A			Tank B			
	Chamber			Chamber			Treatment
	1	2	Mean	1	2	Mean	Mean
Control	17.1 (2.4) (n=40)	16.4 (2.8) (n=42)	16.8	18.0 (2.8) (n=45)	16.5 (2.4) (n=35)	17.4	17.1
Sol. Control	18.8 (2.8) (n=45)	17.0 (3.1) (n=37)	18.0	19.5 (2.8) (n=40)	17.8 (2.6) (n=37)	18.7	18.3
Pooled Control							17.7
9.2	18.8 (2.1) (n=42)	17.3 (2.3) (n=44)	18.0	19.0 (2.0) (n=41)	17.4 (2.2) (n=38)	18.2	18.1
19.0	19.3 (1.7) (n=39)	17.3 (2.3) (n=39)	18.3	18.3 (2.2) (n=42)	16.9 (3.3) (n=40)	17.6	17.9
43.6	18.8 (2.5) (n=44)	17.0 (2.4) (n=41)	17.9	18.2 (1.4) (n=43)	17.0 (2.2) (n=42)	17.6	17.8
96.7	19.4 (2.5) (n=41)	16.0 (2.7) (n=39)	17.7	18.6 (2.4) (n=43)	16.1 (3.2) (n=34)	17.5	17.6
196.9	17.7 (5.3) (n=9)	--- (---) (n=0)	17.7	14.9 (5.2) (n=11)	19.5 (7.8) (n=2)	15.6	16.5#

Note: There were no significant differences from the pooled control or the solvent control using a one-tailed parametric Dunnett's means comparison procedure (P>.05).

#Treatment level not included in statistical comparison to control because of survival effects.

Table 8. Mean (Standard Deviation and n) Growth (Measured as Wet Weight in mg) of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 on Day 58 During a Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L; ppb)	Mean ~~Length~~ weight Tank A Chamber 1	Tank A Chamber 2	Tank A Mean	Tank B Chamber 1	Tank B Chamber 2	Tank B Mean	Treatment Mean
Control	147.4 (57.1) (n=40)	142.1 (54.9) (n=17)	145.9	174.3 (92.7) (n=45)	163.5 (69.3) (n=10)	172.4	158.9
Sol. Control	187.6 (68.1) (n=45)	180.2 (96.2) (n=12)	186.0	216.6 (100.7) (n=40)	159.1 (73.8) (n=12)	203.3	194.3
Pooled Control							176.3
9.2	180.8 (75.7) (n=42)	177.3 (82.8) (n=19)	179.7	206.0 (71.0) (n=41)	189.2 (85.2) (n=15)	201.5	190.1
19.0	204.3 (68.8) (n=39)	173.8 (65.4) (n=14)	196.3	173.0 (73.1) (n=42)	175.8 (97.6) (n=15)	173.7	184.6
43.6	191.3 (90.3) (n=44)	173.1 (54.6) (n=16)	186.4	169.8 (52.3) (n=43)	152.2 (69.6) (n=17)	164.8	175.6
96.7	208.3 (88.4) (n=41)	158.8 (91.1) (n=14)	195.7	192.3 (80.2) (n=43)	198.3 (102.1) (n=9)	192.0	193.9

Note: There were no significant differences from the pooled control or the solvent control using a parametric one-tailed Dunnett's means comparison procedure ($P>.05$).

Treatment level 5 not included because no fish were available for wet weights.

Table 9. Mean (Standard Deviation and n) Growth (Measured as Length in cm) of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 on Day 177 During a Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L: ppb)	Mean Length		Treatment Mean
	Tank A	Tank B	
Control	3.41 (0.32) (n=17)	3.56 (0.52) (n=21)	3.49
Sol. Control	3.56 (0.44) (n=22)	2.60 (0.68) (n=6)	3.35
Pooled Control			3.43
9.2	2.91 (0.50) (n=14)	2.97 (0.43) (n=13)	2.94
19.0	3.33 (0.43) (n=24)	3.12 (0.42) (n=18)	3.24
43.6	3.50 (0.33) (n=23)	2.98 (0.44) (n=16)	3.28
96.7	2.97 (0.49) (n=9)	3.24 (0.44) (n=23)	3.17
196.9	3.10 (----) (n=1)	4.00 (----) (n=1)	3.55#

Note: There were no significant differences from the pooled control using a one-tailed parametric Dunnett's means comparison procedure ($P > .05$).

#Treatment level not included in statistical comparison to control because of survival effects.

Table 10. Mean (Standard Deviation and n) Growth (Measured as Wet Weight in grams) of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 on Day 177 During Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L; ppb)	Tank A	Tank B	Treatment Mean
Control	1.65 (0.49) (n=17)	1.89 (0.83) (n=21)	1.78
Solv.Control	1.95 (0.73) (n=22)	0.74 (0.63) (n=6)	1.69
Pooled Control			1.74
9.6	1.08 (0.65) (n=14)	1.07 (0.65) (n=13)	1.08
19.0	1.64 (0.83) (n=24)	1.19 (0.53) (n=18)	1.45
43.6	1.53 (0.50) (n=23)	1.10 (0.57) (n=16)	1.35
96.7	0.90 (0.58) (n=9)	1.52 (0.59) (n=23)	1.34
196.9	0.70 (----) (n=1)	2.41 (----) (n=1)	1.56#

Note: There were no significant differences from the pooled control using a one-tailed parametric Dunnett's means comparison procedure (P>.05).

#Treatment level not included in statistical comparison to control because of survival effects.

Table 16. Mean Measured Concentrations of BAY HWG-1608 in Saltwater During the Reproduction Phase of a Full Life Cycle Exposure of the Sheepshead Minnow, Cyprinodon variegatus, Under Flow-Through Conditions

Nominal Test Concentration (µg/L; ppb)	Rep	Mean Measured Test Concentration (µg/L; ppb) Replicate	Treatment	Percent of Nominal
Control	A	<1.3		
	B	<1.3	<1.3	---
Solvent Control	A	<1.3		
	B	<1.3	<1.3	---
12.5	A	9.6 (1.1)		
	B	8.8 (1.4)	9.2 (1.3)	74
25.0	A	21.8 (2.0)		
	B	22.0 (2.1)	21.9 (2.0)	88
50.0	A	49.3 (3.1)		
	B	48.6 (4.1)	49.0 (3.6)	98
100	A	98.8 (7.2)		
	B	98.4 (5.9)	98.6 (6.4)	99
200	A	190.5 (16.5)		
	B	201.5 (35.9)	196.0 (27.7)	98

NOTE: Values in parentheses are the standard deviations of the means.

Table 17. Number of Eggs and Number of Female Reproductive Days of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 in a Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L; ppq)	Tank		Session 1	2	3	4	Total
Control	A	EGGS	2329	1764	1011	171	5275
		REPR.DAYS	70	61	59	37	227
	B	EGGS	1306	1871	29	809	4015
		REPR.DAYS	70	70	4	42	186
Sol. Control	A	EGGS	2046	1657	148	3	3854
		REPR.DAYS	70	70	9	4	153
	B	EGGS	729	927	130	76	1862
		REPR.DAYS	45	52	11	5	113
Pooled Control		EGGS	6410	6219	1318	1059	15006
		REPR.DAYS	255	253	83	88	679
9.2	A	EGGS	571	230	470	698	1969
		REPR.DAYS	49	38	17	42	146
	B	EGGS	25	106	185	0	316
		REPR.DAYS	26	19	21	3	69
21.9	A	EGGS	1059	2417	1937	813	6226
		REPR.DAYS	70	70	70	30	240
	B	EGGS	441	503	944	684	2572
		REPR.DAYS	26	42	51	37	156
49.0	A	EGGS	2322	2062	1284	590	6258
		REPR.DAYS	70	70	84	31	255
	B	EGGS	307	1668	184	513	2672
		REPR.DAYS	70	56	24	23	173
98.6	A	EGGS	---[a]	13	---[a]	1190	1203
		REPR.DAYS	0	8	0	42	50
	B	EGGS	2662	1502	2603	1195	7962
		REPR.DAYS	70	70	70	42	252

Note: Treatment level 5 not included because of survival effects in the F0 generation.

[a] Insufficient number of sexually mature fish with which to form a spawning group. Not included in analysis.

