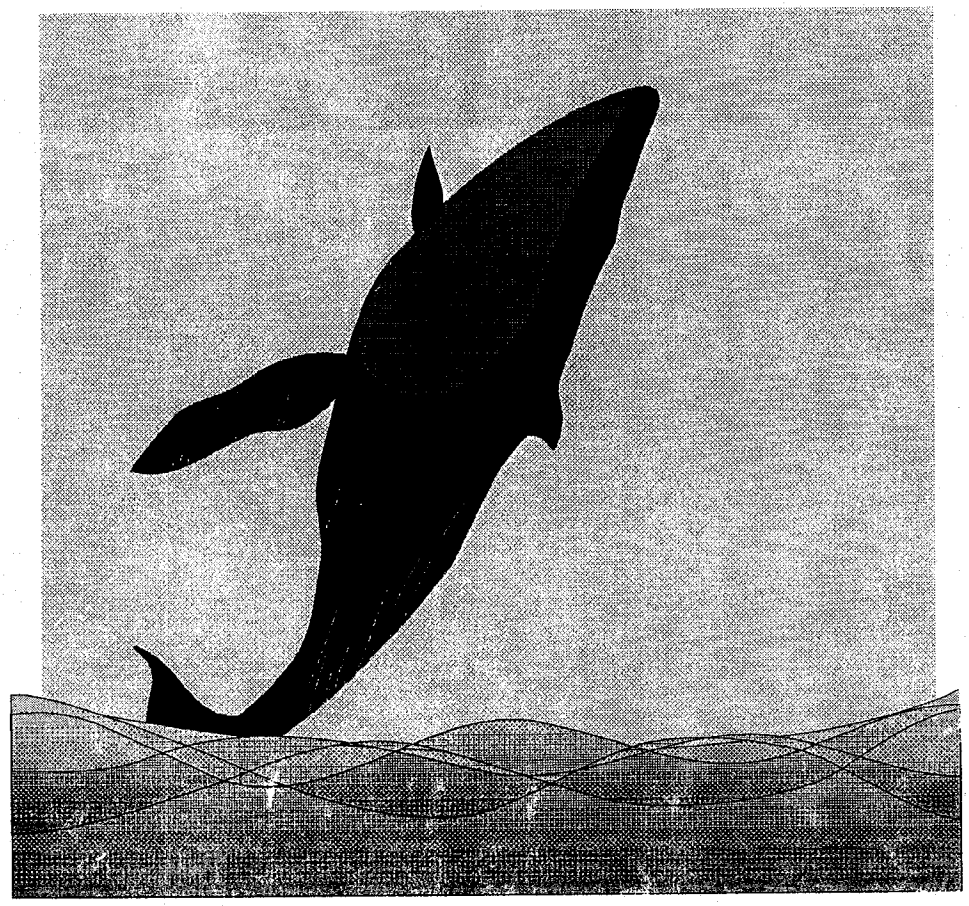
MARINE BIOASSAY PROJECT

TENTH REPORT

Metal, Ammonia, Sediment and Artificial Salt Toxicity Evaluations on Marine Test Organisms



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California Environmental Protection Agency

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Marine Bioassay Project

Tenth Report

June 2000

The University of California, Davis
Department of Environmental Toxicology
Marine Pollution Studies Laboratory at Granite Canyon

The California State Water Resources Control Board,
Division of Water Quality
Oceans Unit

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Executive Summary

The goal of the Marine Bioassay Project (MBP), authorized by the State Water Resources Control Board (SWRCB) in 1984, is to protect California's ocean resources by determining the impacts of toxic waste discharges on marine waters. The Project's primary objectives are 1) to develop and validate critical life stage tests to measure effluent toxicity, 2) to provide technical support to the SWRCB, Regional Water Quality Control Boards, and laboratories that use the toxicity test methods listed in the California Ocean Plan, and 3) to gather additional scientific information necessary for continued revision and application of the Ocean Plan as a means to protect California's marine resources.

In its 15-year history, the MBP has developed four critical life stage protocols using species indigenous to California's coastal waters. These test methods are designed to estimate subtle long-term adverse effects of waste discharges that ultimately damage populations of important marine species. The four toxicity protocols use an alga (giant kelp), a fish (topsmelt), and two invertebrates (red abalone and a Pacific mysid crustacean). All of the MBP test methods are on the 1997 Ocean Plan approved list of critical life stage protocols for use in NPDES compliance monitoring. The entire Ocean Plan list is published in the Procedures Manual for Conducting Toxicity Tests Developed by the Marine Bioassay Project (96-1WQ).

Two State agencies and one university work cooperatively in operating the MBP. The Department of Fish and Game's (DFG) Marine Pollution Studies Laboratory (MPSL) serves as the research facility. The University of California at Davis provides the principal investigators and staff to conduct the research. The SWRCB oversees and provides funding for the Project by contracting with the University of California at Davis to develop and conduct tasks specified in the contract's agreement.

The MBP staff has worked closely with the USEPA in adapting MBP protocols for inclusion into the USEPA West Coast Methods Manual (EPA/600/R-95/136). This

USEPA manual contains seven critical life stage protocols, including the four developed by the MBP.

Regulatory Background

Development of toxicity test protocols to estimate long-term effects of waste discharges are consistent with both federal and state requirements. In 1984, the USEPA issued a national "Policy for the Development of Water Quality Based Limitations for Toxic Pollutants" (49CFR, No. 48, March 9, 1984). This policy outlined a technical approach for controlling discharge of toxic substances through the federal system of discharge permits. In addition to meeting numerical standards for individual chemicals, the policy requires USEPA and the States to use biological testing to complement chemical testing. Biological testing provides information not available from chemical testing. For example, it can provide both chemical interaction and bioavailability data from complex mixtures of toxic materials.

In 1986, AB3500 added Section 13170.2 to the California Water Code. In addition to mandating triennial review of the California Ocean Plan, Section 13170.2 requires the SWRCB to develop and adopt toxicity test protocols. Ocean dischargers of 100 million gallons per day or more have been required in their permits to use the toxicity test protocols for monitoring complex effluents since January 1, 1991. This requirement extended to smaller dischargers on January 1, 1992. Section 3 of AB 3500 expressed legislative intent that the organisms used in testing be representative marine species:

> "If the State Water Resources Control Board determines through its Marine Bioassay Project that a multispecies toxicity testing program with representative marine species for monitoring complex effluent discharges is appropriate, the State Board shall use the multispecies toxicity testing program with representative marine species in adopting the toxicity test protocols specified in Section 13170.2 of the Water Code"

On March 19, 1990, the SWRCB adopted a series of amendments to the California Ocean Plan. These amendments included the addition of a chronic toxicity objective for the protection of marine aquatic life. The SWRCB also adopted a list of seven test protocols deemed sufficiently developed for measuring compliance with the chronic toxicity objective. Included on that list were two protocols developed by the MBP, the giant kelp and the red abalone 48-hour toxicity tests. The MBP has since developed two additional critical life stage tests using the Pacific mysid crustacean (*Holmesimysis costata)* and the topsmelt (*Atherinops affinis*). The Pacific mysid and topsmelt toxicity protocols were added to the Ocean Plan list with the adoption of the 1996-1997 Ocean Plan amendments by the SWRCB.

Project Overview and Technical Summary

The Marine Bioassay Project is designed as a multiple phase program to develop and implement short-term tests to estimate the chronic toxicity of complex effluents discharged to the ocean. Actual laboratory work is conducted at the California Department of Fish and Game's Marine Pollution Studies Laboratory located south of Monterey. To date, nine phases of the Marine Bioassay Project have been completed; chapters of this project describe work performed during the ninth phase. The four primary objectives of the current MBP research were: 1) to assess potential biological impacts of pollutants in the coastal waters off Southern California, 2) to determine the toxicity of ammonia to five west coast marine test species, 3) to evaluate sea salt mixtures for use in adjusting effluent salinity for testing with marine species, and 4) to facilitate the identification of toxic effluent constituents by determining the interactive toxicity of trace metal mixtures. Project staff also participated as instructors in EPA/SETAC sponsored workshops on effluent toxicity monitoring, assisted in developing the commercial supply of toxicity test organisms, and provided technical support to regulators, commercial laboratories and members of the regulated community. The following paragraphs briefly summarize the work conducted and results obtained during this phase of the MBP.

The Southern California Bight has been receiving large volumes of discharged effluent from numerous sources for many years. Chemical constituents of discharged wastewater often bind to suspended particles and tend to accumulate in sea floor sediments. As part of the Southern California Bight Regional Monitoring Program, MBP staff tested 26 samples of sediment from this region to determine their toxicity to burrowing amphipods and sea urchin embryos exposed at the sediment-water interface. Few of these sediments were significantly toxic to either amphipods or sea urchin embryos. Of the 26 solid-phase sediment samples, only one sample from a port site and one from the mouth of a coastal stream were found to be acutely toxic to amphipods. There was no statistically significant amphipod mortality in any of the open-water coastal samples. One sample from an open-water site was significantly toxic to sea urchin embryos exposed at the sediment-water interface.

Ammonia is a common constituent of wastewater effluents and can occur in concentrations lethal to marine life. Despite its common occurrence and toxicity, few data have been available to determine the concentrations that are harmful to representative West Coast marine species. Ammonia toxicity to five marine test species (*Holmesimysis costata, Mytilus galloprovincialis, Haliotis rufescens, Atherinops affinis,* and *Macrocystis pyrifera*) was determined in repetitive dose-response experiments, and three effects levels were established for each species: (1) No Observed Effect Concentrations (NOECs), (2) Lowest Observed Effect Concentrations (LOECs) and (3) Median Effective Concentrations, Median Inhibition Concentrations or Median Lethal Concentrations (EC50s, IC50s or LC50s). The abalone (*H. rufescens*) was the most sensitive species to ammonia, with an EC50 of 0.08 mg/L unionized ammonia. The least sensitive animal species was the mysid (*H. costata*, EC50 = 0.84 mg/L), and the least sensitive species overall was the giant kelp (*M. pyrifera*, EC50 = 1.25 mg/L). The mussel (*M. galloprovincialis*) and topsmelt (*A. affinis*) were intermediate in sensitivity. The resulting ammonia toxicity values will be useful in interpreting effluent monitoring data and in identifying causes of sample toxicity.

Since most wastewater effluents have low salinity relative to marine receiving waters, samples tested for toxicity to marine organisms must be adjusted to marine salinity. This has been successfully accomplished using hypersaline brine solutions, but these solutions dilute the effluent and are unacceptable for testing undiluted samples. Many laboratories have had difficulty identifying dry sea salt formulations to adjust salinity without causing some toxicity to the test organisms. To address this issue, four sea salt mixtures were tested to determine their suitability for use in toxicity testing with west coast marine species. Of these, only the commercially available Tropic Marin® salt mixture allowed all of the test species to survive and develop normally as would be expected in acceptable test controls. Forty Fathoms® Bioassay Grade commercial salts and the GP2 laboratory formulation both provided acceptable results in most, but not all, tests. A fourth salt mixture performed poorly in initial trials, and subsequent trials were discontinued.

Trace metals often co-occur in wastewater effluents, yet little is known about how they act in combination to affect exposed marine organisms. Four metals commonly found in effluents (cadmium, copper, nickel and zinc) were investigated to determine their toxicity, both alone and in all possible combinations, to two marine species (sea urchin *S. purpuratus* and mussel *M. galloprovincialis*). The data generated was used to determine whether the dissolved metals acted additively, less than additively, or synergistically. Few consistent trends in mixture toxicity were observed, with additivity, synergism, and antagonism each occuring with various combinations and species. In general, responses tended more toward additivity as more metals were added to the mixture. These results would have been difficult to predict based on existing knowledge of chemical interactions and cellular metabolism. Information from the present study can be applied to toxicity identification evaluations (TIEs) and effluent chemical measurements to estimate whether various combinations of metals are responsible for observed toxicity in effluent or environmental samples.

Conclusion

This report provides information on a number of topics related to successful implementation of marine toxicity testing to estimate pollution impacts in California's coastal waters. The tests identifying acceptable sea salt mixtures for salinity adjustment provided useful technical information to improve test performance. The data on ammonia and trace metal mixtures are essential for determining the causes of observed toxicity in many effluent samples; and the assessment of ambient toxicity in coastal sediments provided information on the acute effects of pollutants historically discharged into the marine environment. The next phase of the Marine Bioassay Project will involve continued technical support for Ocean Plan monitoring, additional workshops on toxicity test implementation, technical evaluation of testing issues identified by scientists at commercial laboratories, additional development of TIE techniques with west coast species, and evaluation of west coast marine toxicity tests as tools to evaluate the impacts of non-point source runoff to marine biological resources.

Introduction

Project Background

The Marine Bioassay Project (MBP) was authorized by the State Water Resources Control Board (SWRCB) to protect California's ocean resources by determining the toxicity of waste effluents discharged to marine waters. The Project's primary objectives are 1) to develop and validate critical life stage tests to measure effluent toxicity, 2) to provide technical support to the SWRCB, Regional Water Quality Control Boards, and laboratories that use the toxicity test methods listed in the California Ocean Plan, and 3) to gather additional scientific information necessary for continued revision and application of the Ocean Plan as a means to protect California's marine resources. During previous phases of the Project, the project staff had developed short-term toxicity test methods to estimate the chronic toxicity of wastewater, ambient waters and other environmental samples, and have written protocols describing the test methods. Protocols for four MBP test methods have been published in the Procedures Manual for Conducting Toxicity Tests Developed by the Marine Bioassay Project (SWRCB 96-1 WQ), in the U.S. EPA West Coast Testing Manual (EPA/600/R-95/136), and in at least 18 peer-reviewed publications in scientific journals (please see appended bibliography). The four toxicity tests are widely used on the West Coast of North America for monitoring effluent discharge permit compliance, conducting toxicity identification evaluations (TIEs), and performing other environmental assessments.

Objectives of Current MBP Investigations

Use of the MBP toxicity test protocols in various applications requires continued assessment of factors that affect test results and performance. These include factors associated with laboratory techniques, technician training, and application to a variety of environmental assessment needs. The Project tasks described in this report were designed to improve test performance and allow better interpretation of test results, especially when used to determine causes of observed toxicity. These tasks include:

1) Participating in the Southern California Bight Regional Monitoring Program.

This program was part of a major effort to assess sediment and water quality in the coastal ocean off Southern California. The MBP staff assisted in this effort by measuring the toxicity of both solid-phase sediments and of contaminants fluxing from sediments into over-lying water at the sediment-water interface. We tested samples from 26 stations located in the offshore waters of the Bight and in adjacent harbors and enclosed bays.

2) Determining the toxicity of ammonia.

Ammonia is a common anthropogenically enhanced constituent of many wastewater and environmental samples. Results of testing these samples can be better interpreted if the contribution of ammonia to sample toxicity can be quantified. The objective of this task was to determine No Observed Effect Concentrations (NOECs), Lowest Observed Effect Concentrations (LOECs), and Median Effective Concentrations (EC50s, IC50s or LC50s) of ammonia to five test species, *Holmesimysis costata* (mysid), *Haliotis rufescens* (abalone), *Atherinops affinis* (topsmelt fish), *Macrocystis pyrifera* (giant kelp), *and Mytilus galloprovincialis* (bay mussel).

3) Evaluating different sea salts for salinity adjustment.

Most wastewater discharged to the ocean is much less saline than seawater and requires salinity adjustment prior to toxicity testing with marine species. This can often be accomplished by adding a hypersaline brine solution, which adjusts salinity but also dilutes the sample. Effluents that are discharged into poorly mixed receiving waters, such as enclosed embayments, often must be tested without dilution to estimate potential impacts on marine life. In such situations, effluent salinity must be adjusted with dry sea salts. Many labs have had difficulty achieving adequate test organism performance in solutions adjusted with various dry salt mixtures. The purpose of this task was to investigate the applicability of various commercially available sea salts for toxicity testing purposes. We surveyed a number of commercial, municipal, state, and federal laboratories that routinely conduct marine toxicity tests to determine which salts were considered most effective in maintaining organism health during toxicity tests. We then evaluated the recommended salts in laboratory experiments using four marine

species: *Haliotis rufescens, Strongylocentrotus purpuratus, Holmesimysis costata* and *Mytilus galloprovincialis.*

4) Investigating the toxicity of trace metal mixtures.

