

## **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

### *Acartia tonsa*

Study: Barata C, Medina M, Telfer T, Baird DJ. 2002. Determining demographic effects of cypermethrin in the marine copepod *Acartia tonsa*: Stage-specific short tests versus life-table tests. Arch Environ Contam Toxicol 43:373-378.

#### Relevance

Score: 75 (survival), 60 (feeding rate)

Rating: L (survival), N (feeding rate)

#### Reliability

Score: 64

Rating: L

\*No standard method, saltwater, endpoint not linked to survival/reproduction/growth (feeding rate only)

	<b>Barata et al. 2002</b>	<i>A. tonsa</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Maxillopoda	
Order	Calanoida	
Family	Janairoidea	
Genus	<i>Acartia</i>	
Species	<i>tonsa</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Acute test: 20 d-old adult fertile female, eggs, 8-d old copepodids Chronic test: newborn nauplii (< 24 h)	
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	Acute adults: 5 d Acute eggs: 2 d Copepodid feeding: 2 d Chronic: 32 d	
Data for multiple times?	No	
Effect 1	Survival (acute test w/ adults, eggs)	
Control response 1	Adults ~90%, eggs ~78% (estimated from Figure 1A)	
Effect 2	Feeding by 8 d-old	

	<b>Barata et al. 2002</b>	<b><i>A. tonsa</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	copepodids (change in algal cell density)	
Control response 2	~2150 cell/animal/hr (estimated from Figure 1B)	
Effect 3	Egg production (acute)	
Control response 3	~25/female/d (estimated from Figure 1C)	
Temperature	NR for tests, culture condition was 20 °C	
Test type	Static renewal, 48 h renewal	
Photoperiod/light intensity	NR, culture condition was 16 L:8 D	
Dilution water	NR, culture medium was filtered natural seawater (30 psu)	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	fed every other day	
Purity of test substance	99.5%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (ng/L)	Acute: Feeding: 4.2 Chronic: 0.4	Acute: 4 reps; 5 females, 1 male/rep or 100 eggs/rep or 20/rep (feeding) Chronic: 4 reps, 50/rep
Concentration 2 Meas (ng/L)	Acute: 29 Feeding: 7.4 Chronic: 0.7	Same as above
Concentration 3 Meas (ng/L)	Acute: 89.3 Feeding: 22.2 Chronic: 1.1	Same as above
Concentration 4 Meas (ng/L)	Acute: 259.3 Feeding: ~60 (estimated Fig	Same as above

	<b>Barata et al. 2002</b>	<b><i>A. tonsa</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	1B) Chronic: 2.2	
Concentration 5 Meas (ng/L)	Feeding: ~140 (estimated Fig 1B) Chronic: 4.1	Same as above
Concentration 6 Meas (ng/L)	Chronic: 7.4	Same as above
Control	Dilution water	Same as above
LC <sub>50</sub> (95% confidence interval) (ng/L)	Eggs: 128.8 (63.7-197.2) Adults: 108.1 (70.4-146.1)	Method: nonlinear allosteric decay regression model
EC <sub>50</sub> (95% confidence interval) (ng/L)	Feeding rate (8-d olds): 64.6 (40.6-89.1) Clutch size: 167.6 (120.4-217.2)	Method: same as above
NOEC (ng/L)	2 d egg survival: 29.3 5 d adult survival: 29.3 Feeding rate: 7.4 Clutch size: 89.3 (all values assumed as next lowest concentrations tested based on reported LOEC)	Method: 1way ANOVA, 1side Dunnett's multiple comparison test p: NR MSD: NR
LOEC (ng/L)	2 d egg survival: 89.3 5 d adult survival: 89.3 Feeding rate: 22.2 Clutch size: 259.3	Same as above
MATC (GeoMean NOEC,LOEC) (ng/L)	2 d egg survival: 51.2 5 d adult survival: 51.2 Feeding rate: 12.8 Clutch size: 152.2	
% of control at NOEC	2 d egg survival: 113% 5 d adult survival: 100% Feeding rate: 84% Clutch size: 88%	
% of control at LOEC	2 d egg survival: 71% 5 d adult survival: 56% Feeding rate: 83% Clutch size: 24%	

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Measured concentrations (3), Dilution water (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Temperature (4), Conductivity (2), pH (3), Photoperiod (3), Significance level (2), Minimum significant difference (2). -30

Acceptability (Table 3.8): No 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), Temperature (6), Conductivity (1), pH (2), Photoperiod (2), Number of concentrations (3), Random design (2), Minimum significant difference (1). -42

## Toxicity Data Summary

### *Acartia tonsa*

Study: Medina M, Barata C, Telfer T, Baird DJ. 2002. Age- and sex-related variation in sensitivity to the pyrethroid cypermethrin in the marine copepod *Acartia tonsa* Dana. Arch Environ Contam Toxicol 42:17-22.

Relevance

Score: 75

Rating: L

Reliability

Score: 69

Rating: L

\*No standard method, saltwater

	<b>Medina et al. 2002</b>	<i>A. tonsa</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Maxillopoda	
Order	Calanoida	
Family	Janairoidea	
Genus	<i>Acartia</i>	
Species	<i>tonsa</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Nauplii (< 2d old) or adults (mature)	
Source of organisms	Lab colony	
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?	Only on Figures (values could be estimated from graph)	
Effect 1	Mortality	
Control response 1	Nauplii: 12% Adults: 6%	
Temperature	20 °C	
Test type	Static renewal (48 h renewal)	
Photoperiod/light intensity	16 L:8 D	
Dilution water	Filtered seawater	30 psu
pH	NR	
Hardness	NR	

	<b>Medina et al. 2002</b>	<b><i>A. tonsa</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Food present during exposures (phytoplankton)	
Purity of test substance	99.5%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (µg/L)	5 concentrations Nauplii: 0.004-0.1 ug/L Adults: 0.07-1.5 ug/L	3-4 reps Naup: 20/rep Adults: 15/rep
Concentration 2 Nom/Meas (µg/L)	NR	Same as above
Concentration 3 Nom/Meas (µg/L)	NR	Same as above
Concentration 4 Nom/Meas (µg/L)	NR	Same as above
Concentration 5 Nom/Meas (µg/L)	NR	Same as above
Control	Dilution water	Same as above
LC <sub>50</sub> (µg/L)	96 h nauplii: 0.005 96 h adults: 0.142	Method: probit

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), Hypothesis tests (8). -27

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Feeding (3), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Random design (2), Dilution factor (2), Hypothesis tests (3). -35

Toxicity Data Summary

*Acartia tonsa*

Study: Medina M, Barata C, Telfer T, Baird DJ. 2004. Assessing the risks to zooplankton grazers of continuous versus pulsed cypermethrin exposures from marine cage aquaculture. Arch Environ Contam Toxicol 47:67-73.

Relevance

Score: 85

Rating: L

Reliability

Score: 77

Rating: R

\*Saltwater

	<b>Medina et al. 2004</b>	<i>A. tonsa</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	APHA 1989	
Phylum	Arthropoda	
Class	Maxillopoda	
Order	Calanoida	
Family	Janiroidea	
Genus	<i>Acartia</i>	
Species	<i>tonsa</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adults	
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	24 h 1 h	
Data for multiple times?	Yes	
Effect 1	Survival	
Control response 1	24 h: 100% Males 144 h after 1 h pulse: 80%	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	16 L: 8 D	
Dilution water	Filtered seawater	30 psu
pH	NR	
Hardness	NR	
Alkalinity	NR	

	<b>Medina et al. 2004</b>	<b><i>A. tonsa</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Food (phytoplankton) present in dilution water	
Purity of test substance	99.5%	
Concentrations measured?	Yes	
Measured is what % of nominal?	87 ± 5.2%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (µg/L)	0.5/0.2 0.5/0.2	3-4 reps, 40/rep
Concentration 2 Nom/Meas (µg/L)	0.4 0.7	3-4 reps, 40/rep
Concentration 3 Nom/Meas (µg/L)	0.5 5/2.2	3-4 reps, 40/rep
Concentration 4 Nom/Meas (µg/L)	0.9	3-4 reps, 40/rep
Concentration 5 Nom/Meas (µg/L)	3/1.3	3-4 reps, 40/rep
Control	Dilution water	3-4 reps, 40/rep
LC <sub>50</sub> (µg/L)	24 h: 0.75*	Method: probit
NOEC (µg/L)	Survival 144 h after 24 h pulse: < 0.2 Male survival 144 h after 1 h pulse: 0.7	Method: 1 or 2 way ANOVA p: 0.05 MSD: NR
LOEC (µg/L)	Survival 144 h after 24 h pulse: 0.2 Male survival 144 h after 1 h pulse: 2.2	Same as above
MATC (GeoMean NOEC,LOEC) (µg/L)	Male survival 144 h after 1 h pulse: 1.24	
% of control at NOEC	100%	
% of control at LOEC	80%	

Notes:\*estimated from Figure 3. Other LC50's are given in Figure 3 for mortality observed post-exposure

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), Minimum significant difference (2). -21

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Conductivity (1), pH (2), Random design (2), Dilution factor (2), Minimum significant difference (1). -25

Appendix B1: studies rated RR, RL, LR, LL

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

	<b>Cutkomp &amp; Subramanyam 1986</b>	<i>A. aegypti</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Aedes</i>	
Species	<i>aegypti</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	3 <sup>rd</sup> 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	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Cutkomp &amp; Subramanyam 1986</b>	<i>A. aegypti</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Feeding	None during test	
Purity of test substance	94.2%	
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	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 <sub>50</sub> (95% confidence limits) (µg/L)	20 °C: 0.16 (0.13-0.18) 30 °C: 0.34 (0.29-0.39)	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: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 76

Rating: R

\*No standard method

	<b>Stephenson 1982</b>	<i>A. aegypti</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Culicidae	
Genus	<i>Aedes</i>	
Species	<i>aegypti</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	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?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	18 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson 1982</b>	<i>A. aegypti</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution. # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub> (µg/L)	24 h: 1 (0.4-4)	Method: Probit
EC <sub>50</sub> (µg/L)	2 h: 0.05 (0.01-0.09) 24 h: 0.03	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

Appendix B1: studies rated RR, RL, LR, LL

Toxicity Data Summary

*Asellus aquaticus* (>90%)

*Asellus meridianus* (<10%)

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. *Aquatic Toxicology* 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 74

Rating: R

\*No standard method

	<b>Stephanson1982</b>	<b><i>A. aquaticus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Isopoda	
Family	Aselloidea	
Genus	<i>Asellus</i>	
Species	<i>auaticus, meridianus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	3-8 mm	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	15± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephanson1982</b>	<b><i>A. aquaticus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution. # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub> (µg/L)	24 h: 0.2 (0.1-0.4)	Method: Probit
EC <sub>50</sub> (µg/L)	2 h: 0.03 24 h: 0.02	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Prior Contamination (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

Appendix B1: studies rated RR, RL, LR, LL

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: 76.5

Rating: R

\*Saltwater

	<b>Cripe 1994</b>	<b><i>A. bahia</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	ASTM	
Phylum	Arthropoda	
Class	Crustacea (Malacostraca)	
Order	Mysida	
Family	Mysidae	
Genus	<i>Americamysis</i>	
Species	<i>bahia</i>	
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	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Cripe 1994</b>	<i>A. bahia</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
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	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 <sub>50</sub> (95% confidence interval) (µg/L)	0.027 (0.024-0.031)	Method: trimmed Spearman-Kärber

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), Hypothesis tests (3). -23

## Toxicity Data Summary

*Americamysis bahia*

Study: Cripe GM, Ingley-Guezou A, Goodman LR, Forester J. 1989. Effect of food availability on the acute toxicity of four chemicals to *Mysidopsis bahia* (Mysidacea) in static exposures. Environ Toxicol Chem 8:333-338.

