Appendix B1

Data summary sheets for studies rated RR, RL, LR, LL

Abbreviations used in this appendix:
NR = Not Reported

Study Ratings:
RR = Relevant, Reliable
RL = Relevant, Less Reliable
LR =Less Relevant, Reliable
LL = Less Relevant, Less Reliable

Unused lines deleted from tables

Summary sheets are in alphabetical order according to species

Toxicity Data Summary

Aedes aegypti

Study: Canyon DV, Hii JLK. 1999. Insecticide susceptibility status of *Aedes aegypti* (Diptera: Culicidae) from Townsville. Australian J Entomol 38:40-43.

Relevance
Score: 100
Rating: R

Reliability
Score: 65
Rating: L

	Canyon & Hii 1999	***A. aegypti***
Parameter	**Value**	**Comment**
Test method cited	WHO/VBC/81.807 & 81.806	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*aegypti*	Townsville 1989 strain Townsville 1995 strain
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3rd or early 4th instar larvae	
Source of organisms	Lab colonies	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	27 ± 2°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered tap water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	

	Canyon & Hii 1999	***A. aegypti***
Parameter	**Value**	**Comment**
Purity of test substance	Technical grade	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	1mL ethanol/250 mL dilution water	
Concentration 1 Nom/Meas (μg/L)	Possible range: 0.008-40	4 reps, 20-25/rep
Concentration 2 Nom/Meas (μg/L)	NR	
Concentration 3 Nom/Meas (μg/L)	NR	
Concentration 4 Nom/Meas (μg/L)	NR	
Concentration 5 Nom/Meas (μg/L)	NR	
Concentration 6 Nom/Meas (μg/L)	NR	
Control	Solvent	4 reps, 20-25/rep
LC_{50} (μg/L)	1989: 2.8 (2.7-3.0) 1995: 2.5 (2.4-2.6)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -36

Toxicity Data Summary

Aedes aegypti

Study: Cutkomp LK, Subramanyam B. 1986. Toxicity of pyrethroids to *Aedes aegypti* larvae in relation to temperature. Journal of the American Mosquito Control Association. 2:347-349.

Relevance
Score: 90
Rating: R

Reliability
Score: 62.5
Rating: L

*No standard method

	Cutkomp & Subramanyam 1986	***A. aegypti***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*aegypti*	
Family in North America?	Yes	
Age/size at start of test/growth phase	3rd instar larvae	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	< 7%	
Temperature	20 ± 1°C 30 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Cutkomp & Subramanyam 1986	***A. aegypti***
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	100%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	1% ethanol	
Concentration 1 Nom/Meas (μg/L)	0.05	3-6 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3-6 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3-6 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3-6 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	3.75	3-6 reps, 10/rep
Control	Solvent	3-6 reps, 10/rep
LC_{50} (95% confidence limits) (μg/L)	20 °C: 0.27 (0.22-0.31) 30 °C: 0.98 (0.90-1.06)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -41

Toxicity Data Summary

Aedes aegypti

Study: Parsons JT, Surgeoner GA. 1991a. Effect of exposure time on the acute toxicities of permethrin, fenitrothion, carbaryl and carbofuran to mosquito larvae. Environ Toxicol Chem 10:1219-1227.

Relevance
Score: 90
Rating: R

Reliability
Score: 72.5
Rating: L

*No standard method

	Parsons & Surgeoner 1991	***A. aegypti***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*aegypti*	
Family in North America?	Yes	
Age/size at start of test/growth phase	3rd instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	Yes, 1 h, 4 h	
Effect 1	Immobility	
Control response 1	< 10%	
Effect 2	Emergence to adult stage	
Control response 2	< 10%	
Temperature	25 ± 1°C	
Test type	Static	
Photoperiod/light intensity	16 L:8 D	
Dilution water	Dechlorinated tapwater	
pH	7.8-8.0	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Parsons & Surgeoner 1991	***A. aegypti***
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	90.8%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.5% acetone	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, $\log_2$ series	3-5 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Concentration 6 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Control	Solvent and dilution water	3-5 reps, 20/rep
LC_{50} ($\pm$ standard error) (µg/L) For emergence to adults	1 h: 4.67 (0.59) 4 h: 1.15 (0.13) 24 h: 0.45 (0.08)	Method: probit
EC_{50} (µg/L) For larvae immobility	24 h: 0.85 (calculated from regression equation)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Hypothesis tests (8). -28

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Random design (2), Hypothesis tests (3). -27

Toxicity Data Summary

Aedes aegypti

Study: Parsons JT, Surgeoner GA. 1991b. Acute toxicities of permethrin, fenitrothion, carbaryl and carbofuran to mosquito larvae during single- or multiple-pulse exposures. Environ Toxicol Chem 10:1229-1233.

Relevance
Score: 90
Rating: R

Reliability
Score: 71.5
Rating: L

*No standard method

	Parsons & Surgeoner 1991b	***A. aegypti***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*aegypti*	
Family in North America?	Yes	
Age/size at start of test/growth phase	3rd instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	2 h or 1 h followed by 6 h non-exposed followed by 1 h	
Data for multiple times?	Yes, 2 h, 1 + 1 h	
Effect 1	Immobility	
Control response 1	< 10%	
Effect 2	Survival to adult stage (168-192 h after start of exposure)	
Control response 2	< 10%	
Temperature	25 ± 1°C	
Test type	Static	
Photoperiod/light intensity	16 L:8 D	
Dilution water	Dechlorinated tapwater	
pH	7.8-8.0	

	Parsons & Surgeoner 1991b	***A. aegypti***
Parameter	**Value**	**Comment**
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	90.8%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.5% acetone	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, $\log_2$ series	3-5 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Concentration 6 Nom/Meas (µg/L)	NR	3-5 reps, 20/rep
Control	Solvent and dilution water	3-5 reps, 20/rep
LC_{50} ($\pm$ standard error) (µg/L) For emergence to adults	1 +1 h: 2.03 (0.06) 2 h: 2.32 (0.46)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Hypothesis tests (8). -28

Acceptability (Table 3.8): No standard method (5), Appropriate duration (2), Measured concentrations within 20% of nominal (4), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Random design (2), Hypothesis tests (3). -29

Toxicity Data Summary

Aedes atropalpus

Study: Cilek JE, Craig GB, Jr, Knapp FW. 1995. Comparative susceptibility of larvae of three *Aedes* species to malathion and permethrin. Journal of the American Mosquito Control Association 11:416-418.

Relevance
Score: 90
Rating: R

Reliability
Score: 62
Rating: L

*No standard method

	Cilek et al. 1995	***A. atropalpus***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*atropalpus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3rd instar larvae	
Source of organisms	Laboratory cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	20 ± 1°C	
Test type	Static	
Photoperiod/light intensity	Continuous light	
Dilution water	Dechlorinated tapwater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.7%	

	Cilek et al. 1995	***A. atropalpus***
Parameter	**Value**	**Comment**
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	1% acetone	
Concentration 1 Nom/Meas (μg/L)	5 concentrations	4 reps, 25/rep
Concentration 2 Nom/Meas (μg/L)	NR	4 reps, 25/rep
Concentration 3 Nom/Meas (μg/L)	NR	4 reps, 25/rep
Concentration 4 Nom/Meas (μg/L)	NR	4 reps, 25/rep
Concentration 5 Nom/Meas (μg/L)	NR	4 reps, 25/rep
Control	Solvent and dilution water	4 reps, 25/rep
LC_{50} (95% confidence interval) (μg/L)	6.168 (5.688-6.671)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -31

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -45

Toxicity Data Summary

Americamysis bahia

Study: Cripe GM. 1994. Comparative acute toxicities of several pesticides and metals to *Mysidopsis bahia* and potlarval *Penaeus duorarum.* Environ Toxicol Chem 13:1867-1872.

Relevance
Score: 85
Rating: L

Reliability
Score: 75.5
Rating: R

*Saltwater

	Cripe 1994	***A. bahia***
Parameter	**Value**	**Comment**
Test method cited	ASTM	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	*Americamysis*	
Species	*bahia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juveniles, ≤ 24 h old	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	3%	
Temperature	25 ± 0.5°C	
Test type	Static	
Photoperiod/light intensity	14 h light: 10 h light	
Dilution water	Filtered seawater	25 o/oo salinity
pH	7.8-8.1	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	5.9 mg/L	
Feeding	Yes at start of test	
Purity of test substance	Technical grade	
Concentrations measured?	No	

	Cripe 1994	***A. bahia***
Parameter	**Value**	**Comment**
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	10 uL/L; 90% triethylene glycol/10% acetone	
Concentration 1 Nom/Meas (μg/L)	5 concentrations at 60% dilutions	2 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	2 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	2 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	2 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	2 reps, 10/rep
Control	Dilution water and solvent	Reps and # per
LC_{50} (95% confidence interval) (μg/L)	0.095 (0.077-0.12)	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis tests (8). -24

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Feeding (3), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Random design (2), Adequate replicates (2), Hypothesis tests (3). -25

Toxicity Data Summary

Americamysis bahia

Study: Kent SJ, Williams TD, Sankey SA, Grinell AJ. 1992. Permethrin: Acute toxicity to mysid shrimp (*Mysidopsis bahia*) of a 10% EC formulation. Study performed by Imperial Chemical Industries, PLC Group Environmental Laboratory: Brixham, Devon, UK. EPA MRID 42584001.

Relevance
Score: 70
Rating: L

Reliability
Score: 83
Rating: R

*Saltwater, Low chemical purity

	Kent et al. 1992	***A. bahia***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1989, USEPA 1978	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	*Americamysis*	
Species	*bahia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 24 h old	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	0%	
Temperature	25 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	16 L: 8 D	
Dilution water	Filtered seawater	Tor Bay, Devon Salinity 20 o/oo
pH	8.02-8.09	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	7.0-7.7 mg/L	

	Kent et al. 1992	***A. bahia***
Parameter	**Value**	**Comment**
Feeding	Fed daily with *Artemia salina*	
Purity of test substance	10%	Emulsifiable concentrate
Concentrations measured?	Yes	
Measured is what % of nominal?	79-89%	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (μg/L)	1.8/1.60	2 reps, 20/rep
Concentration 2 Nom/Meas (μg/L)	1.0/0.87	2 reps, 20/rep
Concentration 3 Nom/Meas (μg/L)	0.56/0.44	2 reps, 20/rep
Concentration 4 Nom/Meas (μg/L)	0.32/0.27	2 reps, 20/rep
Concentration 5 Nom/Meas (μg/L)	0.18/0.15	2 reps, 20/rep
Concentration 6 Nom/Meas (μg/L)	0.10/0.086	2 reps, 20/rep
Concentration 7 Nom/Meas (μg/L)	0.056/0.048	2 reps, 20/rep
Control	Dilution water	2 reps, 20/rep
LC_{50} (95% confidence interval) (μg/L)	24 h: 0.82 (0.69-1.0) 48 h: 0.59 (0.50-0.71) 72 h: 0.49 (0.40-0.61) 96 h: 0.47 (0.39-0.59)	Method: moving average angle
NOEC (μg/L)	0.32	Method: NR p: NR MSD: NR

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis tests (8). -14

Acceptability (Table 3.8): Chemical purity (10), Hardness (2), Alkalinity (2), Conductivity (1), Adequate replicates (2), Hypothesis tests (3). -20

Toxicity Data Summary

Americamysis bahia (formerly *Mysidopsis bahia*)

Study: Schimmel SC, Garnas RL, Patrick JM, Moore JC. 1983. Acute toxicity, bioconcentration, and persistence of AC 222,705, benthiocarb, chlorpyrifos, fenvalerate, methyl parathion, and permethrin in the estuarine environment. J Agric Food Chem 31:104-113.

Relevance
Score: 85
Rating: L

Reliability
Score: 63
Rating: L

*Saltwater

	Schimmel et al. 1983	***A. bahia***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	*Americamysis*	
Species	*bahia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Newly hatched, ≤ 24 h	
Source of organisms	Collected from estuarine waters near Gulf Breeze, FL or lab cultures	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	≤ 10%	
Temperature	26.0 °C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	22.6 o/oo salinity
pH	NR	
Hardness	NR	
Alkalinity	NR	

	Schimmel et al. 1983	***A. bahia***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Fed brine shrimp to prevent starvation	
Purity of test substance	92%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.05% triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	NR	4 reps, 5/rep
Concentration 2 Nom/Meas (μg/L)	NR	
Concentration 3 Nom/Meas (μg/L)	NR	
Concentration 4 Nom/Meas (μg/L)	NR	
Concentration 5 Nom/Meas (μg/L)	NR	
Concentration 6 Nom/Meas (μg/L)	NR	
Control	Solvent and dilution water	4 reps, 5/rep
LC_{50} (μg/L)	0.02 (0.017-0.024)	Method: probit, moving average, or binomial test

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -40

Toxicity Data Summary

Americamysis bahia

Study: Thompson RS. 1986. Supplemental data in support of MRID 42584001. Permethrin: Determination of acute toxicity to mysid shrimps (*Mysidopsis bahia*). Laboratory project ID BL/B/2921. Brixham study no P131/B. Study performed by Brixham Environmental Laboratory: Devon, UK. EPA MRID 43492902.

Relevance
Score: 85
Rating: L

Reliability
Score: 86
Rating: R

*Saltwater

	Thompson 1986	***A. bahia***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	*Americamysis*	
Species	*bahia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	3-5 d old	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	0%	
Temperature	25 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	14 L: 10 D	
Dilution water	Filtered seawater diluted with freshwater	Tor Bay, Devon Salinity 20 o/oo
pH	8.22-8.32	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	6.55-7.30 mg/L	

	Thompson 1986	***A. bahia***
Parameter	**Value**	**Comment**
Feeding	Fed daily with *Artemia salina*	
Purity of test substance	90.8% radiochemical purity	
Concentrations measured?	Yes	
Measured is what % of nominal?	64-72%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, LSC	
Concentration of carrier (if any) in test solutions	0.00425% triethylene glycol	
Concentration 1 Nom/Meas (µg/L)	0.32/0.20	1 rep, 20/rep
Concentration 2 Nom/Meas (µg/L)	0.18/0.13	1 rep, 20/rep
Concentration 3 Nom/Meas (µg/L)	0.1/0.069	1 rep, 20/rep
Concentration 4 Nom/Meas (µg/L)	0.056/0.037	1 rep, 20/rep
Concentration 5 Nom/Meas (µg/L)	0.032/0.21	1 rep, 20/rep
Concentration 6 Nom/Meas (µg/L)	0.018/0.012	1 rep, 20/rep
Control	Dilution water and solvent	1 rep, 20/rep
LC_{50} (95% confidence interval) (µg/L)	24 h: > 0.20 48 h: 0.14 (0.12-0.19) 72 h: 0.11 (0.090-0.14) 96 h: 0.075 (0.059-0.96)	Method: probit
NOEC (µg/L)	0.012	Method: NR p: NR MSD: NR

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis tests (8). -14

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Hardness (2), Alkalinity (2), Conductivity (1), Adequate replicates (2), Hypothesis tests (3). -14

Toxicity Data Summary

Americamysis bahia

Thompson RS. 1986. Permethrin: determination of acute toxicity to mysid shrimps (*Mysidopsis bahia*). Brixham Environmental Laboratory, Brixham, UK, Rept No BL/B/2921. EPA MRID 43492902.

Relevance
Score: 85
Rating: L

Reliability
Score: 87
Rating: R

*Saltwater

Reference	**Thompson 1986**	***A. bahia***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Peracarida	
Family	Mysidae	
Genus	*Americamysis*	
Species	*bahia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	3-5 days old	
Source of organisms	Continuous lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	4 days (96 hr)	
Data for multiple times?	Yes	24, 48, 72, 96 hr
Effect 1	Mortality	
Control response 1	0%	
Temperature	25±1°C	
Test type	Continuous flow	
Photoperiod/light intensity	14:10 light:dark	
Dilution water	Filtered sea water	
pH	8.22-8.32	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	6.55 – 7.30 mg/L	

Reference	**Thompson 1986**	***A. bahia***
Parameter	**Value**	**Comment**
Feeding	Fed *A. salina* naupili daily	
Purity of test substance	90.8 %	
Concentrations measured?	Yes	
Measured is what % of nominal?	64-72%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	0.017 mL triethylene glycol/L	
Concentration 1 Nom/Meas (µg/L)	0.32 / 0.202	4 Reps, 5/rep
Concentration 2 Nom/Meas (µg/L)	0.18 / 0.13	4 Reps, 5/rep
Concentration 3 Nom/Meas (µg/L)	0.1 / 0.0692	4 Reps, 5/rep
Concentration 4 Nom/Meas (µg/L)	0.056 / 0.0374	4 Reps, 5/rep
Concentration 5 Nom/Meas (µg/L)	0.032 / 0.0207	4 Reps, 5/rep
Concentration 6 Nom/Meas (µg/L)	0.018 / 0.011	4 Reps, 5/rep
Control	Dilution water and solvent control	4 Reps, 5/rep
LC_{50} (µg/L) (95% CI)	24 hr >0.20 48 hr 0.14 (0.12-0.19) 72 hr 0.11 (0.090-0.14) 96 hr 0.075 (0.059-0.096)	Probit Analysis

Reliability points taken off for:
Documentation: Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis tests (8). -14

Acceptability: Measured concentrations within 20% of nominal (4), Hardness (2), Alkalinity (2), Conductivity (1), Hypothesis tests (3). -12

Toxicity Data Summary

Americamysis bahia

Study: Thompson RS, Williams TD, Tapp JF. 1989. Permethrin: Determination f chronic toxicity to mysid shrimps (*Mysidopsis bahia*) (Run 2). Laboratory project ID: BL/B/3574. Study performed by Imperial Chemical Industries PLC Brixham Laboratory Freshwater Quarry: Brixham, Devon, UK. EPA MRID 41315701.

Relevance
Score: 85
Rating: L

Reliability
Score: 84.5
Rating: R

*Saltwater

	Thompson et al. 1989	***A. bahia***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1987, USEPA 1978	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	*Americamysis*	
Species	*bahia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 24 h old	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	30 d	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	12.5%	
Effect 2	Number of offspring from male-female pair	
Control response 2	Dilution water: 13.5 Solvent: 0	
Effect 3	Dry weight	
Control response 3	Female: 0.7 mg Male: 0.64 mg	
Temperature	25 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	14 L: 10 D	

	Thompson et al. 1989	***A. bahia***
Parameter	**Value**	**Comment**
Dilution water	Filtered seawater mixed with freshwater	Tor Bay, Devon salinity 20 o/oo
pH	8.12-8.30	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	7.2-7.7 mg/L	
Feeding	Fed daily with *Artemia*	
Purity of test substance	>95% w/w radiochemical purity	
Concentrations measured?	Yes	
Measured is what % of nominal?	46-62%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC, LSC	
Concentration of carrier (if any) in test solutions	0.00037% triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	0.04/0.024	2 reps, 20/rep
Concentration 2 Nom/Meas (μg/L)	0.02/0.011	2 reps, 20/rep
Concentration 3 Nom/Meas (μg/L)	0.01/0.0046	2 reps, 20/rep
Concentration 4 Nom/Meas (μg/L)	0.005/0.0031	2 reps, 20/rep
Concentration 5 Nom/Meas (μg/L)	0.0025/0.0013	2 reps, 20/rep
Concentration 6 Nom/Meas (μg/L)	0.0013/0.00075	2 reps, 20/rep
Control	Solvent and dilution water	2 reps, 20/rep
NOEC (μg/L)	Mortality: 0.011	Method: Dennett's procedure p: 0.05 MSD: NR
LOEC (μg/L)	Mortality: 0.024	Same as above
MATC (GeoMean NOEC,LOEC)	0.016 μg/L	
% of control at NOEC	15/12.5=120%	
% of control at LOEC	100/12.5=800%	

Notes: No significant effects on male or female dry weight.
Reproduction could not be statistically evaluated due to low numbers of offspring produced

Reliability points taken off for:
Documentation (Table 3.7): Hardness (2), Alkalinity (2), Conductivity (2), Minimum significant difference (2), Point estimates (8). -16

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Hardness (2), Alkalinity (2), Conductivity (1), Adequate replicates (2), Minimum significant difference (1), Point estimates (3). -15

Toxicity Data Summary

Aedes hendersoni

Study: Cilek JE, Craig GB, Jr, Knapp FW. 1995. Comparative susceptibility of larvae of three *Aedes* species to malathion and permethrin. Journal of the American Mosquito Control Association 11:416-418.

Relevance
Score: 90
Rating: R

Reliability
Score: 62
Rating: L

*No standard method

	Cilek et al. 1995	***A. hendersoni***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*hendersoni*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3rd instar larvae	
Source of organisms	Laboratory cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	20 ± 1°C	
Test type	Static	
Photoperiod/light intensity	Continuous light	
Dilution water	Dechlorinated tapwater	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.7%	

	Cilek et al. 1995	***A. hendersoni***
Parameter	**Value**	**Comment**
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	1% acetone	
Concentration 1 Nom/Meas (µg/L)	5 concentrations	4 reps, 25/rep
Concentration 2 Nom/Meas (µg/L)	NR	4 reps, 25/rep
Concentration 3 Nom/Meas (µg/L)	NR	4 reps, 25/rep
Concentration 4 Nom/Meas (µg/L)	NR	4 reps, 25/rep
Concentration 5 Nom/Meas (µg/L)	NR	4 reps, 25/rep
Control	Solvent and dilution water	4 reps, 25/rep
LC_{50} (95% confidence interval) (µg/L)	3.507 (3.166-3.870)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -31

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -45

Toxicity Data Summary

Acipensar brevirostrum (Shortnose sturgeon)
Acipenser oxyrhynchus (Atlantic sturgeon)
Alosa sapidissima (American shad)

Study: Dwyer FJ, Hardesty DK, Ingersoll CG, Kunz JL, Whites DW. 2000. Assessing contaminant sensitivity of American shad, Atlantic sturgeon and Shortnose sturgeon final report. U.S. Geological Survey, Columbia Environmental Research Center, Columbia, MS.

--Sturgeon results also reported in Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: Shad 92.5, sturgeons 85
Rating: Shad R, sturgeons L

Reliability
Score: shad 70.5, sturgeons 69.5
Rating: shad L, sturgeons L

*No toxicity values (sturgeons only), unacceptable control response (shad only)

	Dwyer et al. 2000	***A. brevirostrum* *A. oxyrhynchus* *A. sapidissima***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975, ASTM 1998	
Phylum	Chordata	
Class	Osteichthyes	
Order	Clupeiformes	
Family	Clupeidae	
Genus	*Alosa*	
Species	*sapidissima*	shad
Family in North America?	Yes	
Age/size at start of test/growth phase	Shad: 0.006 g dry wt A. sturgeon: 1.11 g wet wt S. sturgeon: 0.74 g wet wt	
Source of organisms	Shad: Hudson River hatchery, College Station, PA Atlantic sturgeon: Hudson River hatchery, Lamar, PA Shortnose sturgeon: hatchery in Warm Springs, GA	
Have organisms been exposed to contaminants?	Possibly	

	Dwyer et al. 2000	***A. brevirostrum* *A. oxyrhynchus* *A. sapidissima***
Parameter	**Value**	**Comment**
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	48 h	
Data for multiple times?	no	
Effect 1	Shad mortality	
Control response 1	Dilution water: 20% Solvent: 25%	
Effect 2	Atlantic sturgeon mortality	
Control response 2	0%	
Effect 3	Shortnose sturgeon mortality	
Control response 3	0%	
Temperature	Shad: 22 °C Sturgeons: 17°C	
Test type	Static	
Photoperiod/light intensity	NR, “ambient light”	
Dilution water	Reconstituted ASTM hard water	
pH	Shad: 8.6 Sturgeons: 8.4	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Shad: 8.5 mg/L A. sturgeon: 8.6 mg/L S. sturgeon: 8.7 mg/L	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Only stocks	
Measured is what % of nominal?	88% for stock solution	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	Max. 0.05 mL/L acetone	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60 % dilution series	3 reps, 10 shad/rep, 7 S. sturgeon/rep, 9 A. sturgeon/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 7-10 fish/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 7-10 fish/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 7-10 fish/rep

	Dwyer et al. 2000	***A. brevirostrum* *A. oxyrhynchus* *A. sapidissima***
Parameter	**Value**	**Comment**
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 7-10 fish/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 7-10 fish/rep
Control	Dilution water and solvent	3 reps, 7-10 fish/rep
LC_{50} (95% confidence interval) (μg/L)	Shad: 2.08 (1.78-2.37) A. sturgeon: >1.2 S. sturgeon: >1.2	Method: probit or moving average or nonlinear interpolation

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Photoperiod (3), Hypothesis tests (8), Point estimates (8 – sturgeons only). -24 shad, -32 sturgeons

Acceptability (Table 3.8): Appropriate duration (2), Control response (9 – shad only), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Prior contamination (4), Temperature (3), Conductivity (1), Photoperiod (2), Adequate replicates (2), Hypothesis tests (3), Point estimates (3- sturgeons only). –35 Shad, -29 sturgeons

Toxicity Data Summary

Aedes triseriatus

Study: Cilek JE, Craig GB, Jr, Knapp FW. 1995. Comparative susceptibility of larvae of three *Aedes* species to malathion and permethrin. Journal of the American Mosquito Control Association 11:416-418.

Relevance
Score: 90
Rating: R

Reliability
Score: 62
Rating: L

*No standard method

	Cilek et al. 1995	***A. triseriatus***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Aedes*	
Species	*triseriatus*	6 strains Walton (WAL) Vero Beach (VB) UNDERC Kentucky (UKEN) Salado (SAL) Alabama (ALA)
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3rd instar larvae	
Source of organisms	Laboratory cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	20 ± 1°C	
Test type	Static	
Photoperiod/light intensity	Continuous light	
Dilution water	Dechlorinated tapwater	
pH	NR	

	Cilek et al. 1995	***A. triseriatus***
Parameter	**Value**	**Comment**
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.7%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	1% acetone	
Concentration 1 Nom/Meas (μg/L)	5 concentrations	4 reps, 25/rep
Concentration 2 Nom/Meas (μg/L)	NR	4 reps, 25/rep
Concentration 3 Nom/Meas (μg/L)	NR	4 reps, 25/rep
Concentration 4 Nom/Meas (μg/L)	NR	4 reps, 25/rep
Concentration 5 Nom/Meas (μg/L)	NR	4 reps, 25/rep
Control	Solvent and dilution water	4 reps, 25/rep
LC_{50} (95% confidence interval) (μg/L)	WAL: 8.39 (8.11-8.70) VB: 7.68 (7.40-7.98) SAL: 7.38 (6.80-8.15) UKEN: 6.39 (5.61-6.93) UNDERC: 6.23 (5.64-6.79) ALA: 4.46 (4.18-4.72)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -31

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organism size (3), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -45

Toxicity Data Summary

Alonella sp.