Trace metals can occur at toxic concentrations in effluents and environmental samples. Often, different metals are present at individual concentrations below those capable of causing observed toxicity. When multiple metals are present, they may act additively, resulting in situations where the combined effect of multiple metals may result in sample toxicity. However, chemical combinations may also act in less than additive (antagonistic) or greater than additive (synergistic) fashion, complicating the identification of constituents responsible for observed biological effects. To determine whether trace metal toxicity is additive, synergistic or antagonistic, we investigated the toxicity to sea urchin and bivalve embryos of all possible combinations of four trace metals (copper, zinc, cadmium, and nickel). Comparison of single and multiple chemical effect concentrations provided information that can be applied to toxicity identification evaluations to determine causes of sample toxicity, and may assist in the interpretation of chemical measurements.

5) Providing technical expertise.

The MBP staff prepared and presented materials at a SETAC/EPA workshop in San Diego attended by Regional Board permit writers and others involved in the use of toxicity tests in permit monitoring. This was part of a continuing effort to facilitate the implementation of toxicity testing protocols for the evaluation of potential wastewater impacts on marine life. Other MBP staff activities included meetings, telephone conversations and written communications with Board staff members and scientists from public and private laboratories; presentations and discussions at statewide and national conferences (such as SETAC); and publication of toxicity testing results in the peer-reviewed scientific literature.

6) Supporting the development of commercial test organism suppliers.

Successful implementation of an effluent toxicity testing program requires the continuous availability of test organisms. To assist in this effort we provided commercial suppliers with broodstock specimens of topsmelt (*Atherinops affinis*) and mysids (*Holmesimysis costata*), discussed technical and programmatic details with suppliers and laboratories needing test organisms, kept records of available suppliers, and disseminated that information within the testing community.

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Section 1 - Tolerances of Several Marine Toxicity Test Organisms to Ammonia and Artificial Salts

Introduction

Toxicity tests are widely used to estimate the biological impacts of pollutants found in wastewater and contaminated areas. Most of the effluent and environmental samples tested contain complex mixtures of numerous anthropogenic and naturally derived chemicals. Toxicity test organisms exposed to such samples may respond to individual contaminants or to the combined dosage of multiple compounds. Often it is important to determine the chemical cause of toxicity through toxicity identification evaluations (TIEs), or through chemical analysis and reference to previously derived toxicity thresholds. Since ammonia is commonly found in toxic samples, its potential contribution to observed toxicity is often quickly determined through reference to known no observed effect concentrations (NOECs) or other toxicity threshold values. Previous studies have determined the toxicity of ammonia to a variety of test species, but few data have been available for the commonly used west coast marine test organisms *Atherinops affinis* (topsmelt), *Holmesimysis costata* (mysid), *Haliotis rufescens* (abalone), *Macrocystis pyrifera* (giant kelp), and *Mytilus sp.* (bay mussel). This study was designed to determine NOEC, LOEC, and EC50, IC50 or LC50 values for these species.

Ammonia exists in water in equilibrium between the ionized (NH_4^+) and unionized (NH_3) fractions, with the unionized form being the major contributor to toxicity (Miller et al. 1990). This equilibrium is strongly influenced by pH, and the concentration of unionized ammonia is determined by measuring total ammonia and calculating the unionized fraction based on sample pH (Phillips et al. 1997).

Another factor that may affect organism response in toxicity tests is the manner in which test solution salinity is adjusted. Many marine test organisms cannot tolerate wide fluctuations in sample salinity. Since many effluent samples are composed primarily of freshwater, their salinities must be adjusted prior to organism exposure. Salinity

adjustment is often done successfully using a brine solution (concentrated seawater), which increases salinity but also dilutes the sample. There are, however, some samples that must be tested without dilution in order to estimate biological impacts in poorly mixed receiving waters. In such situations, artificial mixtures of marine salts can be used to increase salinity with little, if any, dilution effect. However, many laboratories have reported difficulty obtaining acceptable test organism performance in artificial seawater. We interviewed a number of laboratory managers to identify salt mixtures that had been used successfully with certain test organisms, and designed the study to determine which of these salts produced acceptable levels of control response in artificial seawater.

There is currently one widely accepted standard protocol for using artificial salts (EPA 1993), where a modified version of the hand-prepared salt mixture GP2 is added to sample water to increase salinity. In addition to GP2, we tested three commercially available salt mixtures using the following four marine toxicity test organisms: *Strongylocentrotus purpuratus* (purple sea urchin embryos), *M. galloprovincialis* (bay mussel embryos), *Holmesimysis costata* (mysid juveniles) and *H. rufescens* (red abalone). This study was designed to identify salt mixtures that could be easily used to adjust effluent sample salinity without adversely affecting the test organisms.

Materials and Methods

Test Conditions

All tests were performed at the Marine Pollution Studies Laboratory at Granite Canyon (MPSL), Monterey County, California. Tests were conducted in constant-temperature rooms under standard test conditions (US EPA 1993, US EPA 1995, SWRCB 1996), with the exception of *H. costata* ammonia tests, which were 96-h survival tests performed at 15 °C. Water quality parameters (dissolved oxygen, pH, salinity and temperature) were measured at test initiation for all tests, and at test renewal and termination for ammonia tests.

Test Organisms

Broodstocks of *H. rufescens* and *S. purpuratus* were maintained at MPSL throughout the year. *M. galloprovincialis* broodstock was supplied by Carlsbad Aquafarms. *A. affinis* larvae were supplied by Aquatic Biosystems. *H. costata* broodstock and *M. pyrifera* sporophylls were collected by MPSL staff from Monterey Bay kelp beds (Monterey, CA). All organisms were maintained in aquaria supplied by continuously flowing, aerated, natural seawater at ambient sea surface temperature.

Unionized Ammonia Concentration-Response Tests

Ammonia test solutions were diluted from purchased stock (Orion) to nominal test concentrations using 1-μm filtered seawater. Range-finding tests were performed for each species prior to conducting the definitive toxicity tests. Three definitive short-term toxicity tests were performed for each species, with 3-5 lab replicates per treatment.

Total ammonia was measured using either an ammonia electrode or the spectrophotometric salicylate method at the beginning and end of all ammonia tests, and before and after test renewal for *A. affinis* and *H. costata*. Total ammonia concentrations were averaged over the duration of the test and converted to unionized ammonia concentrations (mg/L NH_3) based on test solution pH (Phillips et al. 1998). NOECs, LOECs, EC50s, LC50s and IC50s were calculated from unionized ammonia concentration and organism response with ToxCalc™ (Tidepool Scientific Software, v. 5.0), using the EPA statistical procedure (US EPA 1995) and the trimmed Spearman-Karber method (Hamilton 1977) or linear interpolation method.

Artificial Salt Tolerance Tests

Three salts were originally selected for testing: modified GP2 (US EPA 1993) and two commercially prepared marine salts, Forty Fathoms® Bioassay Grade, and Coralife®. Because of the initial poor performance of Coralife®, Tropic Marin® was substituted in subsequent testing efforts.

Salts were mixed with distilled water into 100% stocks of a nominal 34‰ salinity. Salt stock solutions were subsequently mixed with 1-μm filtered seawater to approximate 80, 60, 40, and 20% test solutions. Short-term toxicity tests were performed with 3-5 lab replicates per treatment, 3 times each. Organism response was compared to the minimum percent survival or normal development required for control replicates in each test protocol.

Results

Test species exhibited a wide range of sensitivity to unionized ammonia (Table 1.1). *H. rufescens* and *M. galloprovincialis* were the most sensitive to ammonia of the five species tested, and results were similar to those from other studies (Bay et al. 1993, Tang et al. 1997, Table 1.2). In some cases, the calculated LOEC exceeded the median effect concentration because of the steep slope of the dose-response curve.

Table 1.1. NOEC, LOEC and EC-, IC- or LC50 for unionized ammonia.

			Unionized Ammonia (μg/L, mean ± SE)		
Species	Duration	Endpoint	NOEC	LOEC	EC50*
H. costata	96 hours	Mortality	760 ± 120	1200 ± 160	840 ± 120
H. rufescens	48 hours	Larval development	43.3 ± 0.8	102 ± 17.8	82.3 ± 3.8
A. affinis	96 hours	Mortality	<424	587 ± 105	560 ± 17.9
M. galloprovincialis	48 hours	Larval development	90 ± 3	152 ± 5	120 ± 5.8
M. pyrifera	48 hours	Germination	614 ± 41	1010 ± 126	1250 ± 85.1
		Length	<545	850 ± 268	1370 ± 220

* IC50 statistics used for kelp growth endpoint, LC50 for mortality, and EC50 for germination and development

Table 1.2. NOEC, LOEC and EC- or LC50 for unionized ammonia from literature sources.

	Unionized ammonia (μg/L)		
Species	NOEC	LOEC	EC50
Ampelisca abdita	400[1]		830[2]
Eohaustorius estuarius	800[1]		2490[2]
Mytilus galloprovincialis	80[3]*	150[3]*	190[3]*
Neanthes arenaceodentata	680[4]	1250[4]	
Rhepoxynius abronius	400[1]		1590[2]
Purple Urchin Development	10[3]*		72[5]
			30[3]*
Purple Urchin Fertilization			> 1400[5]

[1]US EPA 1994, [2]Kohn et al. 1994, [3]Tang et al. 1997, [4]Dillon 1993, [5]Bay et al. 1993
*values in NH3-N

Artificial salts performed variably, with only Tropic Marin® providing acceptable control response in all tests (Figure 1.1). Concentration-dependent responses were noted in one of three Forty Fathoms® Bioassay Grade and GP2 tests with *H. rufescens* tests, in one of three GP2 tests with *M. galloprovincialis*, and in the one Coralife® test performed with *S. purpuratus* (Figures 1.2 through 1.4). Sea salt performance in these tests, ranked from best to worst was: Tropic Marin®, Forty Fathoms® Bioassay Grade, GP2, Coralife®. Coralife was rejected after only one test.

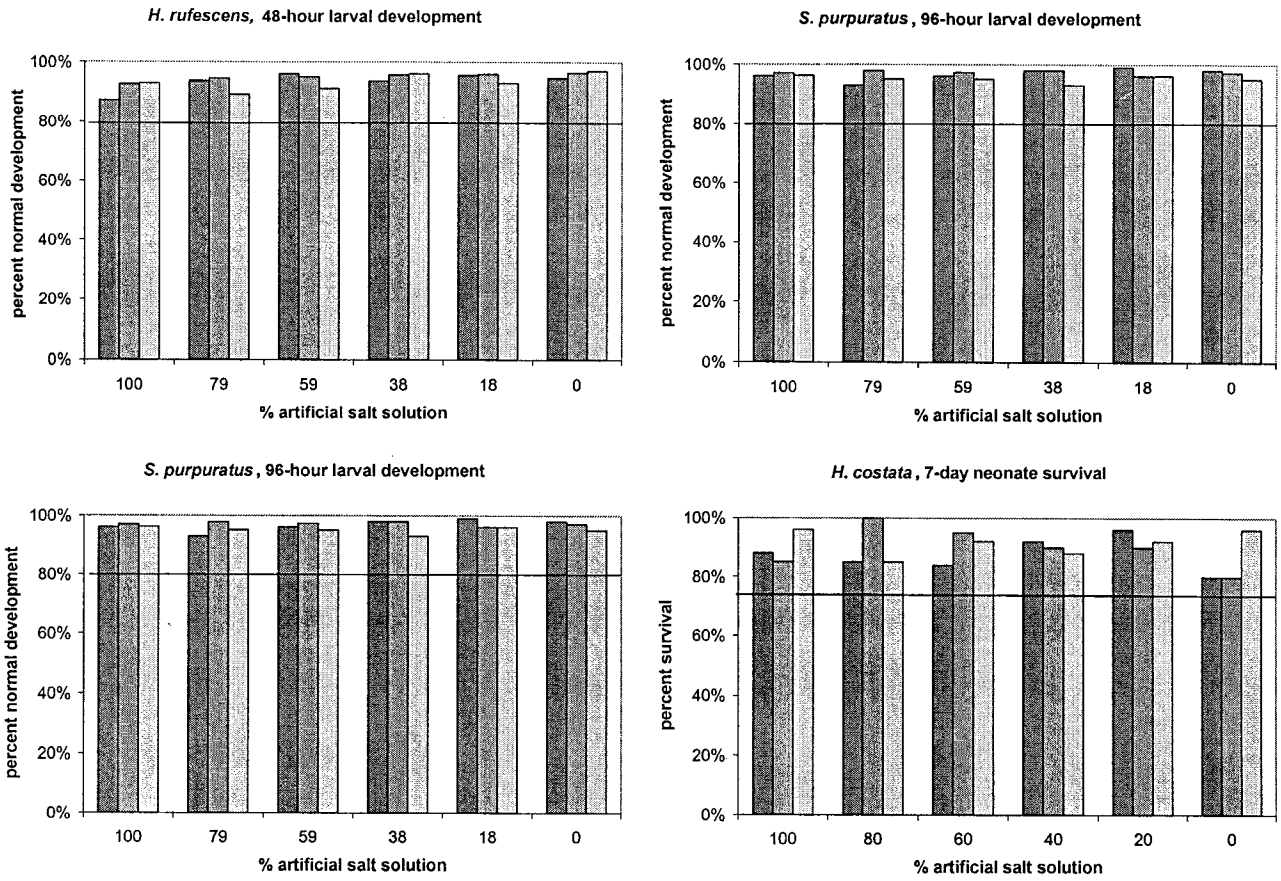

Figure 1.1. Results of Tropic Marin® artificial salt tests. Bars represent replicate means.

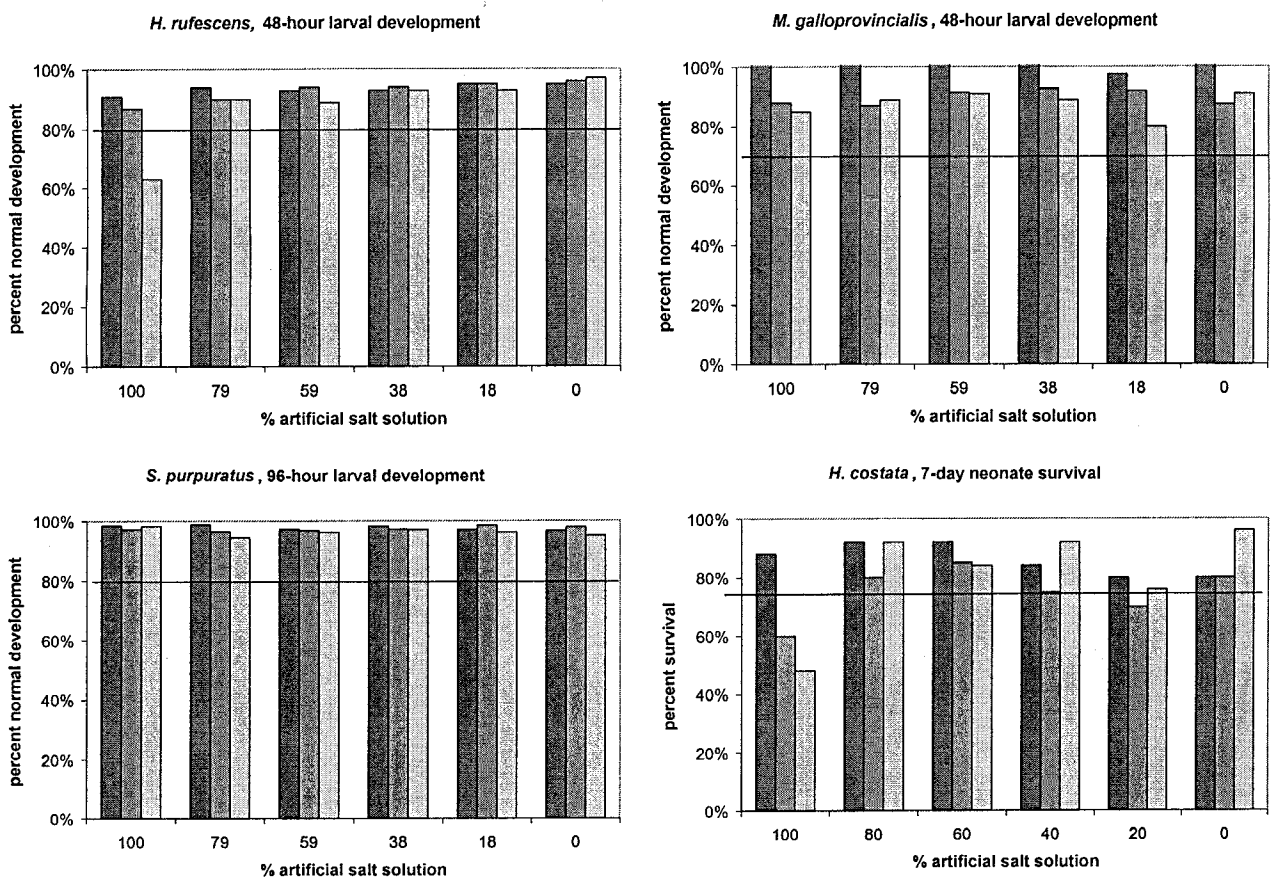

Figure 1.2. Results of Forty Fathoms® artificial salt tests. Bars represent replicate means.