Relevance

Score: 85

Rating: L

Reliability

Score: 77.5

Rating: R

\*Saltwater

	<b>Cripe et al. 1989</b>	<b><i>A. bahia</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	USEPA 1985	
Phylum	Arthropoda	
Class	Crustacea (Malacostraca)	
Order	Mysida	
Family	Mysidae	
Genus	<i>Americamysis</i>	
Species	<i>bahia</i>	
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?	No	
Effect 1	Survival	
Control response 1	>90%	
Temperature	25 ± 1°C	
Test type	Static	
Photoperiod/light intensity	14 L:10 D	
Dilution water	Seawater, 20 o/oo salinity	
pH	7.4-8.0	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	4.8 ppm (range 2.9-6.4 ppm)	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Cripe et al. 1989</b>	<b><i>A. bahia</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Feeding	Yes, <i>Artemia</i> of varying nutritional contents	
Purity of test substance	94.5%	
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 (ng/L)	6.0	2 reps, 10/rep
Concentration 2 Nom/Meas (ng/L)	9.9	2 reps, 10/rep
Concentration 3 Nom/Meas (ng/L)	13.6	2 reps, 10/rep
Concentration 4 Nom/Meas (ng/L)	27.6	2 reps, 10/rep
Concentration 5 Nom/Meas (ng/L)	46.0	2 reps, 10/rep
Control	Solvent and dilution water	2 reps, 10/rep
LC <sub>50</sub> (95% confidence interval) (ng/L)	Low feed rate (10 <i>Artemia</i> /mysid/d) Test 1: 12.8 (11.7-14.1) Test 2: 12.8 (10.4-15.8)  Mid feed rate (60 <i>Artemia</i> /mysid/d) Test 1: 20.5 (16.6-25.2) Test 2: 18.2 (14.2-23.2)  High feed rate (110 <i>Artemia</i> /mysid/d) Test 1: 20.4 (18.6-22.5) Test 2: 18.4 (15.6-21.6)	Method: trimmed Spearman-Kärber

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), pH (3), Hypothesis tests (8). -24

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Carrier solvent (4), Feeding (3), Exposure type (2), Hardness (2), Alkalinity (2), Conductivity (1), Hypothesis tests (3). -21

Appendix B1: studies rated RR, RL, LR, LL

Toxicity Data Summary

*Americamysis bahia*

Study: Ward TJ, Boeri RL. 1991. Acute Toxicity of FMC 56701 Technical and Cypermethrin Technical to the Mysid, *Mysidopsis bahia*. FMC A90-3309. EnviroSystems Division: Hampton, NH. CDPR ID: 118793.

Relevance

Score: 85

Rating: L

Reliability

Score: 83.5

Rating: R

\*Saltwater (15)

	<b>Ward &amp; Boeri 1991</b>	<b><i>A. bahia</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	Lab protocol based in EPA (1985, 1988)	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	<i>Americamysis</i>	
Species	<i>bahia</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	<24 hrs	
Source of organisms	Lab Culture	EnviroSystems
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 hrs	
Data for multiple times?	0, 48,72 & 96 hours	
Effect 1	Mortality	
Control response 1 (based on measured concentrations)	0% over 96 hrs control and solvent	
Effect 2	Lethargic and/or displaying erratic swimming	
Control response 2 (based on measured concentrations)	0% over 96 hrs control and solvent	
Temperature	22± 1 °C	
Test type	Flow through	
Photoperiod/light intensity	16 Light: 8 dark	
Dilution water	Filtered sea water (11-17	Hampton, New

Appendix B1: studies rated RR, RL, LR, LL

	<b>Ward &amp; Boeri 1991</b>	<b><i>A. bahia</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	parts per thousand salinity) chemical analysis performed.	Hampshire
pH	7.8-8.0	with salinity of 17 pp thousand
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	> 7.7 mg/L	
Feeding	2x per day during the test	
Purity of test substance	92.3%	
Concentrations measured?	Yes	
Measured is what % of nominal?	Between 40-264%	6 samples analyzed per loading (Analytical).
Toxicity values calculated based on nominal or measured concentrations?	Nominal and mean measured	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (ng/L)	Nom: 1.4 Meas: 3.7	2 reps, 10 organisms per rep
Concentration 2 Nom/Meas (ng/L)	Nom: 2.6 Meas: 3.4	2 reps, 10 organisms per rep
Concentration 3 Nom/Meas (ng/L)	Nom: 5.0 Meas: 3.9	2 reps, 10 organisms per rep
Concentration 4 Nom/Meas (ng/L)	Nom: 10 Meas: 5.4	2 reps, 10 organisms per rep
Concentration 5 Nom/Meas (ng/L)	Nom: 20 Meas: 7.9	2 reps, 10 organisms per rep
Control	Nom: 0.0 (dilution water & solvent) Meas (control): 2.6 Meas (solvent): 3.1	2 reps, 10 organisms per rep
LC <sub>50</sub> 48 hr (ng/L)	Nom: 11.3 (10.0 to 20.0) Meas: 5.8 (3.9 to 7.9)	Method: Binomial/ non-linear interpolation
LC <sub>50</sub> 72 hr (ng/L)	Nom: 8.6 (7.0 to 11.0) Meas: 5.1 (4.8 to 5.7)	Method: Moving average, Probit
LC <sub>50</sub> 96 hr (ng/L)	Nom: 7.0 (5.5-9.1) Meas: 4.9 (4.9-5.4)	Method: Probit

Notes:

Reliability points taken off for:

Appendix B1: studies rated RR, RL, LR, LL

Documentation (Table 3.7): Hardness (2), alkalinity (2), conductivity (2), hypothesis tests (8). -14

Acceptability (Table 3.8): Measured concentrations within 20% nominal (4), carrier solvent  $\leq 0.5\text{mL/L}$  acute (4), feeding (3), hardness (2), alkalinity (2), conductivity (1), Hypothesis tests (3). -19

## Toxicity Data Summary

*Americamysis bahia*

Study: Ward TJ, Boeri RL, Palmieri MA. 1992. Acute toxicity of FMC 56701 technical and cypermethrin technical to mysid, *Mysidopsis bahia*. FMC study number A91-3454. EnviroSystems Division: Hampton, NH. EPA MRID: 42444601.

Relevance

Score: 85

Rating: L

Reliability

Score: 82.5

Rating: R

\*Not Freshwater (15)

	<b>Ward et al. 1992</b>	<b><i>A. bahia</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	EnviroSystems Protocol based on EPA (1985, 1988)	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	<i>Americamysis</i>	
Species	<i>bahia</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile < 24 hours old	
Source of organisms	Lab Culture (EnviroSystems)	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	96 hours	
Data for multiple times?	24, 48, 72 & 96 hours	
Effect 1	Survival	
Control response 1	100% (both dilution water and solvent control)	
Effect 2	Sub-lethal effects (loss of equilibrium, erratic swimming, loss of reflex, excitability, discoloration or change in behavior)	
Control response 2	0% (no effects observed for dilution water or solvent control).	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Ward et al. 1992</b>	<i>A. bahia</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Temperature	22 ± 1C	
Test type	Flow through	
Photoperiod/light intensity	16: 8 light:dark	
Dilution water	Filtered natural seawater 11-17 ppt	Collected at Hampton, New Hampshire
pH	8.0	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	≥ 7.7 mg/L (≥ 78% saturation)	
Feeding	Once per day during testing	
Purity of test substance	95.9%	
Concentrations measured?	Yes	
Measured is what % of nominal?	40-83%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom/Meas (ng/L)	3.75/ 3.1	2 reps, 10/rep
Concentration 2 Nom/Meas (ng/L)	6.25/ 3.9	2 reps, 10/rep
Concentration 3 Nom/Meas (ng/L)	10/ 4.5	2 reps, 10/rep
Concentration 4 Nom/Meas (ng/L)	15/ 6.0	2 reps, 10/rep
Concentration 5 Nom/Meas (ng/L)	25/ 10.3	2 reps, 10/rep
Controls	Solvent and dilution water	2 reps, 10/rep
LC <sub>50</sub> (95 % confidence interval) (ng/L)	24 h: >10 48 h: 7 (6-10) 72 h: 6 (6-7) 96 h: 5 (5-6)	Method: Binomial/nonlinear interpolation or probit
NOEC	3.9 ng/L	

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis Test (6). -12

Appendix B1: studies rated RR, RL, LR, LL

Acceptability (Table 3.8): Measured concentrations within 20% nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms fed during acute test (3), Hardness (2), Alkalinity (2), Conductivity (1), Hypothesis test (3). -23

## Toxicity Data Summary

*Americamysis bahia*

Study: Wheat J. 1993. FMC-30980 (<sup>14</sup>C labeled cypermethrin): Chronic toxicity to the mysid, *Mysidopsis bahia*, under flow-through conditions. FMC Study Number A91-3480. Laboratory project ID: J9205004a. Toxikon Environmental Sciences: Jupiter, FL. EPA MRID 427253-01.

Relevance

Score: 85

Rating: L

Reliability

Score: 86

Rating: R

\*Not Freshwater (15)

	<b>Wheat 1993</b>	<b><i>A. bahia</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	Envirosystems Protocol based on EPA (1985, 1988)	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Mysida	
Family	Mysidae	
Genus	<i>Americamysis</i>	
Species	<i>bahia</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile < 24 hours old	
Source of organisms	Lab Culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	28 days	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	Mean: 8.75% (5-15%)	
Effect 2	Total # offspring/female reproductive day	
Control response 2	Dil: 1.43, Sol: 1.82	
Effect 3	Growth (length)	
Control response 3	7.0 mm	
Temperature	26.1 ± 1.1 °C	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Wheat 1993</b>	<i>A. bahia</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test type	Flow-through	
Photoperiod/light intensity	16:8 light dark	
Dilution water	Natural sea water filtered salinity between 19-22o/oo	Collected at Hampton, New Hampshire
pH	8.1-8.5	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	≥ 4.4 – 7.0 mg/L (≥ 61- 95% saturation)	
Feeding	Brine Shrimp. Once per day during testing	
Purity of test substance	98.1%	
Concentrations measured?	Yes	
Measured is what % of nominal?	39-50%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	0.0004% DMF	
Concentration 1 Nom/Meas (ng/L)	0.250/ 0.125	2 reps, 20/rep
Concentration 2 Nom/Meas (ng/L)	0.500/ 0.233	2 reps, 20/rep
Concentration 3 Nom/Meas (ng/L)	1.00/ 0.411	2 reps, 20/rep
Concentration 4 Nom/Meas (ng/L)	2.00/ 0.781	2 reps, 20/rep
Concentration 5 Nom/Meas (ng/L)	4.00/ 1.976	2 reps, 20/rep
Controls	Solvent and dilution water	2 reps, 20/rep
NOEC (ng/L)	Mortality: 0.781 Length: 0.781	Method: student's t-test p: 0.05 MSD: NR
LOEC (ng/L)	Mortality: 1.976 Length: 1.976	
MATC (geomean NOEC, LOEC) (ng/L)	Mortality: 1.242 Length: 1.242	
% control at NOEC	Mortality: 15/8.75= 171% Length: 7.1/7.0= 101%	
% control at LOEC	Mortality: 35/8.75= 400% Length: 6.8/7.0= 97%	

Notes:

Reliability points taken off for:

Appendix B1: studies rated RR, RL, LR, LL

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% nominal (4), Hardness (2), Alkalinity (2), Conductivity (1), Point estimates (3). -12

## 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  
Rating: R

	<b>Wheelock <i>et al.</i> 2004</b>	<b><i>C. dubia</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	EPA	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	<i>Ceriodaphnia</i>	
Species	<i>dubia</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 24-h-old	
Source of organisms	Lab cultures; obtained from AQUA-Science (Davis, CA, USA)	
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 °C	
Test type	Static	
Photoperiod/light intensity	16:8-h light : dark	
Dilution water	U.S. EPA moderately hard	Reverse osmosis–treated well water
pH	7.4–7.8	
Hardness	80–100 mg/L	
Alkalinity	60–70 mg/L	
Conductivity	Not reported	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Wheelock <i>et al.</i> 2004</b>	<b><i>C. dubia</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Dissolved Oxygen	Not reported	
Feeding	Prior to test but not during	
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	<0.1 %	
Concentration 1 Nom/Meas (µg/L)	5-7 concentrations	2-4 reps w/ 5 neonates each
Control	Water and methanol control	2-4 reps w/ 5 neonates each
LC <sub>50</sub> (µg/L)	48 h: 0.683 ± 0.072	Calculated from the mortality data using ToxCalc Software.