Study: Naqvi SM, Hawkins RH. 1989. Responses and LC50 values for selected microcrustaceans exposed to Spartan®, Malathion, Sonar®, Weedtrine-D®, and Oust® pesticides. Bull Environ Contam Toxicol 43:386-393.

Relevance
Score: 75
Rating: L

Reliability
Score: 65
Rating: L

*No standard method, Low chemical purity

	Naqvi & Hawkins 1989	***Alonella* sp.**
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Crustacea (Branchiopoda)	
Order	Diplostraca	
Family	Chydoridae	
Genus	*Alonella*	
Species	NR	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Collected from Lake Kernan near Baton Rouge, LA	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0.3%	
Temperature	21 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Aged tapwater	
pH	8.0-8.5	
Hardness	26-28 mg/L, 4 mg/kg as CaCO3	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	6.6-7.5 mg/kg	

	Naqvi & Hawkins 1989	***Alonella* sp.**
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	42% (50.7% xylene)	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom (µg/L)	1.0	3 reps, 100-150/rep
Concentration 2 Nom (µg/L)	2.0	3 reps, 100-150/rep
Concentration 3 Nom (µg/L)	4.0	3 reps, 100-150/rep
Concentration 4 Nom (µg/L)	6.0	3 reps, 100-150/rep
Concentration 5 Nom (µg/L)	8.0	3 reps, 100-150/rep
Concentration 6 Nom (µg/L)	10.0	Reps and # per
Concentration 7 Nom (µg/L)	12.0	
Control	Dilution water	3 reps, 100-150/rep
LC_{50} (95% fiducial limits) (µg/L)	4.0 (3.8-4.9)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -27

Acceptability (Table 3.8): No standard method (5), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Dilution water (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -43

Toxicity Data Summary

Brachycentrus americanus

Study: Anderson RL. 1982. Toxicity of fenvalerate and permethrin to several nontarget aquatic invertebrates. Environ Entomol 11:1251-1257.

Relevance
Score: 90
Rating: R

Reliability
Score: 78.5
Rating: R

*No standard method

	Anderson 1982	***B. americanus***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Trichoptera	
Family	Brachycentridae	
Genus	*Brachycentrus*	Caddisfly
Species	*americanus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Larvae, age/size NR	
Source of organisms	Collected from ponds and streams near Duluth, MN	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Acclimatized for 1 week	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	28 d	
Data for multiple times?	Yes, 21 d	
Effect 1	Mortality	
Control response 1	0%	
Effect 2	Behavioral effects	
Control response 2	0%	
Temperature	15 ± 0.6°C	
Test type	FT	
Photoperiod/light intensity	14 light: 10 dark	
Dilution water	Unfiltered Lake Superior water	
pH	7.6-7.8	
Hardness	46-48 mg/L	
Alkalinity	42-44 mg/L	
Conductivity	NR	

	Anderson 1982	***B. americanus***
Parameter	**Value**	**Comment**
Dissolved Oxygen	>95% saturation	
Feeding	Birch and poplar leaves	
Purity of test substance	Technical	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (μg/L)	0.52 ± 0.14	2 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	0.22 ± 0.09	2 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	0.12 ± 0.05	2 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	0.064 ± 0.024	2 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	0.030 ± 0.010	2 reps, 10/rep
Control	Dilution water	2 reps, 10/rep
LC_{50} (μg/L)	21 d: 0.17 (0.09-0.34)	Method: trimmed Spearman-Karber
EC_{50} (μg/L) behavior	48 h: 0.064	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Age/size (5), Nominal concentrations (3), Conductivity (2), Hypothesis tests (8).

Acceptability (Table 3.8): Standard method (5), Measure concentrations within 20% of nominal (4), Appropriate size/age (3), Prior contamination (4), Organisms randomized (1), Conductivity (1), Random design (2), Adequate replication (2), Hypothesis tests (3).

Toxicity Data Summary

Bufo boreas boreas

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 85
Rating: L

Reliability
Score: 70.5
Rating: L

*No toxicity value

	Dwyer et al. 2005	***B. boreas boreas***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee on Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Amphibia	
Order	Anura	
Family	Bufonidae	
Genus	*Bufo*	
Species	*boreas boreas*	Boreal toad
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Collected in wild by Colorado Division of Wildlife	From West Fork of Clear Creek near Georgetown, CO
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	

	Dwyer et al. 2005	***B. boreas boreas***
Parameter	**Value**	**Comment**
pH	Slightly above 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	119% for stock solution, except one individual stock that was 320% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution series	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (μg/L)	>10.0	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8), Point estimates (8). -43

Acceptability (Table 3.8): Organism size (3), Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3), Point estimates (3). -16

Toxicity Data Summary

Bufo boreas

Study: Dwyer FJ, Hardesty DK, Henke CE, Ingersoll CG, Whites DW, Mount DR, Bridges CM. 1999. Assessing contaminant sensitivity of endangered and threatened species: toxicant classes. EPA/600/R-99/098.

Relevance
Score: 85
Rating: L

Reliability
Score: 73
Rating: L

*No toxicity value calculable

	Dwyer et al. 1999	***B. boreas***
Parameter	**Value**	**Comment**
Test method cited	EPA 1975, ASTM 1998	
Phylum	Chordata	
Class	Amphibia	
Order	Anura	
Family	Bufonidae	
Genus	*Bufo*	
Species	*boreas*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Weight: 12 mg, Length: 9.6 ± 0.7 mm	
Source of organisms	National or state fish hatcheries	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes, 96 h acclimation	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	<10%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR – “ambient lighting”	
Dilution water	Reconstituted hard water	
pH	Mean: 8.4 ± 0.1	
Hardness	167 ± 5 mg/L as CaCO3	
Alkalinity	115 ± 1 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	>40% saturation at 96 h,	

	Dwyer et al. 1999	***B. boreas***
Parameter	**Value**	**Comment**
	>60% saturation at 48 h	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Only the stock solutions	
Measured is what % of nominal?	Stock: 160%	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC (for stocks)	
Concentration of carrier (if any) in test solutions	0.005% acetone	
Concentration 1 Nom (µg/L)	6 concentrations	3 reps, 10/rep
Concentration 2 Nom (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom (µg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (95% confidence interval) (µg/L)	>10	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Hypothesis tests (8), Point estimates (8). -28

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Dissolved oxygen (6), Temperature (3), Conductivity (1), Dilution factor (2), Hypothesis tests (3), Point estimates (3). -26

Toxicity Data Summary

Chironomus dilutes

Study: Anderson, B.S., Phillips, B.M., Hunt, J.W., Connor, V., Richard, N., Tjeerdema, R.S., 2006. Identifying primary stressors impacting macroinvertebrates in the Salinas River (CA, USA): Relative effects of pesticides and suspended particles. Environmental Pollution 141:402-408

Relevance
Score: 90 (No standard method)
Rating: R

Reliability
Score: 74.5
Rating: R

	Anderson et al. 2006	***C. dilutus***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*dilutus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	3rd instar	
Source of organisms	Chesapeake Culture, Hayes, VA.	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	No	
Test duration	96 hours	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	90% survival*	
Temperature	23°C ± 1*	
Test type	Static	
Photoperiod/light intensity	16 light: 8 dark*	
Dilution water	Well Water	
pH	NR	
Hardness	91.6 mg/L*	
Alkalinity	122.4 mg/L CaCO3*	
Conductivity	NR	

	Anderson et al. 2006	***C. dilutus***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	Not fed	
Purity of test substance	100%	
Concentrations measured?	Meas. 2 reps of only some conc's	
Measured is what % of nominal?	61-75%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	Used 100mg/L methanol stock	
Concentration 1 Nom/Meas (µg/L)	0.5/ NR	10 reps/1per
Concentration 2 Nom/Meas (µg/L)	1/ 0.752, 0.654	10 reps/1per
Concentration 3 Nom/Meas (µg/L)	3.2/1.96, 2.25	10 reps/1per
Concentration 4 Nom/Meas (µg/L)	5/ NR	10 reps/1per
Concentration 5 Nom/Meas (µg/L)	20/ NR	10 reps/1per
Control	Solvent and dilution water	10 reps/1per
LC_{50} (µg/L)	10.450 µg/L (calculated with nominal conc)	Method: Spearman-Karber

Other notes: *Control survival, temp. variation and water chemistry obtained by personal communication with the testing laboratory.

Reliability points taken off for:
Documentation: Dissolved Oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -17
Acceptability: Standard method (5), Meas. Concentrations 20% Nom (4), Concentrations exceed 2x water solubility (4), Organisms randomly assigned to containers (1), Organisms properly acclimated (1), Dissolved oxygen (6), Conductivity (1), pH (2), Random / block design (2), Dilution factor (2), Hypothesis tests (3). -31

Toxicity Data Summary

Chironomus dilutus

Study: Harwood AD, You J, Lydy MJ. 2009. Temperature as a toxicity identification evaluation tool for pyrethroid insecticides: Toxicokinetic confirmation. Environ Toxicol Chem 28:1051-1058.

Relevance
Score: 100
Rating: R

Reliability
Score: 80 (23°C), 78.5 (13°C)
Rating: R

	Harwood et al. 2009	***C. dilutus***
Parameter	**Value**	**Comment**
Test method cited	USEPA 2000	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Chironomidae	
Genus	*Chironomus*	
Species	*dilutus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	4th instar	
Source of organisms	Laboratory cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	92%	
Temperature	23 ± 0.3°C 13 ± 0.5°C	
Test type	Static	
Photoperiod/light intensity	16 light:8 dark	
Dilution water	USEPA moderately hard water	
pH	6.7-7.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	275-396 uS/cm	
Dissolved Oxygen	6.39-7.41 mg/L	
Feeding	None during test	
Purity of test substance	>96%	

	Harwood et al. 2009	***C. dilutus***
Parameter	**Value**	**Comment**
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Meas	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	% acetone	
Concentration 1 Nom/Meas (µg/L)	0.0164	5 reps, 10 /rep
Concentration 2 Nom/Meas (µg/L)	NR	5 reps, 10 /rep
Concentration 3 Nom/Meas (µg/L)	NR	5 reps, 10 /rep
Concentration 4 Nom/Meas (µg/L)	NR	5 reps, 10 /rep
Concentration 5 Nom/Meas (µg/L)	NR	5 reps, 10 /rep
Concentration 6 Nom/Meas (µg/L)	0.419	5 reps, 10 /rep
Control	Solvent and dilution water	5 reps, 10 /rep
LC_{50} (fiducial limits) (µg/L)	13 °C: 0.0585 (0.0426-0.0808)* 23 °C: 0.189 (0.131-0.295)	Method: log-probit

Notes: water-only bioassays also contained ~ 10g Fisher sea sand to provide a substrate for the midges and prevent cannibalism.
*not the standard test temperature, significantly different from LC_{50} at 23°C

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Hypothesis tests (8). -18

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Carrier solvent (4), Temperature (3 – 13degC only), Organisms randomized (1), Organisms/rep (2), Hardness (2), Alkalinity (2), Random design (2), Dilution factor (2), Hypothesis tests (3). 23°C: -22, 13°C:-25

Toxicity Data Summary

Ceriodaphnia dubia

Study: Wheelock CE, Miller JL, Miller MJ, Gee SJ, Shan G, Hammock BD. 2004. Development of toxicity identification evaluation procedures for pyrethroid detection using esterase activity. Environmental Toxicology and Chemistry 23(11): 2699-2708

Relevance
Score: 100
Rating: R

Reliability
Score: 74.5
Rating: R

Reference	**Wheelock *et al.* 2004**	***C. dubia***
Parameter	**Value**	**Comment**
Test method cited	EPA	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Ceriodaphnia*	
Species	*dubia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 24 h	
Source of organisms	Lab culture, AQUA-Science, Davis, CA	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	> 90%	
Temperature	25 +/- 1 ºC	
Test type	Static	
Photoperiod/light intensity	16:8 light: dark	
Dilution water	EPA moderately hard	
pH	7.4-7.8	
Hardness	80-100 mg/L	
Alkalinity	60-70 mg/L	
Conductivity	Measured but NR	
Dissolved Oxygen	Measured but NR	
Feeding	None	

Reference	**Wheelock *et al.* 2004**	***C. dubia***
Parameter	**Value**	**Comment**
Purity of test substance	99%	
Concentrations measured?	No	
Measured is what % of nominal?	NR	
Chemical method documented?	Yes	GC-MS
Concentration of carrier (if any) in test solutions	<1%	
Concentration 1 Nom/Meas (μg/L)	5-7 concentrations	2-4 w/ 5 neonates each
Control	Water and methanol control	2-4 w/ 5 neonates each
LC_{50}	48 h: 0.250 +/- 0.119 μg/L	ToxCal software, but no stat method reported

Reliability points taken off for:
Documentation: Nominal concentrations (3), Measured concentrations (3), Dissolved Oxygen (4), Conductivity (2), Statistical methods identified (5), Hypothesis tests (8)

Acceptability: Meas. Concentrations 20% Nom (4), Carrier solvent ≤ 0.5 mL/L (4), Dissolved oxygen (6), Conductivity (1), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3)

Toxicity Data Summary

Hyalella azteca

Study: Wheelock CE, Miller JL, Miller MJ, Phillips BM, Gee SJ, Tjeerdema RS, Hammock BD. 2005. Influence of container adsorption upon observed pyrethroid toxicity to *Ceriodaphnia dubia* and *Hyalella azteca.* Aquatic Toxicology 74:47-52.

Relevance
Score: 92.5
Rating: R

Reliability
Score: 65.5
Rating: L

*Control not described

	Wheelock et al. 2005	***C. dubia***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1993	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Diplostraca (Cladocera)	
Family	Daphniidae	
Genus	*Ceriodaphnia*	
Species	*dubia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 24 h	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes *	Info obtained from Wheelock et al. 2004
Test vessels randomized?	Yes *	Info obtained from Wheelock et al. 2004
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	≤ 5%	
Temperature	25 ± 1°C *	Info obtained from Wheelock et al. 2004
Test type	Static	
Photoperiod/light intensity	16 L:8 D*	Info obtained from Wheelock et al. 2004
Dilution water	EPA moderately hard *	Info obtained from

	Wheelock et al. 2005	***C. dubia***
Parameter	**Value**	**Comment**
		Wheelock et al. 2004
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	99%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	<1% methanol *	Info obtained from Wheelock et al. 2004
Concentration 1 Nom/Meas (µg/L)	0	4 reps, 5/rep
Concentration 2 Nom/Meas (µg/L)	0.125	4 reps, 5/rep
Concentration 3 Nom/Meas (µg/L)	0.250	4 reps, 5/rep
Concentration 4 Nom/Meas (µg/L)	0.375	4 reps, 5/rep
Control	Not described	4 reps, 5/rep
LC_{50} (95% confidence interval) (µg/L)	Time to test initiation (min) 15: 0.0658 (0.0605-0.0782) 30: 0.0742 (0.0554-0.1057) 60: 0.0781 (0.0584-0.1070) 120: 0.0893 (0.0575-0.1464) 240: 0.1402 (0.1064-0.1679)**	Method: Spearman-Karber

Notes:
* Info obtained from: Wheelock CE, Miller JL, Miller MJ, Gee SJ, Shan F, Hammock BD. 2004. Development of toxicity identification evaluation procedures for pyrethroid detection using esterase activity. Environ Toxicol Chem 23:2699-2708. – as cited in the article.
** statistically significant difference from the other time intervals

Reliability points taken off for:
Documentation (Table 3.7): Control type (8), Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -36

Acceptability (Table 3.8): Control description (6), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Number of concentrations (3), Hypothesis tests (3). -33

Toxicity Data Summary

Ceriodaphnia dubia

Study: Yang WC, Hunter W, Spurlock F, Gan J. 2007. Bioavailability of permethrin and cyfluthrin in surface waters with low levels of dissolved organic matter. *J. Environ. Qual.* 36:1678-1685.

Relevance
Score: 100
Rating: R

Reliability
Score: 76.5
Rating: R

Reference	**Yang *et al.* 2007**	***C. dubia***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1993	Effluent toxicity tests
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Ceriodaphnia*	
Species	*dubia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Neonates, < 24 h	
Source of organisms	Lab cultures	Aquatic BioSystems, Fort Collins, CO
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes, several months	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	<10% for all waters tested	
Temperature	21 ± 1°C	
Test type	Static	
Photoperiod/light intensity	16 L: 8 D	
Dilution water	15 filtered surface waters from Orange and Riverside Counties, CA	See notes below for key to numbered waters
pH	1) 7.30 2) 6.87 3) 6.85	

Reference	**Yang *et al.* 2007**	***C. dubia***
Parameter	**Value**	**Comment**
	4) 7.36 5) 7.76 6) 7.02 7) 7.14 8) 7.70 9) 7.24 10) 6.95 11) 7.05 12) 7.73 13) 7.29 14) 6.67 15) 6.85	
Hardness (mg/L)	1) 303 2) >1000 3) 200 4) 162 5) 223 6) >1000 7) >1000 8) 270 9) 365 10) 308 11) >1000 12) 440 13) 200 14) 302 15) 220	
Alkalinity (mg/L)	1) 323 2) 318 3) 180 4) 118 5) 204 6) 361 7) 317 8) 230 9) 269 10) 235 11) 470 12) 130 13) 223 14) 304 15) 198	
Conductivity	NR	
Dissolved Oxygen	NR	

Reference	**Yang *et al.* 2007**	***C. dubia***
Parameter	**Value**	**Comment**
Feeding	Yes, shortly before exposure and at 48 h	
Purity of test substance	99.3%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutionsd	$\leq$ 0.1% acetone	
Concentration 1 Nom/Meas (µg/L)	0.2	5 org/rep
Concentration 2 Nom/Meas (µg/L)	0.5	5 org/rep
Concentration 3 Nom/Meas (µg/L)	1.0	5 org/rep
Concentration 4 Nom/Meas (µg/L)	2.0	5 org/rep
Concentration 5 Nom/Meas (µg/L)	4.0	5 org/rep
Control	Dilution waters, DI water	5 org/rep
LC_{50} (95% confidence interval) (µg/L)	0) 0.652 (0.484-0.856) 1) 0.788 (0.545-1.040) 2) 0.622 (0.427-0.824) 3) 0.772 (0.574-1.013) 4) 0.745 (0.568-0.957) 5) 0.858 (0.591-1.138) 6) 0.571 (0.427-0.740) 7) 0.580 (0.407-0.718) 8) 0.609 (0.486-0.747) 9) 0.570 (0.459-0.689) 10) 0.827 (0.669-1.012) 11) 0.585 (0.677-0.793) 12) 0.849 (0.655-1.085) 13) 0.889 (0.666-1.120) 14) 0.865 (0.672-1.098) 15) 0.996 (0.764-1.286)*	Method: Probit * indicates significantly different than DI water control (0), these values were excluded from the RR data set because they had high DOM concentrations.

Notes:

LC_{50} calculated based on nominal concentrations.

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (4), Dissolved oxygen (4), Conductivity (2), Hypothesis tests (8). -22
Acceptability: Measured concentrations w/in 20% nominal (4), Carrier solvent (4), Organisms randomized (1), Dissolved oxygen (6), Conductivity (1), Exposure type (2), Random design (2), Adequate replication (2), Hypothesis tests (3). -25

Toxicity Data Summary

Ceriodaphnia dubia

Study: Yang W, Spurlock F, Liu W, Gan J. 2006a. Effects of dissolved organic matter on permethrin bioavailability to *Daphnia* species. J Agric Food Chem 54:3967-3972.

Relevance
Score: 92.5
Rating: R

Reliability
Score: 72
Rating: L

*Control response not reported

	Yang et al. 2006	***C. dubia***
Parameter	**Value**	**Comment**
Test method cited	US EPA	Effluent toxicity test
Phylum	Arthropoda	
Class	Crustacea (Branchiopoda)	
Order	Diplostraca (Cladocera)	
Family	Daphniidae	
Genus	*Ceriodaphnia*	
Species	*dubia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 24 h	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	21 ± 1°C	
Test type	Static	
Photoperiod/light intensity	16 L: 8 D	
Dilution water	Moderately hard water amended with 1) Lake water 2) Pond water 3) compost extract	
pH	NR	
Hardness	Lake: 418 mg/L Pond: 353 mg/L Compost: 209 mg/L	

	Yang et al. 2006	***C. dubia***
Parameter	**Value**	**Comment**
Alkalinity	Lake: 458 mg/L Pond: 352 mg/L Compost: 181 mg/L	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Right before exposure and at 48 h, added so that partitioning effects were uniform among all treatments	
Purity of test substance	99.3%	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	% NR, acetone	
Concentration 1 Nom/Meas (μg/L)	0.2	4 reps, 5/rep
Concentration 2 Nom/Meas (μg/L)	0.4	4 reps, 5/rep
Concentration 3 Nom/Meas (μg/L)	0.8	4 reps, 5/rep
Concentration 4 Nom/Meas (μg/L)	1.2	4 reps, 5/rep
Concentration 5 Nom/Meas (μg/L)	2.4	4 reps, 5/rep
Concentration 6 Nom/Meas (μg/L)	4.8	4 reps, 5/rep
Control	Dilution water	4 reps, 5/rep
LC_{50} (μg/L)	Lake water DOC 0 mg/L: 0.52 (0.38-0.65) 1 mg/L: 0.57 (0.42-0.69) 5 mg/L: 0.54 (0.43-0.66) 10 mg/L: 0.74 (0.57-0.95) 20 mg/L: 0.78 (0.63-0.95)* 30 mg/L: 1.09 (0.81-1.39)* Compost extract DOC 0 mg/L: 0.48 (0.39-0.58) 1 mg/L: 0.52 (0.39-0.63) 5 mg/L: 0.49 (0.388-0.60) 10 mg/L: 0.59 (0.42-0.74) 20 mg/L: 0.73 (0.52-0.90)* 30 mg/L: 0.92 (0.71-1.19)* Pond water DOC 0 mg/L: 0.56 (0.41-0.68) 0.5 mg/L: 0.51 (0.38-0.62)	Method: probit

	Yang et al. 2006	***C. dubia***
Parameter	**Value**	**Comment**
	1 mg/L: 0.59 (0.48-0.72) 2 mg/L: 0.66 (0.49-0.81) 5 mg/L: 0.76 (0.57-0.95)* 10 mg/L: 1.03 (0.81-1.32)*	

Notes: *Significantly different from 0 mg/L DOC.

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -24

Acceptability (Table 3.8): Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Dissolved oxygen (6), Conductivity (1), pH (2), Random design (2), Hypothesis tests (3). -32

Toxicity Data Summary

Culex pipiens pallens

Study: Kasai S, Shono T, Komagata O, Tsuda Y, Kobayashi M, Motoki M, Kashima I, Tanikawa T, Yoshida M, Tanaka I, Shinjo G, Hashimoto T, Ishikawa T, Takahashi T, Higa Y, Tomita T. 2007. Insecticide resistance in potential vector mosquitoes for west nile virus in Japan. Journal of Medical Entomology 44:822-829.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 60
Rating: L

*Unacceptable standard method, Control response not reported

	Kasai et al. 2007	***C. pipiens pallens***
Parameter	**Value**	**Comment**
Test method cited	WHO 1981	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Culex*	
Species	*pipiens pallens*	Horaana strain (susceptible)
Family in North America?	Yes	
Age/size at start of test/growth phase	Early 4th instar larvae	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	26 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Kasai et al. 2007	***C. pipiens pallens***
Parameter	**Value**	**Comment**
Feeding	NR	
Purity of test substance	91.2%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.5% alcohol	
Concentration 1 Nom/Meas (μg/L)	NR	3 reps, 20-30/rep
Concentration 2 Nom/Meas (μg/L)	NR	
Concentration 3 Nom/Meas (μg/L)	NR	
Concentration 4 Nom/Meas (μg/L)	NR	
Concentration 5 Nom/Meas (μg/L)	NR	
Concentration 6 Nom/Meas (μg/L)	NR	
Control	Solvent	3 reps, 20-30/rep
LC_{50} (μg/L)	7.7 (7.3-8.2)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): Unacceptable standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3). -46

Toxicity Data Summary

Culex pipiens pallens

Study: Song F, Cao X, Zhao T, Dong Y, Lu B. 2007. Pyrethroid resistance and distribution of kdr allele in *Culex pipiens pallens* in north China. International Journal of Pest Management 53:25-34.

Relevance
Score: 90
Rating: R

Reliability
Score: 62
Rating: L

*No standard method

	Song et al. 2007	***C. pipiens pallens***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Culex*	
Species	*pipiens pallens*	Strains: Tanghekou (TH) Susceptible lab culture (Ss)
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3rd – early 4th instar larvae	
Source of organisms	Parent generation collected in field – 1st or 2nd generation Or lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	< 4%	
Temperature	26 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	

	Song et al. 2007	***C. pipiens pallens***
Parameter	**Value**	**Comment**
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	92%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.5% acetone	
Concentration 1 Nom/Meas (μg/L)	7 concentrations	3 reps, 20/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 20/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 20/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 20/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 20/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 20/rep
Control	Solvent	3 reps, 20/rep
LC_{50} (95% confidence limit) (μg/L)	Ss: 3.85 (3.47-4.27) TH: 9.904 (5.341-18.37)	Method: probit

Notes: Other strains were tested but the toxicity values exceeded 2x the aqueous solubility of permethrin.

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -42

Toxicity Data Summary

Culex quinquefasciatus

Study: Corbel V, Raymond M, Chandre F, Darriet F, Hougard J-M. 2003. Efficacy of insecticide mixtures against larvae of *Culex quinquefasciatus* (Say) (Diptera:Culicidae) resistant to pyrethroids and carbamates. Pest Manag Sci 60:375-380.

Relevance
Score: 90
Rating: R

Reliability
Score: 63.5
Rating: L

*Unacceptable standard method

	Corbel et al. 2003	***C. quinquefasciatus***
Parameter	**Value**	**Comment**
Test method cited	WHO 1970	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	*Culex*	
Species	*quinquefasciatus*	Say R-LAB strain (carbamate resistant)
Family in North America?	Yes	
Age/size at start of test/growth phase	Late 3rd and 5th instar larvae	
Source of organisms	Lab colony	
Have organisms been exposed to contaminants?	Not these organisms, but ancestors breed for carbamate resistance	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	< 5%	
Temperature	27 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Distilled water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Corbel et al. 2003	***C. quinquefasciatus***
Parameter	**Value**	**Comment**
Feeding	NR	
Purity of test substance	94.4%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	1 mL ethanol/99 mL dilution water	
Concentration 1 Nom/Meas (μg/L)	5-8 concentrations	3 tests with 5 reps, 20/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 tests with 5 reps, 20/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 tests with 5 reps, 20/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 tests with 5 reps, 20/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 tests with 5 reps, 20/rep
Control	Solvent	3 tests with 5 reps, 20/rep
LC_{50} (μg/L)	1.2	Method: log-probit

Notes: The results for the permethrin resistant strain were not reported because the LC50 of 400 ug/L exceeded 2x the water solubility (5.5 ug/L).
There are also results for mixtures with propoxur, a carbamate insecticide.