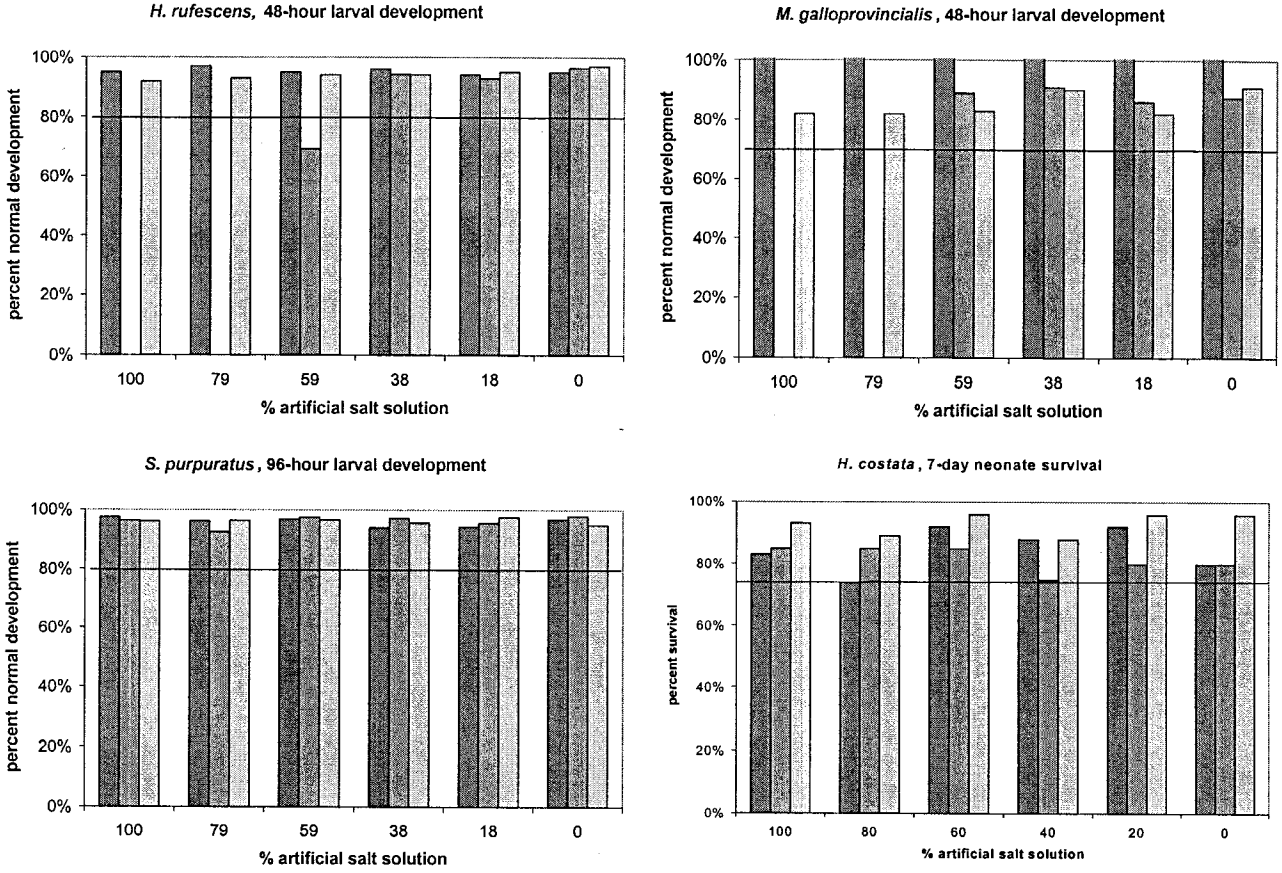

Figure 1.3. Results of GP2 artificial salt tests. Bars represent replicate means.

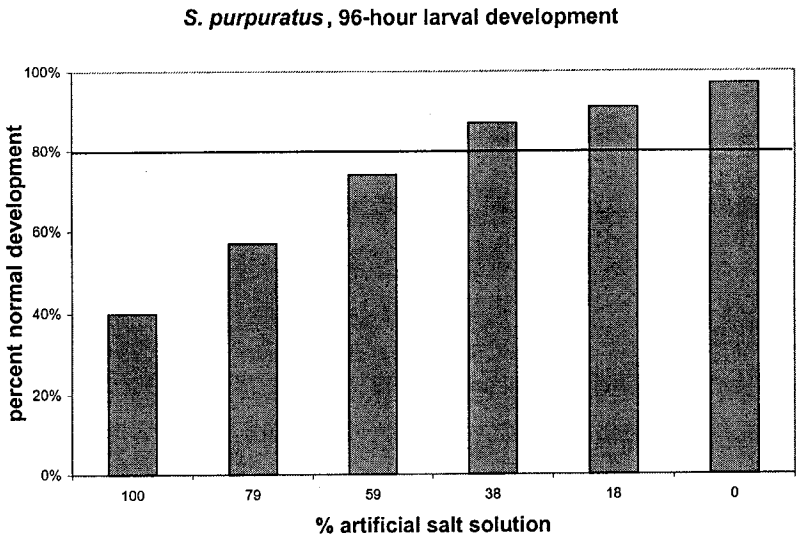

Figure 1.4. Results of Coralife® artificial salt tests. Bars represent replicate means.

Discussion

It is possible that effluent samples from a variety of sources may have ammonia concentrations exceeding some of the NOEC values derived in this study (Table 1.1). In such cases, ammonia could be responsible for any observed toxicity. However, the presence of ammonia at elevated concentrations does not rule out the possibility that other compounds might also be present in toxic amounts. The data shown here, as well as data from other studies (Table 1.2), may be used to identify samples in which ammonia concentrations are lower than NOEC values, thereby making it more likely that compounds other than ammonia are responsible for toxicity.

These data may also be useful in the selection of appropriate species for testing effluents of known or suspected composition. For example, a sample thought to contain pesticide products and moderate levels of ammonia might be successfully tested using the mysid test. This test is sensitive to a variety of insecticides (Hunt et al. 1997), but is more tolerant of ammonia then echinoderm or mollusk embryo/larval tests, allowing useful resolution of toxic constituents.

With regard to salinity adjustment, Tropic Marin® allowed an acceptable control response with all the species tested, indicating that this salt formulation may be used when testing 100% effluent. Forty Fathoms® Bioassay Grade is currently used by other testing laboratories for some protocols. It adversely affected *M. galloprovincialis* embryos in one test. That protocol is often sensitive to metals and other trace toxicants. Forty Fathoms® also affected *H. costata* in two tests. Both salts should be useful as convenient, readily available alternatives to brine for adjusting salinity when sample dilution is undesirable. However, since these salts were used only in distilled water, further testing is warranted to confirm their reliability in routine testing of effluent samples. GP2 may be useful in *S. purpuratus* tests, but did not meet control acceptability criteria for *M. galloprovincialis*, *H. costata* and *H. rufescens*.

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Section 2 - Toxicity of Metal Mixtures to Purple Sea Urchins (*Strongylocentrotus purpuratus*) and Bay Mussels (*Mytilus galloprovincialis*)

Abstract

Combinations of trace metals often occur in wastewater and ambient samples. Knowing how trace metals interact in complex mixtures is valuable when interpreting chemistry data and conducting TIEs to determine the causes of toxicity. Of the metals most commonly found in wastewater and environmental samples, copper and zinc are essential for the proper function of biochemical processes, while cadmium and nickel are not known to be necessary for biological function. Elevated concentrations of any metal ion can cause substitution reactions that may lead to the inhibition of enzyme activity or the destabilization of structural components of cellular molecules. In this study, purple sea urchin and bay mussel embryos were exposed to these four metals individually and in combinations to determine effects on larval development. Metals were combined in equitoxic amounts by taking equal proportions of the single metal concentrations that bracketed the individual metal EC50s. Using a toxic unit approach, we determined if trace metal toxicity was greater-than additive, additive or less-than additive. For sea urchins, binary combinations of Cu+Cd, Cu+Ni and Ni+Zn produced greater-than additive responses. Cd+Ni produced an additive response, and Cd+Zn and Cu+Zn produced less-than additive responses. Trinary combinations with Cu+Ni+Zn produced greater-than additive responses while Cd+Cu+Ni and Cd+Ni+Zn were additive and Cd+Cu+Zn was less-than additive. The four-metal combination produced an additive response. Single experiments with mussels produced results that agreed with sea urchin results in four of eleven mixtures. These experiments can be used to evaluate the contribution of these metals to the toxicity of complex mixtures.

Introduction

Wastewater and ambient water samples often contain mixtures of trace metals, but the interactive effects of these mixtures are mostly unknown. Attempts have been made at predicting the toxicity of complex mixtures using the concentration addition model based on toxic unit summation (Logan and Wilson 1995, Haas and Stirling 1994, Swartz et al.

1995). Deviations from straight concentration addition are usually attributed to partial addition (Enserink et al. 1991).

Ambient water quality monitoring takes into account individual metals but has generally ignored mixtures (Enserink et al. 1991, Masnado et al. 1995). Because ambient samples are rarely contaminated with a single metal, it may be necessary to understand how metals interact in order to determine causes of observed toxicity. Metals can interact with organisms in different ways, particularly at the cellular level, and it is difficult to predict the effects of mixtures based on straight additivity. Competition for binding sites within the cell membrane, with metallo-enzymes, metallothioneins, or target molecules with metal-specific sensitivities can create antagonistic and synergistic interactions that deviate from straight concentration addition (Sharma et al. 1999).

Many studies have been conducted looking at the interactive effects of metals on a variety of species (Masnado et al. 1995, Van Gestel and Hensbergen 1997, Hansen et al. 1999, Kraak et al. 1994, Negilski et al. 1981, Vanegas et al. 1997). Several of these studies are outlined in Table 2.1 to illustrate the variety of responses that can occur among species. No general trend for metal mixture toxicity can be found in the literature (Kraak et al. 1994, Sharma et al. 1999). Few studies have been conducted with invertebrates and there is no awareness of any studies examining the effects of metal mixtures on invertebrate larval development.

Larval development toxicity tests with invertebrates are used extensively for effluent monitoring and for screening environmental samples (APHA 1998). Understanding how larval test organisms develop in the presence of metal mixtures will allow for better interpretation of chemical analyses and toxicity identification evaluation (TIE) results. An understanding of metal interaction will also improve permit monitoring and the management of polluted sites by identifying problems associated with metals. The objectives of this study were to investigate the toxicity of trace metal mixtures. Toxicity of cadmium, copper, nickel and zinc to two marine species was measured both individually and in all possible combinations. These metals were chosen because they

are commonly found in effluents and at contaminated sites. This work was designed to determine whether trace metal toxicity to larval organisms was greater-than additive, additive, or less-than additive.

Table 2.1. Results of metal mixture experiments from the literature conducted with various species and endpoints.

Metal Combination	Shrimp[1] Survival *Callianassa australiensis*	Amphipod[2] Survival *Allorchestes compressa*	Zebra Mussel[3] Filtration *Dreissena polymorpha*	Fish[4] Survival *Fundulus heteroclitus*	Daphnid[5] Growth and Reproduction *Daphnia magna*	Daphnid[6] Survival *Ceriodaphnia dubia*	Bacterial[7] fluorescence *Pseudomonas. fluorescens*	Insect[8] Growth *Folsomia candida*
Cd+Cu	additive	synergistic	synergistic				synergistic	
Cd+Zn	antagonistic	additive	additive				synergistic	antagonistic
Cu+Zn	antagonistic	synergistic	antagonistic				synergistic	
Cd+Cu+Zn	antagonistic	synergistic	additive	synergistic				
Cd+Cr+Cu+Ni+Zn						synergistic		
As+Cd+Cr+Cu+ Hg+Pb+Ni+Zn					additive			

[1]Negilski et al. 1981, [2]Ahsanullah et al. 1988, [3]Kraak et al. 1994, [4]Eisler and Gardner 1979, [5]Enserink et al. 1991, [6]Masnado et al. 1995, [7]Preston et al. 2000, [8]Van Gestel and Hensbergen. 1997

Methods

Research and Development

Before the experimental design was finalized, specialists in metals and mixture toxicity were solicited for comments so as to refine the experimental design. Concerns were expressed about the complexity of the initial design that combined varying proportions of the EC50 of each metal. Initial experiments based on the original design produced variable responses at the EC50 concentration in single metal tests, and made the interpretation of metal combinations difficult. Due to difficulties encountered with first experimental design, additional literature was consulted to improve the experimental design. The second design was based on the toxic unit (TU) approach in which the TU contribution for individual metals could be calculated in a mixture. The aforementioned specialists reviewed this new design. Combination tests were initiated using cadmium, copper and zinc, and rangefinder tests were initiated with silver. Results from silver rangefinder tests demonstrated that responses were too variable for the purposes of the

mixture analysis. Therefore, nickel was substituted for silver in the final experiments. Copper and zinc (essential metals) and nickel and cadmium (non-essential metals) were chosen for the study based on their usual presence in effluent and ambient samples.

Metal Mixtures

Metal stock solutions were prepared at the following concentrations: Cd – 100,000 μg/L, Cu – 10,000 μg/L, Ni – 1,000,000 μg/L, and Zn – 10,000 μg/L. These same stock solutions were stored and used in all experiments. Chemical confirmation was performed on the stock solutions to determine percent deviation from nominal concentrations. Based on the analyses of stock solutions and experimental dilutions, metal concentrations are presented in the results as nominal amounts.

Each binary mixture experiment was composed of three tests: two single metal tests and a combination test. The single metal tests included six concentrations prepared so that the expected EC50 was evenly bracketed. These test concentrations were determined in previous laboratory experiments. The six concentrations for the combination test were prepared by combining one half of each of the single metal concentrations (see example, Table 2.2). EC50s were calculated from tests in each experiment using Trimmed Spearman-Karber analysis or linear interpolation analysis if there was an incomplete range of responses. Using the single metal EC50s, toxic units (TUs) were calculated for each single metal concentration. By dividing these TU values in half we could determine the TU contribution of each metal in the binary test concentrations. Linear equations were used based on the combination concentrations and the individual metal TU contributions to determine how many TUs of each metal were contributing to the combination EC50. If the metals in combination were strictly additive, the sum of TU contributions from each metal at the combination EC50 would equal 1. Mixture TUs less than one indicated that metals interacted synergistically, and mixture TUs greater than one indicated antagonistic interaction.

Table 2.2. Study design example for mixture experiment using cadmium and copper.

Single Metal Test		Single Metal Test		Mixture Test		
Cadmium Concentration	Cadmium TU	Copper Concentration	Copper TU	½ Cd+½ Cu Concentration	Cd TU in mix	Cu Tu in mix
0 µg/L	0.00	0 µg/L	0.00	0 µg/L	0.00	0.00
100	0.34	3.2	0.20	51.6	0.17	0.10
180	0.62	5.6	0.35	92.8	0.31	0.18
320	1.10	10	0.63	165	0.55	0.31
560	1.93	18	1.13	289	0.97	0.56
1000	3.45	32	2.00	516	1.72	1.00
Cd EC50	290.12	Cu EC50	15.98	Cd+Cu EC50	123.07	
	At a Cd+Cu EC50 = 123.07			Cd contribution =	0.406	TU
				Cu contribution =	0.234	TU
				Total =	0.640	TU

An additional binary combination experiment was conducted with sea urchins using copper and zinc to determine if altering copper concentrations above and below equitoxic levels affected the response. Instead of combining half of the standard copper concentrations with zinc (0, 3.2, 5.6, 10, 18, 32 µg/L), copper was added using less than equitoxic concentrations (0, 1.8, 3.2, 5.6, 10, 18 µg/L) and greater than equitoxic concentrations (0, 5.6, 10, 18, 32, 56 µg/L). This experiment, therefore, consisted of three copper dose-response tests, one zinc dose-response test, and three combination dose-response tests.