Table 18. Reproductive Growth (Measured as Eggs per Female Reproductive Day) of F0 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 in a Full Life Cycle Toxicity Test

Treatment Group - Treatment Group	Tank	Eggs Per Female Reproductive Day Session 1	2	3	4	Overall Mean
Control	A	33.3	28.9	17.1	4.6	23.2
	B	18.7	26.7	7.2	19.3	21.6
	MEAN	26.0	27.7	16.5	12.4	22.5
Sol. Control	A	29.2	23.7	16.4	0.8	25.2
	B	16.2	17.8	11.8	15.2	16.5
	MEAN	24.1	21.2	13.9	8.8	21.5
Pooled Control		25.1	24.6	15.9	12.0	22.1
9.2	A	11.7	6.1	27.6	16.6	13.5
	B	1.0	5.6	8.8	0.0	4.6
	MEAN	7.9	5.9	17.2	15.5	10.6
21.9	A	15.1	34.5	27.7	27.1	25.9
	B	17.0	12.0	18.5	18.5	16.5
	MEAN	15.6	26.1	23.8	22.3	22.2
49.0	A	33.2	29.5	15.3	19.0	24.5
	B	4.4	29.8	7.7	22.3	15.4
	MEAN	18.8	29.6	13.6	20.4	20.9
98.6	A	---[a]	1.6	---[a]	28.3	24.1
	B	38.0	21.5	37.2	28.5	31.6
	MEAN	38.0	19.4	37.2	28.4	30.3

Note: There were no significant differences from the pooled control using a one-tailed Dunnett's means comparison procedure ($P>.05$).

Treatment level 5 not included because of survival effects in the F0 generation.

[a] Insufficient number of sexually mature fish with which to form a spawning group. Not included in analysis.

Table 24. Mean Measured Concentrations of BAY HWG-1608 in Saltwater During the F1 Phase of a Full Life Cycle Toxicity Test with Sheepshead Minnow, Cyprinodon variegatus

Nominal Test Concentration (µg/L; ppb)	Rep	Mean Measured Test Concentration (µg/L; ppb) Replicate	Treatment	Percent of Nominal
Control	A	<1.3		
	B	<1.3	<1.3	---
Solvent Control	A	<1.3		
	B	<1.3	<1.3	---
12.5	A	9.8 (1.6)		
	B	9.4 (1.4)	9.6 (1.5)	77
25.0	A	18.5 (2.3)		
	B	18.3 (2.2)	18.4 (2.2)	73
50.0	A	49.3 (17.8)		
	B	44.6 (3.7)	46.9 (12.8)	94
100	A	99.3 (8.8)		
	B	96.3 (8.2)	97.8 (8.4)	98
200	A	194.7 (25.6)		
	B	189.4 (14.7)	192.0 (20.6)	96

NOTE: Values in parentheses are the standard deviations of the means.

Table 25. Hatching Success (Percent Hatch) of F1 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 During a Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L; ppb)	Percent Hatch						
	Tank A			Tank B			
	Chamber			Chamber			Treatment
	1	2	Mean	1	2	Mean	Mean
Control	75.0	96.0	86.7	100.0	100.0	100.0	93.7
Sol. Control	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Pooled Control							96.9
9.6	100.0	100.0	100.0	---	---	---	100.0
18.4	76.0	72.0	74.0	100.0	84.0	92.0	83.0*
46.9	100.0	100.0	100.0	92.0	96.0	94.0	97.0
97.8	100.0	96.0	98.0	100.0	100.0	100.0	99.0

Note: Initial number = 25 per chamber, except for control, tank A, chamber 1, n=20 and level 1, tank B, for which there were no data available.

*Significantly different ($P<.05$) from the pooled control using a one-tailed Chi-square and Fisher's exact test.

Treatment level 5 not included because of survival effects in the F0 generation.

Table 26. Survival of F1 (Day 28 Post-Hatch) Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 at the Termination of a Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration Group	Percent Survival (Number of Fish Alive/Total Hatch) Tank A Chamber 1	Tank A Chamber 2	Tank A Mean	Tank B Chamber 1	Tank B Chamber 2	Tank B Mean	Treatment Mean
Control	100.0 (15/15)	91.7 (22/24)	94.9	100.0 (25/25)	92.0 (23/25)	96.0	95.5
Sol. Control	72.0 (18/25)	92.0 (23/25)	82.0	84.0 (21/25)	96.0 (24/25)	90.0	86.0
Pooled Control							90.5
9.6	100.0 (25/25)	100.0 (25/25)	100.0	---[a] (0/0)	---[a] (0/0)	---[a]	100.0
18.4	94.7 (18/19)	100.0 (18/18)	97.3	92.0 (23/25)	90.5 (19/21)	91.3	94.0
46.9	96.0 (24/25)	96.0 (24/25)	96.0	100.0 (23/23)	100.0 (24/24)	100.0	97.9
97.8	100.0 (25/25)	83.3 (20/24)	91.8	96.0 (24/25)	100.0 (25/25)	98.0	94.9

Note: There were no significant differences from the pooled control using a one-tailed test.

Treatment level 5 not included because of survival effects in the F0 generation.

[a] No eggs were produced for this replicate.

Table 27. Mean (Standard Deviation and n) of Growth (Measured as Length in mm) of F1 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 at Termination of a Full Life Cycle Toxicity Test

Treatment Group - Mean Measured Concentration (µg/L; ppb)	Mean Length						
	Tank A			Tank B			
	Chamber			Chamber			Treatment
	1	2	Mean	1	2	Mean	Mean
Control	13.3 (1.9) (n=15)	12.6 (1.6) (n=22)	12.9	13.8 (1.2) (n=25)	14.2 (1.4) (n=23)	14.0	13.5
Sol. Control	13.9 (1.2) (n=18)	13.6 (1.3) (n=23)	13.7	14.1 (0.9) (n=21)	14.2 (1.0) (n=24)	14.2	14.0
Pooled Control							13.7
9.6	13.5 (1.0) (n=25)	13.0 (1.0) (n=25)	13.3	---[a] (---) (n=0)	---[a] (---) (n=0)	---[a]	13.3
18.4	13.9 (1.6) (n=18)	13.8 (1.2) (n=18)	13.9	14.2 (1.0) (n=23)	14.7 (0.9) (n=19)	14.4	14.2
46.9	13.3 (1.3) (n=24)	13.0 (0.8) (n=24)	13.2	13.4 (1.3) (n=23)	13.3 (1.3) (n=24)	13.4	13.3
97.8	13.2 (1.3) (n=25)	13.4 (1.2) (n=20)	13.3	12.7 (1.3) (n=24)	12.5 (1.1) (n=25)	12.6	12.9*

Note: *Significantly different (P<.05) from the pooled control using a one-tailed parametric Dunnett's means comparison procedure.

Treatment level 5 not included because of survival effects in the F0 generation.

[a] Tank B - There were no data available; see Table 26.

Table 28. Mean (Standard Deviation and n) of Growth (Measured as Wet Weight in mg) of F1 Sheepshead Minnows, Cyprinodon variegatus, Exposed to BAY HWG-1608 at Termination of a Full Life Cycle Toxicity Test (28 Days Post-Hatch)

Treatment Group - Mean Measured Concentration	Mean Wet Weight						
	Tank A			Tank B			
	Chamber 1	Chamber 2	Mean	Chamber 1	Chamber 2	Mean	Treatment Mean
Control	67.5 (28.8) (n=15)	53.8 (17.4) (n=22)	59.3	73.6 (22.6) (n=25)	83.6 (23.5) (n=23)	78.4	70.1
Sol. Control	75.8 (16.4) (n=18)	64.0 (18.0) (n=23)	69.2	79.8 (21.9) (n=21)	81.3 (16.9) (n=24)	80.6	75.2
Pooled Control							72.6
9.6	63.0 (17.6) (n=25)	55.9 (14.7) (n=25)	59.5	---[a] (---) (n=0)	---[a] (---) (n=0)	---[a]	59.5
18.4	86.1 (36.5) (n=18)	80.0 (19.7) (n=18)	83.0	87.5 (19.3) (n=23)	101.6 (23.9) (n=19)	93.8	88.9
46.9	70.0 (20.6) (n=24)	62.8 (14.7) (n=24)	66.4	71.3 (18.8) (n=23)	66.7 (22.2) (n=24)	69.0	67.7
97.8	66.3 (19.7) (n=25)	71.1 (21.1) (n=20)	68.4	43.3 (15.1) (n=24)	41.1 (12.9) (n=25)	42.2	54.7*

Note: *Significantly different ($P<.05$) from the pooled control using a one-tailed parametric Dunnett's means comparison procedure.