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -34

Acceptability (Table 3.8): Unacceptable standard method (5), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Feeding (3), Dilution water (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -39

Toxicity Data Summary

Cyprinodon variegatus

Study: Hansen DJ, Goodman LR, Moore JC, Higdon PK. 1983. Effects of the synthetic pyrethroids AC 222,705, permethrin and fenvalerate on sheepshead minnows in early life stage toxicity tests. Environ Toxicol Chem 2:251-258.

Relevance
Score: 75
Rating: L

Reliability
Score: 77
Rating: R

*No standard method, saltwater

	Hansen et al. 1983	***C. variegatus***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Actinopterygii	
Order	Cyprinodontiformes	
Family	Cyprinodontidae	
Genus	*Cyprinodon*	
Species	*variegatus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	1.5-24 h old embryos	
Source of organisms	Eggs from lab-cultured fish	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	28 d	
Data for multiple times?	No	
Effect 1	Embryo survival	
Control response 1	95%	
Effect 2	Fry survival	
Control response 2	97%	
Effect 3	Average length of hatched fish	
Control response 3	9.8 mm	
Temperature	30 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	12 h:12 h	
Dilution water	Seawater	25 o/oo salinity
pH	NR	
Hardness	NR	

	Hansen et al. 1983	***C. variegatus***
Parameter	**Value**	**Comment**
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	3.6-6.6 mg/L (58-100% saturation)	
Feeding	Fish fed 1-2 times daily with *Artemia salina* nauplii	
Purity of test substance	93%	From Schimmel et al. 1983
Concentrations measured?	Yes	
Measured is what % of nominal?	95-110%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC/MS	
Concentration of carrier (if any) in test solutions	% 9 mg/L triethylene glycol	
Concentration 1 Nom/Meas w/ std dev. (µg/L)	1.25/1.6 (0.13)	4 reps, 20/rep
Concentration 2 Nom/Meas w/ std dev. (µg/L)	2.5/2.4 (0.36)	4 reps, 20/rep
Concentration 3 Nom/Meas w/ std dev. (µg/L)	5.0/5.6 (0.93)	4 reps, 20/rep
Concentration 4 Nom/Meas w/ std dev. (µg/L)	10/10.0 (2.6)	4 reps, 20/rep
Concentration 5 Nom/Meas w/ std dev. (µg/L)	20/22.0 (2.9)	4 reps, 20/rep
Concentration 6 Nom/Meas w/ std dev. (µg/L)	40/42.0 (2.1)	4 reps, 20/rep
Control	Solvent	4 reps, 20/rep
NOEC w/ std dev. (µg/L)	Embryo/fry survival: 10 (2.6)	Method: ANOVA and Duncan's multiple range test p: 0.05 MSD: NR
LOEC w/ std dev. (µg/L)	Fry survival: 22.0 (2.9)*	Same as above
MATC (GeoMean NOEC,LOEC) (µg/L)	Fry survival: 14.8*	
% of control at NOEC	Fry survival: 102%	
% of control at LOEC	Fry survival: 1%	

Notes: *LOEC and MATC not valid because they exceed 2x the aqueous solubility of permethrin (5.5 ug/L)

Reliability points taken off for:

Documentation (Table 3.7): Hardness (2), Alkalinity (2), Conductivity (2), pH (3), Minimum significant difference (2), Point estimates (8). -17

Acceptability (Table 3.8): No standard method (5), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Hardness (2), Alkalinity (2), Temperature (3), Conductivity (1), pH (2), Random design (2), Minimum significant difference (1), Point estimates (3). -29

Schimmel SC, Garnas RL, Patrick JM, Moore JC. 1983. Acute toxicity, bioconcentration, and persistence of AC 222,705, benthiocarb, chlorpyrifos, fenvalerate, methyl parathion, and permethrin in the estuarine environment. J Agric Food Chem 31:104-113.

Toxicity Data Summary

Cyprinodon variegatus

Study: Schimmel SC, Garnas RL, Patrick JM, Moore JC. 1983. Acute toxicity, bioconcentration, and persistence of AC 222,705, benthiocarb, chlorpyrifos, fenvalerate, methyl parathion, and permethrin in the estuarine environment. J Agric Food Chem 31:104-113.

Relevance
Score: 85
Rating: L

Reliability
Score: 61.5
Rating: L

*Saltwater

	Schimmel et al. 1983	***C. variegatus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980	
Phylum	Chordata	
Class	Actinopterygii	
Order	Cyprinodontiformes	
Family	Cyprinodontidae	
Genus	*Cyprinodon*	
Species	*variegatus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Collected from estuarine waters near Gulf Breeze, FL or lab cultures	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	$\leq$ 5%	
Temperature	30.0 °C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	22.1 o/oo salinity
pH	NR	
Hardness	NR	
Alkalinity	NR	

	Schimmel et al. 1983	***C. variegatus***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	93%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	0.05% triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	NR	1 rep, 20/rep
Concentration 2 Nom/Meas (μg/L)	NR	
Concentration 3 Nom/Meas (μg/L)	NR	
Concentration 4 Nom/Meas (μg/L)	NR	
Concentration 5 Nom/Meas (μg/L)	NR	
Concentration 6 Nom/Meas (μg/L)	NR	
Control	Solvent and dilution water	1 rep, 20/rep
LC_{50} (μg/L)	7.8 (6.2-10)	Method: probit, moving average, or binomial test

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -35

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organism size (3), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -42

Toxicity Data Summary

Cyprinus carpio

Hill RW, Maddock BG, Hart B & Cornish SK. (1976). "Determination of the Acute Toxicity of PP 557 to Mirror Caro (*Cyprinus carpio*)". Imperial Chemical Industries Limited, Brixham Laboratory.

Relevance
Score: 75
Rating: L

Reliability
Score: 63.5
Rating: L

Relevance Points taken off for: Standard Method (10), Controls (15)

Reference	**Hill et al, 1976**	*Cyprinus carpio*
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chordata	
Class	Actinopterygii	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Cyprinus*	
Species	*carpio*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Avg weight: 7.91 g Avg length:76.1 mm	
Source of organisms	Kerswell Priory, Cullompton, Devon	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Control response 1		
Temperature	23±0.5°C	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	reservoir	
pH	7.80-8.10	
Hardness	44.0-58.5 ppm as $CaCO_3$	

Reference	**Hill et al, 1976**	*Cyprinus carpio*
Parameter	**Value**	**Comment**
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>87% saturation	
Feeding	NR	
Purity of test substance	NR	
Concentrations measured?	Yes	
Measured is what % of nominal?	44-154%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	10 mg/L DMSO	
Concentration 1 Nom/Meas (mg/L)	0.47 / 0.370, 0.280	1 Reps and 10 organisms per rep, test repeated 2x
Concentration 2 Nom/Meas (mg/L)	0.22 / 0.2250, 0.2150	"
Concentration 3 Nom/Meas (mg/L)	0.10 / 0.074, 0.090, 0.076	"
Concentration 4 Nom/Meas (mg/L)	0.068 / 0.0655, 0.0530, 0.0396	"
Concentration 5 Nom/Meas (mg/L)	0.047 / 0.0500, 0.0475, 0.0412	"
Concentration 6 Nom/Meas (mg/L)	0.022 / 0.0340, 0.0265, 0.0255, 0.0116	"
Concentration 7 Nom/Meas (mg/L)	0.01 / 0.009, 0.010, 0.0044	"
Concentration 8 Nom/Meas (mg/L)	0.0033 / 0.0040, 0.00265	"
Control	Not described	1 Reps and 10 organisms per rep, test repeated 2x
LC50; (mg/L)	24 hr 0.098* 48 hr 0.385* 96 hr 0.015*	Concentration correlated with Geometric Mean Survival Periods

***LC50s exceed water solubility of permethrin (0.5-6 ug/L)**

Reliability points taken off for:
Documentation: Control type (8), Chemical purity (5), Alkalinity (2), Conductivity (2), Photoperiod (3), Statistical methods (5), Hypothesis tests (8).

Acceptability: No standard method (5), Control description (6), Control response (9), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Feeding (3), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3).

Toxicity Data Summary

Cypria sp.

Study: Naqvi SM, Hawkins RH. 1989. Responses and LC50 values for selected microcrustaceans exposed to Spartan®, Malathion, Sonar®, Weedtrine-D®, and Oust® pesticides. Bull Environ Contam Toxicol 43:386-393.

Relevance
Score: 75
Rating: L

Reliability
Score: 65
Rating: L

*No standard method, Low chemical purity

	Naqvi & Hawkins 1989	***Cypria* sp.**
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Ostracoda	
Order	Podocopida	
Family	Cypridoidea	
Genus	*Cypria*	
Species	NR	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Collected from Lake Kernan near Baton Rouge, LA	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0.3%	
Temperature	21 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Aged tapwater	
pH	8.0-8.5	
Hardness	26-28 mg/L, 4 mg/kg as CaCO3	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	6.6-7.5 mg/kg	

	Naqvi & Hawkins 1989	***Cypria* sp.**
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	42% (50.7% xylene)	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom (µg/L)	1.0	3 reps, 100-150/rep
Concentration 2 Nom (µg/L)	2.0	3 reps, 100-150/rep
Concentration 3 Nom (µg/L)	4.0	3 reps, 100-150/rep
Concentration 4 Nom (µg/L)	6.0	3 reps, 100-150/rep
Concentration 5 Nom (µg/L)	8.0	3 reps, 100-150/rep
Concentration 6 Nom (µg/L)	10.0	3 reps, 100-150/rep
Concentration 7 Nom (µg/L)	12.0	3 reps, 100-150/rep
Control	Dilution water	3 reps, 100-150/rep
LC_{50} (95% fiducial limits) (µg/L)	5.0 (4.8-6.4)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -27

Acceptability (Table 3.8): No standard method (5), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Dilution water (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -43

Toxicity Data Summary

Daphnia magna (first instar)

Study: Doma S, Evered P. 1977. PP557: Acute toxicity and reproduction studies on first instar and ephippia of *Daphnia magna*. ICI Plant Protection Division. CDPR ID: study number 15139.

Relevance
Score: 85
Rating:L

Reliability
Score: 63
Rating: L

Chemical Purity (15)

Reference	**Doma et al, 1977**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	Daphnia	
Species	magna	
Family in North America?	Yes	
Age/size at start of test/growth phase	First Instar	
Source of organisms	NR	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 hr	
Data for multiple times?	Yes	24 & 48 hr
Effect 1	Immobility	
Control response 1	0%	
Temperature	18±1°C	
Test type	Static	
Photoperiod/light intensity	30 watt, 3500 lux	
Dilution water	Reconstituted hard water	
pH	8.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>85% saturation	

Reference	**Doma et al, 1977**	***D. magna***
Parameter	**Value**	**Comment**
Feeding	Not Fed	
Purity of test substance	25% emulsifiable concentrate	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	1% acetone	
Concentrations Nom (µg/L)	100, 50, 10, 5, 1, 0.5, 0.1, 0.05, 0.01	3 Reps and 10 organisms per rep
Control	Solvent control and diluents control	3 Reps and 10 organisms per rep
LC50; (95% CI) (µg/L)	24 hr 1.82 (1.54-2.15) 48 hr 0.76 (0.66-0.88)	Logit transformation

Reliability points taken off for:
Documentation: Organism source (5), Chemical Grade (5), Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -34

Acceptability: Chemical Purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), Hardness (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -40

Toxicity Data Summary

Daphnia Magna

Study: Aquatic Environmental Sciences. 1976. Acute toxicity of FMC 33297 ACT 29 .11, .12 to bluegill sunfish (*Lepomis macrochirus* Rafinesque) and the water flea (*Daphnia Magna* Straus). Aquatic Environmental Sciences: Tarrytown, NY. CDPR ID: study number 15099.

Relevance
Score: 85
Rating: L

Reliability
Score: 67.5
Rating: L

*Chemical purity not reported

Reference	**Aq. Envir. Sci., 1976**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	1^{st} instar, < 20 hr	
Source of organisms	Laboratory stock cultures	Original stock from National Water Quality Laboratory, Duluth, MN
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 28, 96 hr
Effect 1	Immobility	
Control response	0%	
Temperature	17 $\pm$ 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered soft lake water	
pH	7.30	

Reference	**Aq. Envir. Sci., 1976**	***D. magna***
Parameter	**Value**	**Comment**
Hardness	44 mg/L $CaCO_3$	
Alkalinity	20 mg/L $CaCO_3$	
Conductivity	130 µmhos/cm	
Dissolved Oxygen	7.9-8.9 mg/L (84-95% saturation)	
Feeding	Not Fed	
Purity of test substance	NR	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	%NR, acteone	
Concentration 1 Nom (µg/L)	18.0	4 Reps and 5 organisms per rep
Concentration 2 Nom (µg/L)	10.0	4 Reps and 5 organisms per rep
Concentration 3 Nom (µg/L)	5.6	4 Reps and 5 organisms per rep
Concentration 4 Nom (µg/L)	3.2	4 Reps and 5 organisms per rep
Concentration 5 Nom (µg/L)	1.8	4 Reps and 5 organisms per rep
Control	Solvent and dilution water	4 Reps and 5 organisms per rep
EC_{50} (µg/L)	24 hr 22.1 (20.1-24.3)* 48 hr 7.2 (5.8-8.9)	Method: Spearman-Karber

*Exceeds 2x the aqueous solubility of permethrin (5.5-6 ug/L)

Reliability points received for:
Documentation: Results not signed, dated (6), Chemical purity (5), Analytical method (4), Measured concentrations (3), Photoperiod (3), Hypothesis tests (8). -29

Acceptability: Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Dissolved oxygen (6), Photoperiod (2), Random design (2), Hypothesis tests (3). -36

.Toxicity Data Summary

Daphnia magna

Study: Bentley RE. 1975. Acute toxicity of FMC-33297 technical to water flea (*Daphnia magna*). EG&G, Bionomics: Wareham, MA. CDPR ID: study number 15076.

Relevance
Score: 100
Rating: R

Reliability
Score: 72.5
Rating: L

Reference	**Bentley 1975**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	US EPA 1975	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Less than 12 hr	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Immobility	
Control response 1	10%	
Temperature	21±1.0°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	7.1	
Hardness	35 mg/L $CaCO_3$	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Yes, after 48 hr	
Purity of test substance	95.7%	
Concentrations measured?	No	

Reference	**Bentley 1975**	***D. magna***
Parameter	**Value**	**Comment**
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	%NR, acetone	Solvent control performed
Concentration 1 Nom (µg/L)	0.140	3 Reps, 5/rep
Concentration 2 Nom (µg/L)	0.100	3 Reps, 5/rep
Concentration 3 Nom (µg/L)	0.075	3 Reps, 5/rep
Concentration 4 Nom (µg/L)	0.056	3 Reps, 5/rep
Concentration 5 Nom (µg/L)	0.042	3 Reps, 5/rep
Concentration 6 Nom (µg/L)	0.032	3 Reps, 5/rep
Control	Solvent and dilution water	3 Reps, 5/rep
LC50; (µg/L) (95% CI)	24 hr 0.258 (0.014-0.476) 48 hr 0.075 (0.054-0.103) 96 hr 0.039 (0.025-0.062)	Least squares regression

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -26

Acceptability: Measured concentrations within 20% of nominal (4), Carrier solvent (4), Feeding (3), Exposure type (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -29

Toxicity Data Summary

Daphnia magna

Study: Doma S, Evered P. 1977. PP557: Acute toxicity and reproduction studies on first instar and ephippia of *Daphnia magna*. ICI Plant Protection Division. CDPR ID: study number 15139.

Relevance
Score: 100
Rating: R

Reliability
Score: 70.5
Rating: L

Reference	**Doma & Evered 1977**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	First Instar	
Source of organisms	NR	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 hr	
Data for multiple times?	Yes	24 & 48 hr
Effect 1	Immobility	
Control response 1	0%	
Temperature	18±1°C	
Test type	Static	
Photoperiod/light intensity	30 watt, 3500 lux	
Dilution water	Reconstituted hard water	
pH	8.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>85% saturation	
Feeding	Not Fed	

Reference	**Doma & Evered 1977**	***D. magna***
Parameter	**Value**	**Comment**
Purity of test substance	98.7%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	1% acetone	
Concentrations Nom 1 (µg/L)	100	3 Reps and 10/rep
Concentrations Nom 2 (µg/L)	50	3 Reps and 10/rep
Concentrations Nom 3 (µg/L)	10	3 Reps and 10/rep
Concentrations Nom 4 (µg/L)	5	3 Reps and 10/rep
Concentrations Nom 5 (µg/L)	1	3 Reps and 10/rep
Concentrations Nom 6 (µg/L)	0.5	3 Reps and 10/rep
Concentrations Nom 7 (µg/L)	0.1	3 Reps and 10/rep
Concentrations Nom 8 (µg/L)	0.05	3 Reps and 10/rep
Concentrations Nom 9 (µg/L)	0.01	3 Reps and 10/rep
Control	Solvent and dilution water	3 Reps and 10/rep
LC50; (95% CI) (µg/L)	24 hr 2.06 (1.65-2.58) 48 hr 0.6 (0.53-0.67)	Logit transformation

Reliability points taken off for:
Documentation: Organism source (5), Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -29

Acceptability: Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), Hardness (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -30

Toxicity Data Summary

Daphnia magna (ephippia)

Study: Doma S, Evered P. 1977. PP557: Acute toxicity and reproduction studies on first instar and ephippia of *Daphnia magna*. ICI Plant Protection Division. CDPR ID: study number 15139.

Relevance	Reliability
Score: 77.5	Score: 61.5
Rating:L	Rating: L

Chemical Purity (15), Control response (7.5)

Note: This test studied "resting eggs" (ephippia) of *D. magna*. Two studies were performed: The first (Test A) exposed "conditioned" ephippia (dried out to push them out of dormancy). Test B exposed non-conditioned (dormant) ephippia. Exposure lasted 48 hours, conditioning 24 hours. These tests are best categorized as chronic, however, EC50's were reported rather than LOECs of NOECs.

Reference	**Doma & Evered 1977**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	Daphnia	
Species	magna	
Family in North America?	Yes	
Age/size at start of test/growth phase	2 month old ephippia	
Source of organisms	NR	
Have organisms been exposed to contaminants?	NR	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	7 days and 20 days	
Data for multiple times?	Yes	24 & 48 hr
Effect 1	Hatched	On 7th Day
Effect 2	Lived	On 7th Day
Effect 3	2nd generation hatched	Experiment lasted 20 days
Control response 1	NR	
Temperature	20°C	

Reference	**Doma & Evered 1977**	***D. magna***
Parameter	**Value**	**Comment**
Test type	Static	
Photoperiod/light intensity	12 hr, 30 watt, 1000 lux	
Dilution water	Reconstituted hard water	
pH	8.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>85% saturation	
Feeding	Not Fed	
Purity of test substance	25% emulsifiable concentrate	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	1% acetone	
Test A Concentrations Nom (µg/L)	100, 30, 10, 3, 1, 0.5, 0.1, 0.01, 0.001	3 Reps and ~100 organisms per rep
Test A Control	Diluent water	5 reps
Test A LC50; (µg/L)	0.034*	Logit transformation *95% CI cut off
Test B Concentrations Nom (µg/L)	100, 30, 10, 3, 1, 0.5, 0.1, 0.01, 0.001	3 Reps and 20 organisms per rep
Test B Control	Diluent water	5 reps
Test B LC50; (µg/L)	0.108 (0.035-0.339)	Logit transformation

Reliability points taken off for:
Documentation: Organism source (5), Chemical Grade (5), Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -34

Acceptability: Chemical Purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Prior contamination (4), Organisms randomized (1), Organism acclimation (1), Hardness (2), Alkalinity (2), Temperature not held to ± 1°C (3), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -43

Toxicity Data Summary

Daphnia magna

Study: Hamer MJ. 1990. Phase 3 summary of MRID 00042139. PP557: Acute toxicity of emulsifiable concentrate (JFU5054) to first instar *Daphnia magna.* Study performed by ICI Agrochemicals Jealott's Hill Research Station: Bracknell, Berkshire, UK. Report No: TMJ1504B. EPA MRID 42277004.

Relevance
Score: 85
Rating: L

Reliability
Score: 73.5
Rating: L

*Low chemical purity

	Hamer 1990	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Crustacea (Branchiopoda)	
Order	Diplostraca (Cladocera)	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 24 h old	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	Yes	
Effect 1	Immobility	
Control response 1	0%	
Temperature	18 ± 1°C	
Test type	Static	
Photoperiod/light intensity	16 L: 8 D	
Dilution water	Standard reconstituted hard water	
pH	8.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>95% saturation	

	Hamer 1990	***D. magna***
Parameter	**Value**	**Comment**
Feeding	NR	
Purity of test substance	NR	
Concentrations measured?	No	
Measured is what % of nominal?	n/a%	
Toxicity values calculated based on nominal or measured concentrations?	Nominal, but calculated based on % a.i.	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (μg/L)	20	3 tests, 3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	10	3 tests, 3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	5	3 tests, 3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	2.1	3 tests, 3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	0.5	3 tests, 3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	0.2	3 tests, 3 reps, 10/rep
Concentration 7 Nom/Meas (μg/L)	0.1	3 tests, 3 reps, 10/rep
Concentration 8 Nom/Meas (μg/L)	0.05	3 tests, 3 reps, 10/rep
Control	Dilution water	3 tests, 3 reps, 10/rep
EC_{50} (μg a.i./L)	24 h: 1.93 (1.76-2.12) 48 h: 1.31 (1.17-1.48)	Method: linear regression

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis tests (8). -21

Acceptability (Table 3.8): Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Conductivity (1), Random design (2), Hypothesis tests (3). -32

Toxicity Data Summary

Daphnia magna

Study: Kent SJ, Morris DS, Banner AJ & Johnson PA. 1995. Permethrin: Acute toxicity to *Daphnia magna* of a 25% formulation. Report number BL5382/B. Brixham Environmental Laboratory: Brixham, UK. CDPR ID: 139554.

Relevance
Score: 85
Rating: L

Reliability
Score: 87.5
Rating: R

Relevance Points taken off for: Chemical Purity (15)

Reference	**Kent et al. 1995**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1986	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Less than 24 hours	
Source of organisms	Continuous lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	48 hr	
Data for multiple times?	Yes	24, 48 hr
Effect 1	Immobility	
Control response 1	0%	
Temperature	20±1°C	
Test type	Static	
Photoperiod/light intensity	16L:8D	
Dilution water	Elendt's M4 Daphnia medium	
pH	7.99	
Hardness	247 mg/L as $CaCO_3$	
Alkalinity	43.6 mg/L as $CaCO_3$	

Reference	**Kent et al. 1995**	***D. magna***
Parameter	**Value**	**Comment**
Conductivity	656 µS/cm	
Dissolved Oxygen	>60% saturation	
Feeding	Not fed	
Purity of test substance	26.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	70-81%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	none	
Concentration 1 Nom a.i./Meas a.i. (µg/L)	4.7/3.7	4 Reps and 5 per
Concentration 2 Nom a.i./Meas a.i. (µg/L)	2.6/2.1	4 Reps and 5 per
Concentration 3 Nom a.i./Meas a.i. (µg/L)	1.5/1.1	4 Reps and 5 per
Concentration 4 Nom a.i./Meas a.i. (µg/L)	0.84/0.64	4 Reps and 5 per
Concentration 5 Nom a.i./Meas a.i. (µg/L)	0.47/0.33	4 Reps and 5 per
Concentration 6 Nom a.i./Meas a.i. (µg/L)	0.26/0.19	4 Reps and 5 per
Concentration 7 Nom a.i./Meas a.i. (µg/L)	0.15/0.11	4 Reps and 5 per
Control	Dilution water	4 Reps and 5 per
EC_{50} (µg a.i./L)	24 hr: >3.7 48 hr: 0.84 (0.68-1.0)	Moving average angle method

EC50 calculated with measured concentration of active ingrediant

Reliability points taken off for:
Documentation: Hypothesis tests (8).

Acceptability: Chemical purity (10), Measured concentrations within 20% of nominal (4), Hypothesis tests (3). -17

Toxicity Data Summary

Daphnia magna

Study: Kent SJ, Williams NJ, Gillings E, Morris DS. 1995. Permethrin: chronic toxicity to *Daphnia magna*. Zeneca Brixham Environmental Laboratory: Brixham, UK. Laboratory project ID BL5443/B. EPA MRID 43745701.

Endpoint: Mortality

Relevance	Reliability
Score: 85 (Toxicity values)	Score: 88.5
Rating: L	Rating: R

Chronic endpoints:

Relevance	Reliability
Score: 100	Score: 90
Rating: R	Rating: R

Reference	**Kent et al. 1995**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	ASTM, Draft No. 6	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	<24 hours old	
Source of organisms	Continuous in lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	21 days	
Data for multiple times?	No	
Effect 1	Immobility	
Control response 1	0%	
Effect 2	Reproduction	
Control response 2	Mean: 68 $\pm$ 3.8 offspring/parent	Pooled control response
Effect 3	Length	
Control Response 3	3.92 mm	Pooled control response

Reference	**Kent et al. 1995**	***D. magna***
Parameter	**Value**	**Comment**
Effect 4	Dry weight	
Control Response 4	707 $\pm$ 125.2 µg	Pooled control response
Temperature	20±1°C	
Test type	Flow-through	
Photoperiod/light intensity	16:8 hour light:dark	
Dilution water	DI water with salts added	
pH	8.4-8.5	
Hardness	189 $CaCO_3$ mg/L	
Alkalinity	127 $CaCO_3$ mg/L	
Conductivity	679 µS/cm	
Dissolved Oxygen	8.4 - 9.4 mg/L	≥100% saturation
Feeding	Fed a cultured algae, 2x/day	
Purity of test substance	98.6%	^{14}C permethrin
Concentrations measured?	Yes	
Measured is what % of nominal?	48-59%	
Chemical method documented?	Yes	TLC
Concentration of carrier (if any) in test solutions	100 µL/L triethylene glycol in exposure conc and solvent control	
Concentration 1 Nom/Meas (ng/L)	640/340	4 Reps and 10/rep
Concentration 2 Nom/Meas (ng/L)	320/190	4 Reps and 10/rep
Concentration 3 Nom/Meas (ng/L)	160/84	4 Reps and 10/rep
Concentration 4 Nom/Meas (ng/L)	80/39	4 Reps and 10/rep
Concentration 5 Nom/Meas (ng/L)	40/19	4 Reps and 10/rep
Control	Dilution water and solvent	4 Reps and 10/rep
LC_{50}	>340 ng/L	
NOEC (ng/L)	Reproduction: 39 Length: 39 Weight: ≥ 340	Method: ANOVA
LOEC (ng/L)	Reproduction: 84 Length: 84 Weight: >340	Same as above
MATC (ng/L)	Reproduction: 57 Length: 57 Weight: >340	
% of control at NOEC	Repro: 71/68=104% Length: 3.92/3.92=100%	
% of control at LOEC	Repro: 60/68=88% Length: 3.84/3.92=98%	

Reliability points taken off for:
Documentation: Minimum significant difference (2), Point estimates (8). -10

Acceptability: Measured concentrations within 20% of nominal (4), Statistical method (2), Minimum significant difference (1), Point estimates (3). -10

Toxicity Data Summary

Daphnia magna

Study: LeBlanc GA. 1976. Acute toxicity of FMC-33297 technical to *Daphnia magna*. EG&G, Bionomics: Wareham, MA. CDPR ID: study number 15100.