Combination experiments with three and four metals were conducted in a similar manner except that single metal concentrations were divided into thirds and fourths, respectively. The average response of the sea urchin combination experiments was deemed significantly greater-than additive, additive, or less-than additive using one-sample t-tests to compare the mean TU sum from the combination test to a strictly additive response of 1 TU (n=3 replicate tests). Mussel experiments were labeled less-than additive if the sum TUs was greater than 1.2 and greater-than additive if the sum TUs was less than 0.8 (Broderius et al. 1995).

Analytical Procedures

Nominal concentrations of metals associated with toxic effects were verified by analyzing two samples per dose-response experiment. Metals were analyzed at the California Department of Fish and Game Trace Metal Analytical Facility at Moss Landing, CA, using Inductively Coupled Plasma Mass Spectrometry (ICP, US EPA method 1638). Because analyses were conducted in a seawater matrix, the ICP was blanked using open ocean seawater as a background.

Ninety-eight samples were analyzed for varying combinations of the four test metals. A set of Standard Reference Metals (SRMs) was analyzed with every batch of 25 samples to determine method accuracy and precision. Six randomly selected samples, as well as seawater blanks, were spiked with known concentrations of metals and analyzed to determine the effect of sample matrix on metal recovery. Recoveries were considered acceptable if they were within 30% of the calculated spike. Eleven duplicate samples were also analyzed for precision.

Toxicity Tests

Toxicity tests were conducted using the developing embryos of purple sea urchins (*Strongylocentrotus purpuratus*) and bay mussels (*Mytilus galloprovincialis*). Details of the test protocols are given in U.S. EPA 1995. Sea urchins were collected from the Monterey County coast near Granite Canyon, and held at the Marine Pollution Studies Laboratory (MPSL) at ambient seawater temperature and salinity until testing. Mussel broodstock was obtained from Marine Research and Educational Products in Carlsbad, CA. On the day of a test, animals were induced to spawn and gametes were collected. Eggs were fertilized and embryos were introduced to test containers. Test containers were polyethylene-capped, seawater leached, 20-ml glass scintillation vials containing 10 mL of sample. Each test container was inoculated with approximately 250 embryos (25/ml). After a 48-hour exposure for mussels and a 96-hour exposure for sea urchins, larvae were fixed in 5% buffered formalin. Larvae in each container were examined under an inverted light microscope at 100x to determine the proportion of normal live larvae for mussels and the proportion of normally developed larvae for sea urchins.

Tests were conducted at ambient seawater salinity (34‰). Sixty liters of test water was collected at the initiation of the study and stored at 4°C in high-density polyethylene carboys. Using seawater from a single batch eliminated any variability that could be caused by various binding agents in different seawater lots. Each combination experiment with sea urchins was replicated three times. Because experiments with sea urchins produced variable results with no specific pattern, we decided to conduct the mussel experiments once.

Results

Analytical Chemistry

Measured metal concentrations varied from nominal concentrations by up to 23% (Table 2.3). Cadmium concentrations were the most variable with measured amounts ranging from 13 to 18% below nominal amounts. Nickel and zinc were the most stable metals, with measured concentrations varying 0-7% from nominal. Accuracy and precision based on measurements of Standard Reference Materials ranged from 0.31 to 4.02% and 1.08 to 3.00%, respectively. Between-duplicate relative percent differences were below 15% except for two copper measurements at the lowest concentrations. These measurements differed by 36 and 60%. Spiked matrix samples were considered acceptable if recoveries did not vary by more than 30%. Recoveries ranged from 0 to 13%. Based on these analytical results, the following toxicity data are presented using nominal concentrations.

Table 2.3. Results of metal concentration verification analyses. RPD indicates relative percent difference between nominal and mean concentrations.

Cd			**Cu**			**Ni**			**Zn**		
Nominal	Mean	RPD	Nominal	Mean	RPD	Nominal	Mean	RPD	Nominal	Mean	RPD
0 µg/L	0.03		0 µg/L	0.04		0 µg/L	0.05		0 µg/L	0.00	
45	39.1	14%	1.4	1.5	7%	45	45.1	0%	14	14.4	3%
60	50.6	17%	1.9	1.5	21%	60	59.7	1%	18.7	19.2	2%
90	78.9	13%	2.8	2.2	23%	90	88.0	2%	28	27.8	1%
140	121.9	14%	4.5	4.2	7%	140	137.3	2%	45	47.4	5%
180	154.0	16%	6	5.3	13%	180	175.3	3%	56	60.3	7%
186.7	155.4	18%	9	7.6	16%	186.7	183.2	2%	60	63.3	5%
280	243.4	14%	10	8.5	16%	280	268.7	4%	90	95.5	6%
560	480.7	15%	32	30.1	6%	560	535.6	4%	180	188.0	4%

Sea Urchin Experiments

The single metal components of the combination experiments produced mean sea urchin EC50 values for each of the four metals (Table 2.4). EC50 values for the essential metals, Cu and Zn, were the least variable, while Cd had the highest variability. Cadmium also had the most variable contributions of toxic units in the mixture experiments. Table 5 presents EC50s for single metals and combination tests. The TU sums and the relative TU contributions of single metals are also listed.

Table 2.4. Mean sea urchin EC50 values for tests conducted during this study. Units in μg/L. SD = standard deviation, N = number of samples, CV = coefficient of variation.

	Cd EC50	Cu EC50	Ni EC50	Zn EC50
Mean	342.3	15.3	341.4	96.9
SD	137.6	2.2	84.8	12.2
N	12	15	8	15
CV	40%	14%	25%	13%

Binary metal combinations tested with sea urchins produced all possible interactions. Greater-than additive responses were noted for Cd+Cu, Cu+Ni and Ni+Zn. In each of these cases, the mixture response, as indicated by the toxic units for the combination was statistically less than expected based on the number of individual metal toxic units added to the test solutions. This is demonstrated for these combinations in Figure 2.1a by the histogram bars being significantly lower than the additivity standard of 1 TU. An additive response occurred with Cd+Ni, where the toxic units for combination were roughly the same as expected based on individual metal toxic units added. Less-than additive responses occurred with Cd+Zn and Cu+Zn. The most variable response occurred in the Cd+Ni pair, with TU sums ranging from 0.848 to 1.345 (Table 2.5).

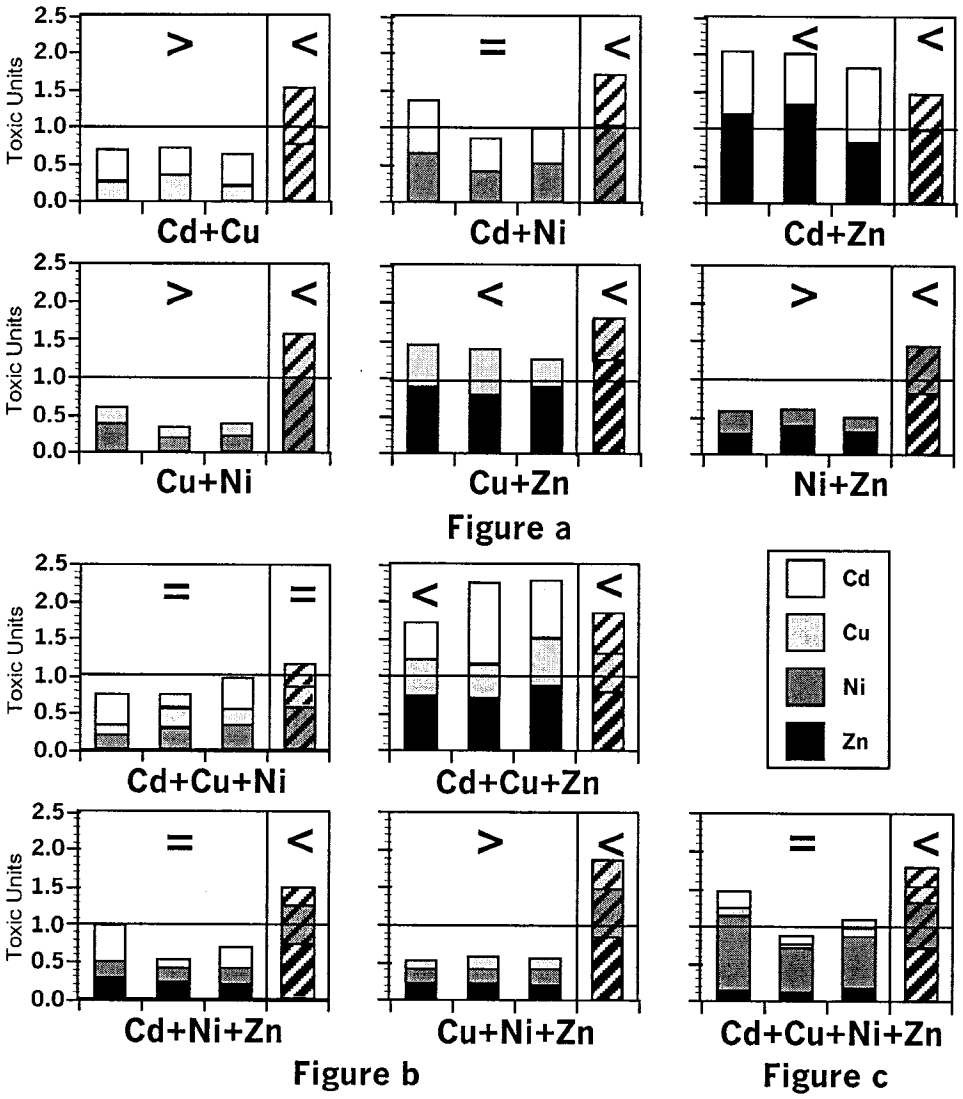

Figure 2.1a-c. Results of binary, trinary and quarternary combinations of Cd, Cu Ni and Zn. < indicates less-than additive response, = indicates additive response, > indicates greater-than additive response. Plain bars denote sea urchin data and cross-hatched bars denote mussel data.

Table 2.5. Sea urchin and mussel metal mixture results. Individual metal and mixture EC50s (μg/L) are listed next to relative toxic unit contribution. Means and standard deviations are listed for sea urchin EC50s and TU contributions.

	Sea Urchin								Mussel	
Metal Mixture	EC50	TUs	EC50	TUs	EC50	TUs	Mean	SD	EC50	TUs
Cd	290.12	0.406	462.46	0.364	179.01	0.422	0.397	0.030	5597.63	0.750
Cu	15.98	0.234	15.41	0.347	13.57	0.180	0.254	0.085	10.78	0.750
Cd+Cu	123.07		173.54		78.23		124.95	47.68	3748.40	
TU Sum		0.640		0.711		0.602	0.651	0.055		1.500
Cd	237.39	0.689	389.91	0.441	380.81	0.467	0.532	0.136	5597.63	0.675
Ni	244.89	0.656	407.99	0.407	348.72	0.503	0.522	0.126	604.37	1.013
Cd+Ni	328.01		339.46		359.56		342.34	15.97	3374.90	
TU Sum		1.345		0.848		0.971	1.055	0.259		1.688
Cd	290.12	0.850	462.46	0.678	179.01	1.004	0.844	0.163	5597.63	0.484
Zn	86.01	1.177	100.90	1.314	90.71	0.813	1.101	0.259	151.60	0.969
Cd+Zn	326.92		423.71		239.00		329.88	92.39	2421.65	
TU Sum		2.027		1.992		1.817	1.945	0.113		1.453
Cu	14.41	0.200	16.12	0.139	14.66	0.159	0.166	0.031	10.78	0.558
Ni	244.89	0.381	407.99	0.176	348.72	0.212	0.256	0.109	604.37	0.992
Cu+Ni	95.28		73.12		75.66		81.35	12.13	620.12	
TU Sum		0.581		0.315		0.371	0.422	0.140		1.550
Cu	15.78	0.529	12.95	0.595	19.93	0.365	0.496	0.118	10.78	0.558
Zn	97.97	0.891	99.35	0.783	81.94	0.881	0.852	0.060	477.20	1.231
Cu+Zn	92.84		85.05		79.38		85.76	6.76	192.30	
TU Sum		1.420		1.378		1.246	1.348	0.091		1.788
Ni	244.89	0.300	407.99	0.227	348.72	0.195	0.241	0.054	604.37	0.642
Zn	111.63	0.271	102.84	0.358	93.43	0.292	0.307	0.045	477.20	0.791
Ni+Zn	96.86		119.20		88.48		101.51	15.88	494.17	
TU Sum		0.571		0.585		0.487	0.548	0.053		1.433
Cd	197.92	0.417	678.98	0.171	227.92	0.407	0.332	0.139	5597.63	0.284
Cu	20.21	0.133	14.49	0.270	13.28	0.222	0.208	0.070	10.78	0.284
Ni	412.60	0.200	419.67	0.295	267.05	0.333	0.276	0.069	604.37	0.568
Cd+Cu+Ni	166.75		245.42		185.11		199.09	41.16	2840.78	
TU Sum		0.750		0.736		0.962	0.816	0.127		1.136
Cd	462.46	0.507	179.01	1.091	339.48	0.765	0.788	0.293	5597.63	0.522
Cu	15.41	0.475	13.57	0.452	13.11	0.626	0.518	0.095	10.78	0.522
Zn	100.90	0.729	90.71	0.692	95.59	0.870	0.764	0.094	477.20	0.783
Cd+Cu+Zn	316.94		266.05		347.83		310.27	41.30	2608.29	
TU Sum		1.711		2.235		2.261	2.069	0.310		1.826
Cd	197.92	0.472	678.98	0.114	227.92	0.261	0.282	0.180	5597.63	0.247
Ni	412.60	0.215	419.67	0.189	267.05	0.220	0.208	0.017	604.37	0.495
Zn	108.48	0.279	119.09	0.227	97.82	0.192	0.233	0.044	477.20	0.742
Cd+Ni+Zn	214.60		189.43		137.22		180.42	39.47	2472.52	
TU Sum		0.966		0.530		0.673	0.723	0.222		1.484
Cu	20.21	0.119	14.49	0.169	13.28	0.137	0.142	0.025	10.78	0.383
Ni	412.60	0.179	419.67	0.19	267.05	0.213	0.194	0.017	604.37	0.656
Zn	108.48	0.219	119.09	0.211	97.82	0.183	0.204	0.019	477.20	0.821
Cu+Ni+Zn	99.54		105.34		76.07		93.65	15.50	547.02	
TU Sum		0.517		0.570		0.533	0.540	0.027		1.860
Cd	237.39	0.205	389.91	0.091	380.81	0.116	0.137	0.060	5597.60	0.231
Cu	14.41	0.103	16.12	0.066	14.66	0.095	0.088	0.019	10.78	0.231
Ni	244.89	1.000	407.99	0.588	348.72	0.706	0.765	0.212	604.37	0.619
Zn	111.63	0.137	102.84	0.107	93.43	0.158	0.134	0.026	477.20	0.691
Cd+Cu+Ni+Zn	113.89		82.44		105.49		100.61	16.29	2304.71	
TU Sum		1.445		0.852		1.075	1.124	0.300		1.771

Table 2.6. EC50 and TU values from variable copper concentration experiment with zinc. EC50 units are in μg/L.

	EC50	TUs
Cu <	19.96	0.248
Zn	81.94	1.019
Cu+Zn	91.83	
TU Sum		1.267
Cu =	19.93	0.365
Zn	81.84	0.881
Cu+Zn	79.38	
TU Sum		1.246
Cu >	20.10	0.557
Zn	81.94	0.783
Cu+Zn	75.30	
TU Sum		1.340

Trinary metal combinations produced a less-than additive response for Cd+Cu+Zn (Figure 2.1b, TU sums significantly greater than 1 TU). Tests in two of the trinary metal experiments (Cd+Cu+Ni and Cd+Ni+Zn) produce generally greater-than additive responses, but because of the variability of TU sums the mean response was not statistically different from additive. Cu+Ni+Zn produced a greater than additive response. The four-metal experiment produced a mean response that was statistically additive, but variable (Figure 2.1c).

The additional binary metal experiment with copper and zinc demonstrated that regardless of an increased or decreased range of copper concentrations in the mixture, the overall larval development response was still less-than additive (Table 2.6). Copper EC50s were similar regardless of the concentrations used to determine the statistic, but the contribution of copper toxic units to the combination varied according to the concentration range. As the copper TU contribution increased the zinc TU contribution decreased.

Mussel Experiments

Only four of the eleven combination experiments with the mussel larval development test (n = 1 test per combination) produced responses that were similar to those from sea urchin tests (Figure 2.1, Table 2.5). The binary combinations of Cd+Zn and Cu+Zn, and the trinary combination of Cd+Ni+Zn were less-than additive for both species, and the combination of Cd+Cu+Ni was additive for both species. All mussel tests besides the trinary combination of Cd+Cu+Ni produced responses that were less-than additive.