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), Exposure type (2), Appropriate spacing between concentrations (2), Appropriate statistical method (2), Hypothesis tests (3)

Appendix B1: studies rated RR, RL, LR, LL

Toxicity Data Summary

*Chaoborus crystallinus* (>85%)

*Chaoborus flavicens* (<15%)

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. *Aquatic Toxicology* 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 74

Rating: R

\*No standard method

	<b>Stephenson1982</b>	<b><i>C. crystallinus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family	Chaoboridae	
Genus	<i>Chaoborus</i>	
Species	<i>crystallinus, flavicens</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Larvae	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	15± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 + 20 mg/L as	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson1982</b>	<i>C. crystallinus</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	CaCO3	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution. # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub> (µg/L)	24 h: 0.2 (0.03-0.4)	Method: Probit
EC <sub>50</sub> (µg/L)	2 h: 0.09 (0.02-0.2) 24 h: 0.03	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Prior Contamination (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

## Toxicity Data Summary

*Chironomus thummi*

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 74

Rating: R

\*No standard method

	<b>Stephenson 1982</b>	<i>C. thummi</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera	
Family		
Genus	<i>Chironomus</i>	
Species	<i>thummi</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Larvae	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	15 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson 1982</b>	<b><i>C. thummi</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution. # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub>	24 h: $\geq 5$	Method: Probit
EC <sub>50</sub>	2 h: 0.1 (0.07-0.2) 24 h: 0.2 (0.1-0.3)	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Prior contamination (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

## Toxicity Data Summary

*Cloeon dipterum*

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 74

Rating: R

\*No standard method

	<b>Stephenson 1982</b>	<i>C. dipterum</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Ephemeroptera	
Family		
Genus	<i>Cloeon</i>	
Species	<i>dipterum</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Larvae	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	15 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson 1982</b>	<i>C. dipterum</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution. # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub> (µg/L)	0.6 (0.3-1)	Method: Probit
EC <sub>50</sub> (µg/L)	0.07 (0.04-0.2)	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Prior contamination (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

## Toxicity Data Summary

*Corixa punctata*

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 74

Rating: R

\*No standard method

	<b>Stephenson1982</b>	<i>C. punctata</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Hemiptera	
Family	Corixidae	
Genus	<i>Corixa</i>	
Species	<i>punctata</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adults	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	15± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson1982</b>	<i>C. punctata</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution. # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub> (µg/L)	24 h: $\geq 5$	Method: Probit
EC <sub>50</sub> (µg/L)	2 h: 0.5 (0.4-0.8) 24 h: 0.7 (0.4-2)	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Prior Contamination (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

## Toxicity Data Summary

*Cyprinodon variegatus*

Study: Chandler AB. 1990. FMC 45806: Acute toxicity to sheepshead minnow (*Cyprinodon variegatus*) under flow-through test conditions. Laboratory project ID: 3903026-0350-3140. ESE: Gainesville, FL. CDPR: 118791.

Relevance

Score: 75

Rating: L

Reliability

Score: 83.5

Rating: R

\*No standard method, saltwater

	<b>Chandler 1990</b>	<b><i>C. variegatus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	Follows an FMC protocol sited but not included in report	Not Acceptable
Phylum	Chordata	
Class	Actinopterygii	
Order	Cyprinodontiformes	
Family	Cyprinodontidae	
Genus	<i>Cyprinodon</i>	
Species	<i>variegatus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	2 lots of fish: Lot 1) 107 days old at start of test and Lot 2) 87 days old at start of test. Both lots within the 'juvenile' range for <i>C. Variegatus</i> . Average length: 20.5 ± 2.26mm,	
Source of organisms	Lab Culture	Aquatic Biosystems, Inc., Ft. Collins, CO)
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 Hours	
Data for multiple times?	24, 48, 72, 96 hours	
Effect 1	Mortality	
Control response 1	0%	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Chandler 1990</b>	<i>C. variegatus</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Effect 2	Non-lethal effects	
Control response 2	Surviving fish in 4.07 µg/L exhibited loss of equilibrium after 48hrs.	
Temperature	20-22 C	
Test type	Flow-through	
Photoperiod/light intensity	16:8 hours Light: Dark	
Dilution water	Filtered sea water with salinity of 20 parts per thousand. Sea water collected from Atlantic Ocean near Marineland Florida and adjusted with well water. Chemical characterization performed.	
pH	7.9-8.3	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	≥ 6 mg/L (≥ 78% saturation)	
Feeding	Not During Test	
Purity of test substance	91.5%	
Concentrations measured?	Yes	
Measured is what % of nominal?	31-52%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	77µg DMF/L	
Concentration 1 Nom/Meas (µg/L)	0.78/ 0.391	2 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	1.30/ 0.532	2 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	2.16/ 0.675	2 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	3.60/ 1.87	2 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	6.0/ 4.07	2 reps, 10/rep
Control	Solvent and dilution water	2 reps, 10/rep
LC <sub>50</sub> (95% confidence interval) (µg/L)	24 h: >4.61 48 h: >2.14 72 h: > 2.14	Method: non-linear interpolation

Appendix B1: studies rated RR, RL, LR, LL

	<b>Chandler 1990</b>	<i>C. variegatus</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	96 h: 3.42 (1.87-4.07) Or 3.88 (2.14-4.61) ? Lower value is given in report body, while higher value is given in Table 3-4	

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Hardness (2), Alkalinity (2), Conductivity (2), Hypothesis tests (8). -14

Acceptability (Table 3.8): Acceptable standard method (5), Measured concentrations within 20% nominal (4), Hardness (2), Alkalinity (2), Conductivity (1), Random block design (2), Hypothesis test (3). -19

## Toxicity Data Summary

*Cyprinus carpio*

Study: Aydin R, Koprucu K, Dorucu M, Koprucu SS, Pala M. 2005. Acute toxicity of synthetic pyrethroid cypermethrin on the common carp (*Cyprinus carpio* L.) embryos and larvae. *Aquaculture International* 13:451-458.

Relevance

Score: 75

Rating: L

Reliability

Score: 74.5

Rating: R

\*No standard method, Low chemical purity

	<b>Aydin et al. 2005</b>	<b><i>C. carpio</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	<i>Cyprinus</i>	
Species	<i>carpio</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Eggs Larvae (hatched eggs)	
Source of organisms	Fish hatchery in Turkey	
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	Larval mortality	
Control response 1	96 h: 11.9%	
Effect 2	Embryo hatching success	
Control response 2	95.1%	
Effect 3	Number of dead embryos	
Control response 3	4.9%	
Temperature	24 ± 1°C	
Test type	Static renewal, 12 h renewal	
Photoperiod/light intensity	12 L:12 D	
Dilution water	NR	
pH	7.3 ± 0.3	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Aydin et al. 2005</b>	<b><i>C. carpio</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Hardness	120.5 ± 3.4 mg/L	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	7.8 ± 0.2 mg/L	
Feeding	Initiated in larvae after yolk sack absorption	
Purity of test substance	20%	
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 (µg/L)	0.0001	5 reps, 200/rep
Concentration 2 Nom (µg/L)	0.001	5 reps, 200/rep
Concentration 3 Nom (µg/L)	0.01	5 reps, 200/rep
Concentration 4 Nom (µg/L)	0.1	5 reps, 200/rep
Concentration 5 Nom (µg/L)	1	5 reps, 200/rep
Concentration 6 Nom (µg/L)	2	5 reps, 200/rep
Concentration 7 Nom (µg/L)	4	5 reps, 200/rep
Concentration 8 Nom (µg/L)	8	5 reps, 200/rep
Control	Solvent	5 reps, 200/rep
LC <sub>50</sub> (µg/L)	Larval mortality: 1 h: 7.816 (2.829-33.652) 24 h: 6.196 (2.481-22.897) 48 h: 2.940 (1.327-8.125) 72 h: 1.304 (0.612-3.389) 96 h: 0.809 (0.530-1.308)	Method: probit
NOEC (µg/L)	Larval mortality: <0.0001	Method: chi-square test p: 0.05 MSD: NR
LOEC (µg/L)	Larval mortality: 0.0001	Same as above
MATC (GeoMean NOEC,LOEC)	Not calculable	
% of control at NOEC	Not calculable	
% of control at LOEC	186/119=156%	

Notes:

Reliability points taken off for:

Appendix B1: studies rated RR, RL, LR, LL

Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Dilution water (3), Alkalinity (2), Conductivity (2), Minimum significant difference (2), % control of NOEC/LOEC (2). -18

Acceptability (Table 3.8): No standard method (5), Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Dilution water (2), Alkalinity (2), Conductivity (1), Random design (2), NOEC response reasonable (1), Minimum significant difference (1). -33

## Toxicity Data Summary

*Cyprinus carpio*

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 72

Rating: L

\*No standard method, control response not reported

	<b>Stephenson 1982</b>	<b><i>C. carpio</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	<i>Cyprinus</i>	
Species	<i>carpio</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	8-10 g	
Source of organisms	Commercial hatchery	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes (10 d)	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	Test 1) 10 ± 1°C Test 2) 20-25°C	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	
Alkalinity	NR	
Conductivity	NR	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson 1982</b>	<i>C. carpio</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	85-95%	
Concentrations measured?	Yes	
Measured is what % of nominal?	>70%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (µg/L)	Test 1) 5 conc (0.44-1.1) Test 2) 6 conc (0.48-1.8)	1 rep, 5/rep
Control	Dilution water	1 rep, 5/rep
LC <sub>50</sub> (µg/L)	Test 1) 0.9 (0.6-1.7) Test 2) 1.1 (0.6-2.8)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Organisms/rep (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -35

## Toxicity Data Summary

*Daphnia magna*

Study: Kim Y, Jung J, Oh S, Choi K. 2008. Aquatic toxicity of cartap and cypermethrin to different life stages of *Daphnia magna* and *Oryzias latipes*. Journal of Environmental Science and Health B 43:56-64.

Relevance

Score: acute: 92.5, chronic: 92.5

Rating: R

Reliability

Score: acute: 68, chronic: 69

Rating: acute: L, chronic: L

\*acute: control response not reported, chronic: control response not clearly reported, not clear if it is acceptable or not.