Relevance
Score: 100
Rating: R

Reliability
Score: 80
Rating: R

Reference	**LeBlanc 1976**	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	<24 hrs	
Source of organisms	Lab stocks	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	48 hr	
Data for multiple times?	Yes	24, 48 hr
Effect 1	Immobility	
Control response 1	0%	
Temperature	22 ± 1.0°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	7.3-7.6	
Hardness	35 mg/L $CaCO_3$	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	85-94% saturation	
Feeding	Not Fed	
Purity of test substance	Technical	

Reference	**LeBlanc 1976**	***D. magna***
Parameter	**Value**	**Comment**
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	%NR, acetone	Solvent control performed
Concentration 1 Nom (μg/L)	1.0	3 Reps, 5/rep
Concentration 2 Nom (μg/L)	0.75	3 Reps, 5/rep
Concentration 3 Nom (μg/L)	0.56	3 Reps, 5/rep
Concentration 4 Nom (μg/L)	0.42	3 Reps, 5/rep
Concentration 5 Nom (μg/L)	0.32	3 Reps, 5/rep
Concentration 6 Nom (μg/L)	0.24	3 Reps, 5/rep
Concentration 7 Nom (μg/L)	0.16	3 Reps, 5/rep
Concentration 8 Nom (μg/L)	0.10	3 Reps, 5/rep
Control	Solvent and dilution water	3 Reps, 5/rep
EC_{50} (μg/L) (95% CI)	24 hr 0.93 (0.44-2.0) 48 hr 0.32 (0.24-0.44)	Method: probit

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -22

Acceptability: Measured concentrations within 20% of nominal (4), Carrier solvent (4), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -18

Toxicity Data Summary

Daphnia magna

Study: McWilliam RA, Baird DJ. 2002. Postexposure feeding depression: A new toxicity endpoint for use in laboratory studies with *Daphnia magna*. Environ Toxicol Chem 21:1198-1205.

Relevance
Score: Acute: 82.5, Chronic: 75
Rating: L

Reliability
Score: Acute: 70, Chronic: 71
Rating: L

*Acute: No standard method, Control response not reported
Chronic: No standard method, Endpoint not related to survival/growth/reproduction

	McWilliam & Baird 2002	***D. magna***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Crustacea (Branchiopoda)	
Order	Diplostraca (Cladocera)	
Family	Daphniidae	
Genus	*Daphnia*	
Species	*magna*	
Family in North America?	Yes	
Age/size at start of test/growth phase	4-5 d old 4th instar larvae	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	Feed rate: 24 h Mortality: 48 h	
Data for multiple times?	No	
Effect 1	Feeding rate a) During 24 h exposure b) During 4h postexposure	
Control response 1	4-6 x 10^5 cells/individual/h	
Effect 2	Mortality with feeding	
Control response 2	NR	
Effect 3	Mortality without feeding	
Control response 3	NR	
Temperature	20 ± 1°C	
Test type	Static	
Photoperiod/light intensity	14 L:10 D	

	McWilliam & Baird 2002	***D. magna***
Parameter	**Value**	**Comment**
	Feeding experiments in dark	
Dilution water	ASTM hard water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Feed rate: yes (5×10^5 cells/mL *Chlorella vulgaris*) Mortality w/ food: yes (same) Morality w/o food: no	
Purity of test substance	98%	
Concentrations measured?	Yes	
Measured is what % of nominal?	53 $\pm$ 2.0%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, HPLC	
Concentration of carrier (if any) in test solutions	No solvent used	
Concentration 1 Nom (µg/L)	Mortality w/food: 5 Mortality w/o food: 0.1 Feed rate: 0.5	5 reps, 5/rep
Concentration 2 Nom (µg/L)	Mortality w/food: 6.7 Mortality w/o food: 0.2 Feed rate: 0.9	5 reps, 5/rep
Concentration 3 Nom (µg/L)	Mortality w/food: 9 Mortality w/o food: 0.3 Feed rate: 1.6	5 reps, 5/rep
Concentration 4 Nom (µg/L)	Mortality w/food: 12 Mortality w/o food: 0.4 Feed rate: 2.8	5 reps, 5/rep
Concentration 5 Nom (µg/L)	Mortality w/food: 16 Mortality w/o food: 0.6 Feed rate: 5.0	5 reps, 5/rep
Concentration 6 Nom (µg/L)	Mortality w/food: 22 Mortality w/o food: 0.9	5 reps, 5/rep
Concentration 7 Nom (µg/L)	Mortality w/food: 29 Mortality w/o food: 1.4	5 reps, 5/rep
Concentration 8 Nom (µg/L)	Mortality w/food: 39 Mortality w/o food: 2.1	5 reps, 5/rep
Concentration 9 Nom (µg/L)	Mortality w/food: 52 Mortality w/o food: 3.2	5 reps, 5/rep
Concentration 10 Nom (µg/L)	Mortality w/food: 70	5 reps, 5/rep

	McWilliam & Baird 2002	***D. magna***
Parameter	**Value**	**Comment**
	Mortality w/o food: 5.0	
Control	Dilution water (w/ or w/o food)	5 reps, 5/rep
LC_{50} (95% confidence interval) (μg/L)	Feeding: 5.36 (2.5-10.6) No feeding: 0.54 (0.03-19.3)	Method: probit
EC_{50} (95% confidence interval) (μg/L)	Feeding rate during exposure: 1.09 (0.1-1.2)	Method: allosteric regression by least-squares method
NOEC	Feeding rate during exposure: 0.48 Feeding rate postexposure: 0.48	Method: Williams test $P < 0.05$ MSD: NR
LOEC	Feeding rate during exposure: 0.85 Feeding rate postexposure: 0.85	Same as above
MATC (GeoMean NOEC,LOEC)	Feeding rate during exposure: 0.64 Feeding rate postexposure: 0.64	
% of control at NOEC	Feeding rate during exposure: 90% Feeding rate postexposure: 99%	
% of control at LOEC	Feeding rate during exposure: 65% Feeding rate postexposure: 82%	

Notes:

Reliability points taken off for:
Documentation (Table 3.7):
Acute: Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -24

Chronic: Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Minimum significant difference (2), Point estimates (8). -26

Acceptability (Table 3.8):
Acute: No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Random design (2), Hypothesis tests (3). -36

Chronic: No standard method (5), Appropriate duration (2), Measured concentrations within 20% of nominal (4), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Minimum significant difference (1), Point estimates (3). -32

Toxicity Data Summary

Danio rerio

Study: Zhang X-Y, Yu X-Y, Wang D-L, Yan H-J, Liu X-J. 2010. Acute toxicity to zebrafish of two organophosphates and four pyrethroids and their binary mixtures. Pest Manag Sci 66:84-89.

Relevance
Score: 90
Rating: R

Reliability
Score: 75
Rating: R

*Unacceptable standard method (China EPA)

	Zhang et al. 2010	***D. rerio***
Parameter	**Value**	**Comment**
Test method cited	Chinese EPA method	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Danio*	
Species	*rerio*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Length: 3.0 ± 0.5 cm, Weight: 0.3 ± 0.1 g	
Source of organisms	Local pet store in China	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	< 5%	
Temperature	23 ± 1°C	
Test type	Static renewal – 24 h renewal	
Photoperiod/light intensity	14 L: 10 D	
Dilution water	Dechlorinated tapwater	
pH	6.9-7.5	
Hardness	140-165 mg/L as CaCO3	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	6.8-7.6 mg/L	

	Zhang et al. 2010	***D. rerio***
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	90%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	% NR, acetone	
Concentration 1 Nom/Meas (μg/L)	5 concentrations	3 reps, 20/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 20/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 20/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 20/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 20/rep
Control	Solvent	3 reps, 20/rep
LC_{50} (95% confidence interval) (μg/L)	24 h: 5.2 (4.1-6.6) 48 h: 3.0 (1.9-3.8) 72 h: 2.6 (1.8-3.3) 96 h: 2.5 (1.7-3.2)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Hypothesis tests (8). -22

Acceptability (Table 3.8): Unacceptable standard method (5), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Random design (2), Dilution factor (2), Hypothesis tests (3). -28

Toxicity Data Summary

Diaptomus sp.

Study: Naqvi SM, Hawkins RH. 1989. Responses and LC50 values for selected microcrustaceans exposed to Spartan®, Malathion, Sonar®, Weedtrine-D®, and Oust® pesticides. Bull Environ Contam Toxicol 43:386-393.

Relevance	Reliability
Score: 75	Score: 65
Rating: L	Rating: L

*No standard method, Low chemical purity

	Naqvi & Hawkins 1989	***Diaptomus* sp.**
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum		
Class		
Order		
Family		
Genus	*Diaptomus*	
Species	NR	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Collected from Lake Kernan near Baton Rouge, LA	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0.3%	
Temperature	21 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Aged tapwater	
pH	8.0-8.5	
Hardness	26-28 mg/L, 4 mg/kg as CaCO3	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	6.6-7.5 mg/kg	

	Naqvi & Hawkins 1989	***Diaptomus* sp.**
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	42% (50.7% xylene)	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom (µg/L)	1.0	3 reps, 100-150/rep
Concentration 2 Nom (µg/L)	2.0	3 reps, 100-150/rep
Concentration 3 Nom (µg/L)	4.0	3 reps, 100-150/rep
Concentration 4 Nom (µg/L)	6.0	3 reps, 100-150/rep
Concentration 5 Nom (µg/L)	8.0	3 reps, 100-150/rep
Concentration 6 Nom (µg/L)	10.0	Reps and # per
Concentration 7 Nom (µg/L)	12.0	
Control	Dilution water	3 reps, 100-150/rep
LC_{50} (95% fiducial limits) (µg/L)	7.0 (6.2-7.3)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -27

Acceptability (Table 3.8): No standard method (5), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Dilution water (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -43

Toxicity Data Summary

Etheostoma fonticola (reported as *E. rubrum*)

Study: Dwyer FJ, Hardesty DK, Henke CE, Ingersoll CG, Whites DW, Mount DR, Bridges CM. 1999. Assessing contaminant sensitivity of endangered and threatened species: toxicant classes. EPA/600/R-99/098.

Relevance	Reliability
Score: 100	Score: 77.5
Rating: R	Rating: R

*In this publication, the fish is referred to as *E. rubrum*, not *E. fonticola*, but the common name given is Fountain Darter, which is associated with *E. fonticola*. Another publication by these authors (Dwyer et al. 2005) also reports data for the Fountain Darter (*E. fonticola*) and says a more detailed account of the tests can be found in this publication, so it has been assumed that the data in the two publications are identical and that the species name was incorrectly reported in the earlier publication.

	Dwyer et al. 1999	***E. fonticola***
Parameter	**Value**	**Comment**
Test method cited	EPA 1975, ASTM 1998	
Phylum	Chordata	
Class	Osteichthyes	
Order	Perciformes	
Family	Percidae	
Genus	*Etheostoma*	
Species	*fonticola*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Weight: 62 $\pm$ 19 mg, Length: 20.2 $\pm$ 2.0 mm	
Source of organisms	National or state fish hatcheries	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes, 96 h acclimation	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	<10%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR – “ambient lighting”	
Dilution water	Reconstituted hard water	

	Dwyer et al. 1999	***E. fonticola***
Parameter	**Value**	**Comment**
pH	Mean: 8.4 ± 0.1	
Hardness	167 ± 5 mg/L as CaCO3	
Alkalinity	115 ± 1 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	>40% saturation at 96 h, >60% saturation at 48 h	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Only the stock solutions	
Measured is what % of nominal?	Stock: 160%	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC (for stocks)	
Concentration of carrier (if any) in test solutions	0.005% acetone	
Concentration 1 Nom (µg/L)	6 concentrations	2 reps, 10/rep
Concentration 2 Nom (µg/L)	NR	2 reps, 10/rep
Concentration 3 Nom (µg/L)	NR	2 reps, 10/rep
Concentration 4 Nom (µg/L)	NR	2 reps, 10/rep
Concentration 5 Nom (µg/L)	NR	2 reps, 10/rep
Concentration 6 Nom (µg/L)	NR	2 reps, 10/rep
Control	Solvent and dilution water	2 reps, 10/rep
LC_{50} (95% confidence interval) (µg/L)	6 h: >10 12 h: 5.60 (4.76-6.67) 24 h: 4.26 (3.58-5.19) 48 h: 3.34 (2.75-4.16) 72 h: 3.34 (2.75-4.16) 96 h: 3.34 (2.75-4.16)	Method: 12 & 24 h: probit. 48-96 h: moving average

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Hypothesis tests (8). -20

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Dissolved oxygen (6), Temperature (3), Conductivity (1), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -25

Toxicity Data Summary

Etheostoma fonticola

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 100
Rating: R

Reliability
Score: 75
Rating: R

	Dwyer et al. 2005	***E. fonticola***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee n Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Perciformes	
Family	Percidae	
Genus	*Etheostoma*	
Species	*fonticola*	Fountain darter
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Commercial fishery	San Marcos NFH and Tech. Ctr. San Marcos, TX
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	Slightly above 8.0	

	Dwyer et al. 2005	***E. fonticola***
Parameter	**Value**	**Comment**
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	119% for stock solution, except one individual stock that was 320% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	2 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Control	Solvent and dilution water	2 reps, 10/rep
LC_{50} (µg/L)	3.34	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -35

Acceptability (Table 3.8): Organism size (3), Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Adequate replicates (2), Hypothesis tests (3). -15

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Etheostoma lepidum

Study: Dwyer FJ, Hardesty DK, Henke CE, Ingersoll CG, Whites DW, Mount DR, Bridges CM. 1999. Assessing contaminant sensitivity of endangered and threatened species: toxicant classes. EPA/600/R-99/098.

Relevance
Score: 100
Rating: R

Reliability
Score: 77.5
Rating: R

	Dwyer et al. 1999	***E. lepidum***
Parameter	**Value**	**Comment**
Test method cited	EPA 1975, ASTM 1998	
Phylum	Chordata	
Class	Osteichthyes	
Order	Perciformes	
Family	Percidae	
Genus	*Etheostoma*	
Species	*lepidum*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Weight: 133 ± 19 mg, Length: 22.6 ± 0.4 mm	
Source of organisms	National or state fish hatcheries	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes, 96 h acclimation	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	<10%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR – “ambient lighting”	
Dilution water	Reconstituted hard water	
pH	Mean: 8.4 ± 0.1	
Hardness	167 ± 5 mg/L as CaCO3	
Alkalinity	115 ± 1 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	>40% saturation at 96 h, >60% saturation at 48 h	
Feeding	None during test	

	Dwyer et al. 1999	***E. lepidum***
Parameter	**Value**	**Comment**
Purity of test substance	95.2%	
Concentrations measured?	Only the stock solutions	
Measured is what % of nominal?	Stock: 160%	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC (for stocks)	
Concentration of carrier (if any) in test solutions	0.005% acetone	
Concentration 1 Nom (μg/L)	6 concentrations	2 reps, 7/rep
Concentration 2 Nom (μg/L)	NR	2 reps, 7/rep
Concentration 3 Nom (μg/L)	NR	2 reps, 7/rep
Concentration 4 Nom (μg/L)	NR	2 reps, 7/rep
Concentration 5 Nom (μg/L)	NR	2 reps, 7/rep
Concentration 6 Nom (μg/L)	NR	2 reps, 7/rep
Control	Solvent and dilution water	2 reps, 7/rep
LC_{50} (95% confidence interval) (μg/L)	6 h: 4.31 (3.71-5.04) 12 h: 3.10 (2.20-3.60) 24 h: 2.71 (2.36-3.13) 48 h: 2.71 (2.36-3.13) 72 h: 2.71 (2.36-3.13) 96 h: 2.71 (2.36-3.13)	Method: probit except 12 h: linear interpolation

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Hypothesis tests (8). -20

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Dissolved oxygen (6), Temperature (3), Conductivity (1), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -25

Toxicity Data Summary

Etheostoma lepidum

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 100
Rating: R

Reliability
Score: 75
Rating: R

	Dwyer et al. 2005	***E. lepidum***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee on Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Perciformes	
Family	Percidae	
Genus	*Etheostoma*	
Species	*lepidum*	Greenthroat darter
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Commercial fishery	San Marcos NFH and Tech. Ctr. San Marcos, TX
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	Slightly above 8.0	

	Dwyer et al. 2005	***E. lepidum***
Parameter	**Value**	**Comment**
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	119% for stock solution, except one individual stock that was 320% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution series	2 reps, 7/rep
Concentration 2 Nom/Meas (μg/L)	NR	2 reps, 7/rep
Concentration 3 Nom/Meas (μg/L)	NR	2 reps, 7/rep
Concentration 4 Nom/Meas (μg/L)	NR	2 reps, 7/rep
Concentration 5 Nom/Meas (μg/L)	NR	2 reps, 7/rep
Concentration 6 Nom/Meas (μg/L)	NR	2 reps, 7/rep
Control	Solvent and dilution water	2 reps, 7/rep
LC_{50} (μg/L)	2.71	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -35

Acceptability (Table 3.8): Organism size (3), Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Adequate replicates (2), Hypothesis tests (3). -15

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Eucyclops sp.

Study: Naqvi SM, Hawkins RH. 1989. Responses and LC50 values for selected microcrustaceans exposed to Spartan®, Malathion, Sonar®, Weedtrine-D®, and Oust® pesticides. Bull Environ Contam Toxicol 43:386-393.

Relevance
Score: 75
Rating: L

Reliability
Score: 65
Rating: L

*No standard method, Low chemical purity

	Naqvi & Hawkins 1989	***Eucyclops* sp.**
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Maxillopoda	
Order	Cyclopoida	
Family	Cyclopidae	
Genus	*Eucyclops*	
Species	NR	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Collected from Lake Kernan near Baton Rouge, LA	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0.3%	
Temperature	21 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Aged tapwater	
pH	8.0-8.5	
Hardness	26-28 mg/L, 4 mg/kg as CaCO3	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	6.6-7.5 mg/kg	

	Naqvi & Hawkins 1989	***Eucyclops* sp.**
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	42% (50.7% xylene)	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom (µg/L)	1.0	3 reps, 100-150/rep
Concentration 2 Nom (µg/L)	2.0	3 reps, 100-150/rep
Concentration 3 Nom (µg/L)	4.0	3 reps, 100-150/rep
Concentration 4 Nom (µg/L)	6.0	3 reps, 100-150/rep
Concentration 5 Nom (µg/L)	8.0	3 reps, 100-150/rep
Concentration 6 Nom (µg/L)	10.0	3 reps, 100-150/rep
Concentration 7 Nom (µg/L)	12.0	3 reps, 100-150/rep
Control	Dilution water	3 reps, 100-150/rep
LC_{50} (95% fiducial limits) (µg/L)	5.0 (4.3-5.5)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -27

Acceptability (Table 3.8): No standard method (5), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organism size (3), Prior contamination (4), Organisms randomized (1), Dilution water (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -43

Toxicity Data Summary

Gambusia affinis

Study: Naqvi SM, Hawkins R. 1988. Toxicity of selected insecticides (Thiodan ®, Security®, Spartan®, and Sevin®) to mosquitofish, *Gambusia affinis.* Bull Environ Contam Toxicol 40:779-784.

Relevance
Score: 75
Rating: L

Reliability
Score: 63.5
Rating: L

*No standard method, low chemical purity

	Naqvi & Hawkins 1988	***G. affinis***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cyprinodontiformes	
Family	Poeciliidae	
Genus	*Gambusia*	
Species	*affinis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	2.76 ± 0.09 cm length, 0.289 ± 0.031 g wt	
Source of organisms	Collected from a ditch near Southern University campus	Baton Rouge, Louisiana
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	96 h acclimation, but many fish had nematode parasites	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	1.7%	
Temperature	20 ± 3°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Aged tapwater (not dechlorinated)	
pH	7.8	
Hardness	12 mg/L CaCO3/100mL sample	

	Naqvi & Hawkins 1988	***G. affinis***
Parameter	**Value**	**Comment**
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	6.5-7.0 mg/L	
Feeding	None during tests	
Purity of test substance	47% (53% xylene)	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom (µg/L)	5.0	6 reps, 10/rep
Concentration 2 Nom (µg/L)	10.0	6 reps, 10/rep
Concentration 3 Nom (µg/L)	15.0	6 reps, 10/rep
Concentration 4 Nom (µg/L)	20.0	6 reps, 10/rep
Concentration 5 Nom (µg/L)	25.0	6 reps, 10/rep
Control	Dilution water	6 reps, 10/rep
LC_{50} (95% fiducial limits) (µg/L)	12.0 (10.52-13.34)	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -25

Acceptability (Table 3.8): No standard method (5), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Prior contamination (4), Organisms randomized (1), Organism acclimation/health (1), Exposure type (2), Dilution water (2), Alkalinity (2), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Random design (2), Hypothesis tests (3). -48

Toxicity Data Summary

Gambusia affinis

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 65
Rating: L

*No standard method, control description

	Thurston et al. 1985	***G. affinis***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cyprinodontiformes	
Family	Poeciliidae	
Genus	*Gambusia*	
Species	*affinis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Test 1: Mean wt. 0.13 g Test 2: Mean wt. 0.12 g	
Source of organisms	Stock cultures or fish hatchery	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	Test 1: 5% Test 2: 0%	
Temperature	Test 1: 19.1 ± 1°C Test 2: 17.9 ± 1°C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Ground water spring	
pH	8.00-8.02	
Hardness	NR	
Alkalinity	NR	

	Thurston et al. 1985	***G. affinis***
Parameter	**Value**	**Comment**
Conductivity	340 siemens	
Dissolved Oxygen	Test 1: 7.88 mg/L Test 2: 8.28 mg/L	
Feeding	None during tests	
Purity of test substance	93%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Not clear, probably measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	%NR, dimethylformamide	
Concentration 1 Nom/Meas (μg/L)	5 concentrations	2 reps, #/rep NR
Concentration 2 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 3 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 4 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 5 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Control	Not clear	2 reps, #/rep NR
LC_{50} (95% confidence interval) (μg/L)	Test 1: 8.02 (6.09-10.6) Test 2: 4.62 (3.45-6.19)	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Control type (8), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Hypothesis tests (8). -29

Acceptability (Table 3.8): No standard method (5), Control description (6), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Hardness (2), Alkalinity (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -41

Toxicity Data Summary

Gila elegans

Study: Dwyer FJ, Sappington LC, Buckler DR, Jones SB. 1995. Use of a surrogate species in assessing contaminant risk to endangered and threatened fishes. Final report – September, 1995. EPA/600/R-96/029.

Relevance
Score: 85
Rating: L

Reliability
Score: 70
Rating: L

*No toxicity values

	Dwyer et al. 1995	***G. elegans***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975, ASTM 1988	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Gila*	
Species	*elegans*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Run 1) 0.29 ± 0.08 g Run 2) 0.52 ± 0.09 g	
Source of organisms	Fish hatchery	Dexter NFH, Dexter, NM
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Acclimated for 96 h	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes, 12 h, 24 h	
Effect 1	Mortality	
Control response 1	0%	
Effect 2	Muscarinic cholinergic receptor binding	
Control response 2	NR	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	“ambient lighting”	
Dilution water	Reconstituted hard water	
pH	8.35 ± 0.29	
Hardness	173 ± 9 mg/L as CaCO3	

	Dwyer et al. 1995	***G. elegans***
Parameter	**Value**	**Comment**
Alkalinity	117 ± 4 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Generally ≥ 60% saturation, but several instances of <60% saturation	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Stocks only	
Measured is what % of nominal?	Tests in 1992: 93% (stocks) Tests in 1993: 128% (stocks)	One sample had recovery of 308% and was not included in average b/c value is thought to be incorrect b/c it did not show differing biological results
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (µg/L)	12 h: >25 24 h: >25 96 h: >25	Method: n/a

Notes: LC50s are geometric means of the LC50s calculated for each run (n=2).

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Photoperiod (3), Hypothesis tests (8), Point estimates (8). -27

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized

(1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3), Point estimates (3). -33

Toxicity Data Summary

Gila elegans

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance
Score: 85
Rating: L

Reliability
Score: 65.5
Rating: L

*Toxicity value not calculable.

	Sappington et al. 2001	***G. elegans***
Parameter	**Value**	**Comment**
Test method cited	USEPA, ASTM	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Gila*	
Species	*elegans*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean wt 0.41 ± 0.09 g	
Source of organisms	Fish hatchery or commercial source	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	4 d acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	12 h, 24 h	
Effect 1	Mortality	
Control response 1	96.7%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	> 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	

	Sappington et al. 2001	***G. elegans***
Parameter	**Value**	**Comment**
Purity of test substance	95.2%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.05% acetone or triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (95% confidence interval) (μg/L)	12 h: >25.0 24 h: >25 96 h: >25	Method: probit, moving average, untrimmed Spearman-Karber, or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8) Point estimates (8). -38

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Hypothesis tests (3), Point estimates (3). -31

Toxicity Data Summary

Gammarus pulex

Study: McLoughlin N, Yin D, Maltby L, Wood RM, Yu H. 2000. Evaluation of sensitivity and specificity of two crustacean biochemical biomarkers. Environ Toxicol Chem 19:2085-2092.