Discussion

The objective of this study was to investigate the responses of larval invertebrates to various combinations of four trace metals in order to aid in the interpretation of data from chemical analyses and toxicity identification evaluations. The results demonstrate few consistent trends, and indicate that additive, synergistic and antagonistic responses are all possible with different metals combinations and test species. The six binary combinations produced all three possible outcomes, as did the four trinary combinations, while a mixture of all four metals produced additive toxicity to sea urchins and less-than-additive toxicity to mussels. For the sea urchin tests, the toxicity of metal combinations tended toward additivity as more metals were added to the mixture. One of the six binary combinations, two of the four trinary combinations, and the one four-metal combination produced additive responses. Although there is not much agreement in the literature about metal mixture toxicity, Enserink et al (1991) suggested that mixtures involving large numbers of metals are additive, but mixtures involving two or three metals are unpredictable.

Differences in response to metal mixtures by mussel and sea urchin larvae might be due to the difference in exposure duration (48 versus 96 hours), as well as basic differences in physiology. First cleavage in mussel embryos, and most other invertebrates, is determinate. Echinoderms and most vertebrates have indeterminate cleavage. This physiological difference might play a role in response to metals mixtures, but as outlined in Table 1, interspecies differences are variable even among invertebrates.

Factors that influence the toxicity of metals can include the interactions of non-essential metals with essential metals, the formation of metal-protein complexes, and the organism age and stage of development (Viarengo 1985). Literature studies mostly demonstrate the effects of metals combinations on adult organisms. Larval organisms in the present study began their exposure at the one-cell stage or during early cell division. Therefore, the metal interactions are taking place on a cellular level, rather than through organ response. Copper and zinc are considered essential metals to normal cell function and exist in homeostatic balance, while cadmium and nickel are non-essential. Copper acts as a catalyst for many enzyme systems, and zinc is essential for the proper structure and function of cell membranes (Viarengo 1985). Cadmium can disrupt the ionic balance and alter the permeability characteristics of cell membranes (Viarengo 1985), and nickel can cause mutagenicity in cells because the genotoxic effects on the cell are dependent on the differential intracellular compartmentalization of the nickel ion (Fletcher et al. 1994).

Excess amounts of metals entering a cell can cause increased metallothionein production and changes in lysosomal activity (Langston 1990). These processes help control the homeostasis of existing cellular metals and the detoxification of excess metals. Increased amounts of essential metals can also inhibit natural cell functions and ultimately be toxic through displacement of other metals at binding sites (George 1990). As metal concentrations increase, metal substitution reactions take place and the inhibition of enzyme activity and the destabilization of the structural components of cellular molecules may occur. Interactions among chemically related metals might cause various reactions through competition for binding sites at membrane transporters, metallo-enzymes, metallothioneins, or target molecules with specific sensitivities (Sharma et al. 1999). When zinc was associated with copper, cadmium, or both metals, an antagonistic response occurred. This might have been because these three metal ions have similar chemical behavior, with the toxicity being more related to binding site competition than specific cellular processes (George 1990).

The results of water quality monitoring are often interpreted on the basis of single compounds, and chemical interactions are often overlooked or poorly understood. Concentrations of metals that do not cause adverse effects when tested individually can cause toxicity when tested at the same concentrations in mixtures. Enserink et al. (1991) tested mixtures in which individual metal concentrations were at the maximum levels for Dutch water quality criteria, and found the mixtures to be highly toxic to *Daphnia magna*. Similarly, Spehar and Fiandt (1986) tested metal mixtures based on the United States water quality criteria and found that combinations of metals worked in an additive manner for *Ceriodaphnia dubia*. Masnado et al. (1995) tested samples containing combinations of metals at permitted concentrations and found them to be toxic to *Ceriodaphnia dubia*.

The United States Environmental Protection Agency's acute marine water quality criteria are: 43 μg/L for cadmium, 3.9 μg/L for copper, 140 μg/L for nickel, and 170 μg/L for zinc (US EPA 1986). The ranges of concentrations of copper, nickel and zinc tested in this study bracketed the acute criteria for these metals. However, the range of cadmium concentrations tested averaged 10 times higher than the acute criterion. The four metals used in this study would cause abnormal development for sea urchins and mussels if they were tested in combination in MPSL dilution water at criteria concentrations. Although the toxic response for sea urchins would occur solely because of the addition of 170 μg/L zinc, well above the EC50 of 96.9 μg/L (1.75 TU), criteria concentrations of copper and nickel would contribute an additional 0.70 toxic units to the mixture based on the current experiments. Mussels are less sensitive to zinc than sea urchins (EC50 = 175 μg/L), but still might be affected by combinations of the four metals at criteria concentrations.

Copper and zinc concentrations tested in this study are comparable with those found in municipal effluents from southern California, while tested concentrations of cadmium and nickel were one to three orders of magnitude higher (SCCWRP 1998). Effluent concentrations of copper were at the high end of single-metal dose response experiments and concentrations of zinc were in the middle range. Undiluted southern

California effluents containing both of these metals at reported average concentrations would cause toxicity to sea urchin and mussel larvae.

Results of metal mixture tests with a range of species demonstrate that interactive effects are unpredictable and sometimes contradictory (Sharma et al. 1999). However, knowledge of metal interactions for specific species is still important in monitoring situations because it will allow interpretation of chemistry data from ambient and effluent samples. When TIEs suggest that metals are the cause of toxicity, associated chemistry data can be reviewed more critically if the responses to certain metal combinations are known.

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Section 3 - Evaluating the Toxicity of Coastal Sediments Collected as Part of the Southern California Bight Pilot Project

Introduction

The Southern California Bight (SCB) is an open coastal embayment between Point Conception, Santa Barbara County, and Cabo Colonet, Baja California. This part of the ocean is a transitional region adjacent to warm subtropical waters and influenced by cold currents from the temperate north. The topography of the Bight is complex, with submarine canyons, ridges, basins, and large offshore islands. The mixing of currents throughout this range of varied physical features creates habitat for a broad spectrum of marine species, including more than 500 species of fish, 1500 species of invertebrates, and a diverse assemblage of resident and migratory marine mammal and bird populations.

Each year, local, state, and federal agencies spend in excess of $10 million to monitor the condition of natural resources in the SCB (SCCWRP 1998). Much of this monitoring effort has focused on the effects of waste discharges, compliance with National Pollutant Discharge Elimination System (NPDES) permit requirements, and comparisons with water quality standards set by the California Ocean Plan and the Federal Clean Water Act. While these studies provide important information for minimizing anthropogenic impacts, many were designed to evaluate impacts in confined areas near individual discharges. The limited geographic scope of these studies prompted resource managers to develop monitoring strategies for the entire SCB. Regional information was needed to assess cumulative impacts of multiple contaminant inputs and to evaluate chemical transport, fate, and environmental effects on habitats throughout the Bight.

In 1994 the Southern California Bight Pilot Project (SCBPP) was initiated to address monitoring needs. Administered by the Southern California Coastal Water Research Project (SCCWRP), the pilot project assessed water quality, sediment contamination, the status of biological resources, species diversity, and the presence of marine debris.

The SCBPP provided a "snapshot" of the condition of the SCB. The SCBPP developed new analytical tools to evaluate regional data sets and organizational structures to coordinate participation by numerous organizations (SCCWRP 1998). The Southern California Bight 1998 Regional Monitoring Project expanded on the 1994 survey by including more participants, sampling different habitats, and measuring additional parameters.

As part of the Marine Bioassay Project's continuing assessment of anthropogenic impacts in California coastal waters, staff from the Marine Pollution Studies Laboratory at Granite Canyon (MPSL) participated in the Southern California Bight Regional Monitoring Program by conducting tests to estimate the toxicity of SCB sediments. This included measurement of amphipod survival in solid-phase sediments, and measurement of sea urchin embryo/ larval development after exposure to constituents fluxing from sediments at the sediment-water interface. Twenty-six stations distributed throughout the Southern California Bight were evaluated by MPSL. As a first step in this program, MPSL participated in an interlaboratory comparison in which seven laboratories conducted the amphipod (*Eohaustorius estuarius*) toxicity test on four split sediment samples supplied by SCCWRP.

Methods

In August of 1998, toxicity tests were conducted on sediment samples from coastal waters of the Southern California Bight ranging from Malibu Creek to Northern San Diego Bay (Figures 3.1 through 3.5). The samples included 12 marine sites, 13 port sites and one river site (Malibu Creek). The 26 sediment samples were tested with the 10-day amphipod (*Eohaustorius estuarius*) solid-phase test and the sea urchin (*Strongylocentrotus purpuratus*) sediment/water interface (SWI) test. A subset of 12 samples were also tested with SWI tests using flow-through overlying water.

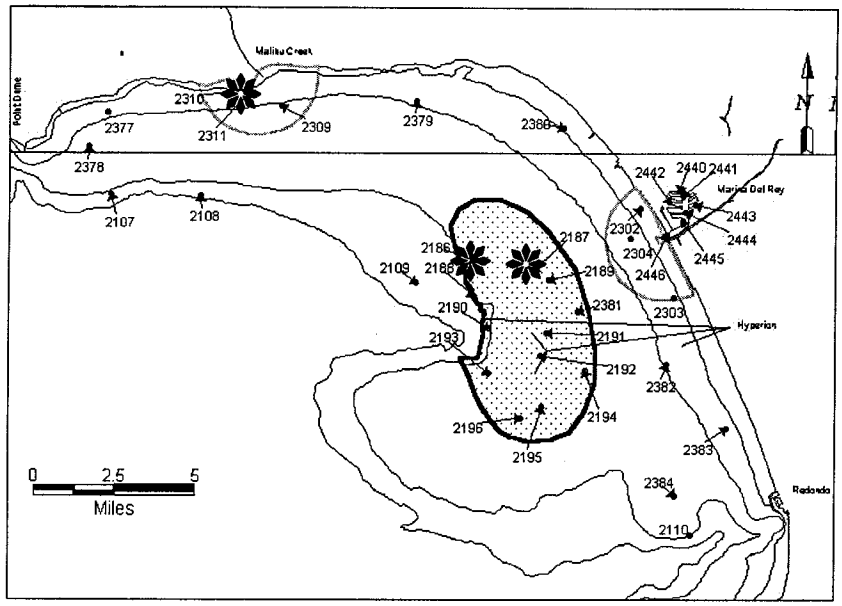

Figure 3.1. Southern California Bight Regional Monitoring Program sediment sampling sites. Asterisk indicates samples tested by MPSL. Map from SCCWRP 1998.

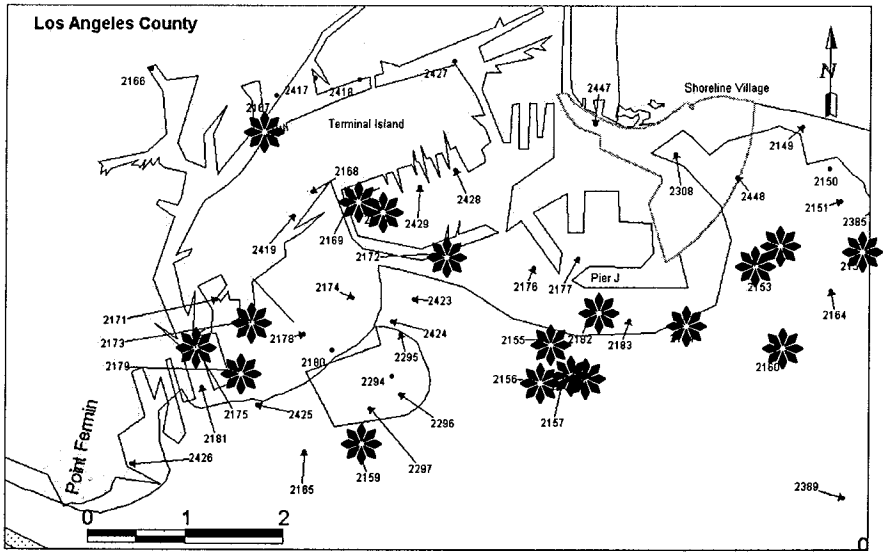

Figure 3.2. Southern California Bight Regional Monitoring Program sediment sampling sites. Asterisk indicates samples tested by MPSL. Map from SCCWRP 1998.

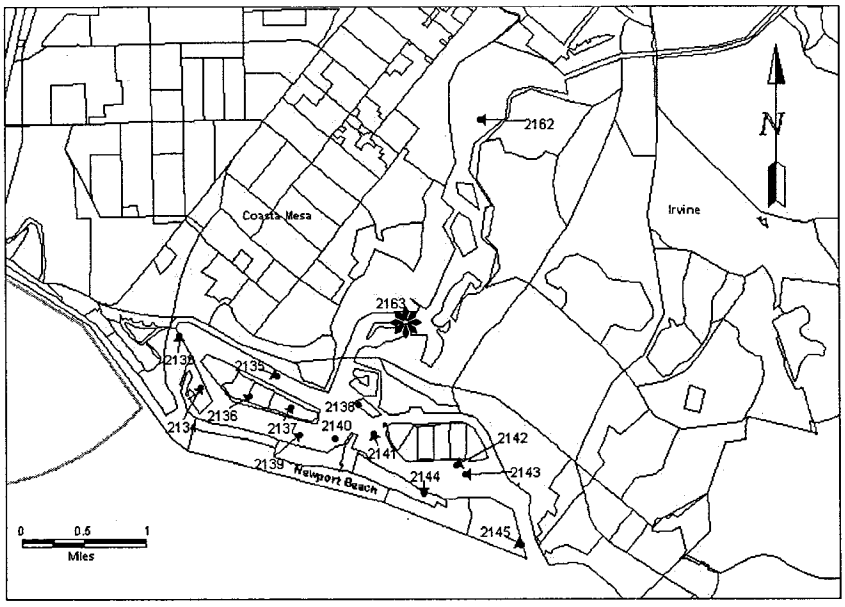

Figure 3.3. Southern California Bight Regional Monitoring Program sediment sampling sites. Asterisk indicates samples tested by MPSL. Map from SCCWRP 1998.

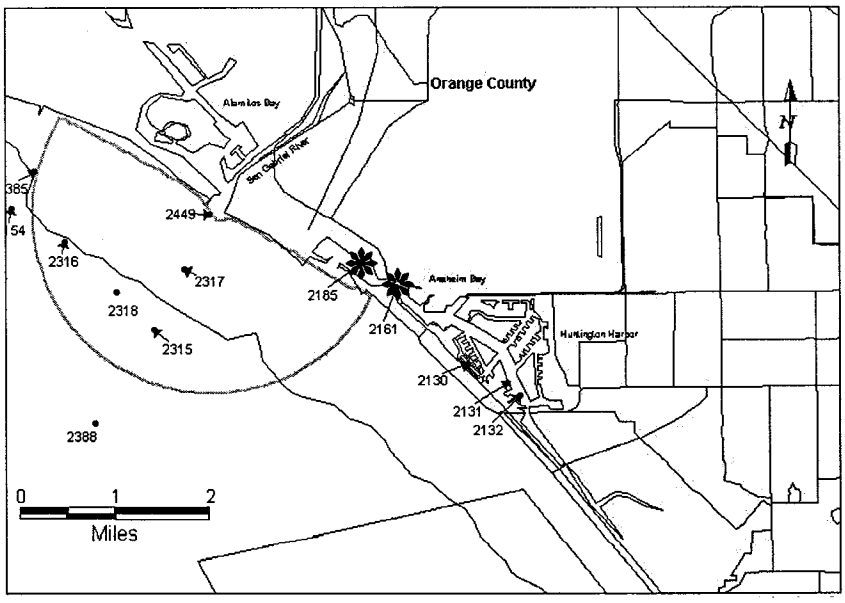

Figure 3.4. Southern California Bight Regional Monitoring Program sediment sampling sites. Asterisk indicates samples tested by MPSL. Map from SCCWRP 1998.