	<b>Kim et al. 2008</b>	<b><i>D. magna</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	USEPA 2002, OECD	
Phylum	Arthropoda	
Class	Crustacea (Branchiopoda)	
Order	Diplostraca (Cladocera)	
Family	Daphniidae	
Genus	<i>Daphnia</i>	
Species	<i>magna</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Acute & chronic: < 24 h neonates Chronic: 7 d old juveniles	
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	Acute: 96 h Chronic: 21 d	
Data for multiple times?	No	
Effect 1	Brood number/female	
Control response 1	Neonates: 5.1 Juveniles: 6	
Effect 2	Number of young/female (not clear if per brood or total)	
Control response 2	Neonates: 18 Juveniles: 14.5	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Kim et al. 2008</b>	<b><i>D. magna</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Effect 3	Immobility	
Control response 3	NR	
Temperature	21.0 ± 1.0 °C	
Test type	Static renewal, 48 h renewal	
Photoperiod/light intensity	NR	
Dilution water	Moderately hard water	
pH	7.9 ± 0.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	325-338 uS	
Dissolved Oxygen	8.4-8.8	
Feeding	Daily for chronic; for acute, at 48 h before renewal to minimize sorption to food	
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	0.5% DMSO	
Concentration 1 Nom (µg/L)	Acute: 0.0003 Chronic neonate: 0.0000002 Chronic juvenile: 0.00002	Acute: 4 reps, 5/rep Chronic: 10 reps, 10/rep
Concentration 2 Nom (µg/L)	Acute: 0.003 Chronic neonate: 0.000002 Chronic juvenile: 0.0002	Acute: 4 reps, 5/rep Chronic: 8 reps, 10/rep
Concentration 3 Nom (µg/L)	Acute: 0.03 Chronic neonate: 0.00002 Chronic juvenile: 0.002	Acute: 4 reps, 5/rep Chronic: 9 reps, 10/rep
Concentration 4 Nom (µg/L)	Acute: 0.3 Chronic neonate: 0.0002 Chronic juvenile: 0.02	Acute: 4 reps, 5/rep Chronic: 6 reps, 10/rep
Concentration 5 Nom (µg/L)	Acute: 3 Chronic neonate: 0.002 Chronic juvenile: 0.2	Acute: 4 reps, 5/rep Chronic: 3 reps, 10/rep
Concentration 6 Nom (µg/L)	Acute: 30	Acute: 4 reps, 5/rep
Concentration 7 Nom (µg/L)	Acute: 62.5	Acute: 4 reps, 5/rep
Concentration 8 Nom (µg/L)	Acute: 125	Acute: 4 reps, 5/rep
Concentration 9 Nom (µg/L)	Acute: 250	Acute: 4 reps, 5/rep
Concentration 10 Nom (µg/L)	Acute: 500	Acute: 4 reps, 5/rep
Concentration 11 Nom (µg/L)	Acute: 1000	Acute: 4 reps, 5/rep

Appendix B1: studies rated RR, RL, LR, LL

	<b>Kim et al. 2008</b>	<b><i>D. magna</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Control	Acute: Solvent and dilution water Chronic: probably dilution water, use of solvent control not reported	Acute: 4 reps, 5/rep Chronic: 9 reps, 10/rep
EC <sub>50</sub> (95% confidence interval) (µg/L)	48 h: 0.10 (0.035-0.28) 72 h: 0.002 (0.0011-0.005) 96 h: 0.0006 (0.0003-0.0011)	Method: calculated with ToxStat program
NOEC (µg/L)	Neonates Brood #/female: 0.00002 # young/female: 0.0000002 7 d juveniles Brood #/female: 0.02 # young/female: 0.00002	Method: ANOVA p: *<0.05, ** <0.01 MSD: NR
LOEC	Neonates Brood #/female: 0.0002* # young/female: 0.000002** 7 d juveniles Brood #/female: 0.2** # young/female: 0.0002**	Same as above
MATC (GeoMean NOEC,LOEC)	Neonates Brood #/female: 0.000063 # young/female: 0.00000063 7 d juveniles Brood #/female: 0.063 # young/female: 0.000063	
% of control at NOEC	Neonates Brood #/female: 4.8/5.1=94% # young/female: 17/18=94% 7 d juveniles Brood #/female: 5/6=83% # young/female: 12/14.5=83%	
% of control at LOEC	Neonates Brood #/female: 3.5/5.1=68% # young/female: 14/18=78% 7 d juveniles Brood #/female: 3.9/6=65% # young/female: 11/14.5=76%	

Notes:

## Appendix B1: studies rated RR, RL, LR, LL

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Statistical methods (5 – acute only), Hypothesis tests (8-acute only), Minimum significant difference (2 – chronic only), Point estimates (8 – chronic only). A: -27, C: -24

Acceptability (Table 3.8): Appropriate control (6 – chronic only), Control response (9), Measured concentrations within 20% of nominal (4), Concentrations > 2x aqueous solubility (4 – acute only), Carrier solvent (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Photoperiod (2), Random design (2), Dilution factor too large (2), Statistical method (2 – acute only), Hypothesis tests (3 – acute only), Minimum significant difference (1 – chronic only), Point estimates (3 – chronic only). A: -37, C: -38

## Toxicity Data Summary

*Daphnia magna*

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 76

Rating: R

\*No standard method

	<b>Stephenson1982</b>	<i>D. magna</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Crustacea	
Order	Cladocera	
Family	Daphniidae	
Genus	<i>Daphnia</i>	
Species	<i>magna</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 24 h	
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?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	18 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson1982</b>	<b><i>D. magna</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution. # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub>	24 h: 2 (1-5)	Method: Probit
EC <sub>50</sub>	2 h: ≥ 5 24 h: 2 (1-3)	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

## Toxicity Data Summary

*Daphnia magna*

Study: Ward TJ, Boeri RL. 1991. Acute toxicity of FMC 56701 technical and cypermethrin technical to daphnid, *Daphnia magna*. FMC Study: A90-3310. EnviroSystems Division: Hampton, NH. CDPR ID: 118786.

Relevance  
Score: 100  
Rating: R

Reliability  
Score: 90  
Rating: R

	<b>Ward &amp; Boeri 1991</b>	<b><i>D. magna</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	US EPA (1985, 1988)	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	<i>Daphnia</i>	
Species	<i>magna</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile First Instar (<24hrs 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?	Yes	
Test duration	48 hrs	
Data for multiple times?	Yes (24 & 48 hr)	
Effect 1	Survival	
Control response 1	100% Survival (water and solvent control)	
Effect 2	Sublethal Effects (Immobilization & Loss of Equilibrium, Erratic swimming, loss of reflex, discoloration or change in behavior.)	
Control response 3	0% in solvent and water controls.	
Temperature	20 ± 1°C	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Ward &amp; Boeri 1991</b>	<b><i>D. magna</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test type	Static Renewal	
Photoperiod/light intensity	16:8 hour light: dark	
Dilution water	Filtered well water	
pH	6.8-7.7	
Hardness	180 mg/L	
Alkalinity	NR	
Conductivity	800 (umhos/cm)	
Dissolved Oxygen	6.9 mg/L	
Feeding	None during test	
Purity of test substance	92.3%	
Concentrations measured?	Yes	
Measured is what % of nominal?	20-60%	
Toxicity values calculated based on nominal or measured concentrations?	Mean measured	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	Acetone: 0.5mL/L	
Concentration 1 Nom/Meas (µg/L)	Nom.: 0.025 Meas: 0.040 ± 0.011	2 reps, 10 animals per rep
Concentration 2 Nom/Meas (µg/L)	Nom.: 0.040 Meas.: 0.061± 0.025	
Concentration 3 Nom/Meas (µg/L)	Nom.: 0.060 Meas.:0.067± 0.040	
Concentration 4 Nom/Meas (µg/L)	Nom.: 0.150 Meas.: 0.148 ± 0.051	
Concentration 5 Nom/Meas (µg/L)	Nom.: 0.250 Meas.: 0.249± 0.057	
Concentration 6 Nom/Meas (µg/L)	Nom.: 0.400 Meas.: 0.386 ± 0.102	
Control	0.01ug/L	
LC <sub>50</sub> (95% confidence interval) (µg/L)	24 h: >0.386 48 h: 0.134 (0.114-0.157)	Method: probit

Notes: Points deducted for the % nominal as the lowest 2 loadings were greater than 20% and these values were used in the calculation of the LC50.

Reliability points taken off for:

Documentation (Table 3.7): Alkalinity (2), Hypothesis Test (8). -10

Acceptability (Table 3.8): Measured concentrations within 20% nominal (4), Organisms randomized (1), Alkalinity (2), Hypothesis tests (3). -10

## Toxicity Data Summary

*Daphnia magna*

Study: Wheat J, Evans J. 1994. Zetacypermethrin technical and cypermethrin technical: Comparative acute toxicity to the water flea, *Daphnia magna*, under flow-through conditions. FMC Study No. A92-3636. Laboratory project ID: J9210001b. Toxikon Environmental Sciences: Jupiter, FL. EPA MRID 432935-01.

Relevance

Score: 100

Rating: R

Reliability

Score: 90

Rating: R

	<b>Wheat &amp; Evans 1994</b>	<b><i>D. magna</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	US EPA (1985, 1988)	
Phylum	Arthropoda	
Class	Branchiopoda	
Order	Cladocera	
Family	Daphniidae	
Genus	<i>Daphnia</i>	
Species	<i>magna</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juvenile First Instar (<24hrs old)	
Source of organisms	Lab culture	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	48 hrs	
Data for multiple times?	Yes (24 & 48 hr)	
Effect 1	Mortality	
Control response 1	5%	
Temperature	20 ± 1°C	
Test type	Flow Through	
Photoperiod/light intensity	16:8 hour light: dark	
Dilution water	Filtered tap water	
pH	6.8-7.0	
Hardness	Moderately Hard (80-84 mg CaCO <sub>3</sub> /L )	
Alkalinity	13 m/L CaCO <sub>3</sub>	
Conductivity	413 to 421 (umhos/cm)	
Dissolved Oxygen	69-80% saturation (6.2-7.7	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Wheat &amp; Evans 1994</b>	<b><i>D. magna</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	mg/L)	
Feeding	None during test	
Purity of test substance	95.7%	
Concentrations measured?	Yes- control	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	
Chemical method documented?	Yes	
Concentration of carrier (if any) in test solutions	11.3 uL/L DMF	
Concentration 1 Nom/Meas (µg/L)	0.084	2 reps, 10 animals per rep
Concentration 2 Nom/Meas (µg/L)	0.139	
Concentration 3 Nom/Meas (µg/L)	0.232	
Concentration 4 Nom/Meas (µg/L)	0.387	
Concentration 5 Nom/Meas (µg/L)	0.645	
Concentration 6 Nom/Meas (µg/L)	1.075	
Control	Solvent and dilution water	
LC <sub>50</sub> (95% confidence interval) (µg/L)	48 h: 0.1615 (0.1344-0.1917)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Measured concentrations (3), Hypothesis tests (8). -11

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Dilution water source (2), Hypothesis test (3). -9

## Toxicity Data Summary

*Gammarus pulex*

Study: Adam O, Badot P-M, Degiorgi F, Crini G. 2009. Mixture toxicity assessment of wood preservative pesticides in the freshwater amphipod *Gammarus pulex* (L.). *Ecotoxicology and Environmental Safety* 72:441-449.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 63

Rating: L

\*No standard method, Control response not acceptable

	<b>Adam et al. 2009</b>	<b><i>G. pulex</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Amphipoda	
Family	Gammaridae	
Genus	<i>Gammarus</i>	
Species	<i>pulex</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adults, >6 mm	
Source of organisms	Collected in field from an unpolluted stream	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Acclimated at least 10 d	
Animals randomized?	Yes	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	Yes, but only estimated from Fig 2	
Effect 1	Mortality	
Control response 1	5-13.3%	
Temperature	15 °C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Mineral water	
pH	6.99 ± 0.02	
Hardness	NR	
Alkalinity	NR	
Conductivity	252 ± 8 uS/cm	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Adam et al. 2009</b>	<i>G. pulex</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Dissolved Oxygen	49 ± 8% saturation at 96 h	
Feeding	NR	
Purity of test substance	97.0%	
Concentrations measured?	Yes	
Measured is what % of nominal?	Mean: 46% at 96 h	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC-ECD	
Concentration of carrier (if any) in test solutions	0.01% acetonitrile	
Concentration 1 Nom/Meas (µg/L)	0-0.2, # of concentrations NR	6 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	0.050/0.048 (meas. at t <sub>0</sub> )	6 reps, 10/rep
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	6 reps, 10/rep
LC <sub>50</sub> (95 % confidence interval) (µg/L)	24 h: 0.12* (0.116-0.135) 48 h: 0.11* (0.098-0.116) 72 h: 0.092* (0.084-0.103) 96 h: 0.09 (0.082-0.101)	Method: Hill's model

Notes: \*LC50 values estimated from Fig. 2, but 95% confidence intervals are reported in Table 4.