Relevance
Score: Acute: 82.5, Chronic: 75
Rating: L

Reliability
Score: Acute: 75.5, Chronic: 74
Rating: R

*No standard method, endpoint not related to survival/growth/reproduction (chronic only), control response not reported (acute only)

	McLoughlin et al. 2000	***G. pulex***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Amphipoda	
Family	Apoidea	
Genus	*Gammarus*	
Species	*pulex*	
Family in North America?	Yes	
Age/size at start of test/growth phase	> 5 mm	
Source of organisms	Collected in a stream	Crags Stream, Derbyshire, UK
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Acclimated 1 week	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	144 h	
Data for multiple times?	Yes, 24, 48, 72, 96, 120	
Effect 1	Mortality	
Control response 1	NR	
Effect 2	Feeding rate	Not related to survival/growth/ reproduction
Control response 2	~0.26 mg/mg/d (Fig 3)	
Effect 3	Glutathione-S-transferase (GST) activity	Not related to survival/growth/ reproduction
Control response 3	0.20 nmol/min/ug protein (?)	
Temperature	15 ± 1°C	

	McLoughlin et al. 2000	***G. pulex***
Parameter	**Value**	**Comment**
Test type	Static renewal (24 h)	
Photoperiod/light intensity	12:12	
Dilution water	Artificial pond water	
pH	7.3 $\pm$ 0.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	577 $\pm$ 11 uS/cm	
Dissolved Oxygen	7.75 $\pm$ 0.4 mg/L	
Feeding	None during test	
Purity of test substance	$\geq$ 99%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC/MS	
Concentration of carrier (if any) in test solutions	None used	
Concentration 1 Nom/Meas (µg/L)	0.04	30 reps, 1/rep
Concentration 2 Nom/Meas (µg/L)	0.08	30 reps, 1/rep
Concentration 3 Nom/Meas (µg/L)	0.16/0.12	30 reps, 1/rep
Concentration 4 Nom/Meas (µg/L)	0.3	30 reps, 1/rep
Concentration 5 Nom/Meas (µg/L)	0.6/0.45	30 reps, 1/rep
Control	Dilution water	30 reps, 1/rep
LC_{50} (95% Cl) (µg/L)	24 h: >0.45 48 h: >0.45 72 h: >0.45 96 h: 0.44 (0.03) 120 h: 0.26 (0.03) 144 h: 0.17 (0.03)	Method: probit
NOEC	48 h GST: 0.06 (estimated from Fig 2) Feeding rate: 0.03	Method: 1way ANOVA, Tukey test p: 0.05 MSD:
LOEC	48 GST: 0.12 Feeding rate: 0.06	Same as above
MATC (GeoMean NOEC,LOEC)	48 h GST: 0.085 (estimated) Feeding rate: 0.04	
% of control at NOEC	48 GST: 0.17/0.20 (?) Feeding rate: 0.21/0.26	
% of control at LOEC	48 GST: 0.19/0.20 (?) Feeding rate: 0.17/0.26	

Notes:

Reliability points taken off for:
Documentation (Table 3.7):
Acute: Measured concentrations (3), Hardness (2), Alkalinity (2), Hypothesis tests (8). -15

Chronic: Measured concentrations (3), Hardness (2), Alkalinity (2), Minimum significant difference (2), % control of NOEC/LOEC (2), Point estimates (8). -19

Acceptability (Table 3.8):
Acute: No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Prior contamination (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Random design (2), Hypothesis tests (3). -34

Chronic: No standard method (5), Measured concentrations within 20% of nominal (4), Prior contamination (4), Organisms randomized (1), Dilution water (2), Hardness (2), Alkalinity (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Minimum significant difference (1), Point estimates (3). -33

Toxicity Data Summary

Hyalella azteca

Study: Anderson BS, Phillips BM, Hunt JW, Connor V, Richard N, Tjeerdema RS. 2006. Identifying primary stressors impacting macroinvertebrates in the Salinas River (CA, USA): Relative effects of pesticides and suspended particles. Environmental Pollution 141:402-408.

Relevance
Score: 90 (No standard method)
Rating: R

Reliability
Score: 78
Rating: R

	Anderson et al. 2006	***H. azteca***
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Amphipoda	
Family	Hyalellidae	
Genus	*Hyalella*	
Species	*azteca*	
Family in North America?	Yes	
Age/size at start of test/growth phase	3rd instar	
Source of organisms	Aquatic Biosystems, Fort Collins, CO	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	No	
Test duration	96 hours	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	90% survival*	
Temperature	23°C ± 1*	
Test type	Static	
Photoperiod/light intensity	16 light: 8 dark*	
Dilution water	Well Water	
pH	NR	
Hardness	91.6 mg/L*	
Alkalinity	122.4 mg/L CaCO3*	
Conductivity	NR	

	Anderson et al. 2006	***H. azteca***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	Not fed	
Purity of test substance	100%	
Concentrations measured?	yes	
Measured is what % of nominal?	0-61%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	Used 100mg/L methanol stock	
Concentration 1 Nom/Meas (ng/L)	5.6/ NR 3 reps/5per	
Concentration 2 Nom/Meas (ng/L)	10/ NR 3 reps/5per	Meas. 2 reps of only some conc's
Concentration 3 Nom/Meas (ng/L)	18/ND, 11 3 reps/5per	
Concentration 4 Nom/Meas (ng/L)	32/ 16 3 reps/5per	
Concentration 5 Nom/Meas (ng/L)	56/ 29 3 reps/5per	
Control	0/ NR 3 reps/5per	
LC_{50}	21.1 ng/L	Spearman-Karber

Other notes: *Control survival, temp. variation and water chemistry obtained by personal communication with the testing laboratory.

Reliability points taken off for:
Documentation: Dissolved Oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8)
Acceptability: Standard method (5), Meas. Concentrations 20% Nom (4), Organisms randomly assigned to containers (1), Organisms properly acclimated (1), Dissolved oxygen (6), Conductivity (1), pH (2), Random / block design (2), Dilution factor (2), Hypothesis tests (3)

Toxicity Data Summary

Hyalella azteca

Study: Brander SM. Werner I, White JW, Deanovic LA. 2009. Toxicity of a dissolved pyrethroid mixture to *Hyalella azteca* at environmentally relevant concentrations. Environmental Toxicology and Chemistry, 28:1493-1499.

Relevance - Mortality
Score: 92.5 (control response not reported)
Rating: R

Reliability
Score: 64.2
Rating: L

Relevance – Protein content
Score: 70 (toxicity values not calculable, endpoint)
Rating: L

Reliability
Score: 70
Rating: L

Reference	**Brander *et al.* 2009**	***H. azteca***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1994	WET test method
Phylum	Arthropoda	
Class	Malacostraca	
Order	Amphipoda	
Family	Dogielinotidae	
Genus	*Hyalella*	
Species	*azteca*	
Family in North America?	yes	
Age/size at start of test/growth phase	7-14 d old	
Source of organisms	Commercial supplier	Aquatic Research Organisms
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	NR	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	10 d	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Effect 2	Protein content of organism	Not clearly linked to survival, growth, or repro. for adult organisms
Control response 2	Fig. 6 (~8.2 mg/mL protein)	
Temperature	23 ± 2°C	
Test type	Static renewal, renewed	

Reference	**Brander *et al.* 2009**	***H. azteca***
Parameter	**Value**	**Comment**
	every 5 d	
Photoperiod/light intensity	16 h L:8 h D	
Dilution water	USEPA moderately hard water	Made from deionized water
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Yes, every 2 d, and after water renewal	
Purity of test substance	99.2%	
Concentrations measured?	Yes, but some estimated values were used to calculate toxicity values in 2008 tests	
Measured is what % of nominal?	67-105%	
Chemical method documented?	Not reported, samples sent to lab for analysis	California Dept. of Fish and Game, Fish and Wildlife Water Pollution Control Lab.
Concentration of carrier (if any) in test solutions	0.025% methanol	
Concentration 1 Nom/Meas 2007/Est 2008 (µg/L)	0.0120/0.0119/0.004	6 reps, 10/rep
Concentration 2 Nom/Meas 2007/Est 2008 (µg/L)	0.0240/0.0254/0.008	6 reps, 10/rep
Concentration 3 Nom/Meas 2007/Est 2008 (µg/L)	0.0480/0.0573/0.016	6 reps, 10/rep
Control	Solvent and dilution water	6 reps, 10/rep
LC_{50} (95% confidence interval) (µg/L)	10 d: 0.0489	Method: regression analysis
NOEC (µg/L)	Protein content: Not calculable	Method: NR p: 0.05 MSD: NR
LOEC (µg/L)	Protein content: Not calculable	Same as above
MATC (GeoMean NOEC,LOEC)	Protein content: Not calculable	
% control at NOEC	NR	
% of control LOEC	NR	

Notes:
The toxicity values of the protein content analysis could not be calculated because all of the surviving organisms from all concentrations tested were pooled together in a single group for analysis, thus, a dose-response relationship cannot be established for this endpoint. Although, there was a significant difference ($p<0.05$) in protein content between exposed organisms and control organisms (fig. 6).

Mortality Reliability points taken off for:
Documentation: Analytical method (4), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8).
Acceptability: Appropriate duration (2), Control response (9), Measured concentrations within 20% of nominal (4), Organism size (3), Organisms randomized (1), Organism acclimation (1), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Random design (2), Dilution factor (2), Hypothesis tests (3).

Protein content Reliability points taken off for:
Documentation: Analytical method (4), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistical methods (5), Point estimates (8), Minimum significant difference (2), % control of NOEC/LOEC (2).
Acceptability: Control response (9), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Organism acclimation (1), Exposure type (2), Random design (2), Dilution factor (2), Hypothesis tests (3), Point estimates (3).

Toxicity Data Summary

Hybopsis monacha

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 100
Rating: R

Reliability
Score: 75
Rating: R

	Dwyer et al. 2005	***H. monacha***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee on Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Hybopsis*	
Species	*monacha*	Spotfin chub
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Commercial fishery	Conservation Fisheries, Knoxville, TN
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	17 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	Slightly above 8.0	

	Dwyer et al. 2005	***H. monacha***
Parameter	**Value**	**Comment**
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	119% for stock solution, except one individual stock that was 320% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	2 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Control	Solvent and dilution water	2 reps, 10/rep
LC_{50} (µg/L)	1.70	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -35

Acceptability (Table 3.8): Organism size (3), Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Adequate replicates (2), Hypothesis tests (3). -15

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Ictalurus punctatus

Study: Buccafusco RJ. 1976a. Acute Toxicity of PP-557 technical to channel catfish (*Ictalurus punctatus*). EG&G Bionomics: Wareham, MA. CDPR ID: study number 15147.

Relevance
Score: 100
Rating: R

Reliability
Score: 75
Rating: R

Reference	**Buccafusco 1976**	***I. punctatus***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Chordata	
Class	Actinopterygii	
Order	Siluriformes	
Family	Ictaluridae	
Genus	*Ictalurus*	
Species	*punctatus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean weight: 1.2 g Mean length: 35 mm	
Source of organisms	Commercial hatchery	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Control response 1	0%	
Temperature	21±1.0°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	7.1-6.9	
Hardness	35 mg/L $CaCO_3$	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	98-39% saturation	
Feeding	Not fed	
Purity of test substance	92.4%	
Concentrations measured?	No	

Reference	**Buccafusco 1976**	***I. punctatus***
Parameter	**Value**	**Comment**
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	%NR, acetone	
Concentration 1 Nom (µg/L)	10	1 rep, 10 per
Concentration 2 Nom (µg/L)	7.5	1 rep, 10 per
Concentration 3 Nom (µg/L)	5.6	1 rep, 10 per
Concentration 4 Nom (µg/L)	4.2	1 rep, 10 per
Concentration 5 Nom (µg/L)	3.2	1 rep, 10 per
Control	Solvent and dilution water	1 rep, 10 per
LC_{50} (95% CI) (µg/L)	24 hr 6.0 (4.9-7.5) 48 hr 5.4 (3.9-7.4) 96 hr 5.4 (3.9-7.4)	Method: Log-dose-probit

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -22

Acceptability: Measured concentrations within 20% of nominal (4), Carrier solvent (4), Exposure type (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -28

Toxicity Data Summary

Ictalurus punctatus

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 65
Rating: L

*No standard method, control description

	Thurston et al. 1985	***I. punctatus***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Siluriformes	
Family	Ictaluridae	
Genus	*Ictalurus*	
Species	*punctatus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Test 1: Mean wt. 2.81 g Test 2: Mean wt. 2.49 g	
Source of organisms	Stock cultures or fish hatchery	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	Test 1: 0% Test 2: 10%	
Temperature	Test 1: 19.1 ± 1°C Test 2: 17.8 ± 1°C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Ground water spring	
pH	8.02-8.03	
Hardness	NR	

	Thurston et al. 1985	***I. punctatus***
Parameter	**Value**	**Comment**
Alkalinity	NR	
Conductivity	340 siemens	
Dissolved Oxygen	Test 1: 7.88 mg/L Test 2: 8.72 mg/L	
Feeding	None during tests	
Purity of test substance	93%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Not clear, probably measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	%NR, dimethylformamide	
Concentration 1 Nom/Meas (μg/L)	5 concentrations	2 reps, #/rep NR
Concentration 2 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 3 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 4 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 5 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Control	Not clear	2 reps, #/rep NR
LC_{50} (95% confidence interval) (μg/L)	Test 1: 3.44 (3.04-3.90) Test 2: 2.06 (1.16-3.65)	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Control type (8), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Hypothesis tests (8). -29

Acceptability (Table 3.8): No standard method (5), Control description (6), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Hardness (2), Alkalinity (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -41

Toxicity Data Summary

Lepomis macrochirus

Study: Aquatic Environmental Sciences. 1976. Acute toxicity of FMC 33297 ACT 29 .11, .12 to bluegill sunfish (*Lepomis macrochirus* Rafinesque) and the water flea (*Daphnia Magna* Straus). Aquatic Environmental Sciences: Tarrytown, NY. CDPR ID: study number 15099.

Relevance
Score: 85
Rating: L

Reliability
Score: 67.5
Rating: L

* Chemical purity not reported

Reference	**Aq. Envir. Sci, 1976**	***L. macrochirus***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Chordata	
Class	Actinopterygii	
Order	Perciformes	
Family	Centrarchidae	
Genus	*Lepomis*	
Species	*macrchirus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	8 mos old, 30 mm, 0.29 g	
Source of organisms	Commercial hatchery in Nebraska	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 28, 96 hr
Effect 1	Mortality	
Control response	0%	
Temperature	22 $\pm$ 0.5 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted soft water	
pH	7.81	
Hardness	42 mg/L $CaCO_3$	
Alkalinity	21 mg/L $CaCO_3$	
Conductivity	199 µmhos/cm	

Reference	**Aq. Envir. Sci, 1976**	***L. macrochirus***
Parameter	**Value**	**Comment**
Dissolved Oxygen	2.4-8.3 mg/L (28-97% saturation)	
Feeding	Not Fed	
Purity of test substance	NR	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	%NR, acetone	
Concentration 1 Nom (µg/L)	10.00	1 rep, 10 organisms per rep
Concentration 2 Nom (µg/L)	5.60	1 rep, 10 organisms per rep
Concentration 3 Nom (µg/L)	3.20	1 rep, 10 organisms per rep
Concentration 4 Nom (µg/L)	1.80	1 rep, 10 organisms per rep
Concentration 5 Nom (µg/L)	1.00	1 rep, 10 organisms per rep
Control	Solvent and dilution water	1 rep, 10 organisms per rep
LC_{50} (µg/L)	24 hr 5.64 (4.52-7.03) 48 hr 3.36 (2.78-4.05) 96 hr 2.52 (1.88-3.36)	Method: Spearman-Karber

Reliability points taken off for:
Documentation: Results not signed, dated (6), Chemical purity (5), Analytical method (4), Measured concentrations (3), Photoperiod (3), Hypothesis tests (8). -29

Acceptability: Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -36

Toxicity Data Summary

Lepomis macrochirus

Study: Bentley RE. 1974. Acute toxicity of FMC-33297 technical to bluegill (*Lepomis macrochirus)* and rainbow trout (*Salmo gairdneri)*. Bionomics EG&G Environmental Consultants: Wareham, MA. CDPR ID: study number: 15078.

Relevance	Reliability
Score: 90	Score: 70
Rating: R	Rating: L

Relevance Points taken off for: Standard method (10)

Reference	**Bentley 1974**	***L. macrochirus***
Parameter	**Value**	**Comment**
Test method cited	Methods for toxicity tests with aquatic organisms – Committee on methods for toxicity tests with aquatic organisms (in press)	
Phylum	Chordata	
Class	Actinopterygii	
Order	Perciformes	
Family	Centrarchidae	
Genus	*Lepomis*	
Species	*macrochirus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean weight: 1.0 g Mean length: 37 mm	
Source of organisms	Commercial hatchery in Nebraska	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Control response 1	0%	
Temperature	20±1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted water	
pH	7.1	

Reference	**Bentley 1974**	***L. macrochirus***
Parameter	**Value**	**Comment**
Hardness	35 ppm $CaCO_3$	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	4.4-8.6 mg/L	Less than 60% by end of test
Feeding	Not Fed	
Purity of test substance	Technical	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	%NR, acetone	
Concentration 1 Nom (µg/L)	16.0	1 Rep, 10/ rep
Concentration 2 Nom (µg/L)	12.0	1 Rep, 10/ rep
Concentration 3 Nom (µg/L)	8.7	1 Rep, 10/ rep
Concentration 4 Nom (µg/L)	7.5	1 Rep, 10/ rep
Concentration 5 Nom (µg/L)	6.5	1 Rep, 10/ rep
Concentration 6 Nom (µg/L)	5.6	1 Rep, 10/ rep
Concentration 7 Nom (µg/L)	4.2	1 Rep, 10/ rep
Concentration 8 Nom (µg/L)	3.2	1 Rep, 10/ rep
Control	Solvent and dilution water	1 Rep, 10/ rep
LC_{50} (95% confidence interval) (µg/L)	24 h: 9.6 (8.1-11.3) 48 h: 6.4 (5.4-7.6) 96 h: 6.1 (5.1-7.3)	Method: Probit, least squares regression

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -22

Acceptability: Unacceptable standard method (5), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -38

Toxicity Data Summary

Lepomis macrochirus

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 65
Rating: L

*No standard method, control description

	Thurston et al. 1985	***L. macrochirus***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Perciformes	
Family	Centrachidae	
Genus	*Lepomis*	
Species	*macrochirus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Test 1: mean wt. 0.34 g Test 2: mean wt. 0.58 g	
Source of organisms	Stock cultures or fish hatchery	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	Test 1: 18.5 ± 1°C Test 2: 18.0 ± 1°C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Ground water spring	
pH	7.90-7.92	
Hardness	NR	
Alkalinity	NR	
Conductivity	340 siemens	

	Thurston et al. 1985	***L. macrochirus***
Parameter	**Value**	**Comment**
Dissolved Oxygen	Test 1: 8.89 mg/L Test 2: 9.21 mg/L	
Feeding	None during tests	
Purity of test substance	93%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Not clear, probably measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	%NR, dimethylformamide	
Concentration 1 Nom/Meas (μg/L)	5 concentrations	2 reps, #/rep NR
Concentration 2 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 3 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 4 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 5 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Control	Not clear	2 reps, #/rep NR
LC_{50} (95% confidence interval) (μg/L)	Test 1: 5.81 (4.67-7.22) Test 2: 4.56 (3.46-6.01)	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Control type (8), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Hypothesis tests (8). -29

Acceptability (Table 3.8): No standard method (5), Control description (6), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Hardness (2), Alkalinity (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -41

Toxicity Data Summary

Limnaea stagnalis

Doma S. 1976. PP557: Acute toxicity and reproduction studies on the large pond snail, *Limnaea stagnalis*. ICI Plant Protection Division. CDPR ID: study number 15135.

Relevance	Reliability
Score: 70	Score: 63
Rating: L	Rating: L

Relevance Points taken off for: Chemical Purity (15), Toxicity values (15)

Reference	**Doma 1976**	***L. stagnalis***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Mollusca	
Class	Gastropoda	
Order		
Family	Lymnaeidae	
Genus	*Limnaea*	*Lymnaea?*
Species	*stagnalis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	12-16 weeks, sexually mature	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	Exposure: 48 hour, Experiment 36 days	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	48 h: 0% 36 d: 33%	
Temperature	21-22°C	
Test type	Static	
Photoperiod/light intensity	12 hr diurnal	
Dilution water	DI H_2O, reconstituted to EPA specifications	
pH	NR	
Hardness	$NaHCO_3$ 192 mg,	

Reference	**Doma 1976**	***L. stagnalis***
Parameter	**Value**	**Comment**
	$CaSO_4 \cdot 2H_2O$ 120 mg, $MgSO_4 \cdot 7H_2O$ 120 mg, KCl 8 mg/L	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Not fed	
Purity of test substance	25% EC Formulation	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (mg/L)	200, 100, 10, 3, 1, 0,3, 0.1, 0.01, 0.001	3 Reps and 10 organisms per rep
Control	Dilution water	3 Reps and 10 per

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Statistical methods (5), Hypothesis tests (8), Point estimates (8).

Acceptability: Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Dissolved oxygen (6), Random design (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3), Point estimates (3).

Toxicity Data Summary

Limnaea stagnalis

Doma S. (1976). "PP557: Acute toxicity and reproduction studies on the large pond snail, *Limnaea stagnalis*". ICI Plant Protection Division.

Relevance	Reliability
Score: 62.5	Score:
Rating:N	Rating:

Relevance Points taken off for: Chemical Purity (15), Toxicity values (15), Control Response (7.5)

Reference	**Doma, 1976**	*Limnaea stagnalis*
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Mollusca	
Class	Gastropoda	
Order		Not classified
Family	Lymnaeidae	
Genus	*Limnaea*	*Lymnaea?*
Species	*stagnalis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	12-16 weeks, sexually mature	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	Exposure: 48 hour, Experiment 36 days	
Data for multiple times?	No	
Effect 1	Reproduction	
Effect 2	Egg Survival	
Temperature	21-22°C, 22-27°C	
Test type	Static	
Photoperiod/light intensity	12 hr diurnal, natural light	
Dilution water	DI H_2O, reconstituted to EPA specifications	
pH	NR	
Hardness	$NaHCO_3$ 192 mg,	

Reference	**Doma, 1976**	*Limnaea stagnalis*
Parameter	**Value**	**Comment**
	$CaSO_4 \cdot 2H_2O$ 120 mg, $MgSO_4 \cdot 7H_2O$ 120 mg, KCl 8 mg/L	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Not fed	
Purity of test substance	25% EC Formulation	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (mg/L)	200, 100, 10, 3, 1, 0,3, 0.1, 0.01, 0.001	3 Reps and 10 organisms per rep
Control		3 Reps and 10 per

TABLE 2.

Acute toxicity of PP557 and its effects on reproduction of snails

Concentration PP557 (mg/l)	Number of snails at the end of experiment•	Average length in cm of snails	Average Weight in g of snails	Number of egg clutches produced	Number of fertilized egg clutches	% of fertile egg clutches	Average number of egg clutches laid by a single snail
200	0	-	-	-	-	-	-
100	0	-	-	-	-	-	-
10	17	2.68	1.64	64	34	53	4
3	25	2.63	1.48	93	72	77	4
1	21	2.61	1.57	69	41	59	3
0.3	14	2.75	2.07	75	43	57	5
0.1	21	2.61	1.57	87	44	51	4
0.01	11	2.50	1.63	40	21	52	4
0.001	20	2.45	1.50	79	61	77	4
Control	20	2.52	1.60	69	41	59	4

• experiment lasted 36 days including the 2 days exposure to PP557.

10 snails per test vessel exposed, 3 vessels per treatment.

Effect of PP557 on egg mass development

Concentration PP557 (mg/l)	200	100	10	3	1	0.3	0.1	0.01	0.001	Control
Numbers of egg clutches which developed normally	10	10	10	10	10	10	10	10	10	10

10 egg clutches per test vessel exposed.

Toxicity Data Summary

Menidia beryllina

Study: Ward GS, Rabe BA. 1989. Acute toxicity of permethrin technical to inland silversides (*Menidia beryllina*) under flow-through conditions. FMC corporation study number A88-2747. Laboratory project ID: Hunter/ESE No. 93008-0200-2130. Study performed by HUNTER/ESE Inc.: Gainesville, FL. EPA MRID 41874901.

Relevance
Score: 85
Rating: L

Reliability
Score: 86
Rating: R

*Saltwater

	Ward & Rabe 1989	***M. beryllina***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1985	
Phylum	Chordata	
Class	Actinopterygii	
Order	Atheriniformes	
Family	Atherinopsidae	
Genus	*Menidia*	
Species	*beryllina*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juveniles, 0.035 ± 0.010 g wet wt, 15 ± 1 mm standard length	
Source of organisms	Commercial supplier	Aquatic Indicator, St. Augustine, FL
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	Dilution water: 0% Solvent: 15%	
Temperature	22 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	16 L:8 D	
Dilution water	Natural filtered seawater diluted with well water	Salinity 20 o/oo
pH	7.9-8.0	

	Ward & Rabe 1989	***M. beryllina***
Parameter	**Value**	**Comment**
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	≥ 5.7 ppm (≥ 74% saturation)	
Feeding	None during test	
Purity of test substance	94.6%	
Concentrations measured?	Yes	
Measured is what % of nominal?	84-114%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	0.0016% dimethylformamide	
Concentration 1 Nom/Meas (µg/L)	16.0/13.5	2 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	9.6/9.1	Reps and # per
Concentration 3 Nom/Meas (µg/L)	5.8/5.0	Reps and # per
Concentration 4 Nom/Meas (µg/L)	3.4/3.5	Reps and # per
Concentration 5 Nom/Meas (µg/L)	2.1/2.4	Reps and # per
Control	Solvent and dilution water	Reps and # per
LC_{50} (95% confidence interval) (µg/L)	24 h: >13.5 48 h: 12.2 (0-infinity) 72 h: 8.3 (6.9-10.6) 96 h: 6.2 (5.2-7.5)	Method: moving average

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis tests (8). -14

Acceptability (Table 3.8): Concentrations exceed 2x water solubility (4), Hardness (2), Alkalinity (2), Conductivity (1), Adequate replicates (2), Hypothesis tests (3). -14

Toxicity Data Summary

Mugil cephalus

Study: Schimmel SC, Garnas RL, Patrick JM, Moore JC. 1983. Acute toxicity, bioconcentration, and persistence of AC 222,705, benthiocarb, chlorpyrifos, fenvalerate, methyl parathion, and permethrin in the estuarine environment. J Agric Food Chem 31:104-113.

Relevance
Score: 85
Rating: L

Reliability
Score: 61.5
Rating: L

*Saltwater

	Schimmel et al. 1983	***M. cephalus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980	
Phylum	Chordata	
Class	Osteichthyes	
Order	Perciformes	
Family	Mugilidae	
Genus	*Mugil*	
Species	*cephalus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Charleston, SC	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	$\leq$ 5%	
Temperature	24.5 °C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	19.0 o/oo salinity
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Schimmel et al. 1983	***M. cephalus***
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	93%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	0.05% triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	NR	1 rep, 20/rep
Concentration 2 Nom/Meas (μg/L)	NR	
Concentration 3 Nom/Meas (μg/L)	NR	
Concentration 4 Nom/Meas (μg/L)	NR	
Concentration 5 Nom/Meas (μg/L)	NR	
Concentration 6 Nom/Meas (μg/L)	NR	
Control	Solvent and dilution water	1 rep, 20/rep
LC_{50} (μg/L)	5.5 (4.1-7.4)	Method: probit, moving average, or binomial test

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -35

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organism size (3), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -42

Toxicity Data Summary

Menidia menidia

Study: Schimmel SC, Garnas RL, Patrick JM, Moore JC. 1983. Acute toxicity, bioconcentration, and persistence of AC 222,705, benthiocarb, chlorpyrifos, fenvalerate, methyl parathion, and permethrin in the estuarine environment. J Agric Food Chem 31:104-113.