Treatment level 5 not included because of survival effects in the F0 generation.

[a] Tank B - There were no data available; see Table 26.

TITLE: Sheepshead Minnow Survival Day 33
FILE: a:\surv.d33
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	GRPS 1&2 POOLED	1	0.8800	1.2171
1	GRPS 1&2 POOLED	2	0.7600	1.0588
1	GRPS 1&2 POOLED	3	0.8000	1.1071
1	GRPS 1&2 POOLED	4	0.7600	1.0588
1	GRPS 1&2 POOLED	5	0.8000	1.1071
1	GRPS 1&2 POOLED	6	0.8400	1.1593
1	GRPS 1&2 POOLED	7	0.9000	1.2490
1	GRPS 1&2 POOLED	8	0.7200	1.0132
2	10.2 ppb	1	0.8400	1.1593
2	10.2 ppb	2	0.8800	1.2171
2	10.2 ppb	3	0.8200	1.1326
2	10.2 ppb	4	0.7600	1.0588
3	20.7 ppb	1	0.7600	1.0588
3	20.7 ppb	2	0.8000	1.1071
3	20.7 ppb	3	0.8400	1.1593
3	20.7 ppb	4	0.8000	1.1071
4	37.2 ppb	1	0.8800	1.2171
4	37.2 ppb	2	0.8200	1.1326
4	37.2 ppb	3	0.8600	1.1873
4	37.2 ppb	4	0.8400	1.1593
5	81.05 ppb	1	0.8200	1.1326
5	81.05 ppb	2	0.8200	1.1326
5	81.05 ppb	3	0.8600	1.1873
5	81.05 ppb	4	0.7600	1.0588
6	170.5 ppb	1	0.2000	0.4636
6	170.5 ppb	2	0.1700	0.4250
6	170.5 ppb	3	0.2200	0.4882
6	170.5 ppb	4	0.1800	0.4381

Sheepshead Minnow Survival Day 33
File: a:\surv.d33 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	GRPS 1&2 POOLED	8	1.013	1.249	1.121
2	10.2 ppb	4	1.059	1.217	1.142
3	20.7 ppb	4	1.059	1.159	1.108
4	37.2 ppb	4	1.133	1.217	1.174
5	81.05 ppb	4	1.059	1.187	1.128
6	170.5 ppb	4	0.425	0.488	0.454

File: a:\surv.d33 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	GRPS 1&2 POOLED	0.007	0.082	0.029
2	10.2 ppb	0.004	0.066	0.033
3	20.7 ppb	0.002	0.041	0.021
4	37.2 ppb	0.001	0.036	0.018
5	81.05 ppb	0.003	0.053	0.026
6	170.5 ppb	0.001	0.028	0.014

Sheepshead Minnow Survival Day 33
File: a:\surv.d33 Transform: ARC SINE(SQUARE ROOT(Y))

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	GRPS 1&2 POOLED	8	0.808	1.121	1.133
2	10.2 ppb	4	0.825	1.142	1.133
3	20.7 ppb	4	0.800	1.108	1.133
4	37.2 ppb	4	0.850	1.174	1.133
5	81.05 ppb	4	0.815	1.128	1.128
6	170.5 ppb	4	0.193	0.454	0.454

Sheepshead Minnow Survival Day 33
File: a:\surv.d33 Transform: ARC SINE(SQUARE ROOT(Y))

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
GRPS 1&2 POOLED	1.133				
10.2 ppb	1.133	0.327		1.72	k= 1, v=22
20.7 ppb	1.133	0.327		1.80	k= 2, v=22
37.2 ppb	1.133	0.327		1.83	k= 3, v=22
81.05 ppb	1.128	0.178		1.84	k= 4, v=22
170.5 ppb	0.454	18.144	*	1.85	k= 5, v=22

s = 0.060
Note: df used for table values are approximate when v > 20.

TITLE: Sheepshead Minnow Hatching Success
FILE: a:\hatch
TRANSFORM: SQUARE ROOT(Y) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	GRPS 1&2 POOLED	1	0.9600	0.9798
1	GRPS 1&2 POOLED	2	0.8200	0.9055
1	GRPS 1&2 POOLED	3	0.8600	0.9274
1	GRPS 1&2 POOLED	4	0.9200	0.9592
1	GRPS 1&2 POOLED	5	0.8400	0.9165
1	GRPS 1&2 POOLED	6	0.8600	0.9274
1	GRPS 1&2 POOLED	7	0.9400	0.9695
1	GRPS 1&2 POOLED	8	0.8200	0.9055
2	10.2 ppb	1	0.9400	0.9695
2	10.2 ppb	2	0.9800	0.9899
2	10.2 ppb	3	0.8800	0.9381
2	10.2 ppb	4	0.8600	0.9274
3	20.7 ppb	1	0.8200	0.9055
3	20.7 ppb	2	0.8600	0.9274
3	20.7 ppb	3	0.9800	0.9899
3	20.7 ppb	4	0.8400	0.9165
4	37.2 ppb	1	0.8800	0.9381
4	37.2 ppb	2	0.8600	0.9274
4	37.2 ppb	3	0.9600	0.9798
4	37.2 ppb	4	0.8800	0.9381
5	81.05 ppb	1	0.9200	0.9592
5	81.05 ppb	2	0.8800	0.9381
5	81.05 ppb	3	0.9400	0.9695
5	81.05 ppb	4	0.8400	0.9165
6	170.5 ppb	1	0.8200	0.9055
6	170.5 ppb	2	0.9000	0.9487
6	170.5 ppb	3	0.9400	0.9695
6	170.5 ppb	4	0.9200	0.9592

Sheepshead Minnow Hatching Success
File: a:\hatch Transform: SQUARE ROOT(Y)

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	GRPS 1&2 POOLED	8	0.906	0.980	0.936
2	10.2 ppb	4	0.927	0.990	0.956
3	20.7 ppb	4	0.906	0.990	0.935
4	37.2 ppb	4	0.927	0.980	0.946
5	81.05 ppb	4	0.917	0.970	0.946
6	170.5 ppb	4	0.906	0.970	0.946

File: a:\hatch Transform: SQUARE ROOT(Y)

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	GRPS 1&2 POOLED	0.001	0.029	0.010
2	10.2 ppb	0.001	0.029	0.014
3	20.7 ppb	0.001	0.038	0.019
4	37.2 ppb	0.001	0.023	0.012
5	81.05 ppb	0.001	0.024	0.012
6	170.5 ppb	0.001	0.028	0.014

Sheepshead Minnow Hatching Success
File: a:\hatch Transform: SQUARE ROOT(Y)

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	GRPS 1&2 POOLED	8	0.878	0.936	0.936
2	10.2 ppb	4	0.915	0.956	0.946
3	20.7 ppb	4	0.875	0.935	0.946
4	37.2 ppb	4	0.895	0.946	0.946
5	81.05 ppb	4	0.895	0.946	0.946
6	170.5 ppb	4	0.895	0.946	0.946

Sheepshead Minnow Hatching Success
File: a:\hatch Transform: SQUARE ROOT(Y)

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
GRPS 1&2 POOLED	0.936				
10.2 ppb	0.946	0.518		1.72	k= 1, v=22
20.7 ppb	0.946	0.518		1.80	k= 2, v=22
37.2 ppb	0.946	0.532		1.83	k= 3, v=22
81.05 ppb	0.946	0.532		1.84	k= 4, v=22
170.5 ppb	0.946	0.532		1.85	k= 5, v=22

s = 0.029
Note: df used for table values are approximate when v > 20.