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Organism size (3), Feeding (3), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Photoperiod (2), Number of concentrations (3), Random design (2), Dilution factor (2), Statistical method (2), Hypothesis tests (3). -53

## Toxicity Data Summary

*Gammarus pulex*

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 74

Rating: R

\*No standard method

	<b>Stephenson1982</b>	<b><i>G. pulex</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Crustacea (Malacostraca)	
Order	Amphipoda	
Family	Gammaridae	
Genus	<i>Gammarus</i>	
Species	<i>pulex</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	3-8 mm	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	15± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	
Alkalinity	NR	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson1982</b>	<b><i>G. pulex</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution. # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub>	24 h: 0.1 (0.08-0.2)	Method: Probit
EC <sub>50</sub>	2 h: 0.08 (0.06-0.1) 24 h: 0.04 (0.02-0.06)	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Prior Contamination (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

## Toxicity Data Summary

*Gyrinus natator*

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 74

Rating: R

\*No standard method

	<b>Stephenson 1982</b>	<b><i>G. natator</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Coleoptera	
Family	Gyrinidae	
Genus	<i>Gyrinus</i>	
Species	<i>natator</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adults	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	15 ± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson 1982</b>	<b><i>G. natator</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub> (µg/L)	24 h: $\geq 5$	Method: Probit
EC <sub>50</sub> (µg/L)	2 h: 0.2 24 h: 0.07 (0.04-0.2)	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Prior contamination (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

## Toxicity Data Summary

*Hyaella azteca*

Study: Weston DP, Jackson CJ. 2009. Use of Engineered Enzymes to Identify Organophosphate and Pyrethroid-Related Toxicity in Toxicity Identification Evaluations. Environ Sci Technol 43:5514-5520.

Relevance

Score: 100, 85 (impaired swimming)

Rating: R, L (impaired swimming)

Reliability

Score: 87.5

Rating: R

\*Endpoint not linked to survival/growth/reproduction (impaired swimming only)

Reference	Weston & Jackson 2009	<i>H. azteca</i>
Parameter	Value	Comment
Test method cited	USEPA	Modified for <i>H. azteca</i>
Phylum	Arthropoda	
Class	Crustacea - Malacostraca	
Order	Amphipoda	
Family	Hyaellidae	
Genus	<i>Hyaella</i>	
Species	<i>azteca</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	7- 14 d <sup>†</sup>	
Source of organisms	Lab culture <sup>†</sup>	Weston Lab
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes <sup>†</sup>	
Animals randomized?	Yes <sup>†</sup>	
Test vessels randomized?	Yes <sup>†</sup>	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	median control survival was 95% (range 84-100%). Median solvent control survival for the acetone carrier was 98% (84-100%)	
Effect 2	Impaired swimming*	
Control response 2	Survivors never had impaired control response	
Temperature	23 °C	

Appendix B1: studies rated RR, RL, LR, LL

Reference	Weston & Jackson 2009	<i>H. azteca</i>
Parameter	Value	Comment
Test type	Static renewal (48 h)	
Photoperiod/light intensity	16:8 (light:dark)	
Dilution water	EPA moderately hard water, from purified water	
pH	7.5 <sup>†</sup>	
Hardness	90 mg/L as CaCO <sub>3</sub> <sup>†</sup>	
Alkalinity	60 mg/L as CaCO <sub>3</sub> <sup>†</sup>	
Conductivity	335 umhos/cm <sup>†</sup>	
Dissolved Oxygen	7.4 mg/L <sup>†</sup>	
Feeding	Yes, but appropriate	DO depletion & sorption minimized by feeding 6h prior to renewal
Purity of test substance	> 98% <sup>†</sup>	
Concentrations measured?	Yes, see notes	
Measured is what % of nominal?	median 114% of nominal; range 64-189%	Pyrethroid conc. declined to a median of 34% of initial nominal conc. within 48 h (range <12-72%, n = 9).
Chemical method documented?	Yes	GC-uECD
Concentration of carrier (if any) in test solutions	Acetone, < 32 µL/L	
Concentration 1 Nom	5-8 conc. separated by a factor of 0.5 (e.g., 20, 10, 5, 2.5, 1.3 ng/L)	3 reps and 10/rep
Control	solvent	3 reps and 10/rep
LC <sub>50</sub> (95% confidence interval) (ng/L)	2.1 (1.7-2.5) 2.3 (1.3-3.5) 3.1 (2.0-4.4)	Probit
EC <sub>50</sub> (95% confidence interval) (ng/L)	1.6 (1.4-1.9) 1.7 (1.4-1.9) 1.8 (0.9-2.6)	Probit

Other notes:

<sup>†</sup>Indicates information was gathered or clarified via email communication with the author Dr. Donald Weston (dweston@berkeley.edu).

\*Most impaired organisms were lying on their sides, able only to twitch one or more appendages. For those few individuals still able to swim, movement was poorly coordinated and swimming limited to only a few body lengths. Therefore, we also recorded the proportion of animals able to swim normally, with results reported as the median effective concentration (EC<sub>50</sub>).

## Appendix B1: studies rated RR, RL, LR, LL

When spiking water or sediment with pesticides, samples to determine the actual pesticide concentration were taken from one concentration step in the midpoint of the range used. For the water tests, the initial water concentration was determined at time 0 and again when fresh solutions were prepared at 48 h. The two samples were either analyzed separately or as a composite. Samples were also taken of water that had been in the beakers for the maximum period (at the end of the first and second 48 h intervals, combined as a composite).

The average pyrethroid concentrations to which *H. azteca* were exposed were approximated as the nominal concentration minus one-half of the 66% nonenzymatic loss over 48 h (i.e., average actual concentration equal to 33% less than nominal). All reported water concentrations are actual values, derived from nominal concentrations adjusted by this factor.

### **Reliability Scoring**

Documentation points taken off for: Nominal concentrations (3), Measured concentrations (3), Hypothesis tests (8). -14

Acceptability points taken off for: Meas. conc. w/in 20% of nom. (4), Conc. not > 2x water solubility (4), Hypothesis tests (3). -11

Appendix B1: studies rated RR, RL, LR, LL

Toxicity Data Summary

*Hyaella azteca*

Study: Hamer MJ. 1997. Cypermethrin: Acute toxicity of short-term exposures to *Hyaella azteca*. Zeneca Agrochemicals, Jealott's Hill Research Station: Bracknell (Berkshire), UK. Laboratory project ID: TMJ3904B. EPA MRID: 44423501.

Relevance

Score: 90

Rating: R

Reliability

Score: 74

Rating: R

\*No standard method

Reference	Hamer 1997	<i>H. azteca</i>
Parameter	Value	Comment
Test method cited	None	
Phylum	Arthropoda	
Class	Crustacea - Malacostraca	
Order	Amphipoda	
Family	Hyaellidae	
Genus	<i>Hyaella</i>	
Species	<i>azteca</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adult	
Source of organisms	Lab Culture	Jealott's Hill Research Station
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?	Exposure for different durations, but only calculated 96hr EC50	
Effect 1	Mortality	
Control response 1	10%	
Temperature	23 ± 2°C	
Test type	Static renewal (renewal 24 h)	
Photoperiod/light intensity	16:8 (light:dark)	
Dilution water	NR	

Appendix B1: studies rated RR, RL, LR, LL

Reference	Hamer 1997	<i>H. azteca</i>
Parameter	Value	Comment
pH	NR	
Hardness	Hard 160-180 mg CaCO <sub>3</sub> /L	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	Yes, but appropriate	
Purity of test substance	RADIO-CHEMICAL 97%	<sup>14</sup> C
Concentrations measured?	Yes, Liquid Scintillation Counting (LSC)	
Measured is what % of nominal?	~ 80% for concentrations above detection limits	
Chemical method documented?	Yes	LSC
Toxicity values calculated with measured or nominal concentrations?	Nominal	
Concentration of carrier (if any) in test solutions	Acetone, < 5 µL/L	
Concentration 1 Nom/Meas (ng/L)	25/ 24	1 rep, 10/rep
Concentration 2 Nom/Meas (ng/L)	12.5/ <10	
Concentration 3 Nom/Meas (ng/L)	6.25/ <10	
Concentration 4 Nom/Meas (ng/L)	3.13/ <10	
Concentration 5 Nom/Meas (ng/L)	1.56/ <10	
Concentration 6 Nom/Meas (ng/L)	0.78/ <10	
Control	Solvent	
EC <sub>50</sub> (95% confidence interval) (ng/L)	Survival at 96 h after an exposure duration of: 1 h: 170 (110-230) 3 h: 87 (37-310) 6 h: 56 (38-81) 12 h: 23 (10-54) 96 h: 3.6 (2-4.9)	Method: Probit

Other notes:

Reliability Scoring

Documentation points taken off for: Dilution water source (3), Alkalinity (2), Dissolved oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8). -22

Appendix B1: studies rated RR, RL, LR, LL

Acceptability points taken off for: Acceptable standard method (5), Appropriate size/age/growth (3), Organisms randomly assigned to test containers (1), Dilution water source (2), Dissolved oxygen (6), Temperature held to +/- 1C (3), Conductivity (1), pH (2), Random block (2), Adequate replicates (2), Hypothesis tests (3). -30

## Toxicity Data Summary

*Lymnaea acuminata*

Study: Tripathi PK, Singh A. 2004. Toxic effects of cypermethrin and alphasmethrin on reproduction and oxidative metabolism of the freshwater snail, *Lymnaea acuminata*. *Ecotoxicology and Environmental Safety* 58:227-235.

Relevance

Score: 75

Rating: L

Reliability

Score: 62.5

Rating: L

\*No standard method, Chemical purity not reported

	<b>Tripathi &amp; Singh 2004</b>	<i>L. acuminata</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Mollusca	
Class	Gastropoda	
Order	Pulmonata	
Family	Lymnaeidae	
Genus	<i>Lymnaea</i>	
Species	<i>acuminata</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adults (37.2 mm shell height, 20.0 mm shell width at time of collection)	
Source of organisms	Collected from uncontaminated water bodies in Uttar Pradesh, India	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes, 7 d	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	28 d	
Data for multiple times?	Yes	
Effect 1	Number of eggs after 96 h	
Control response 1	288 ± 12.4	
Effect 2	Number of hatched eggs	
Control response 2	262 ± 10.5	
Effect 3	Survival of hatchlings	
Control response 3	7 d: 260 ± 10.2 (99%) 14 d: 255 ± 9.8 (97%) 21 d: 251 ± 8.3 (96%)	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Tripathi &amp; Singh 2004</b>	<b><i>L. acuminata</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	28 d: 248 ± 4.5 (95%)	
Temperature	23 ± 0.8°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Dechlorinated tapwater	
pH	7.2 ± 0.2	
Hardness	NR	
Alkalinity	106 ± 7.6 mg/L	
Conductivity	NR	
Dissolved Oxygen	7.2 ± 0.3 mg/L	
Feeding	None during test	
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	
Chemical method documented?	n/a	
Concentration of carrier (if any) in test solutions	NR	
Concentration 1 Nom (µg/L)	4.0	6 reps, 10/rep
Concentration 2 Nom (µg/L)	8.0	6 reps, 10/rep
Concentration 3 Nom (µg/L)	12.0	6 reps, 10/rep
Control	Dilution water	6 reps, 10/rep
NOEC	Number of eggs after 96 h: <4.0* Number of hatched eggs 96 h: <4.0* Survival of hatchlings after 7 d: 8.0 * Survival of hatchlings after 14 d: <4.0 Survival of hatchlings after 21 d: <4.0 Survival of hatchlings after 28 d: < 4.0	Method: Student's t test p: 0.05 MSD: NR
LOEC	Number of eggs after 96 h: 4.0* Number of hatched eggs: 4.0* Survival of hatchlings after 7 d: 12* Survival of hatchlings after 14 d: 4.0*	Same as above

Appendix B1: studies rated RR, RL, LR, LL

	<b>Tripathi &amp; Singh 2004</b>	<i>L. acuminata</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	Survival of hatchlings after 21 d: 4.0 Survival of hatchlings after 28 d: 4.0	
MATC (GeoMean NOEC,LOEC)	*Not appropriate to calculate	
% of control at NOEC	Given in Table 1	
% of control at LOEC	Given in Table 1	

Notes:\*The number of eggs or snails at this concentration was significantly GREATER than in the controls – statistics were only done on raw data, not on % hatched or % surviving. It is therefore not clear if these data demonstrate a dose-response relationship between cypermethrin exposure and reproduction of snails.