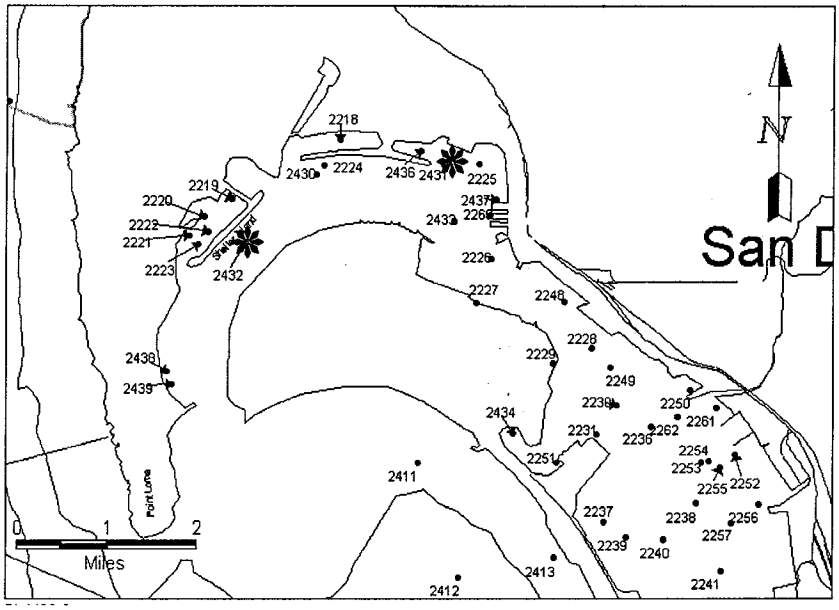

Figure 3.5. Southern California Bight Regional Monitoring Program sediment sampling sites. Asterisk indicates samples tested by MPSL. Map from SCCWRP 1998.

Amphipod Tests

Solid-phase sediment toxicity was assessed using the standard 10-day amphipod survival protocol (U.S. EPA 1994). All *Eohaustorius* individuals were obtained from Northwestern Aquatic Sciences in Yaquina Bay, Oregon. Animals were separated into groups of approximately 100 and placed in polyethylene boxes containing Yaquina Bay collection site sediment, then shipped on ice via overnight courier. Upon arrival at MPSL, the amphipods were acclimated to a salinity of 20‰ and temperature of 15°C. Once acclimated, the animals were held at test temperature and salinity for an additional 48-hours prior to being transferred into the test containers.

Test containers were one-liter glass beakers containing 2 cm of sediment and filled to the 700-ml line with clean one-micron filtered natural seawater adjusted to the appropriate salinity (20‰) with distilled well water. Test sediment and overlying water were allowed to equilibrate for 24 hours, then 20 amphipods were placed in each beaker, along with dilution water to fill test containers to the one-liter line. Test chambers were aerated gently and continuously illuminated at ambient laboratory light levels. Five laboratory replicates of each sample were tested for ten days. After ten days, the sediments were sieved through a 0.5-mm Nitex screen to recover the test animals, and the number of survivors was recorded for each replicate.

Controls were included as part of each sediment test. The negative control consisted of five laboratory replicates of sediment from the amphipod collection site in Yaquina Bay (home sediment; provided by Northwestern Aquatic Sciences). Amphipods in the negative controls were exposed to the home sediment in exactly the same manner as amphipods exposed to test sediments. Amphipod survival was greater than 90% in all negative controls, indicating that laboratory conditions did not adversely affect test results. To evaluate the toxicant sensitivity of each batch of amphipods, positive control reference toxicant tests were conducted concurrently with each sediment test, using a water-only dilution series of cadmium chloride. For the reference toxicant tests, amphipod survival was recorded after a 96-hour exposure to three replicates of four cadmium concentrations and a seawater control.

Test sediments were not sieved to remove indigenous organisms prior to testing, but the sediments were vigorously homogenized, and the presence of any organisms thought capable of interfering with the test amphipods was noted and recorded at the conclusion of the test.

Sea Urchin Embryo-Larval Development Test at the Sediment-Water Interface

The purple sea urchin (*Strongylocentrotus purpuratus*) embryo/larval development test was conducted according to standard protocol (U.S. EPA 1995), with modifications for testing at the sediment-water interface (Anderson et al. 1996). Intact sediment samples were taken with minimal disturbance by inserting polycarbonate core tubes into the Van Veen grab sampler. To maintain sample integrity and avoid disruption of chemical gradients within the surficial sediment, samples were retained in these tubes throughout transport, storage and testing.

Seawater at ambient salinity (34 ± 2‰) was added to each core tube and allowed to equilibrate for 24 hours before starting the test. Sediment-water interface (SWI) test containers for static tests consisted of a 10-cm diameter polycarbonate tube with a 25-μm screen tightly cemented across the bottom. Containers for flow-through tests consisted of 2-cm sections of the same polycarbonate tubing with 25-μm screens affixed at both ends. The seawater flow rate in flow-through exposures was approximately 60 mL per minute.

Sea urchins were collected from the Monterey County coast near Granite Canyon, and held at MPSL in flowing natural seawater at ambient temperature and salinity until testing. Adult sea urchins were held in complete darkness to preserve gonadal condition. On the day of the test, urchins were induced to spawn in air by injection with 0.5 mL of 0.5M KCl. Eggs and sperm collected from the urchins were mixed in seawater at a 500 to 1 sperm to egg ratio, and embryos were distributed to the test containers within one hour of fertilization. Each SWI tube was inoculated with approximately 250 embryos. Containers used in flow-through tests were filled with

embryos before being lowered onto the sediment in the SWI cores. Both types of containers were placed so that the screen was within 1 cm of the surface of the intact sediment core.

In the negative laboratory controls for the SWI tests, sea urchin embryos were exposed to sediment from the amphipod collection site in Yaquina Bay (amphipod home sediment) in a manner identical to the test sediment exposures. The positive control to evaluate the sensitivity of each batch of embryos was a reference toxicant test in which embryos were exposed for 96 hours to a dilution series of copper chloride.

After the 96-hour exposure period, larvae were fixed in 5% buffered formalin. One hundred larvae in each container were examined under an inverted light microscope at 100x to determine the proportion of normally developed larvae.

Data Analysis

Data analysis for both amphipod and sea urchin tests was designed to determine the statistical significance of differences in response between samples and controls. Samples were characterized as toxic if the following two criteria were met: 1) there was a significant difference ($p<0.05$) in mean organism response (e.g., percent survival) between a sample and the control as determined using a separate-variance t-test, and 2) mean organism response in the toxicity test, as a percent of the control, was less than a threshold value based on the 90th percentile Minimum Significant Difference (MSD), a value derived from large sediment toxicity data sets. This threshold was developed using data from the State Water Resources Control Board's Bay Protection and Toxic Cleanup Program (BPTCP) database (Phillips et al. *in review*), following statistical methods described by Thursby et al. (1997). The threshold is based on the overall variability among laboratory replicates for all samples in the data set, with statistical significance determined at an alpha of 0.05 and power of 0.90. The threshold value for *Eohaustorius estuarius* is 75% of the control response (n = 385), and the threshold value for the SWI exposure with *Strongylocentrotus purpuratus* is 59% of the control (n = 109).

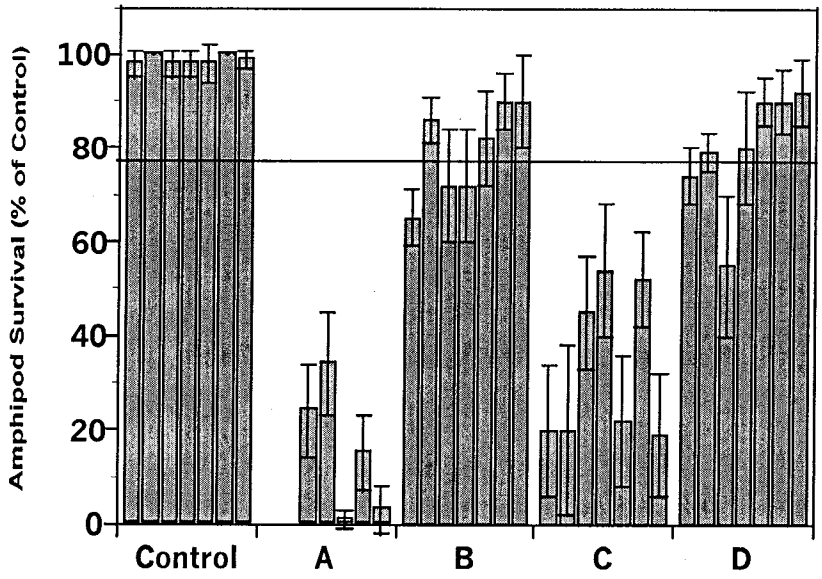

Figure 3.6. Results of an interlaboratory comparison test in which the *Eohaustorius estuarius* solid-phase sediment toxicity test was conducted by seven laboratories on four samples collected from coastal waters in the Southern California Bight. The laboratory codes, in order of presentation, are ABC, GC, LA, MEC, OC, SC, and SD with GC being the Marine Pollution Studies Laboratory at Granite Canyon. All data were normalized to each laboratory's home sediment control. The dashed line indicates a toxicity threshold (75% of the control response). Samples A and C were found to be toxic by all laboratories; samples B and D had results that averaged closer to the threshold value, with some laboratories indicating significant toxicity and others not.

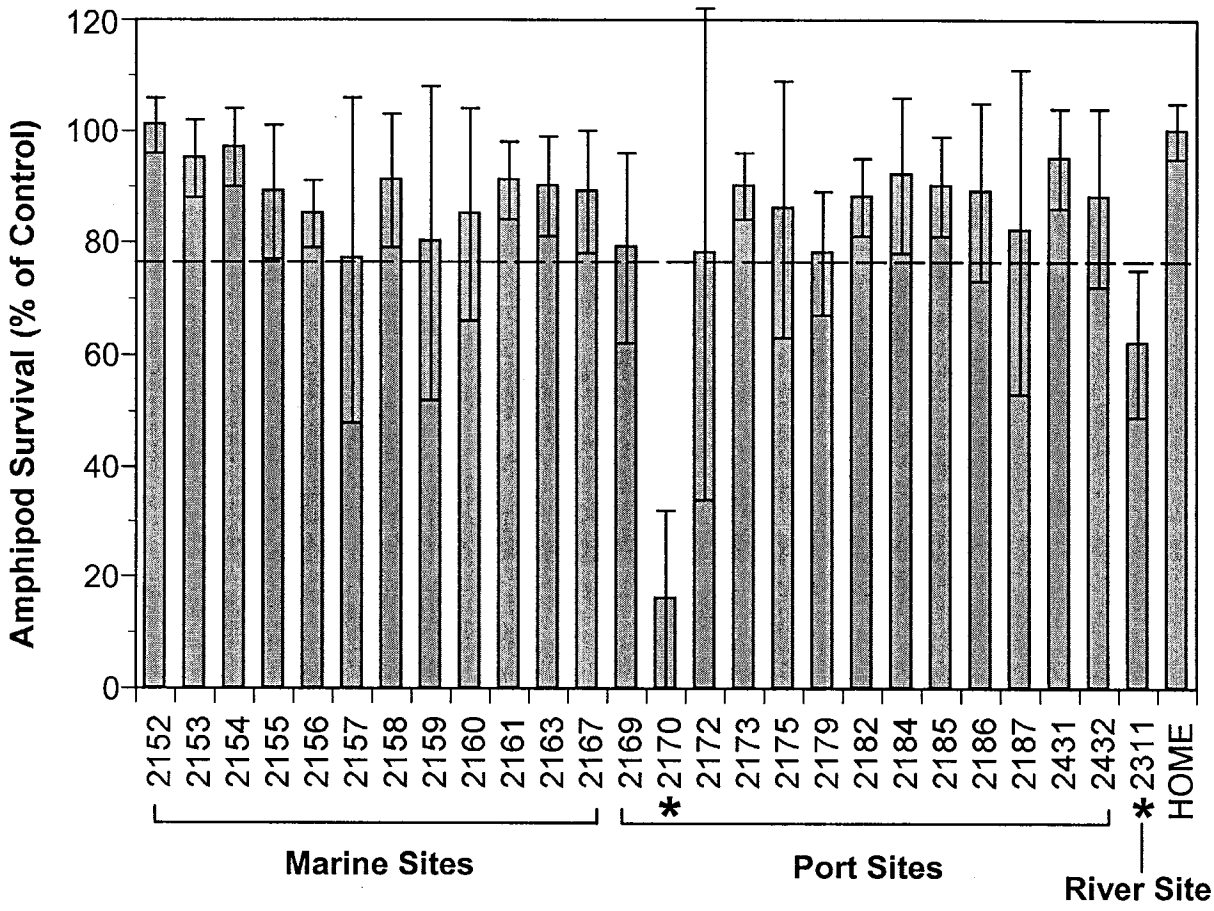

Figure 3.7. Results of 10-day amphipod sediment toxicity tests on samples from coastal waters in the Southern California Bight. Dashed line is a threshold for statistically significant toxicity (as in Figure 6). "Home" signifies control sediment from the amphipod collection site. Asterisks indicate samples that were significantly toxic to amphipods.

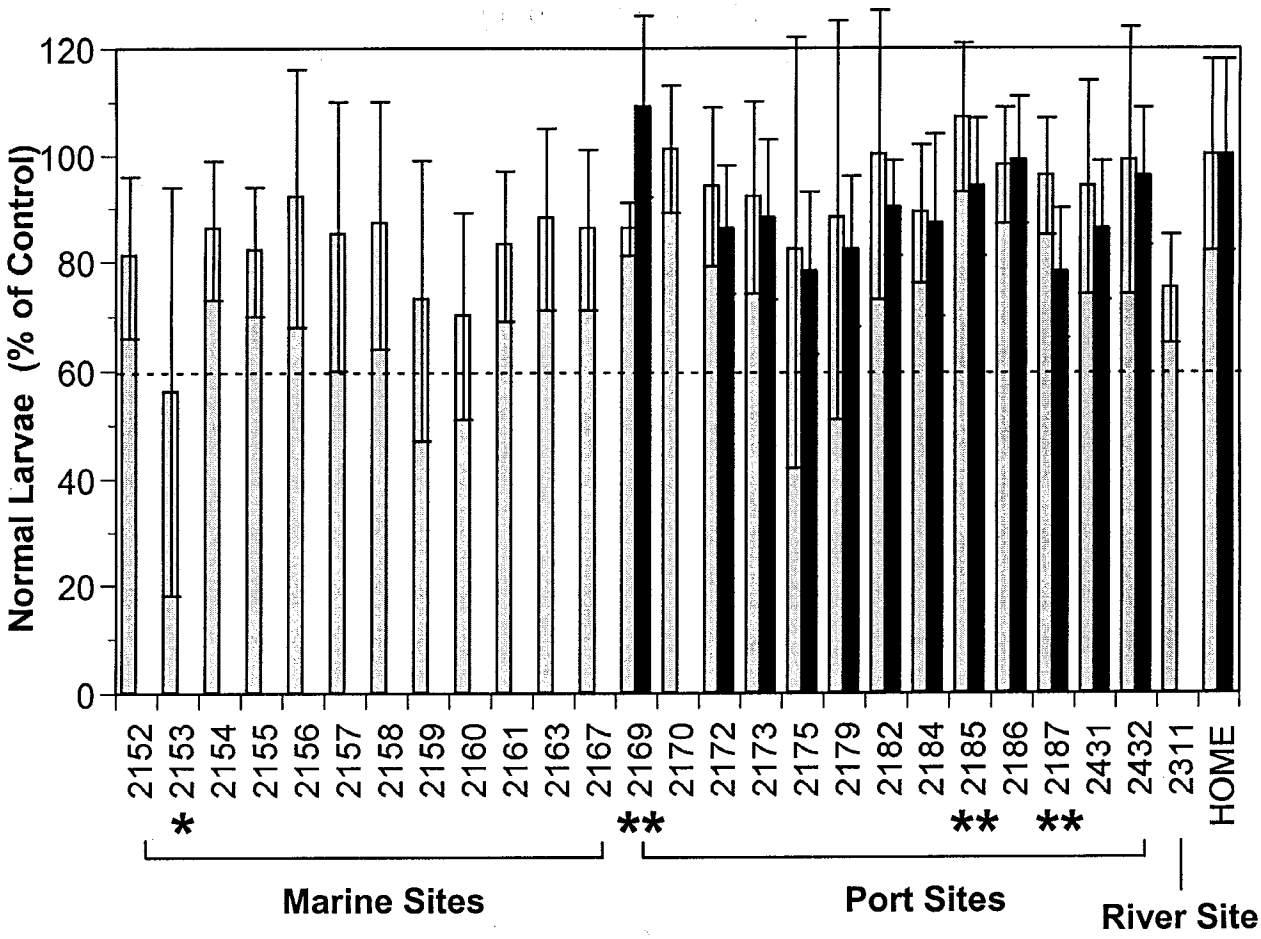

Figure 3.8. Results of sediment/water interface (SWI) tests with the purple sea urchin larvae exposed to intact sediment cores collected from coastal waters in the Southern California Bight. Dashed line is a threshold for statistically significant toxicity (as in Figure 6). Home is the control sediment from the amphipod collection site. Lightly shaded bars are for static SWI exposures, dark bars are for flow-through SWI exposures. Asterisks indicate samples that were significantly toxic to sea urchin development. Double asterisks indicate that static exposures were significantly different from flow-through exposures.