TRT 1 = Dilution Water Control

TRT 2 = Solvent Control

TRT 3 = 9.21 ug/l

TRT 4 = 19.0 ug/l

TRT 5 = 43.6 ug/l

TRT 6 = 97.0 ug/l

TRT 7 = 197 ug/l

F0 LENGTH AT 33 DAYS
ANOVA on Lengths
LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT
1.0000 2.0000 3.0000 4.0000 5.0000 6.0000
7.0000
REP
1.0000 2.0000

DEP VAR: LENGTH N: 1028 MULTIPLE R: 0.245 SQUARED MULTIPLE R: 0.060

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	130.7688	6	21.7948	7.9581	0.0000
REP	17.9259	1	17.9259	6.5455	0.0107
TRT*REP	41.2929	6	6.8822	2.5129	0.0203
ERROR	2777.0240	1014	2.7387		

DURBIN-WATSON D STATISTIC 1.818
FIRST ORDER AUTOCORRELATION .089

Post-hoc pairwise comparison of length/Bonferroni.
USING LEAST SQUARES MEANS.
POST HOC TEST OF LENGTH

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.0000				
2	0.1978	0.0000			
3	0.1648	-0.0330	0.0000		
4	-0.1290	-0.3268	-0.2938	0.0000	
5	-0.2197	-0.4175	-0.3845	-0.0907	0.0000
6	-0.7904	-0.9882	-0.9552	-0.6614	-0.5707
7	-0.9197	-1.1175	-1.0845	-0.7907	-0.7000

	6	7
6	0.0000	
7	-0.1293	0.0000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.0000				
2	1.0000	1.0000			
3	1.0000	1.0000	1.0000		
4	1.0000	1.0000	1.0000	1.0000	
5	1.0000	0.4624	0.7100	1.0000	1.0000
6	0.0004	0.0000	0.0000	0.0064	0.0358
7	0.0353	0.0029	0.0045	0.1425	0.3415

	6	7
6	1.0000	
7	1.0000	1.0000

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000

TOTAL OBSERVATIONS: 163

LENGTH

N OF CASES	163
MINIMUM	7.0000
MAXIMUM	16.0000
MEAN	11.2209
STANDARD DEV	1.6998

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000

TOTAL OBSERVATIONS: 161

LENGTH

N OF CASES	161
MINIMUM	6.0000
MAXIMUM	16.0000
MEAN	11.4161
STANDARD DEV	1.7908

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000

TOTAL OBSERVATIONS: 165

LENGTH

N OF CASES	165
MINIMUM	8.0000
MAXIMUM	14.0000
MEAN	11.3697
STANDARD DEV	1.2308

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000

TOTAL OBSERVATIONS: 166

LENGTH

N OF CASES	166
MINIMUM	6.0000
MAXIMUM	15.0000
MEAN	11.0904
STANDARD DEV	1.3699

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000

TOTAL OBSERVATIONS: 170

	LENGTH
N OF CASES	170
MINIMUM	6.0000
MAXIMUM	14.0000
MEAN	11.0000
STANDARD DEV	1.2593

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000

TOTAL OBSERVATIONS: 163

	LENGTH
N OF CASES	163
MINIMUM	5.0000
MAXIMUM	15.0000
MEAN	10.4294
STANDARD DEV	1.9115

THE FOLLOWING RESULTS ARE FOR:
TRT = 7.0000

TOTAL OBSERVATIONS: 40

	LENGTH
N OF CASES	40
MINIMUM	5.0000
MAXIMUM	19.0000
MEAN	10.3000
STANDARD DEV	3.3066

SUMMARY STATISTICS FOR LENGTH

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 127.4388 DF= 6 PROBABILITY = 0.0000

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	129.1288	6	21.5215	7.7766	0.0000
WITHIN GROUPS	2825.59881021		2.7675		

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 1.0000

TOTAL OBSERVATIONS: 82

LENGTH

N OF CASES	82
MINIMUM	7.0000
MAXIMUM	16.0000
MEAN	11.4024
STANDARD DEV	1.6841

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 2.0000

TOTAL OBSERVATIONS: 81

LENGTH

N OF CASES	81
MINIMUM	7.0000
MAXIMUM	15.0000
MEAN	11.0370
STANDARD DEV	1.7062

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 1.0000

TOTAL OBSERVATIONS: 83

LENGTH

N OF CASES	83
MINIMUM	6.0000
MAXIMUM	16.0000
MEAN	11.3735
STANDARD DEV	1.6507

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 2.0000

TOTAL OBSERVATIONS: 78

LENGTH

N OF CASES	78
MINIMUM	8.0000
MAXIMUM	16.0000
MEAN	11.4615
STANDARD DEV	1.9386

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 1.0000

TOTAL OBSERVATIONS: 86

LENGTH

N OF CASES	86
MINIMUM	9.0000
MAXIMUM	13.0000
MEAN	11.0349
STANDARD DEV	1.1214

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 2.0000

TOTAL OBSERVATIONS: 79

LENGTH

N OF CASES	79
MINIMUM	8.0000
MAXIMUM	14.0000
MEAN	11.7342
STANDARD DEV	1.2477

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 1.0000

TOTAL OBSERVATIONS: 84

LENGTH

N OF CASES	84
MINIMUM	6.0000
MAXIMUM	13.0000
MEAN	11.0595
STANDARD DEV	1.2834

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 2.0000

TOTAL OBSERVATIONS: 82

LENGTH

N OF CASES	82
MINIMUM	7.0000
MAXIMUM	15.0000
MEAN	11.1220
STANDARD DEV	1.4605

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 1.0000

TOTAL OBSERVATIONS: 85

LENGTH

N OF CASES	85
MINIMUM	6.0000
MAXIMUM	14.0000
MEAN	10.8706
STANDARD DEV	1.3255

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 2.0000

TOTAL OBSERVATIONS: 85

LENGTH

N OF CASES	85
MINIMUM	8.0000
MAXIMUM	14.0000
MEAN	11.1294
STANDARD DEV	1.1831

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 1.0000

TOTAL OBSERVATIONS: 82

LENGTH

N OF CASES	82
MINIMUM	6.0000
MAXIMUM	15.0000
MEAN	10.4512
STANDARD DEV	1.8735

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 2.0000

TOTAL OBSERVATIONS: 81

LENGTH

N OF CASES	81
MINIMUM	5.0000
MAXIMUM	14.0000
MEAN	10.4074
STANDARD DEV	1.9607

THE FOLLOWING RESULTS ARE FOR:
TRT = 7.0000
REP = 1.0000

TOTAL OBSERVATIONS: 20

	LENGTH
N OF CASES	20
MINIMUM	5.0000
MAXIMUM	19.0000
MEAN	9.6000
STANDARD DEV	3.5452

THE FOLLOWING RESULTS ARE FOR:
TRT = 7.0000
REP = 2.0000

TOTAL OBSERVATIONS: 20

	LENGTH
N OF CASES	20
MINIMUM	7.0000
MAXIMUM	18.0000
MEAN	11.0000
STANDARD DEV	2.9736

SUMMARY STATISTICS FOR LENGTH

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 135.3557 DF= 13 PROBABILITY = 0.0000

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	177.7036	13	13.6695	4.9913	0.0000
WITHIN GROUPS	2777.02401014		2.7387		

KOLMOGOROV-SMIRNOV ONE SAMPLE TEST USING STANDARD NORMAL DISTRIBUTION

VARIABLE	N-OF-CASES	MAXDIF	PROBABILITY (2-TAIL)
LENGTH	1028.0000	1.0000	0.0000

TRT 1 = Dilution Water Control
TRT 2 = Solvent Control
TRT 3 = 9.21 ug/l
TRT 4 = 19.0 ug/l
TRT 5 = 43.6 ug/l
TRT 6 = 97.0 ug/l
TRT 7 = 197 ug/l

F0 LENGTH AT 58 DAYS
ANOVA on Lengths
LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT
1.0000 2.0000 3.0000 4.0000 5.0000 6.0000
7.0000
REP
1.0000 2.0000

DEP VAR: LENGTH N: 997 MULTIPLE R: 0.191 SQUARED MULTIPLE R: 0.037

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	189.2975	6	31.5496	4.2354	0.0003
REP	9.5438	1	9.5438	1.2812	0.2579
TRT*REP	78.9553	6	13.1592	1.7666	0.1028
ERROR	7322.4497	983	7.4491		

DURBIN-WATSON D STATISTIC 1.665
FIRST ORDER AUTOCORRELATION .162

Post-hoc pairwise comparison of length/Bonferroni.
USING LEAST SQUARES MEANS.