Reliability points taken off for:

Documentation (Table 3.7): Chemical purity (5), Analytical method (4), Measured concentrations (3), Hardness (2), Conductivity (2), Photoperiod (3), Minimum significant difference (2), Point estimates (8). -29

Acceptability (Table 3.8): No standard method (5), Chemical purity (10), Measured concentrations within 20% of nominal (4), Concentrations exceed 2x water solubility (4), Carrier solvent (4), Organisms randomized (1), Exposure type (2), Hardness (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Hypothesis tests (3), Point estimates (3). -46

## Toxicity Data Summary

*Labeo rohita*

Study: Philip GH, Reddy PM, Sridevi G. 1995. Cypermethrin-induced *in vivo* alterations in the carbohydrate metabolism of freshwater fish, *Labeo rohita*. *Ecotoxicology and Environmental Safety* 31:173-178.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 64.5

Rating: L

\*No standard method, control not described (Endpoints other than mortality were not linked to survival/growth/reproduction and are rated N and not reported)

	<b>Philip et al. 1995</b>	<b><i>L. rohita</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	<i>Labeo</i>	
Species	<i>rohita</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	NR	
Source of organisms	Fish hatchery	Fisheries Dept. Anantapur, India
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	0%	
Temperature	27 ± 1°C	
Test type	Static	
Photoperiod/light intensity	16 L: 8 D	
Dilution water	Dechlorinated tapwater	
pH	7.4-7.6	
Hardness	160 mg/L as CaCO <sub>3</sub>	
Alkalinity	87 mg/L as CaCO <sub>3</sub>	
Conductivity	210 umol/cm	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Philip et al. 1995</b>	<b><i>L. rohita</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Dissolved Oxygen	6-7 mg/L	
Feeding	NR	
Purity of test substance	98%	
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 ( $\mu\text{g/L}$ )	6 concentrations estimated from Fig 1 1	Reps and # per: NR
Concentration 2 Nom ( $\mu\text{g/L}$ )	2	Reps and # per: NR
Concentration 3 Nom ( $\mu\text{g/L}$ )	4	Reps and # per: NR
Concentration 4 Nom ( $\mu\text{g/L}$ )	6	Reps and # per: NR
Concentration 5 Nom ( $\mu\text{g/L}$ )	8	Reps and # per: NR
Concentration 6 Nom ( $\mu\text{g/L}$ )	12	Reps and # per: NR
Control	Not described	Reps and # per: NR
LC <sub>50</sub> ( $\mu\text{g/L}$ )	96 h: 5.24	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Control type (8), Organism age (5), Analytical method (4), Measured concentrations (3), Hypothesis tests (8). -28

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), Organism size (3), Prior contamination (4), Organisms randomized (1), Organisms/rep (2), Feeding (3), Random design (2), Adequate replicates (2), Hypothesis tests (3). -43

## Toxicity Data Summary

*Oncorhynchus mykiss*

Study: Davies PE, Cook LSJ, Goenarso D. 1994. Sublethal responses to pesticides of several species of Australian freshwater fish and crustaceans and rainbow trout. Environ Toxicol Chem 13:1341-1354.

Relevance

Score: acute: 82.5, chronic: 75

Rating: L

Reliability

Score: acute: 70.5, chronic: 74

Rating: acute: L, chronic: R

\*No standard method (-10), endpoint not linked to survival/growth/reproduction (chronic only, -15), control response not reported (acute, -7.5)

	<b>Davies et al. 1994</b>	<b><i>O. mykiss</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	<i>Oncorhynchus</i>	
Species	<i>mykiss</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juveniles (1.1-2.5 g, 45-60 mm or 10-30 g, 100-150 mm)	
Source of organisms	Commercial hatchery	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	10 d	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Effect 2	Hepatic GST activity	
Control response 2	3.6 (0.91) mmol substrate/g tissue/ min	
Temperature	12-15 °C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Surface water	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Davies et al. 1994</b>	<b><i>O. mykiss</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
pH	6.5-7	
Hardness	NR	
Alkalinity	NR	
Conductivity	50-120 uS/cm	
Dissolved Oxygen	>80% saturation	
Feeding	Fed commercial salmon food throughout exposures	Not acceptable – should be no feeding in acute test
Purity of test substance	>98%	
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	2-10 mg/L ethanol or acetone (~12.6-12.7 mL/L EtOH or acetone)	>0.5 mL/L, not acceptable
Concentration 1 Nom/Meas (µg/L)	NR/0.17	2 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR/0.33	2 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR/0.49	2 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR/0.87	2 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR/2.52	2 reps, 10/rep
Control	Dilution water	2 reps, 10/rep
LC <sub>50</sub> (95% confidence limit) (µg/L)	12 h: >2.52 96 h: 1.47 (1.20-1.75) 10 d: 1.47 (1.20-1.75)	Method: probit
NOEC (µg/L)	<u>Hepatic GST activity</u> 10 d: 0.49	Method: Dunnett's t statistic, 2way ANOVA p: 0.005 MSD: NR
LOEC (µg/L)	<u>Hepatic GST activity</u> 10 d: 0.87	Same as above
MATC (GeoMean NOEC,LOEC) (µg/L)	<u>Hepatic GST activity</u> 10 d: 0.65	
% of control at NOEC	4.67/3.60= 130%	
% of control at LOEC	5.21/3.60=145%	

Notes:

Reliability points taken off for:  
Documentation (Table 3.7):

Appendix B1: studies rated RR, RL, LR, LL

Acute: Nominal concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Hypothesis tests (8). -18

Chronic: Nominal concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Point estimates (8), Minimum significant difference (2). -20

Acceptability (Table 3.8):

Acute: No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Temperature (3), Photoperiod (2), Random design (2), Hypothesis tests (3). -40

Chronic: No standard method (5), Appropriate duration (2), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Hardness (2), Alkalinity (2), Temperature (3), Photoperiod (2), Random design (2), Minimum significant difference (1), NOEC response reasonable compared to control (1), Point estimates (3). -32

## Toxicity Data Summary

*Oncorhynchus mykiss*

Study: Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. *Aquatic Toxicology* 2:175-185.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 72

Rating: L

\*No standard method, control response not reported

	<b>Stephenson 1982</b>	<b><i>O. mykiss</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	<i>Oncorhynchus</i>	
Species	<i>mykiss</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	1-2 g	
Source of organisms	Commercial hatchery	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes (10 d)	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	Test 1) 10 ± 1°C Test 2) 15 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	
Alkalinity	NR	
Conductivity	NR	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson 1982</b>	<b><i>O. mykiss</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	85-95%	
Concentrations measured?	Yes	
Measured is what % of nominal?	>70%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (µg/L)	Test 1) 4 conc (0.39-1.4) Test 2) 7 conc (0.45-1.1)	1 rep, 5/rep
Control	Dilution water	1 rep, 5/rep
LC <sub>50</sub> (µg/L)	Test 1) 0.5 Test 2) 0.5	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Organisms/rep (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -35

## Toxicity Data Summary

*Oncorhynchus mykiss*

Study: Vaishnav DD, Yurk JJ. 1990. Cypermethrin (FMC 45806): Acute toxicity to rainbow trout (*Oncorhynchus mykiss*) under flow-through test conditions. FMC Corporation study number A89-3109-01. Laboratory project ID: ESE No. 3903026-0750-3140. Environmental Science and Engineering, Inc. (ESE): Gainesville, FL. CDPR 118785.

Relevance  
Score: 100  
Rating: R

Reliability  
Score: 90.5  
Rating: R

	<b>Vaishnav &amp; Yurk 1990</b>	<b><i>O. mykiss</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	US EPA (1982), ASTM 1980	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	<i>Oncorhynchus</i>	
Species	<i>mykiss</i>	Rainbow Trout
Family in North America?	Yes	
Age/size at start of test/growth phase	83-day old juveniles	
Source of organisms	Lab Culture- Aquatic Research Organisms, Hampton NH	.
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	
Effect 1	Mortality	
Control response 1	0%	
Temperature	12± 1 C	
Test type	Flow-Through	
Photoperiod/light intensity	16:8 Hr Light: Dark	
Dilution water	Well water	
pH	7.9-8.1	.
Hardness	269 mg/L CaCO <sub>3</sub>	EPA guidelines 40-180mg/L → not okay

Appendix B1: studies rated RR, RL, LR, LL

	<b>Vaishnav &amp; Yurk 1990</b>	<b><i>O. mykiss</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	253 mg/L CaCO <sub>3</sub>	
Conductivity	390 umhos/cm	
Dissolved Oxygen	8.4-10.6 mg/L (>80% saturation)	
Feeding	Not during test (appropriate)	
Purity of test substance	91.5%	
Concentrations measured?	Yes for stock solution. Nominal exposure concentrations based on measured concentration of stock.	
Measured is what % of nominal?	56-75%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes. HPLC with UV Detection. 0 and 96 hour exposure samples.	
Concentration of carrier (if any) in test solutions	30µL DMF/L	
Concentration 1 Nom/Meas (µg/L)	0.39/ 0.219	2 reps, 20/rep
Concentration 2 Nom/Meas (µg/L)	0.65/0.366	2 reps, 20/rep
Concentration 3 Nom/Meas (µg/L)	1.08/ 0.719	2 reps, 20/rep
Concentration 4 Nom/Meas (µg/L)	1.80/ 1.35	2 reps, 20/rep
Concentration 5 Nom/Meas (µg/L)	3.00/ 2.24	2 reps, 20/rep
Control	Dilution water and solvent	2 reps, 20/rep
LC <sub>50</sub> (95% confidence interval) (µg/L)	24 h: 1.74 (1.35-2.24) 48 h: 1.03 (0.719-1.35) 72 h: 0.95 (0.719-1.35) 96 h: 0.90 (0.72-1.35)	Method: Binomial

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Hypothesis tests (8).

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Hardness (2), Random design (2), Hypothesis tests (3). -11

## Toxicity Data Summary

*Oreochromis niloticus* (formerly *Tilapia nilotica*)

Study: Stephenson RR, Choi SY, Olmos-Jerez A. 1984. Determining the toxicity and hazard to fish of a rice insecticide. Crop Protection 3:151-165.

Relevance

Score: 90

Rating: R

Reliability

Score: 74.5

Rating: R

\*No standard method

	<b>Stephenson et al. 1984</b>	<b><i>O. niloticus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes (Actinopterygii)	
Order	Perciformes	
Family	Cichlidae	
Genus	<i>Oreochromis</i>	
Species	<i>niloticus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	0.6-3.0 g	
Source of organisms	Lab cultured	
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	25 ± 2°C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Dechlorinated tapwater	
pH	7.1-8.1	
Hardness	230-270 mg/L as CaCO <sub>3</sub>	
Alkalinity	NR	
Conductivity	NR	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson et al. 1984</b>	<b><i>O. niloticus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Dissolved Oxygen	7.5-8.5 mg/L	
Feeding	None during test	
Purity of test substance	98.4%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	HPLC	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (µg/L)	NR	10/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	Dilution water	10/rep
LC <sub>50</sub> (µg/L)	24 h: 4 48 h: 3 96 h: 2	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Alkalinity (2), Temperature (3), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -30

## Toxicity Data Summary

*Oreochromis niloticus* (formerly *Tilapia nilotica*)

Study: Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. *Aquatic Toxicology* 2:175-185.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 70.5

Rating: L

\*No standard method, control response not reported

	<b>Stephenson 1982</b>	<b><i>O. niloticus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes (Actinopterygii)	
Order	Perciformes	
Family	Cichlidae	
Genus	<i>Oreochromis</i>	
Species	<i>niloticus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	1-3 g	
Source of organisms	Commercial hatchery	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes (10 d)	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	25 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	
Alkalinity	NR	
Conductivity	NR	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson 1982</b>	<b><i>O. niloticus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	85-95%	
Concentrations measured?	Yes	
Measured is what % of nominal?	>70%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (µg/L)	3 conc (0.7-6.7)	1 rep, 5/rep
Control	Dilution water	1 rep, 5/rep
LC <sub>50</sub> (µg/L)	2.2	Method: graphical interpolation

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Organisms/rep (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Number of concentrations (3), Dilution factor (2), Hypothesis tests (3). -38

## Toxicity Data Summary

*Palaemonetes argentinus*

Study: Collins P, Cappello S. 2006. Cypermethrin toxicity to aquatic life: Bioassays for the freshwater prawn *Palaemonetes argentinus*. Arch Environ Contam Toxicol 51:79-85.