Data from the interlaboratory comparison were evaluated using Analysis of Variance (ANOVA; alpha = 0.05) to determine if there were statistically significant differences among results from different laboratories. Tukey's test was used to identify significant differences among individual laboratories in paired comparisons (alpha = 0.05).

Results

Interlaboratory Tests

In the interlaboratory tests of Southern California Bight samples, two of the samples (A and C) were found to be significantly toxic by all participating laboratories (Figure 3.6). The other two samples were less toxic. Three laboratories indicated sample B was significantly toxic, while the other four laboratories did not. Two laboratories indicated sample D was significantly toxic, while the other five laboratories did not. Analysis of Variance (ANOVA) indicated significant differences among at least some of the seven laboratories for each of the four samples tested ($\alpha = 0.05$). Out of 21 possible comparisons among the seven laboratories, there were 11, 3, 8, and 6 significant differences for samples A through D, respectively. All of the differences for sample B were the result of relatively low survival at one laboratory, and 4 of 6 differences for sample D were the result of another laboratory recording significantly lower survival than three others (Figure 3.6). The data from MPSL were near the middle of the laboratory response distribution for all samples.

Regional Monitoring Program

Few of the sediments collected from the Southern California Bight were significantly toxic to either amphipods or sea urchin embryos (Figures 3.7 and 3.8). One port sample (2170) and the river sample (2311) were significantly toxic to amphipods, but none of the open-water coastal samples were. Potentially predatory worms were noted in single replicates of two separate samples, but neither sample was significantly toxic. One open-water site (sample 2153) was significantly toxic to sea urchin embryos. Based on separate variance t-tests, 3 out of 12 flow-through SWI exposures were significantly different from their static counterparts (double asterisks, Figure 3.8). None of flow-through samples were significantly toxic. This result contrasts with previous

studies where increased toxicity has been observed in flow-through SWI tests, presumably because of increased contaminant flux across steeper chemical gradients maintained by the continuous introduction of clean seawater (Anderson et al. *in press*).

Discussion

Because the Southern California Bight receives surface runoff and municipal and industrial wastewater from a large urban area, it has been the focus of numerous studies investigating biological effects of pollutants (e.g., Bascom et al. 1982, Swartz et al. 1984, Bay et al. 1999). Recent studies have identified numerous locations within Southern California bays and estuaries where elevated concentrations of contaminants have been observed in conjunction with sediment toxicity (Anderson et al. in press, Fairey et al. 1998). In the open coastal waters of the Bight, toxic sediments were collected near sewage outfalls on the Palos Verdes Shelf in the early 1980's (Swartz et al. 1984), but subsequent improvement to wastewater treatment resulted in improved sediment conditions (Swartz et al. 1986). In the present study, none of the 12 samples collected from offshore stations in the SCB were toxic to amphipods, and only one was toxic to sea urchin embryos. Two sites in enclosed bays were toxic to amphipods, though none of these was significantly toxic to sea urchins. These results are consistent with those from the 1994 SCB pilot project, when no toxicity to another amphipod species, *Ampelisca abdita*, was observed in any of the samples collected.

While these results are encouraging, they are indicative only of a lack of short-term effects in the samples collected. No inference can be made from these data regarding the potential impacts from long-term exposure or elevated dietary exposures resulting from bioaccumulation of persistent compounds.

The 1998 Southern California Bight Regional Monitoring Program was able to build upon the organizational efforts made during the 1994 Southern California Bight Pilot Project. The cooperative program brought together a combination of regulatory agencies, the regulated community, and additional scientists from private and academic laboratories. The combination of organizations with different perspectives, interests,

and capabilities resulted in a comprehensive regional-scale approach. By combining resources, these participants were able to expand the number of habitats sampled and the number of indicators measured (SCCWRP 1998). Participation in the program provided the Marine Bioassay Project with an opportunity to investigate the potential for biological impacts in marine sediments from a large section of the California coastal marine environment. As synoptically collected chemistry data become available, this information will be combined to provide a regional scale environmental assessment of the Southern California Bight.

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Section 4 – Marine Bioassay Project Training and Workshops

Since 1989, the Marine Bioassay Project (MBP) has been conducting training workshops to support implementation of the effluent toxicity testing requirements described in the California Ocean Plan. Early workshops were held at the Marine Pollution Studies Laboratory (MPSL) at Granite Canyon, and covered all aspects of sample preparation, organism culture, toxicity testing, data analysis and interpretation. MBP staff participated in an EPA-sponsored two-day workshop in 1990 that focused on West Coast test species culture techniques and protocol development, the proceedings of which were published in an EPA report. In 1991, the MBP staff traveled to San Francisco and San Pedro to conduct hands-on workshops for laboratory managers and staff in Northern and Southern California. In 1993, two workshops were held at Granite Canyon, focusing specifically on all aspects of the mysid protocol. In 1994, the MBP staff joined with scientists from the US EPA to conduct a similar hands-on workshop at the EPA facility in Richmond, CA. This workshop covered all aspects of toxicity testing with all species recommended for use on the west coast, and was held in conjunction with a meeting of the Northern California Chapter of the Society of Environmental Toxicology and Chemistry (SETAC). In September of 1995, Brian Anderson of the MBP staff participated in a weeklong SETAC-sponsored Pellston Workshop entitled "Whole effluent toxicity testing: an evaluation of methods and prediction of receiving system impacts." That workshop resulted in a SETAC special publication by the same name (Chapman et al. 1996). One of the recommendations of that workshop was the formation of a SETAC/EPA expert panel that would, among other responsibilities, provide formal workshops throughout the nation to support toxicity test implementation. One of the first workshops was given as a two-day short-course in conjunction with the national SETAC conference in San Francisco in November of 1997. John Hunt of the MBP staff presented the marine toxicity testing methods as part of that course. In the summer of 1998, during the current phase of the project, Brian Anderson participated in a similar SETAC/EPA sponsored workshop in San Diego, presenting a detailed description of marine toxicity testing methods.

These workshops have provided a forum for exchanging ideas regarding the scientific basis for toxicity testing as an assessment tool, the laboratory details of properly conducting the tests, quality assurance and control, and the use of toxicity data in management decisions. Further workshops are planned in the next phase of the project.

Section 5 – Marine Bioassay Project Assistance with Organism Supply

Throughout the course of the Marine Bioassay Project, MBP staff have identified potential commercial suppliers of toxicity test organisms, assisted those suppliers with technical information on particular species (primarily mysids and topsmelt), and provided contact information to suppliers and testing laboratories who purchase the organisms.

During the current phase of the project, our focus has been on maintaining a dependable supply of topsmelt larvae from Aquatic Biosystems, a company to which we originally supplied topsmelt broodstock, and in promoting the commercial supply of mysids, *Holmesimysis costata*. We have been in contact with Kim Seivers in the Monterey Bay area, Dave Gutoff in the San Diego area and others to check on availability and demand, and have shipped gravid female mysids to Aquatic Biosystems to support their efforts to culture these animals in the laboratory. We have also provided written comments to Steven Baugs of the California Environmental Laboratory Accreditation Program to assist with their supplier inventory, and have had numerous telephone conversations with commercial suppliers and testing laboratories to help coordinate test organism availability. Our current focus is on mysid supply, and we will be testing mysids from commercial suppliers as part of the next phase of the project.