POST HOC TEST OF LENGTH

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.0000				
2	1.2724	0.0000			
3	1.0752	-0.1972	0.0000		
4	0.8864	-0.3860	-0.1888	0.0000	
5	0.7173	-0.5551	-0.3579	-0.1691	0.0000
6	0.5629	-0.7096	-0.5124	-0.3236	-0.1545
7	-0.4181	-1.6905	-1.4933	-1.3046	-1.1354

	6	7
6	0.0000	
7	-0.9810	0.0000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.0000				
2	0.0007	1.0000			
3	0.0078	1.0000	1.0000		
4	0.0768	1.0000	1.0000	1.0000	
5	0.3542	1.0000	1.0000	1.0000	1.0000
6	1.0000	0.4431	1.0000	1.0000	1.0000
7	1.0000	0.1559	0.3709	0.8108	1.0000

	6	7
6	1.0000	
7	1.0000	1.0000

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000

TOTAL OBSERVATIONS: 162

LENGTH

N OF CASES	162
MINIMUM	10.0000
MAXIMUM	27.0000
MEAN	17.0556
STANDARD DEV	2.6616

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000

TOTAL OBSERVATIONS: 159

LENGTH

N OF CASES	159
MINIMUM	8.0000
MAXIMUM	25.0000
MEAN	18.3208
STANDARD DEV	2.9324

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000

TOTAL OBSERVATIONS: 167

LENGTH

N OF CASES	167
MINIMUM	12.0000
MAXIMUM	23.0000
MEAN	18.1317
STANDARD DEV	2.2643

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000

TOTAL OBSERVATIONS: 160

LENGTH

N OF CASES	160
MINIMUM	10.0000
MAXIMUM	24.0000
MEAN	17.9375
STANDARD DEV	2.6006

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000

TOTAL OBSERVATIONS: 170

	LENGTH
N OF CASES	170
MINIMUM	12.0000
MAXIMUM	25.0000
MEAN	17.7765
STANDARD DEV	2.2968

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000

TOTAL OBSERVATIONS: 157

	LENGTH
N OF CASES	157
MINIMUM	9.0000
MAXIMUM	24.0000
MEAN	17.6242
STANDARD DEV	3.0727

THE FOLLOWING RESULTS ARE FOR:
TRT = 7.0000

TOTAL OBSERVATIONS: 22

	LENGTH
N OF CASES	22
MINIMUM	10.0000
MAXIMUM	27.0000
MEAN	16.4545
STANDARD DEV	5.3960

SUMMARY STATISTICS FOR LENGTH

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 58.8147 DF= 6 PROBABILITY = 0.0000

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	198.6053	6	33.1009	4.4275	0.0002
WITHIN GROUPS	7401.4068	990	7.4762		

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 1.0000

TOTAL OBSERVATIONS: 82

	LENGTH
N OF CASES	82
MINIMUM	10.0000
MAXIMUM	27.0000
MEAN	16.7683
STANDARD DEV	2.5834

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 2.0000

TOTAL OBSERVATIONS: 80

	LENGTH
N OF CASES	80
MINIMUM	11.0000
MAXIMUM	25.0000
MEAN	17.3500
STANDARD DEV	2.7240

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 1.0000

TOTAL OBSERVATIONS: 82

	LENGTH
N OF CASES	82
MINIMUM	8.0000
MAXIMUM	25.0000
MEAN	17.9878
STANDARD DEV	3.0449

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 2.0000

TOTAL OBSERVATIONS: 77

	LENGTH
N OF CASES	77
MINIMUM	13.0000
MAXIMUM	25.0000
MEAN	18.6753
STANDARD DEV	2.7836

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 1.0000

TOTAL OBSERVATIONS: 86

LENGTH

N OF CASES	86
MINIMUM	12.0000
MAXIMUM	23.0000
MEAN	18.0465
STANDARD DEV	2.3106

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 2.0000

TOTAL OBSERVATIONS: 81

LENGTH

N OF CASES	81
MINIMUM	12.0000
MAXIMUM	23.0000
MEAN	18.2222
STANDARD DEV	2.2249

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 1.0000

TOTAL OBSERVATIONS: 78

LENGTH

N OF CASES	78
MINIMUM	11.0000
MAXIMUM	24.0000
MEAN	18.2692
STANDARD DEV	2.2371

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 2.0000

TOTAL OBSERVATIONS: 82

LENGTH

N OF CASES	82
MINIMUM	10.0000
MAXIMUM	23.0000
MEAN	17.6220
STANDARD DEV	2.8831

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 1.0000

TOTAL OBSERVATIONS: 85

LENGTH

N OF CASES	85
MINIMUM	12.0000
MAXIMUM	25.0000
MEAN	17.9294
STANDARD DEV	2.5856

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 2.0000

TOTAL OBSERVATIONS: 85

LENGTH

N OF CASES	85
MINIMUM	12.0000
MAXIMUM	22.0000
MEAN	17.6235
STANDARD DEV	1.9699

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 1.0000

TOTAL OBSERVATIONS: 80

LENGTH

N OF CASES	80
MINIMUM	12.0000
MAXIMUM	24.0000
MEAN	17.7375
STANDARD DEV	3.0883

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 2.0000

TOTAL OBSERVATIONS: 77

LENGTH

N OF CASES	77
MINIMUM	9.0000
MAXIMUM	22.0000
MEAN	17.5065
STANDARD DEV	3.0720

THE FOLLOWING RESULTS ARE FOR:

TRT = 7.0000
REP = 1.0000

TOTAL OBSERVATIONS: 9

LENGTH

N OF CASES	9
MINIMUM	10.0000
MAXIMUM	25.0000
MEAN	17.6667
STANDARD DEV	5.2915

THE FOLLOWING RESULTS ARE FOR:
TRT = 7.0000
REP = 2.0000

TOTAL OBSERVATIONS: 13

LENGTH

N OF CASES	13
MINIMUM	10.0000
MAXIMUM	27.0000
MEAN	15.6154
STANDARD DEV	5.5157

SUMMARY STATISTICS FOR LENGTH

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 69.4818 DF= 13 PROBABILITY = 0.0000

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	277.5624	13	21.3510	2.8663	0.0004
WITHIN GROUPS	7322.4497	983	7.4491		

KOLMOGOROV-SMIRNOV ONE SAMPLE TEST USING STANDARD NORMAL DISTRIBUTION

VARIABLE	N-OF-CASES	MAXDIF	PROBABILITY (2-TAIL)
LENGTH	997.0000	1.0000	0.0000

TRT 1 = Dilution Water Control
TRT 2 = Solvent Control
TRT 3 = 9.21 ug/l
TRT 4 = 19.0 ug/l
TRT 5 = 43.6 ug/l
TRT 6 = 97.0 ug/l
TRT 7 = 197 ug/l

F0 WEIGHT AT 58 DAYS
ANOVA on Weight
LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT

1.0000	2.0000	3.0000	4.0000	5.0000	6.0000

REP

1.0000	2.0000

DEP VAR: WEIGHT N: 675 MULTIPLE R: 0.203 SQUARED MULTIPLE R: 0.041

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	102865.8475	5	20573.1695	3.3722	0.0051
REP	1568.9061	1	1568.9061	0.2572	0.6122
TRT*REP	69537.2372	5	13907.4474	2.2796	0.0453
ERROR	.404479E+07	663	6100.7379		

DURBIN-WATSON D STATISTIC 1.986
FIRST ORDER AUTOCORRELATION .005

Post-hoc pairwise comparison of length/Bonferroni.
USING LEAST SQUARES MEANS.
POST HOC TEST OF WEIGHT

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.0000				
2	35.1969	0.0000			
3	31.0524	-4.1444	0.0000		
4	25.4257	-9.7712	-5.6268	0.0000	
5	16.1627	-19.0341	-14.8897	-9.2630	0.0000
6	34.3659	-0.8310	3.3134	8.9402	18.2031

	6
6	0.0000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.0000				
2	0.0129	1.0000			
3	0.0412	1.0000	1.0000		
4	0.2343	1.0000	1.0000	1.0000	
5	1.0000	0.9916	1.0000	1.0000	1.0000
6	0.0179	1.0000	1.0000	1.0000	1.0000