Relevance

Score: mortality: 85, growth: 60, ammonia excretion: 60

Rating: mortality: L, growth: N, ammonia excretion: N

Reliability

Score: mortality: 73

Rating: mortality: L

\*Low chemical purity

Growth endpoint: no standard method, no toxicity value calculable

Ammonia-N excretion endpoint: no standard method, endpoint not linked to survival/growth/reproduction

	<b>Collins &amp; Cappello 2006</b>	<b><i>P. argentinus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Malacostraca	
Order	Decapoda	
Family	Palaemonoidea	
Genus	<i>Palaemonetes</i>	
Species	<i>argentinus</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Mortality: Juveniles, average wt. $0.01 \pm 0.006$ g	
Source of organisms	Collected from Parana River, Argentina	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Acclimated 7 d	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	Yes on Figure 2	
Effect 1	Mortality	
Control response 1	0%	
Temperature	$25 \pm 2^\circ\text{C}$ (reported for acclimation period, not test)	
Test type	Static	
Photoperiod/light intensity	14 L:10 D (reported for acclimation period, not test)	
Dilution water	Artificial water	not clear what this

Appendix B1: studies rated RR, RL, LR, LL

	<b>Collins &amp; Cappello 2006</b>	<b><i>P. argentinus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
		means
pH	8.1 (reported for acclimation period, not test)	
Hardness	83 mg/L (reported for acclimation period, not test)	
Alkalinity	NR	
Conductivity	410 umhos/cm (reported for acclimation period, not test)	
Dissolved Oxygen	5.5 mg/L (reported for acclimation period, not test)	
Feeding	None during test	
Purity of test substance	25%, contains 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	% NR, xylene	
Concentration 1 Nom ( $\mu\text{g/L}$ )	0.0250	3 reps, 10/rep
Concentration 2 Nom ( $\mu\text{g/L}$ )	0.0125	3 reps, 10/rep
Concentration 3 Nom ( $\mu\text{g/L}$ )	0.0062	3 reps, 10/rep
Concentration 4 Nom ( $\mu\text{g/L}$ )	0.0031	3 reps, 10/rep
Concentration 5 Nom ( $\mu\text{g/L}$ )	0.0012	3 reps, 10/rep
Concentration 6 Nom ( $\mu\text{g/L}$ )	0.0006	3 reps, 10/rep
Control	Solvent and dilution water	3 reps, 10/rep
LC <sub>50</sub> (95% confidence interval) ( $\mu\text{g/L}$ )	24 h: 0.0031* 48 h: 0.00275* 72 h: 0.0025* 96 h: 0.0020	Method: probit

Notes: \*Estimated from Figure 2. It is assumed that acclimation conditions are the same as the test conditions because acclimation implies that organisms are getting used to the test conditions.

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Alkalinity (2), Hypothesis tests (8). -17

Acceptability (Table 3.8): Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Prior contamination (4), Organisms randomized (1),

Appendix B1: studies rated RR, RL, LR, LL

Exposure type (2), Dilution water (2), Alkalinity (2), Temperature (3), P Random design (2),  
4 Hypothesis tests (3). -37

## Toxicity Data Summary

*Paratya australiensis*

Study: Davies PE, Cook LSJ, Goenarso D. 1994. Sublethal responses to pesticides of several species of Australian freshwater fish and crustaceans and rainbow trout. Environ Toxicol Chem 13:1341-1354.

Relevance  
Score: 82.5  
Rating: L

Reliability  
Score: 72  
Rating: L

\*No standard method, control response not reported

	<b>Davies et al. 1994</b>	<b><i>P. australiensis</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Crustacea (Malacostraca)	
Order	Decapoda	
Family	Atyidae	
Genus	<i>Paratya</i>	
Species	<i>australiensis</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	0.05-0.15 g	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	10 d	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Temperature	12-15 °C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Surface water	
pH	6.5-7	
Hardness	NR	
Alkalinity	NR	
Conductivity	50-120 uS/cm	
Dissolved Oxygen	>80% saturation	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Davies et al. 1994</b>	<b><i>P. australiensis</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Feeding	NR	
Purity of test substance	>98%	
Concentrations measured?	Yes	
Measured is what % of nominal?	NR	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	GC	
Concentration of carrier (if any) in test solutions	%NR, acetone	
Concentration 1 Nom/Meas (µg/L)	0.17	2 reps, 10-15/rep
Concentration 2 Nom/Meas (µg/L)	0.33	2 reps, 10-15/rep
Concentration 3 Nom/Meas (µg/L)	0.49	2 reps, 10-15/rep
Concentration 4 Nom/Meas (µg/L)	0.87	2 reps, 10-15/rep
Concentration 5 Nom/Meas (µg/L)	2.52	2 reps, 10-15/rep
Control	Dilution water	2 reps, 10-15/rep
LC <sub>50</sub> (95% confidence limit) (µg/L)	12 h: 0.09 (0.06-0.12) 96 h: <0.09 10 d: <0.09	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Hardness (2), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -20

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Prior contamination (4), Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Temperature (3), Conductivity (1), Photoperiod (2), Random design (2), Hypothesis tests (3). -36

## Toxicity Data Summary

*Piona carnea*

Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 90

Rating: R

Reliability

Score: 74

Rating: R

\*No standard method

	<b>Stephenson1982</b>	<i>P. carnea</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Hydracarina	
Family	Pionidae	
Genus	<i>Piona</i>	
Species	<i>carnea</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Adults	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Possibly	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	24 h	
Data for multiple times?	Yes, 2 h	
Effect 1	Mortality	
Control response 1	<10%	
Effect 2	Immobility	
Control response 2	<10%	
Temperature	15± 1°C	
Test type	Static	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson1982</b>	<b><i>P. carnea</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	
Purity of test substance	Technical 85-95%	
Concentrations measured?	Stocks and some dilutions were measured, but they were not sampled from the tests	
Measured is what % of nominal?	>70% at 24 h	
Toxicity values calculated based on nominal or measured concentrations?	Nominal	Stock was measured, nominal is calculated on dilution of stock
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Meas (µg/L)	4.7 (stock) – 200x dilution. # of concentrations NR Approx. logarithmic series	1 rep, 10/rep
Control	Dilution water	1 rep, 10/rep
LC <sub>50</sub> (µg/L)	24 h: 0.05 (0.03-0.08)	Method: Probit
EC <sub>50</sub> (µg/L)	2 h: 0.02 24 h: 0.02	Method: Probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Measured concentrations within 20% of nominal (4), Prior Contamination (4), Organisms randomized (1), Alkalinity (2), Conductivity (1), Photoperiod (2), Number of concentrations (3), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -31

## Toxicity Data Summary

*Penaeus duorarum*

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

Relevance

Score: 85

Rating: L

Reliability

Score: 76.5

Rating: R

\*Saltwater

	<b>Cripe 1994</b>	<b><i>P. duorarum</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	ASTM	
Phylum	Arthropoda	
Class	Crustacea (Malacostraca)	
Order	Decapoda	
Family	Penaeidae	
Genus	<i>Penaeus</i>	
Species	<i>duorarum</i>	
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	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Cripe 1994</b>	<b><i>P. duorarum</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
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	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	2 reps, 10/rep
LC <sub>50</sub> (95% confidence interval) (µg/L)	0.11 (0.089-0.13)	Method: trimmed Spearman-Kärber

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), Hypothesis tests (3). -23

## Toxicity Data Summary

*Pimephales promelas*

Study: Tapp JF, Hill RW, Maddock BG, Harland BJ, Stembridge HM, Bolygo E. 1988. Cypermethrin: Determination of chronic toxicity to fathead minnow (*Pimephales promelas*) full lifecycle. Laboratory project ID: BL/B/3173. ICI PLC, Brixham Laboratory: Brixham (Devon), UK. EPA MRID 40641701.

Relevance

Score: 100

Rating: R

Reliability

Score: 91

Rating: R

	<b>Tapp et al. 1988</b>	<b><i>P. promelas</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	EPA 1986	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	<i>Pimephales</i>	
Species	<i>promelas</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	< 48 h	
Source of organisms	Brood stock at Brixham lab	
Have organisms been exposed to contaminants?	No	
Animals acclimated and disease-free?	Yes	
Animals randomized?	Yes	
Test vessels randomized?	Yes	
Test duration	300 d	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	30 d: Dil – 88%, Solv - 67% 60 d: Dil – 84%, Solv - 67%	
Effect 2	Egg production	
Control response 2	Dil – 379 eggs/female Solv – 856 eggs/female	
Effect 3	Growth (length)	
Control response 3	30 d: 19.7 mm 60 d: 32.2 mm	
Temperature	25 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	Varied over time, simulated Evansville, Indiana starting	10 L: 14 D to 15 L: 9 D

Appendix B1: studies rated RR, RL, LR, LL

	<b>Tapp et al. 1988</b>	<b><i>P. promelas</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	Dec 1	
Dilution water	Filtered dechlorinated tapwater	
pH	7.1-8.2	
Hardness	48.6-75.7 mg/L as CaCO <sub>3</sub>	
Alkalinity	21.1-32.7 mg/L as CaCO <sub>3</sub>	
Conductivity	134 uS/cm	
Dissolved Oxygen	7.46 mg/L (>60% saturation)	
Feeding	Yes, fish feed, brine shrimp	
Purity of test substance	93.1%	
Concentrations measured?	Yes	
Measured is what % of nominal?	62-85%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC	
Concentration of carrier (if any) in test solutions	0.00125% triethylene glycol	
Concentration 1 Nom/Meas (µg/L)	0.06/ 0.051	2 reps, 40 eggs/rep, then 15 fish/rep
Concentration 2 Nom/Meas (µg/L)	0.12/ 0.077	2 reps, 40 eggs/rep, then 15 fish/rep
Concentration 3 Nom/Meas (µg/L)	0.25/ 0.154	2 reps, 40 eggs/rep, then 15 fish/rep
Concentration 4 Nom/Meas (µg/L)	0.50/ 0.323	2 reps, 40 eggs/rep, then 15 fish/rep
Concentration 5 Nom/Meas (µg/L)	1.0/ 0.653	2 reps, 40 eggs/rep, then 15 fish/rep
Control	Solvent and dilution water	2 reps, 40 eggs/rep, then 15 fish/rep
NOEC (µg/L)	<b>30 d F0 survival: 0.077</b> <b>60 d F0 survival: 0.077</b> 150-300 d F0 egg production: 0.15 (significant increase at lower conc)	Method: ANOVA p: 0.05 or 0.01 MSD: NR
LOEC (µg/L)	<b>30 d F0 survival: 0.15</b> <b>60 d F0 survival: 0.15</b> 150-300 d F0 egg production: 0.32	Same as above
MATC (GeoMean NOEC,LOEC) (µg/L)	30/60 d F0 survival: 0.107	
% of control at NOEC	30 d: 76.3/88 = 87% 60 d: 70.0/84 = 84%	
% of control at LOEC	30 d: 72.0/88 = 82%	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Tapp et al. 1988</b>	<i>P. promelas</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
	60 d: $69.5/84 = 83\%$	

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Minimum significant difference (2), Point estimates (8). -10

Acceptability (Table 3.8): Measured concentrations within 20% of nominal (4), Minimum significant difference (1), Point estimates (3). -8

## Toxicity Data Summary

*Pseudaphritus urvillii*

Study: Davies PE, Cook LSJ, Goenarso D. 1994. Sublethal responses to pesticides of several species of Australian freshwater fish and crustaceans and rainbow trout. Environ Toxicol Chem 13:1341-1354.