Relevance
Score: 85
Rating: L

Reliability
Score: 61.5
Rating: L

*Saltwater

	Schimmel et al. 1983	***M. menidia***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980	
Phylum	Chordata	
Class	Actinopterygii	
Order	Atheriniformes	
Family	Atherinopsidae	
Genus	*Menidia*	
Species	*menidia*	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Charleston, SC	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	$\leq$ 5%	
Temperature	25.5 °C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	25.0 o/oo salinity
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	

	Schimmel et al. 1983	***M. menidia***
Parameter	**Value**	**Comment**
Feeding	None during test	
Purity of test substance	93%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	0.05% triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	NR	1 rep, 20/rep
Concentration 2 Nom/Meas (μg/L)	NR	
Concentration 3 Nom/Meas (μg/L)	NR	
Concentration 4 Nom/Meas (μg/L)	NR	
Concentration 5 Nom/Meas (μg/L)	NR	
Concentration 6 Nom/Meas (μg/L)	NR	
Control	Solvent and dilution water	1 rep, 20/rep
LC_{50} (μg/L)	2.2 (1.2-6.4)	Method: probit, moving average, or binomial test

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -35

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organism size (3), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -42

Toxicity Data Summary

Notropis mekistocholas

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 100
Rating: R

Reliability
Score: 76
Rating: R

	Dwyer et al. 2005	***N. mekistocholas***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee n Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Notropis*	
Species	*mekistocholas*	Cape Fear shiner
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Commercial fishery	Conservation Fisheries, Knoxville, TN
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	17 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	Slightly above 8.0	

	Dwyer et al. 2005	***N. mekistocholas***
Parameter	**Value**	**Comment**
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	119% for stock solution, except one individual stock that was 320% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (µg/L)	4.16	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), pH (3), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -35

Acceptability (Table 3.8): Organism size (3), Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -13

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Oncorhynchus apache

Study: Dwyer FJ, Sappington LC, Buckler DR, Jones SB. 1995. Use of a surrogate species in assessing contaminant risk to endangered and threatened fishes. Final report – September, 1995. EPA/600/R-96/029.

Relevance
Score: 100
Rating: R

Reliability
Score: 80.5
Rating: R

	Dwyer et al. 1995	***O. apache***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975, ASTM 1988	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*apache*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Run 1) 0.38 ± 0.18 g Run 2) 0.85 ± 0.49 g	
Source of organisms	Fish hatchery	Williams Creek NFH, White River, AZ
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Acclimated for 96 h	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes, 12 h, 24 h	
Effect 1	Mortality	
Control response 1	0-3.3%	
Effect 2	Muscarinic cholinergic receptor binding	
Control response 2	NR	
Temperature	12 ± °C	
Test type	Static	
Photoperiod/light intensity	“ambient lighting”	
Dilution water	Reconstituted hard water	
pH	8.24 ± 0.29	
Hardness	169 ± 10 mg/L as CaCO3	
Alkalinity	117 ± 8 mg/L as CaCO3	

	Dwyer et al. 1995	***O. apache***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	Always ≥ 60% saturation	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Stocks only	
Measured is what % of nominal?	Tests in 1992: 93% (stocks) Tests in 1993: 128% (stocks)	One sample had recovery of 308% and was not included in average b/c value is thought to be incorrect b/c it did not show differing biological results
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (µg/L)	12 h: 3.88 24 h: 2.27 96 h: 1.71	Method: probit

Notes: LC50s are geometric means of the LC50s calculated for each run (n=2).

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -19

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -20

Toxicity Data Summary

Oncorhynchus apache

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 100
Rating: R

Reliability
Score: 80
Rating: R

	Dwyer et al. 2005	***O. apache***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee n Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*apache*	Apache trout
Family in North America?	Yes	
Age/size at start of test/growth phase	0.62 $\pm$ 0.33 g	From Sappington et al. 2001
Source of organisms	Fish hatchery	Williams Creek NFH, White River, AZ
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	12 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	

	Dwyer et al. 2005	***O. apache***
Parameter	**Value**	**Comment**
pH	Slightly above 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	111% for stock solution, except one individual stock that was 308% - likely an error	From Sappington et al. 2001
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	2 tests, 3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Control	Solvent and dilution water	2 tests, 3 reps, 10/rep
LC_{50} (µg/L)	1.71	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -10

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Oncorhynchus apache

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance
Score: 100
Rating: R

Reliability
Score: 71
Rating: L

*This data reported in this study is identical to those reported in Dwyer et al. 1995, 2005, which are rated RR because more information about the study conditions are reported in those studies, therefore the data in this study will also be reported as RR.

	Sappington et al. 2001	***O. apache***
Parameter	**Value**	**Comment**
Test method cited	USEPA, ASTM	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*apache*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean wt 0.62 $\pm$ 0.33 g	
Source of organisms	Fish hatchery or commercial source	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	4 d acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	12 h, 24 h	
Effect 1	Mortality	
Control response 1	96.7%	
Temperature	12 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	> 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	

	Sappington et al. 2001	***O. apache***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.05% acetone or triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (95% confidence interval) (μg/L)	12 h: 3.9 (3.7-4.1) 24 h: 2.3 (2.0-2.7) 96 h: 1.7 (1.3-2.2)	Method: probit, moving average, untrimmed Spearman-Karber, or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Hypothesis tests (3). -28

Toxicity Data Summary

Oncorhynchus clarki henshawi

Study: Dwyer FJ, Sappington LC, Buckler DR, Jones SB. 1995. Use of a surrogate species in assessing contaminant risk to endangered and threatened fishes. Final report – September, 1995. EPA/600/R-96/029.

Relevance
Score: 100
Rating: R

Reliability
Score: 77.5
Rating: R

	Dwyer et al. 1995	***O. clarki henshawi***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975, ASTM 1988	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*clarki henshawi*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Run 1) 0.34 ± 0.08 g Run 2) 0.57 ± 0.23 g	
Source of organisms	Fish hatchery	Lahontan NFH, Gardnerville, NV
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Acclimated for 96 h	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes, 12 h, 24 h	
Effect 1	Mortality	
Control response 1	0%	
Effect 2	Muscarinic cholinergic receptor binding	
Control response 2	NR	
Temperature	12 ± °C	
Test type	Static	
Photoperiod/light intensity	“ambient lighting”	
Dilution water	Reconstituted hard water	
pH	8.24 ± 0.29	
Hardness	169 ± 10 mg/L as CaCO3	
Alkalinity	117 ± 8 mg/L as CaCO3	
Conductivity	NR	

	Dwyer et al. 1995	***O. clarki henshawi***
Parameter	**Value**	**Comment**
Dissolved Oxygen	Generally ≥ 60% saturation, but several instances of <60% saturation	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Stocks only	
Measured is what % of nominal?	Tests in 1992: 93% (stocks) Tests in 1993: 128% (stocks)	One sample had recovery of 308% and was not included in average b/c value is thought to be incorrect b/c it did not show differing biological results
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (μg/L)	12 h: 3.33 24 h: 1.93 96 h: 1.58	Method: probit or nonlinear interpolation

Notes: LC50s are geometric means of the LC50s calculated for each run (n=6).

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -19

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -26

Toxicity Data Summary

Oncorhynchus clarki henshawi

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 100
Rating: R

Reliability
Score: 79
Rating: R

	Dwyer et al. 2005	***O. clarki henshawi***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee on Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*clarki henshawi*	Lahontan cutthroat trout
Family in North America?	Yes	
Age/size at start of test/growth phase	0.46 ± 0.16 g	From Sappington et al. 2001
Source of organisms	Fish hatchery	Lahontan NFH, Gardnerville, NV
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	12 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	

	Dwyer et al. 2005	***O. clarki henshawi***
Parameter	**Value**	**Comment**
pH	Slightly above 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	111% for stock solution, except one individual stock that was 308% - likely an error	From Sappington et al. 2001
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	2 tests, 3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Control	Solvent and dilution water	2 tests, 3 reps, 10/rep
LC_{50} (µg/L)	1.58	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Adequate replicates (2), Hypothesis tests (3). -12

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Oncorhynchus clarki henshawi

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance	Reliability
Score: 100	Score: 71
Rating: R	Rating: L

*This data is also reported in Dwyer et al. 1995, 2005. More test conditions are reported in these other publications and are rated RR. The data in Sappington et al. 2001 will also be reported in the RR table because of this additional information.

	Sappington et al. 2001	***O. clarki henshawi***
Parameter	**Value**	**Comment**
Test method cited	USEPA, ASTM	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*clarki henshawi*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean wt 0.46 $\pm$ 0.16 g	
Source of organisms	Fish hatchery or commercial source	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	4 d acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	12 h, 24 h	
Effect 1	Mortality	
Control response 1	96.7%	
Temperature	12 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	> 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	

	Sappington et al. 2001	***O. clarki henshawi***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.05% acetone or triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (95% confidence interval) (μg/L)	12 h: 3.3 (2.4-4.7) 24 h: 1.9 (1.4-2.6) 96 h: 1.6 (1.1-2.2)	Method: probit, moving average, untrimmed Spearman-Karber, or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Hypothesis tests (3). -28

Toxicity Data Summary

Oncorhynchus clarki stomias

Study: Dwyer FJ, Sappington LC, Buckler DR, Jones SB. 1995. Use of a surrogate species in assessing contaminant risk to endangered and threatened fishes. Final report – September, 1995. EPA/600/R-96/029.

Relevance
Score: 85
Rating: L

Reliability
Score: 72
Rating: L

*No toxicity values

	Dwyer et al. 1995	***O. clarki stomias***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975, ASTM 1988	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*clarki stomias*	
Family in North America?	Yes	
Age/size at start of test/growth phase	0.31 ± 0.17 g	
Source of organisms	Fish hatchery	Saratoga NFH, Saratoga, WY
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Acclimated for 96 h	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes, 12 h, 24 h	
Effect 1	Mortality	
Control response 1	0-3.3%	
Effect 2	Muscarinic cholinergic receptor binding	
Control response 2	NR	
Temperature	12 ± °C	
Test type	Static	
Photoperiod/light intensity	“ambient lighting”	
Dilution water	Reconstituted hard water	
pH	8.24 ± 0.29	
Hardness	169 ± 10 mg/L as CaCO3	
Alkalinity	117 ± 8 mg/L as CaCO3	

	Dwyer et al. 1995	***O. clarki stomias***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	Generally ≥ 60% saturation, but several instances of <60% saturation	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Stocks only	
Measured is what % of nominal?	Tests in 1992: 93% (stocks) Tests in 1993: 128% (stocks)	One sample had recovery of 308% and was not included in average b/c value is thought to be incorrect b/c it did not show differing biological results
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (μg/L)	12 h: >1.0 24 h: >1.0 96 h: >1.0	Method: n/a

Notes: LC50s are geometric means of the LC50s calculated for each run (n=6).

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Photoperiod (3), Hypothesis tests (8), Point estimates (8). -27

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6),

Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3), Point estimates (3). -29

Toxicity Data Summary

Oncorhynchus clarki stomias

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 85
Rating: L

Reliability
Score: 74.5
Rating: R

*No toxicity value

	Dwyer et al. 2005	***O. clarki stomias***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee on Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*clarki stomias*	Greenback cutthroat trout
Family in North America?	Yes	
Age/size at start of test/growth phase	0.31 $\pm$ 0.17 g	From Sappington et al. 2001
Source of organisms	Fish hatchery	Saratoga NFH, Saratoga, WY
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	12 °C	
Test type	Static	
Photoperiod/light intensity	NR	

	Dwyer et al. 2005	***O. clarki stomias***
Parameter	**Value**	**Comment**
Dilution water	Reconstituted hard water	
pH	Slightly above 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	119% for stock solution, except one individual stock that was 320% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (µg/L)	>1.0	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8), Point estimates (8). -38

Acceptability (Table 3.8): Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3), Point estimates (3). -13

Toxicity Data Summary

Oncorhynchus clarki stomias

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance
Score: 85
Rating: L

Reliability
Score: 65.5
Rating: L

*Toxicity values not calculable

	Sappington et al. 2001	***O. clarki stomias***
Parameter	**Value**	**Comment**
Test method cited	USEPA, ASTM	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*clarki stomias*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean wt 0.31 ± 0.17 g	
Source of organisms	Fish hatchery or commercial source	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	4 d acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	12 h, 24 h	
Effect 1	Mortality	
Control response 1	96.7%	
Temperature	12 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	> 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	

	Sappington et al. 2001	***O. clarki stomias***
Parameter	**Value**	**Comment**
Purity of test substance	95.2%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.05% acetone or triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (95% confidence interval) (μg/L)	12 h: >1.0 24 h: >1.0 96 h: >1.0	Method: probit, moving average, untrimmed Spearman-Karber, or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8), Point estimates (8). -38

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Hypothesis tests (3), Point estimates (3). -31

Toxicity Data Summary

Orconectes immunis

Study: Paul EA, Simonin HA. 2006. Toxicity of three mosquito insecticides to crayfish. Bull Environ Contam Toxicol 76:614-621.

Relevance
Score: 92.5
Rating: R

Reliability
Score: 77.5
Rating: R

*Control response not reported

	Paul & Simonin 2006	***O. immunis***
Parameter	**Value**	**Comment**
Test method cited	USEPA 2002	
Phylum	Arthropoda	
Class	Crustacea (Malacostraca)	
Order	Decapoda	
Family	Astacidae	
Genus	*Orconectes*	
Species	*immunis*	crayfish
Family in North America?	Yes	
Age/size at start of test/growth phase	Juveniles, Mean wt 2 g	
Source of organisms	Culture ponds at a fish hatchery	South Otselic Fish Hatchery, NY
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes, 2 week acclimation	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	3, 24, 48 h	
Effect 1	Mortality	
Control response 1	NR	
Effect 2	Intoxication/erratic swimming/crawling, inability to remain upright	
Control response 2	NR	
Temperature	16.5 ± 1.0°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Spring water	
pH	8.10	
Hardness	132 mg/L CaCO3	
Alkalinity	117 mg/L CaCO3	

	Paul & Simonin 2006	***O. immunis***
Parameter	**Value**	**Comment**
Conductivity	299 umho/L	
Dissolved Oxygen	>6.0 mg/L	
Feeding	None during test	
Purity of test substance	92%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	% NR, acetone	
Concentration 1 Nom/Meas (μg/L)	0.011	8 reps, 5/rep
Concentration 2 Nom/Meas (μg/L)	0.029	8 reps, 5/rep
Concentration 3 Nom/Meas (μg/L)	0.080	8 reps, 5/rep
Concentration 4 Nom/Meas (μg/L)	0.220	8 reps, 5/rep
Concentration 5 Nom/Meas (μg/L)	0.604	8 reps, 5/rep
Concentration 6 Nom/Meas (μg/L)	1.656	8 reps, 5/rep
Control	Solvent	8 reps, 5/rep
LC_{50} (95% confidence interval) (μg/L)	24 h: 0.53 (0.43-0.67) 48 h: 0.31 (0.26-0.36) 96 h: 0.21 (0.17-0.25)	Method: trimmed Spearman-Karber
EC_{50} (95% confidence interval) (μg/L)	3 h: 0.46 (0.39-0.53) 24 h: 0.17 (0.14-0.20) 48 h: 0.11 (0.09-0.13) 96 h: 0.08 (0.07-0.11)	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Photoperiod (3), Hypothesis tests (8). -18

Acceptability (Table 3.8): Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Photoperiod (2), Random design (2), Hypothesis tests (3). -27

Toxicity Data Summary

Oryzias latipes

Study: Rice PJ, Drewes CD, Klubertanz TM, Bradbury SP, Coats JR. 1997. Acute toxicity and behavioral effects of chlorpyrifos, permethrin, phenol, strychnine, and 2,4-dinitrophenol to 30-day-old Japanese medaka (*Oryzias latipes*). Environ Toxicol Chem 16:696-704.

Relevance
Score: 85
Rating: L

Reliability
Score: 80.5
Rating: R

*Species not in a family that resides in North America

	Rice et al. 1997	***O. latipes***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1989	
Phylum	Chordata	
Class	Actinopterygii	
Order	Beloniformes	
Family	Adrianichthyidae	
Genus	*Oryzias*	
Species	*latipes*	
Family in North America?	No	
Age/size at start of test/growth phase	Juveniles, 30 d old, mean length 12 mm	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	48 h	
Data for multiple times?	Yes, 24 h	
Effect 1	Mortality	
Control response 1	$\leq$ 10%	
Temperature	25 ± 1°C	
Test type	Static renewal	
Photoperiod/light intensity	16 L:8 D	
Dilution water	NR	
pH	7.3 ± 0.7	
Hardness	136 ±20 mg/L as CaCO3	
Alkalinity	9.1 ± 4.1 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	7.1 ± 1.3 mg/L	
Feeding	None during test	

	Rice et al. 1997	***O. latipes***
Parameter	**Value**	**Comment**
Purity of test substance	88%	
Concentrations measured?	Yes	
Measured is what % of nominal?	95.0 ± 6.3%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	% NR	
Concentration 1 Nom/Meas (μg/L)	5 concentrations	3 reps, 10-20/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10-20/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10-20/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10-20/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10-20/rep
Control	Solvent and dilution water	3 reps, 10-20/rep
LC_{50} (95% confidence limit) (μg/L)	24 h: 24 (23-25)* 48 h: 11 (10-12)	Method: probit

Notes:
*Exceeds 2x aqueous solubility of permethrin (5.5 ug/L)

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Dilution water (3), Conductivity (2), Hypothesis tests (8). -19

Acceptability (Table 3.8): Appropriate duration (2), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Dilution water (2), Conductivity (1), Random design (2), Dilution factor (2), Hypothesis tests (3). -20

Toxicity Data Summary

Oncorhynchus mykiss

Study: Bentley RE. 1974. Acute toxicity of FMC-33297 technical to bluegill (*Lepomis macrochirus)* and rainbow trout (*Salmo gairdneri)*. Bionomics EG&G Environmental Consultants: Wareham, MA. CDPR ID: study number: 15078.

Relevance	Reliability
Score: 90	Score: 70
Rating: R	Rating: L

Relevance Points taken off for: Standard method (10)

Reference	**Bentley 1974**	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	Methods for toxicity tests with aquatic organisms – Committee on methods for toxicity tests with aquatic organisms (in press)	
Phylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean weight: 1.0 g Mean length: 50 mm	
Source of organisms	Commercial hatchery in Montana	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Control response 1	0%	
Temperature	10±1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted water	

Reference	**Bentley 1974**	***O. mykiss***
Parameter	**Value**	**Comment**
pH	7.1	
Hardness	35 ppm $CaCO_3$	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	4.4-8.6 mg/L	Less than 60% by end of test
Feeding	Not fed	
Purity of test substance	Technical	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	%NR, acetone	
Concentration 1 Nom (µg/L)	87.0	1 Rep, 10/ rep
Concentration 2 Nom (µg/L)	75.0	1 Rep, 10/ rep
Concentration 3 Nom (µg/L)	56.0	1 Rep, 10/ rep
Concentration 4 Nom (µg/L)	32.0	1 Rep, 10/ rep
Concentration 5 Nom (µg/L)	28.0	1 Rep, 10/ rep
Concentration 6 Nom (µg/L)	18.0	1 Rep, 10/ rep
Concentration 7 Nom (µg/L)	12.0	1 Rep, 10/ rep
Concentration 8 Nom (µg/L)	10.0	1 Rep, 10/ rep
Concentration 9 Nom (µg/L)	8.7	1 Rep, 10/ rep
Concentration 10 Nom (µg/L)	6.5	1 Rep, 10/ rep
Concentration 11 Nom (µg/L)	5.6	1 Rep, 10/ rep
Concentration 12 Nom (µg/L)	3.2	1 Rep, 10/ rep
Control	Solvent and blank	1 Rep, 10/ rep
LC50; (95% CI) µg/L	24 h: 31.0 (23.0-41.0) 48 h: 13.1 (10.5-16.5) 96 h: 9.8 (7.7-12.6)	Method: Probit, least squares regression

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -22

Acceptability: Unacceptable standard method (5), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -38

Toxicity Data Summary

Oncorhynchus mykiss

Study: Dwyer FJ, Sappington LC, Buckler DR, Jones SB. 1995. Use of a surrogate species in assessing contaminant risk to endangered and threatened fishes. Final report – September, 1995. EPA/600/R-96/029.

Relevance
Score: 100
Rating: R

Reliability
Score: 77.5
Rating: R

	Dwyer et al. 1995	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975, ASTM 1988	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Run 1) 0.67 ± 0.35 g Run 2) 1.25 ± 0.57 g Run 3) 0.27 ± 0.07 g Run 4) 1.09 ± 0.38 g Run 5) 0.48 ± 0.08 g Run 6) 0.50 ± 0.21 g	
Source of organisms	Commercial fishery or hatchery	Beity's Enterprise, Valley, WA or Ennis National Fish Hatchery, Ennis, MT
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Acclimated for 96 h	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes, 12 h, 24 h	
Effect 1	Mortality	
Control response 1	0%	
Effect 2	Muscarinic cholinergic receptor binding	
Control response 2	NR	
Temperature	12 °C	
Test type	Static	

	Dwyer et al. 1995	***O. mykiss***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	"ambient lighting"	
Dilution water	Reconstituted hard water	
pH	8.24 ± 0.29	
Hardness	169 ± 10 mg/L as CaCO3	
Alkalinity	117 ± 8 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Generally ≥ 60% saturation, but several instances of <60% saturation	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Stocks only	
Measured is what % of nominal?	Tests in 1992: 93% (stocks) Tests in 1993: 128% (stocks)	One sample had recovery of 308% and was not included in average b/c value is thought to be incorrect b/c it did not show differing biological results
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (µg/L)	12 h: 5.75 24 h: 3.78 96 h: 3.31	Method: probit or moving average or nonlinear interpolative procedure

Notes: LC50s are geometric means of the LC50s calculated for each run (n=6).

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -19

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -26

Toxicity Data Summary

Oncorhynchus mykiss

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 100
Rating: R

Reliability
Score: 80
Rating: R

	Dwyer et al. 2005	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee n Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	Rainbow trout
Family in North America?	Yes	
Age/size at start of test/growth phase	0.71 $\pm$ 0.38 g	From Sappington et al. 2001
Source of organisms	Commercial fishery or fish hatchery	Beity's Enterprise, Valley, WA & Ennis NFH, Ennis, MT
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	12 °C	
Test type	Static	
Photoperiod/light intensity	"ambient laboratory lighting"	From Sappington et al. 2001

	Dwyer et al. 2005	***O. mykiss***
Parameter	**Value**	**Comment**
Dilution water	Reconstituted hard water	
pH	Slightly above 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	119% for stock solution, except one individual stock that was 320% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	6 tests, 3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Control	Solvent and dilution water	6 tests, 3 reps, 10/rep
LC_{50} (µg/L)	3.31	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -10

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Oncorhynchus mykiss

Study: Holcombe GW, Phipps GL, Tanner DK. 1982. The acute toxicity of Kelthane, Dursban, disulfoton, Pydrin, and permethrin to fathead minnows *Pimephales promelas* and rainbow trout *Salmo gairdneri.* Environmental Pollution A 29:167-178.

Relevance
Score: 92.5
Rating: R

Reliability
Score: 81
Rating: R

*Control response not reported

	Holcombe et al. 1982	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juveniles	
Source of organisms	Fish hatchery	Fattig Hatcheries, Brady, NE
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes, 24, 48 72 h	
Effect 1	Mortality	
Control response 1	Not reported	
Effect 2	Equilibrium, behavior, coloration, deformities	
Control response 2	Not reported	
Temperature	15.6 ± 1.8°C	
Test type	Flow through	
Photoperiod/light intensity	16 h light:8 h dark, 28 lumens	
Dilution water	Lake Superior water	
pH	7.0-7.4	
Hardness	45.3 mg/L as CaCO3	

	Holcombe et al. 1982	***O. mykiss***
Parameter	**Value**	**Comment**
Alkalinity	41.8 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	9.3 mg/L	
Feeding	None during test	
Purity of test substance	91.9%	
Concentrations measured?	Yes	
Measured is what % of nominal?	90.3 ± 10.4%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	7.0 ± 2.6	2 reps, 10/rep
Concentration 2 Meas (µg/L)	14.7 ± 0.4	2 reps, 10/rep
Concentration 3 Meas (µg/L)	17.8 ± 3.4	2 reps, 10/rep
Concentration 4 Meas (µg/L)	29.8 ± 17.1	2 reps, 10/rep
Concentration 5 Meas (µg/L)	76.7 ± 32.0	2 reps, 10/rep
Control	Dilution water	2 reps, 10/rep
LC_{50} (95% confidence interval) (µg/L)	24 h: 25.8 (20.4-32.6)* 48 h: 17.4 (13.9-21.9)* 72 h: 11.4 (7.2-18.2)* 96 h: 7.0 (7.0-7.0)	Method: trimmed Spearman-Karber

Notes: The results for *Pimephales promelas* are not reported because the LC50 of 15.6 ug/L exceeds 2x the aqueous solubility.
* not valid because > 2x aqueous solubility of permethrin

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Conductivity (2), Hypothesis tests (8). -13

Acceptability (Table 3.8): Control response (9), Concentrations exceed 2x water solubility (4), Temperature (6), Conductivity (1), Adequate replicates (2), Hypothesis tests (3). -25

Toxicity Data Summary

Oncorhynchus mykiss

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance
Score: 100
Rating: R

Reliability
Score: 71
Rating: L

	Sappington et al. 2001	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	USEPA, ASTM	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean wt 0.71 ± 0.38 g	
Source of organisms	Fish hatchery or commercial source	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	4 d acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	12 h, 24 h	
Effect 1	Survival	
Control response 1	96.7%	
Temperature	12 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	> 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	No	

	Sappington et al. 2001	***O. mykiss***
Parameter	**Value**	**Comment**
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.05% acetone or triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (95% confidence interval) (μg/L)	12 h: 5.8 (3.4-8.3) 24 h: 3.8 (3.4-8.3) 96 h: 3.3 (1.7-4.8)	Method: probit, moving average, untrimmed Spearman-Karber, or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Hypothesis tests (3). -28

Toxicity Data Summary

Oncorhynchus mykiss

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 65
Rating: L

*No standard method, control description

	Thurston et al. 1985	***O. mykiss***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Oncorhynchus*	
Species	*mykiss*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean wt. 2.65 g	
Source of organisms	Stock cultures or fish hatchery	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	9.5 ± 1°C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Ground water spring	
pH	8.10 (8.08-8.11)	
Hardness	NR	
Alkalinity	NR	
Conductivity	340 siemens	
Dissolved Oxygen	9.08 mg/L	
Feeding	None during tests	

	Thurston et al. 1985	***O. mykiss***
Parameter	**Value**	**Comment**
Purity of test substance	93%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Not clear, probably measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	%NR, dimethylformamide	
Concentration 1 Nom/Meas (μg/L)	5 concentrations	2 reps, #/rep NR
Concentration 2 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 3 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 4 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 5 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Control	Not clear	2 reps, #/rep NR
LC_{50} (95% confidence interval) (μg/L)	5.47 (4.22-7.10)	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Control type (8), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Hypothesis tests (8). -29

Acceptability (Table 3.8): No standard method (5), Control description (6), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Hardness (2), Alkalinity (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -41

Toxicity Data Summary

Penaeus aztecus

Heitmuller T. 1977. Acute toxicity of PP557 to brown shrimp (*Penaeus aztecus*) and fiddler crabs (*Uca pugilator*). EG&G, Bionomics Marine Research Laboratory: Pensacola, FL. CDPR ID: study number 15141.