	6
6	1.0000

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000

TOTAL OBSERVATIONS: 112

WEIGHT

N OF CASES	112
MINIMUM	37.0000
MAXIMUM	459.0000
MEAN	159.1696
STANDARD DEV	74.4602

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000

TOTAL OBSERVATIONS: 109

WEIGHT

N OF CASES	109
MINIMUM	51.0000
MAXIMUM	466.0000
MEAN	194.2110
STANDARD DEV	86.1174

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000

TOTAL OBSERVATIONS: 117

WEIGHT

N OF CASES	117
MINIMUM	51.0000
MAXIMUM	431.0000
MEAN	190.0000
STANDARD DEV	76.4768

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000

TOTAL OBSERVATIONS: 110

WEIGHT

N OF CASES	110
MINIMUM	38.0000
MAXIMUM	387.0000
MEAN	184.4273
STANDARD DEV	74.8994

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000

TOTAL OBSERVATIONS: 120

	WEIGHT
N OF CASES	120
MINIMUM	49.0000
MAXIMUM	473.0000
MEAN	175.5750
STANDARD DEV	71.5292

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000

TOTAL OBSERVATIONS: 107

	WEIGHT
N OF CASES	107
MINIMUM	29.0000
MAXIMUM	410.0000
MEAN	193.8318
STANDARD DEV	86.9095

SUMMARY STATISTICS FOR WEIGHT

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 7.4541 DF= 5 PROBABILITY = 0.1890

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	102368.8109	5	20473.7622	3.3279	0.0056
WITHIN GROUPS	.411580E+07	669	6152.1691		

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 1.0000

TOTAL OBSERVATIONS: 57

	WEIGHT
N OF CASES	57
MINIMUM	67.0000
MAXIMUM	314.0000
MEAN	145.8246
STANDARD DEV	56.0131

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 2.0000

TOTAL OBSERVATIONS: 55

WEIGHT

N OF CASES	55
MINIMUM	37.0000
MAXIMUM	459.0000
MEAN	173.0000
STANDARD DEV	88.0919

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 1.0000

TOTAL OBSERVATIONS: 57

WEIGHT

N OF CASES	57
MINIMUM	51.0000
MAXIMUM	376.0000
MEAN	185.9298
STANDARD DEV	74.0265

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 2.0000

TOTAL OBSERVATIONS: 52

WEIGHT

N OF CASES	52
MINIMUM	55.0000
MAXIMUM	466.0000
MEAN	203.2885
STANDARD DEV	97.6067

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 1.0000

TOTAL OBSERVATIONS: 61

WEIGHT

N OF CASES	61
MINIMUM	51.0000
MAXIMUM	406.0000
MEAN	179.5902
STANDARD DEV	77.2969

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 2.0000

TOTAL OBSERVATIONS: 56

WEIGHT

N OF CASES	56
MINIMUM	65.0000
MAXIMUM	431.0000
MEAN	201.3393
STANDARD DEV	74.6081

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 1.0000

TOTAL OBSERVATIONS: 53

WEIGHT

N OF CASES	53
MINIMUM	38.0000
MAXIMUM	387.0000
MEAN	196.1321
STANDARD DEV	68.6129

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 2.0000

TOTAL OBSERVATIONS: 57

WEIGHT

N OF CASES	57
MINIMUM	39.0000
MAXIMUM	329.0000
MEAN	173.5439
STANDARD DEV	79.3575

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 1.0000

TOTAL OBSERVATIONS: 60

WEIGHT

N OF CASES	60
MINIMUM	49.0000
MAXIMUM	473.0000
MEAN	186.3500
STANDARD DEV	82.2002

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 2.0000

TOTAL OBSERVATIONS: 60

WEIGHT

N OF CASES	60
MINIMUM	68.0000
MAXIMUM	298.0000
MEAN	164.8000
STANDARD DEV	57.6764

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 1.0000

TOTAL OBSERVATIONS: 55

WEIGHT

N OF CASES	55
MINIMUM	29.0000
MAXIMUM	410.0000
MEAN	195.6909
STANDARD DEV	90.8888

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 2.0000

TOTAL OBSERVATIONS: 52

WEIGHT

N OF CASES	52
MINIMUM	52.0000
MAXIMUM	346.0000
MEAN	191.8654
STANDARD DEV	83.3340

SUMMARY STATISTICS FOR WEIGHT
BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES
CHI-SQUARE = 32.0878 DF= 11 PROBABILITY = 0.0007

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	173380.7350	11	15761.8850	2.5836	0.0032
WITHIN GROUPS	.404479E+07	663	6100.7379		

KOLMOGOROV-SMIRNOV ONE SAMPLE TEST USING STANDARD NORMAL DISTRIBUTION

VARIABLE	N-OF-CASES	MAXDIF	PROBABILITY (2-TAIL)
WEIGHT	675.0000	1.0000	0.0000

TRT 1 = Dilution Water Control
TRT 2 = Solvent Control
TRT 3 = 9.21 ug/l
TRT 4 = 19.0 ug/l
TRT 5 = 43.6 ug/l
TRT 6 = 97.0 ug/l
TRT 7 = 197 ug/l

FO LENGTH AT DAY 177
ANOVA on Lengths
LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT

1.0000	2.0000	3.0000	4.0000	5.0000	6.0000

REP

1.0000	2.0000

DEP VAR: LENGTH N: 206 MULTIPLE R: 0.507 SQUARED MULTIPLE R: 0.257

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	5.4865	5	1.0973	5.6393	0.0001
REP	1.6583	1	1.6583	8.5226	0.0039
TRT*REP	6.3963	5	1.2793	6.5746	0.0000
ERROR	37.7482	194	0.1946		
DURBIN-WATSON D STATISTIC	1.730				
FIRST ORDER AUTOCORRELATION	.132				

Post-hoc pairwise comparison of length/Bonferroni.
USING LEAST SQUARES MEANS.
POST HOC TEST OF LENGTH

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.0000				
2	-0.4049	0.0000			
3	-0.5427	-0.1378	0.0000		
4	-0.2615	0.1434	0.2812	0.0000	
5	-0.2220	0.1830	0.3207	0.0396	0.0000
6	-0.3794	0.0255	0.1633	-0.1178	-0.1574

	6
6	0.0000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.0000				
2	0.0202	1.0000			
3	0.0000	1.0000	1.0000		
4	0.1393	1.0000	0.1627	1.0000	
5	0.4530	1.0000	0.0656	1.0000	1.0000
6	0.0138	1.0000	1.0000	1.0000	1.0000

	6
6	1.0000

ANOVA on Weight
LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT

1.0000	2.0000	3.0000	4.0000	5.0000	6.0000

REP

1.0000	2.0000

DEP VAR: WEIGHT N: 206 MULTIPLE R: 0.474 SQUARED MULTIPLE R: 0.224

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	9.1649	5	1.8330	4.2985	0.0010
REP	1.8895	1	1.8895	4.4311	0.0366
TRT*REP	12.2392	5	2.4478	5.7404	0.0001
ERROR	82.7255	194	0.4264		
DURBIN-WATSON D STATISTIC	1.824				
FIRST ORDER AUTOCORRELATION	.085				

Post-hoc pairwise comparison of Weight/ Bonferroni.
USING LEAST SQUARES MEANS.
POST HOC TEST OF WEIGHT

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.0000				
2	-0.4244	0.0000			
3	-0.6931	-0.2687	0.0000		
4	-0.3539	0.0705	0.3391	0.0000	
5	-0.4528	-0.0284	0.2403	-0.0989	0.0000
6	-0.5602	-0.1358	0.1328	-0.2063	-0.1074

	6
6	0.0000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.0000				
2	0.3351	1.0000			
3	0.0006	1.0000	1.0000		
4	0.2587	1.0000	0.5608	1.0000	
5	0.0445	1.0000	1.0000	1.0000	1.0000
6	0.0142	1.0000	1.0000	1.0000	1.0000