Relevance  
Score: 82.5  
Rating: L

Reliability  
Score: 71  
Rating: L

\*No standard method, control response not reported

	<b>Davies et al. 1994</b>	<b><i>P. urvillii</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes (Actinopterygii)	
Order	Perciformes	
Family	Pseudaphritidae	
Genus	<i>Pseudaphritis</i>	
Species	<i>urvillii</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	Juveniles (6-30 g, 95-160 mm)	
Source of organisms	Collected in field	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	10 d	
Data for multiple times?	Yes	
Effect 1	Mortality	
Control response 1	NR	
Temperature	12-15 °C	
Test type	Flow through	
Photoperiod/light intensity	NR	
Dilution water	Surface water	
pH	6.5-7	
Hardness	NR	
Alkalinity	NR	
Conductivity	50-120 uS/cm	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Davies et al. 1994</b>	<b><i>P. urvillii</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Dissolved Oxygen	>80% saturation	
Feeding	Fed commercial salmon food throughout exposures	Not acceptable – should be no feeding in acute test
Purity of test substance	>98%	
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	2-10 mg/L ethanol or acetone (~12.6-12.7 mL/L EtOH or acetone based on density)	>0.5 mL/L, not acceptable
Concentration 1 Nom/Meas (µg/L)	NR/0.17	2 reps, 10/rep
Concentration 2 Nom/Meas (µg/L)	NR/0.33	2 reps, 10/rep
Concentration 3 Nom/Meas (µg/L)	NR/0.49	2 reps, 10/rep
Concentration 4 Nom/Meas (µg/L)	NR/0.87	2 reps, 10/rep
Concentration 5 Nom/Meas (µg/L)	NR/2.52	2 reps, 10/rep
Control	Dilution water	2 reps, 10/rep
LC <sub>50</sub> (95% confidence limit) (µg/L)	12 h: >2.52 96 h: 2.19 (1.80-2.65) 10 d: 1.47 (1.20-1.75)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Hardness (2), Alkalinity (2), Photoperiod (3), Hypothesis tests (8). -18

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Organisms randomized (1), Feeding (3), Hardness (2), Alkalinity (2), Temperature varied > ±1°C (3), Photoperiod (2), Random design (2), Hypothesis tests (3). -40

Appendix B1: studies rated RR, RL, LR, LL

Toxicity Data Summary

*Salmo trutta*

Study: Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. Aquatic Toxicology 2:175-185.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 70.5

Rating: L

\*No standard method, control response not reported

	<b>Stephenson 1982</b>	<b><i>S. trutta</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Salmoniformes	
Family	Salmonidae	
Genus	<i>Salmo</i>	
Species	<i>trutta</i>	
Family in North America?	Yes	
Age/size at start of test/growth phase	5-8 g	
Source of organisms	Commercial hatchery	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes (10 d)	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	15 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	
Feeding	None during test	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson 1982</b>	<i>S. trutta</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Purity of test substance	85-95%	
Concentrations measured?	Yes	
Measured is what % of nominal?	>70%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (µg/L)	4 conc (1.0-1.5)	1 rep, 5/rep
Control	Dilution water	1 rep, 5/rep
LC <sub>50</sub> (µg/L)	1.2	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Organisms/rep (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Number of concentrations (3), Dilution factor (2), Hypothesis tests (3). -38

## Toxicity Data Summary

*Scardinius erythrophthalmus*

Study: Study: Stephenson RR. 1982. Aquatic toxicology of cypermethrin. I. Acute toxicity to some freshwater fish and invertebrates in laboratory tests. *Aquatic Toxicology* 2:175-185.

Relevance

Score: 82.5

Rating: L

Reliability

Score: 72

Rating: L

\*No standard method, control response not reported

	<b>Stephenson 1982</b>	<b><i>S. erythrophthalmus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Chordata	
Class	Osteichthyes	
Order	Cypriniformes	
Family	Cyprinidae	
Genus	<i>Scardinius</i>	
Species	<i>erythrophthalmus</i>	Common rudd
Family in North America?	Yes	
Age/size at start of test/growth phase	8-10 g	
Source of organisms	Commercial hatchery	
Have organisms been exposed to contaminants?	Not likely	
Animals acclimated and disease-free?	Yes (10 d)	
Animals randomized?	NR	
Test vessels randomized?	NR	
Test duration	96 h	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	NR	
Temperature	15 ± 1°C	
Test type	Flow-through	
Photoperiod/light intensity	NR	
Dilution water	Filtered dechlorinated tapwater	
pH	7.5-8.5	
Hardness	260 ± 20 mg/L as CaCO <sub>3</sub>	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	>80% saturation	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Stephenson 1982</b>	<i>S. erythrophthalmus</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Feeding	None during test	
Purity of test substance	85-95%	
Concentrations measured?	Yes	
Measured is what % of nominal?	>70%	
Toxicity values calculated based on nominal or measured concentrations?	Measured	
Chemical method documented?	Yes, GC-ECD	
Concentration of carrier (if any) in test solutions	0%	
Concentration 1 Nom/Meas (µg/L)	5 conc (0.33-0.56)	1 rep, 5/rep
Control	Dilution water	1 rep, 5/rep
LC <sub>50</sub> (µg/L)	0.4	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Nominal concentrations (3), Measured concentrations (3), Alkalinity (2), Conductivity (2), Photoperiod (3), Hypothesis tests (8). -21

Acceptability (Table 3.8): No standard method (5), Control response (9), Measured concentrations within 20% of nominal (4), Organisms randomized (1), Organisms/rep (2), Alkalinity (2), Conductivity (1), Photoperiod (2), Random design (2), Adequate replicates (2), Dilution factor (2), Hypothesis tests (3). -35

## Toxicity Data Summary

*Trichodactylus borellianus*

Study: Veronica W, Collins PA. 2003. Effects of cypermethrin on the freshwater crab *Trichodactylus borellianus* (Crustacea: Decapoda: Braquiura). Bull Environ Contam Toxicol 71:106-113.

Relevance

Score: 70

Rating: L

Reliability

Score: 65.5

Rating: L

\*Low chemical purity, Family does not reside in North America

	<b>Veronica &amp; Collins 2003</b>	<i>T. borellianus</i>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	USEPA 1975	
Phylum	Arthropoda	
Class	Crustacea	
Order	Decapoda	
Family	Trichodactylidae	
Genus	<i>Trichodactylus</i>	
Species	<i>borellianus</i>	
Family in North America?	No	
Age/size at start of test/growth phase	Adults: Mean carapace length $9.02 \pm 1.85$ mm, mean wt $0.38 \pm 0.18$ g Juvenile: mean carapace length $5.06 \pm 1.24$ mm, mean wt $0.07 \pm 0.04$ g	
Source of organisms	Collected from Salado River, Argentina	
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	0%	
Temperature	$25 \pm 2^\circ\text{C}$	
Test type	Static	
Photoperiod/light intensity	14 L: 10 D	
Dilution water	Artificial pond water	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Veronica &amp; Collins 2003</b>	<b><i>T. borellianus</i></b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
pH	7.2	
Hardness	NR	
Alkalinity	NR	
Conductivity	450 umhos/L	
Dissolved Oxygen	NR	
Feeding	NR	
Purity of test substance	25% in 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	%NR, xylene (in formulation)	
Concentration 1 Nom ( $\mu\text{g/L}$ )	0.0001	3 reps, 5/rep
Concentration 2 Nom ( $\mu\text{g/L}$ )	0.0005	3 reps, 5/rep
Concentration 3 Nom ( $\mu\text{g/L}$ )	0.001	3 reps, 5/rep
Concentration 4 Nom ( $\mu\text{g/L}$ )	0.005	3 reps, 5/rep
Concentration 5 Nom ( $\mu\text{g/L}$ )	0.01	3 reps, 5/rep
Concentration 6 Nom ( $\mu\text{g/L}$ )	0.1	3 reps, 5/rep
Control	Solvent and dilution water	3 reps, 5/rep
LC <sub>50</sub> (95% confidence limit) ( $\mu\text{g/L}$ )	Juveniles and adults pooled because no sig. difference 24 h: 0.0119 (0.0071-0.0234) 48 h: 0.0119 (0.0071-0.0234) 72 h: 0.0104 (0.0054-0.0249) 96 h: 0.0097 (0.0049-0.0231)	Method: probit

Notes:

Reliability points taken off for:

Documentation (Table 3.7): Analytical method (4), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved oxygen (4), Hypothesis tests (8). -23

Acceptability (Table 3.8): Chemical purity (10), Measured concentrations within 20% of nominal (4), Carrier solvent (4), Prior contamination (4), Organisms randomized (1), Feeding (3), Exposure type (2), Hardness (2), Alkalinity (2), Dissolved oxygen (6), Temperature (3), Random design (2), Hypothesis tests (3). -46

Appendix B1: studies rated RR, RL, LR, LL

Toxicity Data Summary

*Simulium vitattum*, - Blackfly  
*Hydropsyche* spp., & *Cheumatopsyche* spp., - Caddisfly  
*Heptageniidae* spp.- Mayfly  
*Enallagma* spp., & *Ishnura* spp.,- Damselfly  
*Hydrophilus* spp., -Water scavenger beetle

Study: Siegfried, Blair D. 1993. Comparative Toxicity of Pyrethroid Insecticides to Terrestrial and Aquatic insects. Environ Toxicol Chem 12:1683-1689.

Relevance

Score: 90 (Standard Method (10))

Rating: R

Reliability

Score: 63.3

Rating: L

	<b>Siegfried 1993</b>	<b>Various</b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test method cited	None cited	
Phylum	Arthropoda	
Class	Insecta	
Order	Diptera, Trichoptera, Ephemeroptera, Odonata, Coleoptera	
Family	various	
Genus	<i>Simulium</i> , <i>Hydropsyche</i> , <i>Ishnura</i> , <i>Enallagma</i> , <i>Hydrophilus</i> , <i>Cheumatopsyche</i> , <i>Heptageniidae</i>	
Species	<i>vitattum</i> , others unidentified	Terrestrial insects tested in this study were not included here.
Family in North America?	Yes	
Age/size at start of test/growth phase	Larva (Black fly & Caddisfly), nymph (Mayfly & Damselfly), adult (beetles)	
Source of organisms	Collected from field, Lancaster County, NE	Various ponds and lakes
Have organisms been exposed to contaminants?	Possibly	Collected from environment
Animals acclimated and disease-free?	Acclimated-72 h	Health status not determined
Animals randomized?	NR	
Test vessels randomized?	NR	

Appendix B1: studies rated RR, RL, LR, LL

	<b>Siegfried 1993</b>	<b>Various</b>
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
Test duration	24 hours	
Data for multiple times?	No	
Effect 1	Mortality	
Control response 1	< 10 mortality, except black flies 14%, mayflies 16%	
Temperature	20 °C	
Test type	Static	
Photoperiod/light intensity	24 h Dark	
Dilution water	Distilled Water	
pH	NR	
Hardness	NR	
Alkalinity	NR	
Conductivity	NR	
Dissolved Oxygen	NR	
Feeding	None	
Purity of test substance	99.4%	
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	Diluted in Distilled Water	
Concentration 1 Nom/Meas (µg/L)	Concentrations NR- 3 concentrations per insecticide, 30 organisms per experiment, 3 replicates	
Control	Exposed to Diluted water	
LC <sub>50</sub>	Black Fly ( <i>S. vittatum</i> ): 9.8 (1.8-15) µg/L* Caddisfly ( <i>Hydropsyche</i> & <i>Chematopsyche</i> ): 1.4 (0.81-2) µg/L Mayfly (Hepatagenidae): 1.3 (0.78-2.1) µg/L Damsel fly ( <i>Enallagma</i> & <i>Ishnura sp.</i> ): 1.4 (0.92-2.0) µg/L Diving Beetle ( <i>Hydrophilus spp</i> ): 8.3 (5.9-11) µg/L	Method: Probit Analysis

Notes: \*value exceeds 2x the aqueous solubility of cypermethrin (4 ug/L).

Reliability points taken off for:

Documentation: Analytical method (4), Nominal concentrations (3), Measured concentrations (3), Hardness (2), Alkalinity (2), Dissolved Oxygen (4), Conductivity (2), pH (3), Hypothesis tests (8)

Appendix B1: studies rated RR, RL, LR, LL

Acceptability: Acceptable standard method (5), Measured concentrations within 20% Nom (4), No prior contaminant exposure (4), Organisms randomly assigned to containers (1), Dilution water source (2), Hardness (2), Alkalinity (2), Dissolved Oxygen (4), Temperature not held to  $\pm 1^{\circ}\text{C}$  (3), Conductivity (2), pH (3), Adequate number of concentrations (3), Random or block design (2), Appropriate spacing between concentrations (2), Hypothesis tests (3)