Relevance
Score: 85
Rating: L

Reliability
Score: 72.5
Rating: L

Relevance Points taken off for: Freshwater (15)

Reference	**Heitmuller 1977**	***P. aztecus***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Decapoda	
Family	Penaeidae	
Genus	*Penaeus*	
Species	*aztecus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile 15-25 mm rostrum-telson length	
Source of organisms	Mississippi Sound	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Control response 1	0%	
Temperature	20±1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	20 o/oo salinity
pH	7.8-8.4	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	18-88%	

Reference	**Heitmuller 1977**	***P. aztecus***
Parameter	**Value**	**Comment**
Feeding	Not fed	
Purity of test substance	89.11%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	Under 0.5 ml/L acetone	
Concentration 1 Nom (µg/L)	0.09, 0.16, 0.29, 0.50, 0.89	2 Reps and 5 organisms per rep
Control	Solvent	2 Reps and 5 per
LC_{50} (95% CI) (µg/L)	48 hr 0.38 (0.26-0.57) 96 hr 0.34 (0.23-0.51)	Method: probit

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -24

Acceptability: Measured concentrations within 20% of nominal (4), Prior contamination (4), Organisms randomized (1), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -31

Toxicity Data Summary

Procambarus blandingi

Buccafusco RJ. 1977. Acute toxicity of permethrin technical (PP 557) to crayfish (*Procambarus blandingi*). EG&G Bionomics: Wareham, MA. CDPR ID study number 15140.

Relevance
Score: 100
Rating: R

Reliability
Score: 79
Rating: R

	Buccafusco 1977	***P.blandingi***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Decapoda	
Family	Cambaridae	
Genus	*Procambarus*	
Species	*blandingi*	
Family in North America?	Yes	
Age/size at start of test/growth phase	24±5 g wet wt. 48±5 mm	
Source of organisms	Commercial supplier	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	312 hr	
Data for multiple times?	Yes	24, 96, 312 hr
Effect 1	Mortality	
Control response 1	0%	
Temperature	22 ± 1.0°C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	7.0-7.1	
Hardness	35 mg/L $CaCO_3$	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>77% saturation	
Feeding	Not fed	
Purity of test substance	89.11%	

	Buccafusco 1977	***P.blandingi***
Parameter	**Value**	**Comment**
Concentrations measured?	no	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	% NR, acetone	
Concentration 1 Nom (µg/L)	0.49	1 Reps and 20 organisms per rep
Concentration 2 Nom (µg/L)	0.37	1 Reps and 20 organisms per rep
Concentration 3 Nom (µg/L)	0.28	1 Reps and 20 organisms per rep
Concentration 4 Nom (µg/L)	0.21	1 Reps and 20 organisms per rep
Concentration 5 Nom (µg/L)	0.16	1 Reps and 20 organisms per rep
Concentration 6 Nom (µg/L)	0.12	1 Reps and 20 organisms per rep
Concentration 7 Nom (µg/L)	0.087	1 Reps and 20 organisms per rep
Control	Dilution water	1 Reps and 20 per
LC50; indicate calculation method	24 hr: 0.66 (0.16-2.6) 96 hr: 0.21 (0.13-0.33) 312 hr: 0.12 (0.071-0.20)	Method: Probit, least squares regression

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -22

Acceptability: Measured concentrations within 20% of nominal (4), Carrier solvent (4), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -20

Toxicity Data Summary

Procambarus clarkii

Study: Jarboe HH, Romaire RP. 1991. Acute toxicity of permethrin to four size classes of red swamp crayfish (*Procambarus clarkii*) and observations of post-exposure effects. Arch Environ Contam Toxicol 20:337-342.

Relevance	Reliability
Score: 77.5	Score: 81.5
Rating:L	Rating: R

*Low chemical purity, control response not reported

	Jarboe & Romaire 1991	***P. clarkii***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975, APHA 1985	
Phylum		
Class		
Order		
Family		
Genus	*Procambarus*	
Species	*clarkii*	
Family in North America?	Yes	
Age/size at start of test/growth phase	1) 8-12 mm, 0.017 g 2) 25-35 mm, 0.64 g 3) 45-55 mm, 2.45 g 4) 65-75 mm, 8.98 g	
Source of organisms	Pond at research station	Ben Hur Research Farm, Louisiana Agricultural Experiment Station, Baton Rouge, LA
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	10 d acclimation	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Effect 2	Growth/survival 28 d post-exposure	
Control response 2	Given in Table 3	
Effect 3	Reproduction 28 d post-exposure: a) onset of sexual	

	Jarboe & Romaire 1991	***P. clarkii***
Parameter	**Value**	**Comment**
	maturity, b) reproduction of viable young	
Control response 3	Given in Table 3	
Temperature	1) 21.8 ± 0.5°C 2) 21.2 ± 0.4°C 3) 22.7 ± 0.6°C 4) 23.1 ± 0.2°C	
Test type	Static	
Photoperiod/light intensity	24 h light	
Dilution water	Dechlorinated filtered tapwater	
pH	7.9-8.8	
Hardness	98.0-99.4 mg/L as CaCO3	
Alkalinity	161.2-172.7 mg/L as CaCO3	
Conductivity	486-506 umhos/cm	
Dissolved Oxygen	$\geq$ 60% saturation, 6.4 mg/L or greater	
Feeding	None during acute test, daily in post-exposure observation	
Purity of test substance	25.6%	emulsifiable concentrate
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	None	
Concentration 1 Nom/Meas (µg/L)	1) 0.099 2) 0.099 3) 0.495 4) 0.653	3 tests with 3 reps, 12-30/rep
Concentration 2 Nom/Meas (µg/L)	1) 0.158 2) 0.170 3) 0.653 4) 0.851	3 tests with 3 reps, 12-30/rep
Concentration 3 Nom/Meas (µg/L)	1) 0.247 2) 0.292 3) 0.861 4) 1.119	3 tests with 3 reps, 12-30/rep
Concentration 4 Nom/Meas (µg/L)	1) 0.396 2) 0.503 3) 1.138	3 tests with 3 reps, 12-30/rep

	Jarboe & Romaire 1991	***P. clarkii***
Parameter	**Value**	**Comment**
Concentration 5 Nom/Meas (μg/L)	1) 0.624 2) 0.684 3) 1.495	3 tests with 3 reps, 12-30/rep
Concentration 6 Nom/Meas (μg/L)	2) 1.485	3 tests with 3 reps, 12-30/rep
Control	Dilution water	3 tests with 3 reps, 12-30/rep
LC_{50} (95% confidence intervals) (μg/L)	1) 0.438 (0.382-0.507) 2) 0.854 (0.725-1.030) 3) 1.298 (1.163-1.469) 4) 0.813 (0.515-0.938)	Method: probit

Notes: NOEC/LOEC values were not calculated for the 28 d post-exposure data, these exposures do not fit into the chronic category because the exposure was only 96 h.

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Hypothesis tests (8). -15

Acceptability (Table 3.8): Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Photoperiod (2), Hypothesis tests (3). -22

Toxicity Data Summary

Pteronarcys dorsata

Study: Anderson RL. 1982. Toxicity of fenvalerate and permethrin to several nontarget aquatic invertebrates. Environ Entomol 11:1251-1257.

Relevance
Score: 75
Rating: L

Reliability
Score: 73
Rating: L

*No standard method, no toxicity values

	Anderson 1982	***P. dorsata***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Plecoptera	
Family	Pteronarcyidae	
Genus	*Pteronarcys*	Stonefly
Species	*dorsata*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Larvae, age/size NR	
Source of organisms	Collected from ponds and streams near Duluth, MN	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Acclimatized for 1 week	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	28 d	
Data for multiple times?	Yes, 21 d	
Effect 1	Mortality	
Control response 1	0%	
Effect 2	Behavioral effects	
Control response 2	0%	
Temperature	15 ± 0.6°C	
Test type	FT	
Photoperiod/light intensity	14 light: 10 dark	
Dilution water	Unfiltered Lake Superior water	
pH	7.6-7.8	
Hardness	46-48 mg/L	
Alkalinity	42-44 mg/L	
Conductivity	NR	

	Anderson 1982	***P. dorsata***
Parameter	**Value**	**Comment**
Dissolved Oxygen	>95% saturation	
Feeding	Yes, Brine shrimp	
Purity of test substance	Technical	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (μg/L)	0.43 ± 0.20	2 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	0.21 + 0.10	2 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	0.12 + 0.04	2 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	0.042 + 0.019	2 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	0.029 + 0.016	2 reps, 10/rep
Control	Dilution water	2 reps, 10/rep
LC_{50} (μg/L)	Not calculable	Method:

Notes:
25% of animals were immobile within 2 h at 0.21 ug/L, 90% immobility within 5 h. 96 h, 65% immobile at 0.12 ug/L. 21d, 100% immobility at 0.042 ug/L. **no effect at 0.029 ug/L (NOEC?).**

Also determined BCF. Mean BCF: 183 + 171 (range 43-570).

Reliability points taken off for:
Documentation (Table 3.7): Age/size (5), Nominal concentrations (3), Conductivity (2), Hypothesis tests (8), Point estimates (8).

Acceptability (Table 3.8): Standard method (5), Measure concentrations within 20% of nominal (4), Appropriate size/age (3), Prior contamination (4), Organisms randomized (1), Conductivity (1), Random design (2), Adequate replication (2), Hypothesis tests (3), Point estimates (3).

Toxicity Data Summary

Penaeus duorarum

Study: Cripe GM. 1994. Comparative acute toxicities of several pesticides and metals to *Mysidopsis bahia* and potlarval *Penaeus duorarum.* Environ Toxicol Chem 13:1867-1872,

Relevance
Score: 85
Rating: L

Reliability
Score: 75.5
Rating: R

*Saltwater

	Cripe 1994	***P. duorarum***
Parameter	**Value**	**Comment**
Test method cited	ASTM	
Phylum		
Class		
Order		
Family		
Genus	*Penaeus*	
Species	*duorarum*	
Family in North America?	Yes	
Age/size at start of test/growth phase	3-5 d old postlarvae	
Source of organisms	Lab cultures	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	7.5%	
Temperature	25 ± 0.5°C	
Test type	Static	
Photoperiod/light intensity	14 h light: 10 h light	
Dilution water	Filtered seawater	25 o/oo salinity
pH	7.5-7.9	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	5.6 mg/L	
Feeding	Yes at start of test	
Purity of test substance	Technical grade	
Concentrations measured?	No	

	Cripe 1994	***P. duorarum***
Parameter	**Value**	**Comment**
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	10 uL/L; 90% triethylene glycol/10% acetone	
Concentration 1 Nom/Meas (μg/L)	5 concentrations at 60% dilutions	2 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	2 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	2 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	2 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	2 reps, 10/rep
Control	Dilution water and solvent	Reps and # per
LC_{50} (95% confidence interval) (μg/L)	0.17 (0.15-0.19)	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis tests (8). -24

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Feeding (3), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Random design (2), Adequate replicates (2), Hypothesis tests (3). -25

Toxicity Data Summary

Penaeus duorarum

Heitmuller T. 1975. Acute toxicity of FMC 33297 technical (95.7%) to eastern oysters (*Crassostrea virginica*), pink shrimp (*Penaeus duorarum*), and fiddler crabs (*Uca pugilator*). Bionomincs - EG&G, Inc. Marine Research Laboratory: Pensacola, FL. CDPR ID: study number 15103.

Relevance
Score: 85
Rating: L

Reliability
Score: 72.5
Rating: L

Relevance Points taken off for:
Freshwater (15)

Reference	**Heitmuller 1975**	***P. duorarum***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Decapoda	
Family	Penaeidae	
Genus	*Penaeus*	
Species	*duorarum*	
Family in North America?	Yes	
Age/size at start of test/growth phase	25-40 mm rostrum-telson length	
Source of organisms	Big Lagoon, Pensacola, FL	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hour	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	19±1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered sea water	25 o/oo salinity
pH	8±0.5	
Hardness	NR	
Alkalinity	NR	

Reference	**Heitmuller 1975**	***P. duorarum***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	Dropped to less than 60% saturation at end of test	
Feeding	Not Fed	
Purity of test substance	95.7%	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	0.0053% acetone	
Concentrations Nom (µg/L)	0.172, 0.306, 0.536, 0.718, 0.957	2 Reps and 5 organisms per rep
Control	Solvent	2 Reps and 5 per
LC_{50}; (µg/L)	0.354 (0.287-0.440)	Method: probit

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -24

Acceptability: Measured concentrations within 20% of nominal (4), Prior contamination (4), Organisms randomized (1), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -31

Toxicity Data Summary

Penaeus duorarum

Study: Schimmel SC, Garnas RL, Patrick JM, Moore JC. 1983. Acute toxicity, bioconcentration, and persistence of AC 222,705, benthiocarb, chlorpyrifos, fenvalerate, methyl parathion, and permethrin in the estuarine environment. J Agric Food Chem 31:104-113.

Relevance
Score: 85
Rating: L

Reliability
Score: 61.5
Rating: L

*Saltwater

	Schimmel et al. 1983	***P. duorarum***
Parameter	**Value**	**Comment**
Test method cited	ASTM 1980	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	*Penaeus*	
Species	*duorarum*	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Collected from estuarine waters near Gulf Breeze, FL or lab cultures	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	$\leq$ 5%	
Temperature	24.9 °C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	25.0 o/oo salinity
pH	NR	
Hardness	NR	
Alkalinity	NR	

	Schimmel et al. 1983	***P. duorarum***
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	93%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	0.05% triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	NR	1 rep, 20/rep
Concentration 2 Nom/Meas (μg/L)	NR	
Concentration 3 Nom/Meas (μg/L)	NR	
Concentration 4 Nom/Meas (μg/L)	NR	
Concentration 5 Nom/Meas (μg/L)	NR	
Concentration 6 Nom/Meas (μg/L)	NR	
Control	Solvent and dilution water	1 rep, 20/rep
LC_{50} (μg/L)	0.22 (0.06-0.79)	Method: probit, moving average, or binomial test

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -35

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organism size (3), Organisms randomized (1), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -42

Toxicity Data Summary

Poeciliopsis occidentalis occidentalis

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 85
Rating: L

Reliability
Score: 69.5
Rating: L

*No toxicity value

	Dwyer et al. 2005	***P. occidentalis occidentalis***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee on Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes (Actinopterygii)	
Order	Cyprinodontiformes	
Family	Poeciliidae	
Genus	*Poeciliopsis*	
Species	*occidentalis occidentalis*	Gila topminnow
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Fish hatchery	NFH and Technology Ctr, Dexter, NM
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	22 °C	
Test type	Static	

	Dwyer et al. 2005	***P. occidentalis occidentalis***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	Slightly above 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	119% for stock solution, except one individual stock that was 320% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	2 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	2 reps, 10/rep
Control	Solvent and dilution water	2 reps, 10/rep
LC_{50} (µg/L)	>10.0	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8), Point estimates (8). -43

Acceptability (Table 3.8): Organism size (3), Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Adequate replication (2), Hypothesis tests (3), Point estimates (3). -18

Toxicity Data Summary

Poeciliopsis occidentalis

Study: Dwyer FJ, Hardesty DK, Henke CE, Ingersoll CG, Whites DW, Mount DR, Bridges CM. 1999. Assessing contaminant sensitivity of endangered and threatened species: toxicant classes. EPA/600/R-99/098.

Relevance
Score: 85
Rating: L

Reliability
Score: 72
Rating: L

*No toxicity value calculable

	Dwyer et al. 1999	***P. occidentalis***
Parameter	**Value**	**Comment**
Test method cited	EPA 1975, ASTM 1998	
Phylum	Chordata	
Class	Osteichthyes (Actinopterygii)	
Order	Cyprinodontiformes	
Family	Poeciliidae	
Genus	*Poeciliopsis*	
Species	*occidentalis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Weight: 219 $\pm$ 65 mg, Length: 27.2 $\pm$ 2.6 mm	
Source of organisms	National or state fish hatcheries	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes, 96 h acclimation	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	<10%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR – “ambient lighting”	
Dilution water	Reconstituted hard water	
pH	Mean: 8.4 $\pm$ 0.1	
Hardness	167 $\pm$ 5 mg/L as CaCO3	
Alkalinity	115 $\pm$ 1 mg/L as CaCO3	
Conductivity	NR	

	Dwyer et al. 1999	***P. occidentalis***
Parameter	**Value**	**Comment**
Dissolved Oxygen	>40% saturation at 96 h, >60% saturation at 48 h	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Only the stock solutions	
Measured is what % of nominal?	Stock: 160%	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC (for stocks)	
Concentration of carrier (if any) in test solutions	0.005% acetone	
Concentration 1 Nom (µg/L)	6 concentrations	2 reps, 10/rep
Concentration 2 Nom (µg/L)	NR	2 reps, 10/rep
Concentration 3 Nom (µg/L)	NR	2 reps, 10/rep
Concentration 4 Nom (µg/L)	NR	2 reps, 10/rep
Concentration 5 Nom (µg/L)	NR	2 reps, 10/rep
Concentration 6 Nom (µg/L)	NR	2 reps, 10/rep
Control	Solvent and dilution water	2 reps, 10/rep
LC_{50} (95% confidence interval) (µg/L)	>10	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Hypothesis tests (8), Point estimates (8). -28

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Dissolved oxygen (6), Temperature (3), Conductivity (1), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3), Point estimates (3). -28

Toxicity Data Summary

Pimephales promelas

Study: Dwyer FJ, Sappington LC, Buckler DR, Jones SB. 1995. Use of a surrogate species in assessing contaminant risk to endangered and threatened fishes. Final report – September, 1995. EPA/600/R-96/029.

Relevance
Score: 100
Rating: R

Reliability
Score: 75.5
Rating: R

	Dwyer et al. 1995	***P. promelas***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975, ASTM 1988	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Pimephales*	
Species	*promelas*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Run 1) 0.32 ± 0.16 g Run 2) 0.56 ± 0.19 g Run 3) 0.45 ± 0.35 g Run 4) 0.40 ± 0.21 g Run 5) 0.34 ± 0.24 g Run 6) 0.39 ± 0.14 g	
Source of organisms	Lab or commercial cultures	MSC cultures or Osage Fisheries, Osage Beach, MO
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Acclimated for 96 h	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes, 12 h, 24 h	
Effect 1	Mortality	
Control response 1	0%	
Effect 2	Muscarinic cholinergic receptor binding	
Control response 2	NR	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	“ambient lighting”	

	Dwyer et al. 1995	***P. promelas***
Parameter	**Value**	**Comment**
Dilution water	Reconstituted hard water	
pH	8.35 ± 0.29	
Hardness	173 ± 9 mg/L as CaCO3	
Alkalinity	117 ± 4 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Generally ≥ 60% saturation, but several instances of <60% saturation	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Stocks only	
Measured is what % of nominal?	Tests in 1992: 93% (stocks) Tests in 1993: 128% (stocks)	One sample had recovery of 308% and was not included in average b/c value is thought to be incorrect b/c it did not show differing biological results
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (µg/L)	12 h: 13.43 (>2x aqueous solubility) 24 h: 9.73 96 h: 9.38	Method: probit or moving average

Notes: LC50s are geometric means of the LC50s calculated for each run (n=6).

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -19

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -30

Toxicity Data Summary

Pimephales promelas

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 100
Rating: R

Reliability
Score: 80
Rating: R

	Dwyer et al. 2005	***P. promelas***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee on Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Pimephales*	
Species	*promelas*	Fathead minnow
Family in North America?	Yes	
Age/size at start of test/growth phase	0.41 $\pm$ 0.09 g	From Sappington et al. 2001
Source of organisms	USGS lab culture or Osage Fisheries commercial culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	“ambient laboratory lighting”	From Sappington et al. 2001
Dilution water	Reconstituted hard water	
pH	Slightly above 8.0	

	Dwyer et al. 2005	***P. promelas***
Parameter	**Value**	**Comment**
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	111% for stock solution, except one individual stock that was 308% - likely an error	From Sappington et al. 2001
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	6 tests, 3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	6 tests, 3 reps, 10/rep
Control	Solvent and dilution water	6 tests, 3 reps, 10/rep
LC_{50} (µg/L)	9.38	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -10

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Pimephales promelas

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance	Reliability
Score: 100	Score: 71
Rating: R	Rating: L

*This study reports the same data as in Dwyer et al. 1995, 2005, which are rated RR because they report more information about test conditions, therefore the data in this study will be reported as RR with the data from the other 2 studies.

	Sappington et al. 2001	***P. promelas***
Parameter	**Value**	**Comment**
Test method cited	USEPA, ASTM	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Pimephales*	
Species	*promelas*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean wt 0.41 $\pm$ 0.09 g	
Source of organisms	Fish hatchery or commercial source	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	4 d acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	12 h, 24 h	
Effect 1	Mortality	
Control response 1	96.7%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	> 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	

	Sappington et al. 2001	***P. promelas***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.05% acetone or triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (95% confidence interval) (μg/L)	12 h: 13.4 (10.3-7.3) 24 h: 9.7 (9.2-11) 96 h: 9.4 (6.7-16)	Method: probit, moving average, untrimmed Spearman-Karber, or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Hypothesis tests (3). -28

Toxicity Data Summary

Pimephales promelas

Study: Spehar RL, Tanner DK, Nordling BR. 1983. Toxicity of the synthetic pyrethroids, permethrin and AC 222,705 and their accumulation in early life stages of fathead minnows and snails. Aquatic Toxicology 3:171-182.

Relevance
Score: 90
Rating: R

Reliability
Score: 82.5
Rating: R

*No standard method

	Spehar et al. 1983	***P. promelas***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Pimephales*	
Species	*promelas*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Hatch: embryos < 1 d old Larvae 4-5 d old	
Source of organisms	Lab culture	Environmental Research Laboratory-Duluth
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	32 d	
Data for multiple times?	No	
Effect 1	Embryo hatchability	
Control response 1	95 $\pm$ 3.8%	
Effect 2	Normal larvae at hatch	
Control response 2	94 $\pm$ 2.3%	
Effect 3	Survival	
Control response 3	92 $\pm$ 13.0%	
Effect 4	Mean weight	
Control response 4	96 ± 25 mg (N=55)	
Temperature	25 ± 2°C	
Test type	Flow through	

	Spehar et al. 1983	***P. promelas***
Parameter	**Value**	**Comment**
Photoperiod/light intensity	16 L: 8 D	
Dilution water	Filtered, sterilized Lake Superior water	
pH	7.4-7.9	
Hardness	34-48 mg/L as CaCO3	
Alkalinity	37-46 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	5.3-7.8 mg/L	
Feeding	Yes, fed brine shrimp 1-3x/d	
Purity of test substance	92%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	0.11 $\pm$ 0.04	4 reps Hatch: 25/rep Survival: 15/rep
Concentration 2 Meas (µg/L)	0.18 $\pm$ 0.03	4 reps Hatch: 25/rep Survival: 15/rep
Concentration 3 Meas (µg/L)	0.33 $\pm$ 0.08	4 reps Hatch: 25/rep Survival: 15/rep
Concentration 4 Meas (µg/L)	0.66 $\pm$ 0.16	4 reps Hatch: 25/rep Survival: 15/rep
Concentration 5 Meas (µg/L)	1.40 $\pm$ 0.12	4 reps Hatch: 25/rep Survival: 15/rep
Control	Dilution water	4 reps Hatch: 25/rep Survival: 15/rep
NOEC (µg/L)	Survival: 0.66 $\pm$ 0.16	Method: 1way ANOVA, Dunnett's one-sided comparison p: 0.05 MSD:
LOEC (µg/L)	Survival: 1.40 $\pm$ 0.12	Same as above
MATC (GeoMean NOEC,LOEC)	0.96 µg/L	

	Spehar et al. 1983	***P. promelas***
Parameter	**Value**	**Comment**
% of control at NOEC	93/92 =101%	
% of control at LOEC	2/92 =2.1%	

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Conductivity (2), Minimum significant difference (2), Point estimates (8). -15

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Temperature (3), Conductivity (1), Random design (2), Minimum significant difference (1), Point estimates (3). -20

Toxicity Data Summary

Pimephales promelas

Study: Thurston RV, Gilfoil TA, Meyn EL, Zajdel RK, Aoki TI, Veith GD. 1985. Comparative toxicity of ten organic chemical to ten common aquatic species. Water Res 19:1145-1155.

Relevance
Score: 82.5
Rating: L

Reliability
Score: 65
Rating: L

*No standard method, control description

	Thurston et al. 1985	***P. promelas***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	*Pimephales*	
Species	*promelas*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean wt. 0.42 g	
Source of organisms	Stock cultures or fish hatchery	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	17.7 ± 1°C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Ground water spring	
pH	8.01	
Hardness	NR	
Alkalinity	NR	
Conductivity	340 siemens	
Dissolved Oxygen	8.94 mg/L	

	Thurston et al. 1985	***P. promelas***
Parameter	**Value**	**Comment**
Feeding	None during tests	
Purity of test substance	93%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Not clear, probably measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	%NR, dimethylformamide	
Concentration 1 Nom/Meas (μg/L)	5 concentrations	2 reps, #/rep NR
Concentration 2 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 3 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 4 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Concentration 5 Nom/Meas (μg/L)	NR	2 reps, #/rep NR
Control	Not clear	2 reps, #/rep NR
LC_{50} (95% confidence interval) (μg/L)	6.40 (4.19-9.77)	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Control type (8), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Hypothesis tests (8). -29

Acceptability (Table 3.8): No standard method (5), Control description (6), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Organisms/rep (2), Hardness (2), Alkalinity (2), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -41

Toxicity Data Summary

Procloeon sp.