	6
6	1.0000

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000

TOTAL OBSERVATIONS: 38

	LENGTH	WEIGHT
N OF CASES	38	38
MINIMUM	2.7000	0.6300
MAXIMUM	4.5000	3.5000
MEAN	3.4921	1.7811
STANDARD DEV	0.4420	0.7015

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000

TOTAL OBSERVATIONS: 28

	LENGTH	WEIGHT
N OF CASES	28	28
MINIMUM	1.9000	0.2200
MAXIMUM	4.2000	3.1500
MEAN	3.3536	1.6879
STANDARD DEV	0.6280	0.8627

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000

TOTAL OBSERVATIONS: 27

	LENGTH	WEIGHT
N OF CASES	27	27
MINIMUM	2.2000	0.2800
MAXIMUM	3.9000	2.2900
MEAN	2.9407	1.0759
STANDARD DEV	0.4627	0.6374

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000

TOTAL OBSERVATIONS: 42

	LENGTH	WEIGHT
N OF CASES	42	42
MINIMUM	2.3000	0.4200
MAXIMUM	4.2000	3.8000
MEAN	3.2381	1.4474
STANDARD DEV	0.4333	0.7438

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000

TOTAL OBSERVATIONS: 39

	LENGTH	WEIGHT
N OF CASES	39	39
MINIMUM	2.3000	0.4400
MAXIMUM	4.1000	2.7200
MEAN	3.3051	1.3549
STANDARD DEV	0.4436	0.5625

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000

TOTAL OBSERVATIONS: 32

	LENGTH	WEIGHT
N OF CASES	32	32
MINIMUM	2.0000	0.2800
MAXIMUM	4.0000	2.7600
MEAN	3.1656	1.3441
STANDARD DEV	0.4674	0.6440

SUMMARY STATISTICS FOR LENGTH

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 6.4456 DF= 5 PROBABILITY = 0.2652

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	5.4269	5	1.0854	4.7822	0.0004
WITHIN GROUPS	45.3927	200	0.2270		

SUMMARY STATISTICS FOR WEIGHT

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 6.9227 DF= 5 PROBABILITY = 0.2265

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	10.2212	5	2.0442	4.2397	0.0011
WITHIN GROUPS	96.4328	200	0.4822		

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 1.0000

TOTAL OBSERVATIONS: 17

	LENGTH	WEIGHT
N OF CASES	17	17
MINIMUM	2.9000	0.9700
MAXIMUM	4.0000	2.6500
MEAN	3.4118	1.6524
STANDARD DEV	0.3180	0.4939

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 2.0000

TOTAL OBSERVATIONS: 21

	LENGTH	WEIGHT
N OF CASES	21	21
MINIMUM	2.7000	0.6300
MAXIMUM	4.5000	3.5000
MEAN	3.5571	1.8852
STANDARD DEV	0.5202	0.8306

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 1.0000

TOTAL OBSERVATIONS: 22

	LENGTH	WEIGHT
N OF CASES	22	22
MINIMUM	2.7000	0.8600
MAXIMUM	4.2000	3.1500
MEAN	3.5591	1.9455
STANDARD DEV	0.4382	0.7329

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 2.0000

TOTAL OBSERVATIONS: 6

	LENGTH	WEIGHT
N OF CASES	6	6
MINIMUM	1.9000	0.2200
MAXIMUM	3.7000	1.8400
MEAN	2.6000	0.7433
STANDARD DEV	0.6753	0.6327

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 1.0000

TOTAL OBSERVATIONS: 14

	LENGTH	WEIGHT
N OF CASES	14	14
MINIMUM	2.2000	0.2800
MAXIMUM	3.9000	2.2900
MEAN	2.9143	1.0807
STANDARD DEV	0.5021	0.6476

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 2.0000

TOTAL OBSERVATIONS: 13

	LENGTH	WEIGHT
N OF CASES	13	13
MINIMUM	2.4000	0.2900
MAXIMUM	3.6000	2.0000
MEAN	2.9692	1.0708
STANDARD DEV	0.4347	0.6527

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 1.0000

TOTAL OBSERVATIONS: 24

	LENGTH	WEIGHT
N OF CASES	24	24
MINIMUM	2.7000	0.4200
MAXIMUM	4.2000	3.8000
MEAN	3.3292	1.6425
STANDARD DEV	0.4278	0.8294

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 2.0000

TOTAL OBSERVATIONS: 18

	LENGTH	WEIGHT
N OF CASES	18	18
MINIMUM	2.3000	0.4200
MAXIMUM	3.8000	2.4400
MEAN	3.1167	1.1872
STANDARD DEV	0.4218	0.5274

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 1.0000

TOTAL OBSERVATIONS: 23

	LENGTH	WEIGHT
N OF CASES	23	23
MINIMUM	2.9000	0.8400
MAXIMUM	4.1000	2.7200
MEAN	3.5000	1.5326
STANDARD DEV	0.3303	0.4979

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 2.0000

TOTAL OBSERVATIONS: 16

	LENGTH	WEIGHT
N OF CASES	16	16
MINIMUM	2.3000	0.4400
MAXIMUM	3.8000	2.3400
MEAN	3.0250	1.0994
STANDARD DEV	0.4435	0.5656

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 1.0000

TOTAL OBSERVATIONS: 9

	LENGTH	WEIGHT
N OF CASES	9	9
MINIMUM	2.3000	0.2900
MAXIMUM	3.8000	2.0700
MEAN	2.9667	0.8989
STANDARD DEV	0.4924	0.5752

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 2.0000

TOTAL OBSERVATIONS: 23

	LENGTH	WEIGHT
N OF CASES	23	23
MINIMUM	2.0000	0.2800
MAXIMUM	4.0000	2.7600
MEAN	3.2435	1.5183
STANDARD DEV	0.4440	0.5928

SUMMARY STATISTICS FOR LENGTH

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 10.0582 DF= 11 PROBABILITY = 0.5252

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	13.0714	11	1.1883	6.1071	0.0000
WITHIN GROUPS	37.7482	194	0.1946		

SUMMARY STATISTICS FOR WEIGHT

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 13.4413 DF= 11 PROBABILITY = 0.2655

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	23.9286	11	2.1753	5.1014	0.0000
WITHIN GROUPS	82.7255	194	0.4264		

KOLMOGOROV-SMIRNOV ONE SAMPLE TEST USING STANDARD NORMAL DISTRIBUTION

VARIABLE	N-OF-CASES	MAXDIF	PROBABILITY (2-TAIL)
WEIGHT	206.0000	0.6434	0.0000
LENGTH	206.0000	0.9724	0.0000

TRT 1 = Dilution Water Control

TRT 2 = Solvent Control

TRT 3 = 9.21 ug/l

TRT 4 = 19.0 ug/l

TRT 5 = 43.6 ug/l

TRT 6 = 97.0 ug/l

TRT 7 = 197 ug/l

F1 LENGTH AND WEIGHT AT TEST TERMINATION
ANOVA on Weights of F1 fish at test termination

LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT

1.0000	2.0000	3.0000	4.0000	5.0000	6.0000

DEP VAR: WEIGHT N: 488 MULTIPLE R: 0.449 SQUARED MULTIPLE R: 0.202

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	57896.3560	5	11579.2712	24.3821	0.0000
ERROR	228905.5283	482	474.9077		

DURBIN-WATSON D STATISTIC 1.799
FIRST ORDER AUTOCORRELATION .098

Post-hoc pairwise comparison of weight/Bonferroni.
USING LEAST SQUARES MEANS.
POST HOC TEST OF WEIGHT

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.0000				
2	5.0453	0.0000			
3	-10.6502	-15.6955	0.0000		
4	18.7738	13.7286	29.4241	0.0000	
5	-2.4230	-7.4682	8.2273	-21.1968	0.0000
6	-15.3614	-20.4067	-4.7112	-34.1352	-12.9385

	6
6	0.0000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.0000				
2	1.0000	1.0000			
3	0.0950	0.0009	1.0000		
4	0.0000	0.0010	0.0000	1.0000	
5	1.0000	0.3261	0.4680	0.0000	1.0000
6	0.0000	0.0000	1.0000	0.0000	0.0008

	6
6	1.0000

ANOVA on Lengths of F1 fish at test termination
LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT

1.0000	2.0000	3.0000	4.0000	5.0000	6.0000

DEP VAR: LENGTH N: 488 MULTIPLE R: 0.330 SQUARED MULTIPLE R: 0.109

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	93.9243	5	18.7849	11.7577	0.0000
ERROR	770.0737	482	1.5977		

DURBIN-WATSON D STATISTIC 1.859
FIRST ORDER AUTOCORRELATION .066

Post-hoc pairwise comparison of length/Bonferroni.
USING LEAST SQUARES MEANS.
POST HOC TEST OF LENGTH

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.0000				
2	0.4476	0.0000			
3	-0.2459	-0.6935	0.0000		
4	0.6608	0.2132	0.9067	0.0000	
5	-0.2427	-0.6903	0.0032	-0.9035	0.0000
6	-0.6016	-1.0492	-0.3557	-1.2624	-0.3589

	6
6	0.0000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.0000				
2	0.3152	1.0000			
3	1.0000	0.0323	1.0000		
4	0.0138	1.0000	0.0013	1.0000	
5	1.0000	0.0041	1.0000	0.0001	1.0000
6	0.0235	0.0000	1.0000	0.0000	0.7732

	6
6	1.0000

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000

TOTAL OBSERVATIONS: 85

	WEIGHT	LENGTH
N OF CASES	85	85
MINIMUM	13.4000	9.0000
MAXIMUM	136.8000	17.0000
MEAN	70.1082	13.5059
STANDARD DEV	25.0776	1.6008

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000

TOTAL OBSERVATIONS: 86

	WEIGHT	LENGTH
N OF CASES	86	86
MINIMUM	28.8000	11.0000
MAXIMUM	126.6000	16.0000
MEAN	75.1535	13.9535
STANDARD DEV	19.4249	1.1051

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000

TOTAL OBSERVATIONS: 50

	WEIGHT	LENGTH
N OF CASES	50	50
MINIMUM	10.8000	10.0000
MAXIMUM	96.6000	15.0000
MEAN	59.4580	13.2600
STANDARD DEV	16.4066	1.0461

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000

TOTAL OBSERVATIONS: 78

	WEIGHT	LENGTH
N OF CASES	78	78
MINIMUM	28.5000	11.0000
MAXIMUM	171.8000	16.0000
MEAN	88.8821	14.1667
STANDARD DEV	26.1082	1.2105

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000

TOTAL OBSERVATIONS: 95

	WEIGHT	LENGTH
N OF CASES	95	95
MINIMUM	17.5000	10.0000
MAXIMUM	112.6000	16.0000
MEAN	67.6853	13.2632
STANDARD DEV	19.2520	1.2047

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000

TOTAL OBSERVATIONS: 94

	WEIGHT	LENGTH
N OF CASES	94	94
MINIMUM	15.0000	10.0000
MAXIMUM	112.8000	15.0000
MEAN	54.7468	12.9043
STANDARD DEV	21.6249	1.2621

SUMMARY STATISTICS FOR WEIGHT

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 20.5860 DF= 5 PROBABILITY = 0.0010

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	57896.3560	5	11579.2712	24.3821	0.0000
WITHIN GROUPS	228905.5283	482	474.9077		

SUMMARY STATISTICS FOR LENGTH

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 17.5673 DF= 5 PROBABILITY = 0.0035

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	93.9243	5	18.7849	11.7577	0.0000
WITHIN GROUPS	770.0737	482	1.5977		

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 1.0000

TOTAL OBSERVATIONS: 37

	WEIGHT	LENGTH
N OF CASES	37	37
MINIMUM	13.4000	9.0000
MAXIMUM	111.6000	16.0000
MEAN	59.3378	12.8919
STANDARD DEV	23.3474	1.7286

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 2.0000

TOTAL OBSERVATIONS: 48

	WEIGHT	LENGTH
N OF CASES	48	48
MINIMUM	32.3000	10.0000
MAXIMUM	136.8000	17.0000
MEAN	78.4104	13.9792
STANDARD DEV	23.3395	1.3287

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 1.0000

TOTAL OBSERVATIONS: 41

	WEIGHT	LENGTH
N OF CASES	41	41
MINIMUM	28.8000	11.0000
MAXIMUM	102.6000	15.0000
MEAN	69.1878	13.7317
STANDARD DEV	18.0889	1.2252

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 2.0000

TOTAL OBSERVATIONS: 45

	WEIGHT	LENGTH
N OF CASES	45	45
MINIMUM	36.8000	12.0000
MAXIMUM	126.6000	16.0000
MEAN	80.5889	14.1556
STANDARD DEV	19.1857	0.9524

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 1.0000

TOTAL OBSERVATIONS: 50

	WEIGHT	LENGTH
N OF CASES	50	50
MINIMUM	10.8000	10.0000
MAXIMUM	96.6000	15.0000
MEAN	59.4580	13.2600
STANDARD DEV	16.4066	1.0461

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 1.0000

TOTAL OBSERVATIONS: 36

	WEIGHT	LENGTH
N OF CASES	36	36
MINIMUM	28.5000	11.0000
MAXIMUM	171.8000	16.0000
MEAN	83.0333	13.8611
STANDARD DEV	29.0958	1.3764

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 2.0000

TOTAL OBSERVATIONS: 42

	WEIGHT	LENGTH
N OF CASES	42	42
MINIMUM	49.0000	12.0000
MAXIMUM	143.6000	16.0000
MEAN	93.8952	14.4286
STANDARD DEV	22.3984	0.9913

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 1.0000

TOTAL OBSERVATIONS: 48

	WEIGHT	LENGTH
N OF CASES	48	48
MINIMUM	22.6000	10.0000
MAXIMUM	112.6000	16.0000
MEAN	66.4438	13.1667
STANDARD DEV	18.0753	1.0980

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 2.0000

TOTAL OBSERVATIONS: 47

	WEIGHT	LENGTH
N OF CASES	47	47
MINIMUM	17.5000	10.0000
MAXIMUM	103.8000	15.0000
MEAN	68.9532	13.3617
STANDARD DEV	20.5018	1.3093

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 1.0000

TOTAL OBSERVATIONS: 45

	WEIGHT	LENGTH
N OF CASES	45	45
MINIMUM	26.1000	10.0000
MAXIMUM	112.8000	15.0000
MEAN	68.4333	13.2667
STANDARD DEV	20.2256	1.2321

THE FOLLOWING RESULTS ARE FOR:
TRT = 6.0000
REP = 2.0000

TOTAL OBSERVATIONS: 49

	WEIGHT	LENGTH
N OF CASES	49	49
MINIMUM	15.0000	10.0000
MAXIMUM	75.5000	15.0000
MEAN	42.1776	12.5714
STANDARD DEV	13.9345	1.2076

SUMMARY STATISTICS FOR WEIGHT

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 32.8193 DF= 10 PROBABILITY = 0.0003

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	86892.8228	10	8689.2823	20.7334	0.0000
WITHIN GROUPS	199909.0615	477	419.0966		

SUMMARY STATISTICS FOR LENGTH

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 24.0000 DF= 10 PROBABILITY = 0.0076

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	140.9623	10	14.0962	9.2995	0.0000
WITHIN GROUPS	723.0356	477	1.5158		

KOLMOGOROV-SMIRNOV ONE SAMPLE TEST USING STANDARD NORMAL DISTRIBUTION

VARIABLE	N-OF-CASES	MAXDIF	PROBABILITY (2-TAIL)
LENGTH	488.0000	1.0000	0.0000
WEIGHT	488.0000	1.0000	0.0000

Ecological Effects Branch One-Liner Data Entry Form

Chemical Tebuconazole Shaughnessy No. 128997 Pesticide Use _____

AQUATIC VERTEBRATE TOX.	% AI	LC_{50} (95%CL) SLOPE	HRS/ TYPE	NOEC	STUDY/REVIEW DATES	MRID/ CATEGORY	LAB	RC
1.								
2.								
3.								
CHRONIC TOX.	**% AI**	**MATC**	**DAYS**	**AFFECTED PARA.**	**STUDY/ REVIEW DATES**	**MRID/ CATEGORY**	**LAB**	**RC**
1. *Cyprinodon variegatus*	96.4	>18.4 <46.9 (geo mean MATC = 29.4) µg ai/l	203	F_1 length at test termination	1993/ 1994	430096-01 ~~Invalid~~ Supplemental Conclusions Revised 12/16/94	TES	RG M
2.								
3.								

COMMENTS: Results based on mean measured concentrations. TES=Toxikon Environmental Sciences,