Study: Anderson, B.S., Phillips, B.M., Hunt, J.W., Connor, V., Richard, N., Tjeerdema, R.S., 2006. Identifying primary stressors impacting macroinvertebrates in the Salinas River (CA, USA): Relative effects of pesticides and suspended particles. Environmental Pollution 141:402-408

Relevance
Score: 90 (No standard method)
Rating: R

Reliability
Score: 75
Rating: R

	Anderson et al. 2006	***Procloeon* sp.**
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Arthropoda	
Class	Insecta	
Order	Ephemeroptera	
Family	Baetidae	
Genus	*Procloeon*	
Species	NR	
Family in North America?	Yes	
Age/size at start of test/growth phase	0.5-1 cm	
Source of organisms	Salinas River	Reported as uncontaminated
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	No	
Animals randomized?	NR	
Test vessels randomized?	No	
Test duration	48 hours	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	90% survival*	
Temperature	23°C ± 1*	
Test type	Static	
Photoperiod/light intensity	16 light: 8 dark*	
Dilution water	Well Water	
pH	NR	
Hardness	91.6 mg/L*	
Alkalinity	122.4 mg/L CaCO3*	
Conductivity	NR	

	Anderson et al. 2006	***Procloeon* sp.**
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	Not fed	
Purity of test substance	100%	
Concentrations measured?	Yes	
Measured is what % of nominal?	0-61%	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	1% methanol	
Concentration 1 Nom/Meas (ng/L)	5.6/ NR	3 reps/5per
Concentration 2 Nom/Meas (ng/L)	10/ NR	Meas. 2 reps of only some conc's
Concentration 3 Nom/Meas (ng/L)	18/ND, 11	3 reps/5per
Concentration 4 Nom/Meas (ng/L)	32/ 16	3 reps/5per
Concentration 5 Nom/Meas (ng/L)	56/ 29	3 reps/5per
Control	Solvent and dilution water	3 reps/5per
LC_{50}	89.6 ng/L	Spearman-Karber

Other notes: *Control survival, temp. variation and water chemistry obtained by personal communication with the testing laboratory.

Reliability points taken off for:
Documentation: Dissolved Oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -17

Acceptability: Standard method (5), Meas. Concentrations 20% Nom (4), Carrier solvent (4), Prior contamination (4), Organisms randomly assigned to containers (1), Organism acclimation (1), Dissolved oxygen (6), Conductivity (1), pH (2), Random / block design (2), Hypothesis tests (3). -33

Toxicity Data Summary

Salvelinus fontinalis

Study: Paul EA, Simonin HA, Tomajer TM. 2005. A comparison of the toxicity of synergized and technical formulations of permethrin, sumithrin, and resmethrin to trout. Arch Environ Contam Toxicol 48:251-259.

Relevance
Score: Acute: 82.5, Chronic: 75
Rating: L

Reliability
Score: Acute 6h, 96 h: 75, Chronic: 77.5
Rating: R

*Acute: No standard method, Control response not reported
*Chronic: No standard method, Endpoint not linked to survival/growth/reproduction

	Paul et al. 2005	***S. fontinalis***
Parameter	**Value**	**Comment**
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Salvelinus*	
Species	*fontinalis*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mortality & intoxication: 6 h: 49 d post feeding, mean length 47 mm, mean wt 1g 96 h: 35-42 d post feeding, mean length 42 mm, mean wt 1 g Swimming time: 28-34 d post feeding, mean length 37 mm, mean wt 1 g	
Source of organisms	Lab strain from fish hatchery	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	Mortality & intoxication: - 6 h (+ 48h postexposure observation) - 96 h Swimming time: 6 h exposure followed by swim test until fish exhaustion	

	Paul et al. 2005	***S. fontinalis***
Parameter	**Value**	**Comment**
	(maximum 10 min.)	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Effect 2	Intoxication	Linked to survival in some cases, not all
Control response 2	NR	
Effect 3	Time to swimming exhaustion against a current (after a 6h exposure)	Not directly linked to survival/growth/ reproduction
Control response 3	Median: 520 s, range: 197-600 s	
Temperature	9.5 ± 0.5°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Spring water	
pH	8.10	
Hardness	132 mg/L CaCO3	
Alkalinity	117 mg/L CaCO3	
Conductivity	299 umho/L	
Dissolved Oxygen	>8.0 mg/L	
Feeding	None during test	
Purity of test substance	>92%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	% NR, acetone	
Concentration 1 Nom/Meas (µg/L)	6h: 2.3 96h: 0.43 Swim: 1.6	6h: 3 reps, 10/rep 96h: 4 reps, 5/rep Swim: 7 tests, 2 reps, 1/rep
Concentration 2 Nom/Meas (µg/L)	6h: 3.2 96h: 0.60 Swim: 3.2	6h: 3 reps, 10/rep 96h: 4 reps, 5/rep Swim: 7 tests, 2 reps, 1/rep
Concentration 3 Nom/Meas (µg/L)	6h: 4.5 96h: 0.85 Swim: 6.3	6h: 3 reps, 10/rep 96h: 4 reps, 5/rep Swim: 7 tests, 2 reps, 1/rep

	Paul et al. 2005	***S. fontinalis***
Parameter	**Value**	**Comment**
Concentration 4 Nom/Meas (μg/L)	6h: 6.3 96h: 1.2	6h: 3 reps, 10/rep 96h: 4 reps, 5/rep
Concentration 5 Nom/Meas (μg/L)	6h: 8.9 96h: 1.6	6h: 3 reps, 10/rep 96h: 4 reps, 5/rep
Concentration 6 Nom/Meas (μg/L)	96h: 2.3	96h: 4 reps, 5/rep
Concentration 7 Nom	96h: 3.2	96h: 4 reps, 5/rep
Concentration 8 Nom	96h: 4.5	96h: 4 reps, 5/rep
Concentration 9 Nom	96h: 6.3	96h: 4 reps, 5/rep
Control	Solvent	6h: 3 reps, 10/rep 96h: 4 reps, 5/rep
LC_{50} (95% confidence interval) (μg/L)	24h: 4.80 (4.16-5.54) 48h: 3.03 (2.86-3.22) 72h:2.91 (2.73-3.11) 96h: 2.86 (2.69-3.05)	Method: probit or trimmed Spearman-Karber
EC_{50} (95% confidence interval) (μg/L) Effect: intoxication during 96 h test	24h: 3.01 (2.81-3.22) 48h: 2.44 (2.24-2.65) 72h: 2.44 (2.24-2.65) 96h: 2.86 (2.69-3.05)	Method: probit or trimmed Spearman-Karber
NOEC (μg/L)	Swim time: 1.6	Method: swim time: nonparametric Mann-Whitney U test $p < 0.005$ MSD: NR
LOEC (μg/L)	Swim time: 3.2	Same as above
MATC (GeoMean NOEC,LOEC) (μg/L)	Swim time: 2.3	
% of control at NOEC	Swim time: 57%	
% of control at LOEC	Swim time: 44%	

Notes:

Reliability points taken off for:
<u>Documentation (Table 3.7):</u>
Acute 96h: Analytical method (4), Measured concentrations (3), Photoperiod (3), Hypothesis tests (8). -18
Acute 6h: Analytical method (4), Measured concentrations (3), Photoperiod (3), Hypothesis tests (8). -18
Chronic swim time: Analytical method (4), Measured concentrations (3), Photoperiod (3), Minimum significant difference (2), Point estimates (8). -20

<u>Acceptability (Table 3.8):</u>

Acute 96 h: No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Photoperiod (2), Random design (2), Hypothesis tests (3). -32

Acute 6h: No standard method (5), Appropriate duration (2), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -32

Chronic swim time: No standard method (5), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Photoperiod (2), Number of concentrations (3), Random design (2), Minimum significant difference (1), Point estimates (3). -25

Toxicity Data Summary

Scaphirhynchus platorynchus

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 85
Rating: L

Reliability
Score: 69.5
Rating: L

*No toxicity value

	Dwyer et al. 2005	***S. platorynchus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee on Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Acipenseriformes	
Family	Acipenseridae	
Genus	*Scaphirhynchus*	
Species	*platorynchus*	Shovelnose sturgeon
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Fish hatchery	Blind Pony Missouri State Fish Hatchery, Sweet Springs, MO
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR	

	Dwyer et al. 2005	***S. platorynchus***
Parameter	**Value**	**Comment**
Dilution water	Reconstituted hard water	
pH	Slightly above 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	119% for stock solution, except one individual stock that was 320% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution series	2 reps, 9/rep
Concentration 2 Nom/Meas (μg/L)	NR	2 reps, 9/rep
Concentration 3 Nom/Meas (μg/L)	NR	2 reps, 9/rep
Concentration 4 Nom/Meas (μg/L)	NR	2 reps, 9/rep
Concentration 5 Nom/Meas (μg/L)	NR	2 reps, 9/rep
Concentration 6 Nom/Meas (μg/L)	NR	2 reps, 9/rep
Control	Solvent and dilution water	2 reps, 9/rep
LC_{50} (μg/L)	Not calculable	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Organism age (5), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8), Point estimates (8). -43

Acceptability (Table 3.8): Organism size (3), Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Adequate replicates (2), Hypothesis tests (3), Point estimates (3). -18

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Scaphirhynchus platyrynchus

Study: Dwyer FJ, Hardesty DK, Henke CE, Ingersoll CG, Whites DW, Mount DR, Bridges CM. 1999. Assessing contaminant sensitivity of endangered and threatened species: toxicant classes. EPA/600/R-99/098.

Relevance
Score: 92.5
Rating: R

Reliability
Score: 73
Rating: L

*Control response not acceptable

	Dwyer et al. 1999	***S. platyrynchus***
Parameter	**Value**	**Comment**
Test method cited	EPA 1975, ASTM 1998	
Phylum	Chordata	
Class	Osteichthyes	
Order	Acipenseriformes	
Family	Acipenseridae	
Genus	*Scaphirhynchus*	
Species	*platyrynchus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Weight: 719 ± 237 mg, Length: 60.1 ± 0.8 mm	
Source of organisms	National or state fish hatcheries	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes, 96 h acclimation	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	>10% in some cases	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR – “ambient lighting”	
Dilution water	Reconstituted hard water	
pH	Mean: 8.4 ± 0.1	
Hardness	167 ± 5 mg/L as CaCO3	
Alkalinity	115 ± 1 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	>40% saturation at 96 h,	

	Dwyer et al. 1999	***S. platyrynchus***
Parameter	**Value**	**Comment**
	>60% saturation at 48 h	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Only the stock solutions	
Measured is what % of nominal?	Stock: 160%	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC (for stocks)	
Concentration of carrier (if any) in test solutions	0.005% acetone	
Concentration 1 Nom (µg/L)	6 concentrations	2 reps, 9/rep
Concentration 2 Nom (µg/L)	NR	2 reps, 9/rep
Concentration 3 Nom (µg/L)	NR	2 reps, 9/rep
Concentration 4 Nom (µg/L)	NR	2 reps, 9/rep
Concentration 5 Nom (µg/L)	NR	2 reps, 9/rep
Concentration 6 Nom (µg/L)	NR	2 reps, 9/rep
Control	Solvent and dilution water	2 reps, 9/rep
LC_{50} (95% confidence interval) (µg/L)	6 h: >10 12 h: 10 24 h: not calculable 48 h: not calculable 72 h: not calculable 96 h: not calculable	Method: probit

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Hypothesis tests (8). -20

Acceptability (Table 3.8): Control response (9), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Dissolved oxygen (6), Temperature (3), Conductivity (1), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -34

Toxicity Data Summary

Salmo salar

Buccafusco RJ. 1976b. Acute toxicity of PP-557 technical to Atlantic salmon (*Salmo salar*). EG&G Bionomics: Wareham, MA. CDPR ID: 00083085, study number 15150.

Relevance
Score: 100
Rating: R

Reliability
Score: 75
Rating: R

Reference	**Buccafusco 1976**	***S. salar***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Salmo*	
Species	*salar*	
Family in North America?	Yes	
Age/size at start of test/growth phase	1.0 g 35 mm	
Source of organisms	New Hampshire Fish and Game Department	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	No	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96hr
Effect 1	Mortality	
Control response 1	0%	
Temperature	12 +/- 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Well water	
pH	6.9-7.1	
Hardness	35 mg/L	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	39-93% saturation	
Feeding	Not fed	
Purity of test substance	92.4%	

Reference	**Buccafusco 1976**	***S. salar***
Parameter	**Value**	**Comment**
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	%NR, acetone	
Concentration 1 Nom (μg/L)	0.75	1 Rep and 10 organisms per rep
Concentration 2 Nom (μg/L)	1.0	1 Rep and 10 organisms per rep
Concentration 3 Nom (μg/L)	1.6	1 Rep and 10 organisms per rep
Concentration 4 Nom (μg/L)	2.4	1 Rep and 10 organisms per rep
Concentration 5 Nom (μg/L)	3.2	1 Rep and 10 organisms per rep
Concentration 6 Nom (μg/L)	4.2	1 Rep and 10 organisms per rep
Control	Solvent and dilution water	1 Rep and 10 organisms per rep
LC_{50} (95% confidence interval) (μg/L)	Time 24 hr: 2.2 (1.7-2.8) 48 hr: 1.8 (1.4-2.4) 96 hr: 1.5 (1.1-2.0)	Method: Least Squares Regression

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -22

Acceptability: Measured concentrations within 20% of nominal (4), Carrier solvent (4), Exposure type (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -28

Toxicity Data Summary

Salmo gairdneri

EG&G Environmental Consultants. (1974). "Acute toxicity of FMC-33297 Technical to Bluegill (*Lepomis macrochirus)* and Rainbow Trout (*Salmo gairdneri).*

Relevance
Score: 90
Rating: R

Reliability
Score: 72.0
Rating: L

Relevance Points taken off for: Standard method (10)

Reference		
Parameter	**Value**	**Comment**
Test method cited	NR	
Phylum	Chordata	
Class	Actinopterygii	
Order	Salmoniformes	
Family	Salmonidae	
Genus	*Salmo*	
Species	*gairdnerii*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean weight: 1.0 g Mean length: 50 mm	
Source of organisms	Commercial hatchery in Montana	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Control response 1		
Temperature	10±1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	DI H_2O	
pH	7.1	
Hardness	$CaCO_3$ 35 ppm	
Alkalinity	NR	

Reference		
Parameter	**Value**	**Comment**
Conductivity	NR	
Dissolved Oxygen	8.6-4.4 mg/L	Less than 60% by end of test
Feeding	Not fed	
Purity of test substance	NR	"tested as 100% active"
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	NR	Solvent control perfromed
Concentration 1 Nom/Meas (mg/L)	0.0870, 0.0750, 0.0560, 0.0320, 0.0280, 0.0180, 0.0120, 0.0100, 0.0087, 0.0065, 0.0056, 0.0032	3 Reps and 10 organisms per rep,
Control	Solvent and blank	3 Reps and 10 per
LC50; (95% CI) mg/L	24 - 0.0310 (0.0230-0.0410) 48 - 0.0131 (0.0105-0.0165) 96 – 0.0098(0.0077-0.0126)	Log-dose-probit **All LC50's exceed water solubility of per. (5.5-6 µg/L)**

Reliability points taken off for:
Documentation: Chemical purity (5), Analytical method (4), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8).

Acceptability: No standard method (5), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Random design (2), Hypothesis tests (3).

Toxicity Data Summary

Uca pugilator

Heitmuller T. 1975. Acute toxicity of FMC 33297 technical (95.7%) to eastern oysters (*Crassostrea virginica*), pink shrimp (*Penaeus duorarum*), and fiddler crabs (*Uca pugilator*). Bionomincs - EG&G, Inc. Marine Research Laboratory: Pensacola, FL. CDPR ID: study number 15103.

Relevance
Score: 85
Rating: L

Reliability
Score: 70.5
Rating: L

Relevance Points taken off for:
Freshwater (15)

Reference	**Heitmuller 1975**	***U. pugilator***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Malacotraca	
Order	Decapoda	
Family	Ocypodidae	
Genus	*Uca*	
Species	*pugilator*	
Family in North America?	Yes	
Age/size at start of test/growth phase	15-20 mm carapace width	
Source of organisms	Big Lagoon, Pensacola, FL	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hour	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	0%	
Temperature	19±1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered sea water	25 o/oo salinity
pH	8±0.5	
Hardness	NR	

Reference	**Heitmuller 1975**	***U. pugilator***
Parameter	**Value**	**Comment**
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	Dropped to less than 60% saturation at end of test	
Feeding	Not Fed	
Purity of test substance	95.7%	
Concentrations measured?	NR	
Measured is what % of nominal?	NR	
Chemical method documented?	NR	
Concentration of carrier (if any) in test solutions	0.0632% Acetone	
Concentration 1 Nom/Meas (µg/L)	0.957, 1.72, 3.54, 7.18, 11.5	2 Reps and 5 organisms per rep
Control	Solvent	2 Reps and 5 per
LC50; (µg/L)	2.39 (1.82-3.25)	Method: probit

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -24

Acceptability: Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Prior contamination (4), Organisms randomized (1), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -35

Toxicity Data Summary

Uca pugilator

Heitmuller T. 1977. Acute toxicity of PP557 to brown shrimp (*Penaeus aztecus*) and fiddler crabs (*Uca pugilator*). EG&G, Bionomics Marine Research Laboratory: Pensacola, FL. CDPR ID: study number 15141.

Relevance
Score: 85
Rating: L

Reliability
Score: 72.5
Rating: L

Relevance Points taken off for: Freshwater (15)

Reference	**Heitmuller 1977**	***U. pugilator***
Parameter	**Value**	**Comment**
Test method cited	US EPA 1975	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Decapoda	
Family	Ocypodidae	
Genus	*Uca*	
Species	*pugilator*	
Family in North America?	Yes	
Age/size at start of test/growth phase	10-15 mm carpace width	
Source of organisms	Big Lagoon	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 hr	
Data for multiple times?	Yes	24, 48, 96 hr
Effect 1	Mortality	
Control response 1	0%	
Temperature	20±1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered seawater	20 o/oo salinity
pH	7.6-8.4	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	22-88%	

Reference	**Heitmuller 1977**	***U. pugilator***
Parameter	**Value**	**Comment**
Feeding	Not fed	
Purity of test substance	89.11%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	Under 0.5 ml/L acetone	
Concentration 1 Nom/Meas (µg/L)	0.50, 0.89, 1.6, 2.9, 5.0, 8.0	2 Reps and 5 organisms per rep
Control	Positive control (acetone)	2 Reps and 5 per
LC_{50} (95% CI) (µg/L)	24 hr 5.3 (2.0-13) 48 hr 2.8 (1.9-4.4) 96 hr 2.2 (1.4-3.5)	Method: probit

Reliability points taken off for:
Documentation: Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -24

Acceptability: Measured concentrations within 20% of nominal (4), Prior contamination (4), Organisms randomized (1), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Hypothesis tests (3). -31

Toxicity Data Summary

Elliptio complanata
Lampsilis fasciola
Lampsilis siliquoidea
Villosa constricta
Villosa delumbis

Study: Bringolf RB, Cope WG, Eads CB, Lazaro PR, Barnhart MC, Shea D. 2007. Acute and chronic toxicity of technical-grade pesticides to Glochidia and juveniles of freshwater mussels (Unionidae). Environ Toxicol Chem 26:2086-2093.

Relevance
Score: 85
Rating: L

Reliability
Score: 72.5
Rating: L

*No toxicity values

	Bringolf et al. 2007a	***mussels***
Parameter	**Value**	**Comment**
Test method cited	ASTM	
Phylum		
Class		
Order		
Family		
Genus	*All listed above*	
Species		
Family in North America?	yes	
Age/size at start of test/growth phase	1) Glochidia (all 5 species) 2) Juveniles ≤ 2 months (*L. fasciola, L. siliquoidea, V. delumbis)*	
Source of organisms	Rivers and streams in North Carolina and Missouri	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	Glochidia: 48 h Juveniles: 96 h	
Data for multiple times?	No	
Effect 1	Survival of glochidia	
Control response 1	≥ 90%	
Effect 2	Survival of juveniles	
Control response 2	> 93%	
Temperature	21 ± 1°C	

	Bringolf et al. 2007a	***mussels***
Parameter	**Value**	**Comment**
Test type	Glochidia: Static Juveniles: Static Renewal	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	8.32-8.61	
Hardness	170-192 mg/L as CaCO3	
Alkalinity	116-130 mg/L as CaCO3	
Conductivity	523-625 uS/cm	
Dissolved Oxygen	> 80% saturation	
Feeding	None during tests	
Purity of test substance	99%	
Concentrations measured?	Yes	
Measured is what % of nominal?	Glochidia: 79.6% Juveniles: 86.5%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC/MS	
Concentration of carrier (if any) in test solutions	% NR, acetone	
Concentration 1 Nom/Meas (μg/L)	5-6 conc	3 reps, 150-200 gloch/rep or 7 juv/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 150-200 gloch/rep or 7 juv/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 150-200 gloch/rep or 7 juv/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 150-200 gloch/rep or 7 juv/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 150-200 gloch/rep or 7 juv/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 150-200 gloch/rep or 7 juv/rep
Control	Dilution water and solvent	3 reps, 150-200 gloch/rep or 7 juv/rep
LC_{50}	Not calculable for either	Method: trimmed Spearman-Karber

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Photoperiod (3), Hypothesis tests (8), Point estimates (8). -25

Acceptability (Table 3.8): Carrier solvent (4), Prior contamination (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Organism acclimation (1), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Hypothesis tests (3), Point estimates (3). -30

Toxicity Data Summary

Xyrauchen texanus

Study: Dwyer FJ, Sappington LC, Buckler DR, Jones SB. 1995. Use of a surrogate species in assessing contaminant risk to endangered and threatened fishes. Final report – September, 1995. EPA/600/R-96/029.

Relevance
Score: 100
Rating: R

Reliability
Score: 75.5
Rating: R

	Dwyer et al. 1995	***X. texanus***
Parameter	**Value**	**Comment**
Test method cited	USEPA 1975, ASTM 1988	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Catostornidae	
Genus	*Xyrauchen*	
Species	*texanus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Run 1) 0.31 ± 0.04 g Run 2) 0.32 ± 0.07 g	
Source of organisms	Fish hatchery	Dexter NFH, Dexter, NM
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Acclimated for 96 h	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	Yes, 12 h, 24 h	
Effect 1	Mortality	
Control response 1	0%	
Effect 2	Muscarinic cholinergic receptor binding	
Control response 2	NR	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	“ambient lighting”	
Dilution water	Reconstituted hard water	
pH	8.35 ± 0.29	
Hardness	173 ± 9 mg/L as CaCO3	
Alkalinity	117 ± 4 mg/L as CaCO3	
Conductivity	NR	

	Dwyer et al. 1995	***X. texanus***
Parameter	**Value**	**Comment**
Dissolved Oxygen	Generally ≥ 60% saturation, but several instances of <60% saturation	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Stocks only	
Measured is what % of nominal?	Tests in 1992: 93% (stocks) Tests in 1993: 128% (stocks)	One sample had recovery of 308% and was not included in average b/c value is thought to be incorrect b/c it did not show differing biological results
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (μg/L)	12 h: 13.05 (>2x aqueous solubility) 24 h: 8.87 96 h: 5.95	Method: probit or nonlinear interpolation

Notes: LC50s are geometric means of the LC50s calculated for each run (n=1-2).

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -19

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -30

Toxicity Data Summary

Xyrauchen texanus

Study: Dwyer FJ, Mayer FL, Sappington LC, Buckler DR, Bridges CM, Greer IE, Hardesty DK, Henke CE, Ingersoll CG, Kunz JL, Whites DW, Augspurger T, Mount DR, Hattala K, Neuderfer GN. 2005. Assessing contaminant sensitivity of endangered and threatened aquatic species: Part I. Acute toxicity of five chemicals. Arch Environ Contam Toxicol 48:143-154.

Relevance
Score: 100
Rating: R

Reliability
Score: 80
Rating: R

	Dwyer et al. 2005	***X. texanus***
Parameter	**Value**	**Comment**
Test method cited	ASTM 2003, Committee on Methods for Toxicity Tests with Aquatic Organisms 1975	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Catostornidae	
Genus	*Xyrauchen*	
Species	*texanus*	Razorback sucker
Family in North America?	Yes	
Age/size at start of test/growth phase	0.32 $\pm$ 0.01 g	From Sappington et al. 2001
Source of organisms	Fish hatchery	NFH and Technology Center Dexter, NM
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	96 h acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	“ambient laboratory lighting”	From Sappington et al. 2001
Dilution water	Reconstituted hard water	

	Dwyer et al. 2005	***X. texanus***
Parameter	**Value**	**Comment**
pH	Slightly above 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	
Dissolved Oxygen	Above acceptable saturation limits	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	Yes	
Measured is what % of nominal?	111% for stock solution, except one individual stock that was 308% - likely an error	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	GC for stocks only	
Concentration of carrier (if any) in test solutions	0.5 mL/L maximum	
Concentration 1 Nom/Meas (µg/L)	6 concentrations, 60% dilution series	2 tests, 3 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Concentration 6 Nom/Meas (µg/L)	NR	2 tests, 3 reps, 10/rep
Control	Solvent and dilution water	2 tests, 3 reps, 10/rep
LC_{50} (µg/L)	5.95	Method: probit or moving-average or nonlinear interpolative procedure

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Organisms randomized (1), Temperature (3), Conductivity (1), Photoperiod (2), Hypothesis tests (3). -10

Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Toxicity Data Summary

Xyrauchen texanus

Study: Sappington LC, Mayer FL, Dwyer FJ, Buckler DR, Jones JR, Ellersieck MR. 2001. Contaminant sensitivity of threatened and endangered fishes compared to standard surrogate species. Environ Toxicol Chem 20:2869-2876.

Relevance
Score: 100
Rating: R

Reliability
Score: 71
Rating: L

*This study reports the same data as in Dwyer et al. 1995, 2005, which are rated RR because they report more information about test conditions, therefore the data in this study will be reported as RR with the data from the other 2 studies.

	Sappington et al. 2001	***X. texanus***
Parameter	**Value**	**Comment**
Test method cited	USEPA, ASTM	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Catostornidae	
Genus	*Xyrauchen*	
Species	*texanus*	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mean wt 0.32 $\pm$ 0.01 g	
Source of organisms	Fish hatchery or commercial source	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	4 d acclimation	
Animals randomized?	NR	
Test vessels randomized?	Yes	
Test duration	96 h	
Data for multiple times?	12 h, 24 h	
Effect 1	Mortality	
Control response 1	96.7%	
Temperature	22 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Reconstituted hard water	
pH	> 8.0	
Hardness	160-180 mg/L as CaCO3	
Alkalinity	110-120 mg/L as CaCO3	
Conductivity	NR	

	Sappington et al. 2001	***X. texanus***
Parameter	**Value**	**Comment**
Dissolved Oxygen	NR	
Feeding	None during test	
Purity of test substance	95.2%	
Concentrations measured?	No	
Measured is what % of nominal?	n/a	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	0.05% acetone or triethylene glycol	
Concentration 1 Nom/Meas (μg/L)	6 concentrations, 60% dilution factor	3 reps, 10/rep
Concentration 2 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 3 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 4 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 5 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Concentration 6 Nom/Meas (μg/L)	NR	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC_{50} (95% confidence interval) (μg/L)	12 h: 13.1 24 h: 8.9 96 h: 6.0 (4.6-7.7)	Method: probit, moving average, untrimmed Spearman-Karber, or nonlinear interpolative procedure

Notes:

Reliability points taken off for:
Documentation (Table 3.7): Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Dissolved oxygen (4), Conductivity (2), pH (3), Photoperiod (3), Hypothesis tests (8). -30

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Organisms randomized (1), Exposure type (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Photoperiod (2), Hypothesis tests (3). -28