Appendices

Appendix A – Ammonia Toxicity Test Raw Data

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
ABALONE	1	9/22/93	0.000	91	19	0.83	0.81	0.03
ABALONE	1	9/22/93	0.000	89	16	0.85		
ABALONE	1	9/22/93	0.000	81	22	0.79		
ABALONE	1	9/22/93	0.000	85	24	0.78		
ABALONE	1	9/22/93	0.000	Sample Lost	Sample Lost	Sample Lost		
ABALONE	1	9/22/93	0.004	100	12	0.89	0.86	0.05
ABALONE	1	9/22/93	0.004	88	10	0.90		
ABALONE	1	9/22/93	0.004	81	19	0.81		
ABALONE	1	9/22/93	0.004	101	12	0.89		
ABALONE	1	9/22/93	0.004	80	20	0.80		
ABALONE	1	9/22/93	0.016	81	27	0.75	0.80	0.05
ABALONE	1	9/22/93	0.016	88	13	0.87		
ABALONE	1	9/22/93	0.016	93	25	0.79		
ABALONE	1	9/22/93	0.016	86	24	0.78		
ABALONE	1	9/22/93	0.016	82	18	0.82		
ABALONE	1	9/22/93	0.042	73	16	0.82	0.82	0.01
ABALONE	1	9/22/93	0.042	73	18	0.80		
ABALONE	1	9/22/93	0.042	98	19	0.84		
ABALONE	1	9/22/93	0.042	94	20	0.82		
ABALONE	1	9/22/93	0.042	84	18	0.82		
ABALONE	1	9/22/93	0.137	0	88	0.00	0.00	0.00
ABALONE	1	9/22/93	0.137	0	91	0.00		
ABALONE	1	9/22/93	0.137	0	111	0.00		
ABALONE	1	9/22/93	0.137	1	99	0.01		
ABALONE	1	9/22/93	0.137	0	100	0.00		
ABALONE	1	9/22/93	0.555	0	102	0.00	0.00	0.00
ABALONE	1	9/22/93	0.555	0	100	0.00		
ABALONE	1	9/22/93	0.555	0	100	0.00		
ABALONE	1	9/22/93	0.555	0	100	0.00		
ABALONE	1	9/22/93	0.555	0	100	0.00		
ABALONE	2	6/23/99	0.001	106	5	0.95	0.96	0.01
ABALONE	2	6/23/99	0.001	100	3	0.97		
ABALONE	2	6/23/99	0.001	93	4	0.96		
ABALONE	2	6/23/99	0.001	95	3	0.97		
ABALONE	2	6/23/99	0.001	98	5	0.95		
ABALONE	2	6/23/99	0.027	99	6	0.94	0.96	0.03
ABALONE	2	6/23/99	0.027	100	5	0.95		
ABALONE	2	6/23/99	0.027	103	2	0.98		
ABALONE	2	6/23/99	0.027	100	0	1.00		
ABALONE	2	6/23/99	0.027	87	7	0.93		
ABALONE	2	6/23/99	0.044	93	1	0.99	0.95	0.02
ABALONE	2	6/23/99	0.044	100	4	0.96		
ABALONE	2	6/23/99	0.044	97	5	0.95		
ABALONE	2	6/23/99	0.044	91	6	0.94		
ABALONE	2	6/23/99	0.044	98	7	0.93		
ABALONE	2	6/23/99	0.090	34	70	0.33	0.30	0.17
ABALONE	2	6/23/99	0.090	35	47	0.43		
ABALONE	2	6/23/99	0.090	37	54	0.41		
ABALONE	2	6/23/99	0.090	36	64	0.36		
ABALONE	2	6/23/99	0.090	0	63	0.00		
ABALONE	2	6/23/99	0.171	0	100	0.00	0.00	0.00
ABALONE	2	6/23/99	0.171	0	100	0.00		
ABALONE	2	6/23/99	0.171	0	100	0.00		
ABALONE	2	6/23/99	0.171	0	100	0.00		
ABALONE	2	6/23/99	0.171	0	100	0.00		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
ABALONE	2	6/23/99	0.290	0	100	0.00	0.00	0.00
ABALONE	2	6/23/99	0.290	0	100	0.00		
ABALONE	2	6/23/99	0.290	0	100	0.00		
ABALONE	2	6/23/99	0.290	0	100	0.00		
ABALONE	2	6/23/99	0.290	0	100	0.00		
ABALONE	3	10/8/99	0.000	87	7	0.93	0.94	0.03
ABALONE	3	10/8/99	0.000	76	7	0.92		
ABALONE	3	10/8/99	0.000	93	2	0.98		
ABALONE	3	10/8/99	0.021	100	4	0.96	0.93	0.02
ABALONE	3	10/8/99	0.021	100	9	0.92		
ABALONE	3	10/8/99	0.021	100	8	0.93		
ABALONE	3	10/8/99	0.044	93	7	0.93	0.93	0.02
ABALONE	3	10/8/99	0.044	98	5	0.95		
ABALONE	3	10/8/99	0.044	82	7	0.92		
ABALONE	3	10/8/99	0.079	76	28	0.73	0.66	0.06
ABALONE	3	10/8/99	0.079	66	37	0.64		
ABALONE	3	10/8/99	0.079	63	39	0.62		
ABALONE	3	10/8/99	0.142	0	100	0.00	0.00	0.00
ABALONE	3	10/8/99	0.142	0	100	0.00		
ABALONE	3	10/8/99	0.142	0	100	0.00		
ABALONE	3	10/8/99	0.235	0	100	0.00	0.00	0.00
ABALONE	3	10/8/99	0.235	0	100	0.00		
ABALONE	3	10/8/99	0.235	0	100	0.00		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	GERMINATED	NON-GERMINATED	PROPORTION GERMINATED	MEAN	STANDARD DEVIATION
KELP	GERM 1	11/30/99	0.000	103	6	0.94	0.98	0.02
KELP	GERM 1	11/30/99	0.000	105	2	0.98		
KELP	GERM 1	11/30/99	0.000	100	1	0.99		
KELP	GERM 1	11/30/99	0.000	100	1	0.99		
KELP	GERM 1	11/30/99	0.000	98	2	0.98		
KELP	GERM 1	11/30/99	0.287	100	2	0.98	0.98	0.02
KELP	GERM 1	11/30/99	0.287	100	1	0.99		
KELP	GERM 1	11/30/99	0.287	99	4	0.96		
KELP	GERM 1	11/30/99	0.287	100	3	0.97		
KELP	GERM 1	11/30/99	0.287	100	0	1.00		
KELP	GERM 1	11/30/99	0.527	102	2	0.98	0.97	0.01
KELP	GERM 1	11/30/99	0.527	98	4	0.96		
KELP	GERM 1	11/30/99	0.527	99	6	0.94		
KELP	GERM 1	11/30/99	0.527	100	3	0.97		
KELP	GERM 1	11/30/99	0.527	100	3	0.97		
KELP	GERM 1	11/30/99	0.692	90	12	0.88	0.93	0.04
KELP	GERM 1	11/30/99	0.692	100	6	0.94		
KELP	GERM 1	11/30/99	0.692	100	2	0.98		
KELP	GERM 1	11/30/99	0.692	93	7	0.93		
KELP	GERM 1	11/30/99	0.692	92	8	0.92		
KELP	GERM 1	11/30/99	1.256	63	57	0.53	0.54	0.04
KELP	GERM 1	11/30/99	1.256	56	52	0.52		
KELP	GERM 1	11/30/99	1.256	67	47	0.59		
KELP	GERM 1	11/30/99	1.256	51	50	0.50		
KELP	GERM 1	11/30/99	1.256	57	43	0.57		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	GERMINATED	NON-GERMINATED	PROPORTION GERMINATED	MEAN	STANDARD DEVIATION
KELP	GERM 1	11/30/99	1.852	11	90	0.11	0.26	0.23
KELP	GERM 1	11/30/99	1.852	13	93	0.12		
KELP	GERM 1	11/30/99	1.852	7	98	0.07		
KELP	GERM 1	11/30/99	1.852	54	47	0.53		
KELP	GERM 1	11/30/99	1.852	49	51	0.49		
KELP	GERM 2	1/5/00	0.000	91	9	0.91	0.89	0.03
KELP	GERM 2	1/5/00	0.000	92	12	0.88		
KELP	GERM 2	1/5/00	0.000	85	15	0.85		
KELP	GERM 2	1/5/00	0.000	92	9	0.91		
KELP	GERM 2	1/5/00	0.000	90	10	0.90		
KELP	GERM 2	1/5/00	0.320	84	16	0.84	0.89	0.04
KELP	GERM 2	1/5/00	0.320	94	8	0.92		
KELP	GERM 2	1/5/00	0.320	91	9	0.91		
KELP	GERM 2	1/5/00	0.320	94	6	0.94		
KELP	GERM 2	1/5/00	0.320	86	14	0.86		
KELP	GERM 2	1/5/00	0.597	91	9	0.91	0.88	0.04
KELP	GERM 2	1/5/00	0.597	86	14	0.86		
KELP	GERM 2	1/5/00	0.597	94	6	0.94		
KELP	GERM 2	1/5/00	0.597	97	19	0.84		
KELP	GERM 2	1/5/00	0.597	87	13	0.87		
KELP	GERM 2	1/5/00	0.943	80	26	0.75	0.77	0.05
KELP	GERM 2	1/5/00	0.943	76	24	0.76		
KELP	GERM 2	1/5/00	0.943	84	16	0.84		
KELP	GERM 2	1/5/00	0.943	76	32	0.70		
KELP	GERM 2	1/5/00	0.943	78	22	0.78		
KELP	GERM 2	1/5/00	1.496	46	54	0.46	0.33	0.17
KELP	GERM 2	1/5/00	1.496	20	82	0.20		
KELP	GERM 2	1/5/00	1.496	47	53	0.47		
KELP	GERM 2	1/5/00	1.496	42	58	0.42		
KELP	GERM 2	1/5/00	1.496	11	90	0.11		
KELP	GERM 2	1/5/00	2.157	4	100	0.04	0.06	0.06
KELP	GERM 2	1/5/00	2.157	16	84	0.16		
KELP	GERM 2	1/5/00	2.157	1	100	0.01		
KELP	GERM 2	1/5/00	2.157	5	96	0.05		
KELP	GERM 2	1/5/00	2.157	2	98	0.02		
KELP	GERM 3	5/10/00	0.000	100	13	0.88	0.83	0.04
KELP	GERM 3	5/10/00	0.000	100	24	0.81		
KELP	GERM 3	5/10/00	0.000	96	20	0.83		
KELP	GERM 3	5/10/00	0.000	91	26	0.78		
KELP	GERM 3	5/10/00	0.000	98	20	0.83		
KELP	GERM 3	5/10/00	0.346	92	34	0.73	0.80	0.07
KELP	GERM 3	5/10/00	0.346	95	35	0.73		
KELP	GERM 3	5/10/00	0.346	96	19	0.83		
KELP	GERM 3	5/10/00	0.346	82	21	0.80		
KELP	GERM 3	5/10/00	0.346	89	11	0.89		
KELP	GERM 3	5/10/00	0.553	88	31	0.74	0.80	0.07
KELP	GERM 3	5/10/00	0.553	86	31	0.74		
KELP	GERM 3	5/10/00	0.553	92	12	0.88		
KELP	GERM 3	5/10/00	0.553	99	15	0.87		
KELP	GERM 3	5/10/00	0.553	78	23	0.77		
KELP	GERM 3	5/10/00	0.840	72	50	0.59	0.63	0.05
KELP	GERM 3	5/10/00	0.840	75	55	0.58		
KELP	GERM 3	5/10/00	0.840	86	47	0.65		
KELP	GERM 3	5/10/00	0.840	71	43	0.62		
KELP	GERM 3	5/10/00	0.840	72	29	0.71		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	GERMINATED	NON-GERMINATED	PROPORTION GERMINATED	MEAN	STANDARD DEVIATION
KELP	GERM 3	5/10/00	1.300	15	84	0.15	0.28	0.07
KELP	GERM 3	5/10/00	1.300	29	77	0.27		
KELP	GERM 3	5/10/00	1.300	35	72	0.33		
KELP	GERM 3	5/10/00	1.300	32	72	0.31		
KELP	GERM 3	5/10/00	1.300	33	69	0.32		
KELP	GERM 3	5/10/00	1.708	7	100	0.07	0.05	0.04
KELP	GERM 3	5/10/00	1.708	3	108	0.03		
KELP	GERM 3	5/10/00	1.708	0	100	0.00		
KELP	GERM 3	5/10/00	1.708	10	90	0.10		
KELP	GERM 3	5/10/00	1.708	6	94	0.06		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	MEAN L	MEAN LENGTH	STANDARD DEVIATION
KELP	GROW 1	11/30/99	0.000	14	15	18	14	12	12	12	14	16	14	14.10	12.84	2.76
KELP	GROW 1	11/30/99	0.000	20	14	18	16	17	18	16	18	14	18	16.90		
KELP	GROW 1	11/30/99	0.000	12	12	10	10	12	10	10	6	8	8	9.80		
KELP	GROW 1	11/30/99	0.000	8	10	10	12	12	12	14	14	10	10	11.20		
KELP	GROW 1	11/30/99	0.000	10	12	14	14	10	14	12	14	12	10	12.20		
KELP	GROW 1	11/30/99	0.287	12	14	12	14	14	12	14	14	16	16	13.80	9.96	2.18
KELP	GROW 1	11/30/99	0.287	8	10	8	8	10	10	8	10	10	8	9.00		
KELP	GROW 1	11/30/99	0.287	8	10	8	8	10	12	10	10	10	8	9.40		
KELP	GROW 1	11/30/99	0.287	8	8	8	10	6	8	10	8	10	8	8.40		
KELP	GROW 1	11/30/99	0.287	10	8	8	12	10	10	10	6	6	12	9.20		
KELP	GROW 1	11/30/99	0.527	11	14	10	12	8	13	14	8	10	12	11.20	10.02	1.59
KELP	GROW 1	11/30/99	0.527	10	10	8	8	10	10	10	10	10	6	9.20		
KELP	GROW 1	11/30/99	0.527	6	6	8	8	8	10	8	6	6	10	7.60		
KELP	GROW 1	11/30/99	0.527	14	14	11	8.4	8.4	8.4	8.4	14	11	11	10.92		
KELP	GROW 1	11/30/99	0.527	11	14	8.4	14	11	8.4	11	11	11	11	11.20		
KELP	GROW 1	11/30/99	0.692	11	11	14	17	8.4	14	14	11	17	14	13.16	10.89	2.24
KELP	GROW 1	11/30/99	0.692	14	14	14	9.8	11	11	8.4	17	14	17	13.02		
KELP	GROW 1	11/30/99	0.692	5.6	5.6	5.6	11	8.4	8.4	8.4	11	8.4	8.4	8.12		
KELP	GROW 1	11/30/99	0.692	14	11	5.6	11	14	14	11	11	8.4	8.4	10.92		
KELP	GROW 1	11/30/99	0.692	8.4	11	5.6	8.4	11	11	11	8.4	8.4	8.4	9.24		
KELP	GROW 1	11/30/99	1.256	5.6	11	11	8.4	8.4	11	8.4	8.4	8.4	8.4	8.96	8.23	1.70
KELP	GROW 1	11/30/99	1.256	9.8	8.4	5.6	7	8.4	8.4	7	8.4	8.4	11	8.26		
KELP	GROW 1	11/30/99	1.256	11	11	11	8.4	8.4	11	8.4	11	8.4	7	9.66		
KELP	GROW 1	11/30/99	1.256	9.8	8.4	7	8.4	9.8	8.4	11	9.8	7	9.8	8.96		
KELP	GROW 1	11/30/99	1.256	5.6	2.8	5.6	8.4	2.8	8.4	5.6	5.6	5.6	2.8	5.32		
KELP	GROW 1	11/30/99	1.852	7	8.4	5.6	7	8.4	5.6	7	7	8.4	8.4	7.28	5.57	2.06
KELP	GROW 1	11/30/99	1.852	8.4	5.6	7	5.6	5.6	7	7	7	5.6	5.6	6.44		
KELP	GROW 1	11/30/99	1.852	8.4	7	5.6	7	8.4	8.4	7	7	7	8.4	7.42		
KELP	GROW 1	11/30/99	1.852	5.6	5.6	2.8	2.8	2.8	2.8	2.8	5.6	2.8	2.8	3.64		
KELP	GROW 1	11/30/99	1.852	5.6	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.08		
KELP	GROW 2	1/5/00	0.000	11	11	11	17	14	17	11	17	11	14	13.44	14.69	6.06
KELP	GROW 2	1/5/00	0.000	22	14	20	22	20	25	20	14	25	22	20.44		
KELP	GROW 2	1/5/00	0.000	8	8	10	10	8	10	6	10	10	8	8.80		
KELP	GROW 2	1/5/00	0.000	20	21	20	21	22	22	25	22	25	17	21.56		
KELP	GROW 2	1/5/00	0.000	8	6	12	8	8	10	8	10	12	10	9.20		
KELP	GROW 2	1/5/00	0.320	14	11	8.4	14	11	8.4	11	14	8.4	8.4	10.92	10.28	3.76
KELP	GROW 2	1/5/00	0.320	20	22	20	15	14	14	14	17	11	17	16.38		
KELP	GROW 2	1/5/00	0.320	6	6	8	8	6	6	10	6	6	6	6.80		
KELP	GROW 2	1/5/00	0.320	8.4	8.4	11	11	14	8.4	11	8.4	5.6	8.4	9.52		
KELP	GROW 2	1/5/00	0.320	8	8	8	6	6	8	8	10	6	10	7.80		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	MEAN L	MEAN LENGTH	STANDARD DEVIATION
KELP	GROW 2	1/5/00	0.597	11	11	20	8.4	14	11	11	11	11	14	12.32	11.59	2.89
KELP	GROW 2	1/5/00	0.597	8.4	8.4	11	8.4	14	14	8.4	14	11	11	10.92		
KELP	GROW 2	1/5/00	0.597	10	6	6	8	8	6	8	6	6	8	7.20		
KELP	GROW 2	1/5/00	0.597	20	11	17	17	14	14	14	20	11	14	15.12		
KELP	GROW 2	1/5/00	0.597	10	16	14	14	12	12	8	12	12	14	12.40		
KELP	GROW 2	1/5/00	0.943	11	8.4	8.4	11	11	13	11	13	11	9.8	10.78	7.31	2.14
KELP	GROW 2	1/5/00	0.943	8.4	5.6	5.6	8.4	8.4	5.6	5.6	8.4	5.6	8.4	7.00		
KELP	GROW 2	1/5/00	0.943	6	6	8	6	8	6	6	4	6	4	6.00		
KELP	GROW 2	1/5/00	0.943	11	8.4	5.6	8.4	5.6	5.6	8.4	8.4	5.6	8.4	7.56		
KELP	GROW 2	1/5/00	0.943	6	4	6	6	6	4	6	4	6	4	5.20		
KELP	GROW 2	1/5/00	1.496	4	4	4	4	4	4	4	4	4	4	4.00	6.14	2.29
KELP	GROW 2	1/5/00	1.496	8.4	8.4	8.4	8.4	9.8	8.4	8.4	8.4	9.8	8.4	8.68		
KELP	GROW 2	1/5/00	1.496	4	4	4	4	4	4	4	4	4	4	4.00		
KELP	GROW 2	1/5/00	1.496	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.60		
KELP	GROW 2	1/5/00	1.496	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.40		
KELP	GROW 2	1/5/00	2.157	6	6	6	6	6	6	6	6	6	6	6.00	3.04	2.92
KELP	GROW 2	1/5/00	2.157	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.60		
KELP	GROW 2	1/5/00	2.157	0	0	0	0	0	0	0	0	0	0	0.00		
KELP	GROW 2	1/5/00	2.157	6	6	6	6	6	6	0	0	0	0	3.60		
KELP	GROW 2	1/5/00	2.157	0	0	0	0	0	0	0	0	0	0	0.00		
KELP	GROW 3	5/10/00	0.000	11	15	13	14	17	15	17	11	15	15	14.42	12.36	2.46
KELP	GROW 3	5/10/00	0.000	14	9.8	13	13	14	17	11	17	18	17	14.28		
KELP	GROW 3	5/10/00	0.000	12	8	8	13	0	13	9	8	12	11	9.40		
KELP	GROW 3	5/10/00	0.000	17	11	14	11	9.8	14	14	17	14	15	13.72		
KELP	GROW 3	5/10/00	0.000	10	12	10	10	12	10	8	8	12	8	10.00		
KELP	GROW 3	5/10/00	0.346	14	17	13	9.8	11	11	17	14	13	11	13.02	12.10	3.14
KELP	GROW 3	5/10/00	0.346	11	13	8.4	11	13	8.4	9.8	17	13	11	11.48		
KELP	GROW 3	5/10/00	0.346	10	5	8	6	7	11	8	8	6	9	7.80		
KELP	GROW 3	5/10/00	0.346	14	20	17	21	18	14	14	20	14	14	16.52		
KELP	GROW 3	5/10/00	0.346	12	14	10	14	12	12	10	12	9	12	11.70		
KELP	GROW 3	5/10/00	0.553	14	11	8.4	14	11	8.4	11	11	8.4	9.8	10.78	12.40	2.20
KELP	GROW 3	5/10/00	0.553	7	9.8	14	11	15	11	15	9.8	15	11	12.04		
KELP	GROW 3	5/10/00	0.553	14	10	10	12	14	12	12	15	11	14	12.40		
KELP	GROW 3	5/10/00	0.553	25	15	11	17	18	11	14	14	18	17	16.10		
KELP	GROW 3	5/10/00	0.553	12	8	10	10	10	14	10	14	9	10	10.70		
KELP	GROW 3	5/10/00	0.840	8.4	9.8	7	8.4	8.4	8.4	9.8	7	7	9.8	8.40	10.20	2.27
KELP	GROW 3	5/10/00	0.840	8.4	8.4	9.8	11	9.8	8.4	8.4	8.4	13	8.4	9.38		
KELP	GROW 3	5/10/00	0.840	9	10	8	10	7	9	10	10	8	11	9.20		
KELP	GROW 3	5/10/00	0.840	11	8.4	17	13	14	17	14	20	11	17	14.14		
KELP	GROW 3	5/10/00	0.840	11	10	8	10	12	8	8	9	10	13	9.90		
KELP	GROW 3	5/10/00	1.300	6	6	5	6	5	7	6	6	5	5	5.70	7.40	1.86
KELP	GROW 3	5/10/00	1.300	5.6	8.4	7	7	8.4	5.6	5.6	7	8.4	5.6	6.86		
KELP	GROW 3	5/10/00	1.300	6	6	6	6	5	6	7	6	6	4	5.80		
KELP	GROW 3	5/10/00	1.300	8.4	8.4	9.8	8.4	9.8	8.4	8.4	7	9.8	8.4	8.68		
KELP	GROW 3	5/10/00	1.300	8.4	9.8	11	8.4	14	11	8.4	11	7	9.8	9.94		
KELP	GROW 3	5/10/00	1.708	6	6	6	6	5	6	7	6	6	4	5.80	3.14	2.90
KELP	GROW 3	5/10/00	1.708	0	0	0	0	0	0	0	0	0	0	0.00		
KELP	GROW 3	5/10/00	1.708	0	0	0	0	0	0	0	0	0	0	0.00		
KELP	GROW 3	5/10/00	1.708	5	5	5	6	5	5	6	5	5	6	5.30		
KELP	GROW 3	5/10/00	1.708	8.4	7	7	8.4	7	8.4	0	0	0	0	4.62		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	NORMAL ALIVE LARVAE	INITIAL DENSITY	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
MUSSEL	1	3/29/00	0.000	193	188	1.03	0.97	0.05
MUSSEL	1	3/29/00	0.000	180	188	0.96		
MUSSEL	1	3/29/00	0.000	174	188	0.93		
MUSSEL	1	3/29/00	0.032	204	188	1.09	0.93	0.16
MUSSEL	1	3/29/00	0.032	175	188	0.93		
MUSSEL	1	3/29/00	0.032	145	188	0.77		
MUSSEL	1	3/29/00	0.054	184	188	0.98	0.93	0.04
MUSSEL	1	3/29/00	0.054	170	188	0.90		
MUSSEL	1	3/29/00	0.054	172	188	0.91		
MUSSEL	1	3/29/00	0.092	147	188	0.78	0.91	0.12
MUSSEL	1	3/29/00	0.092	179	188	0.95		
MUSSEL	1	3/29/00	0.092	190	188	1.01		
MUSSEL	1	3/29/00	0.155	28	188	0.15	0.13	0.02
MUSSEL	1	3/29/00	0.155	27	188	0.14		
MUSSEL	1	3/29/00	0.155	21	188	0.11		
MUSSEL	1	3/29/00	0.276	0	188	0.00	0.00	0.00
MUSSEL	1	3/29/00	0.276	0	188	0.00		
MUSSEL	1	3/29/00	0.276	0	188	0.00		
MUSSEL	1	3/29/00	0.448	0	188	0.00	0.00	0.00
MUSSEL	1	3/29/00	0.448	0	188	0.00		
MUSSEL	1	3/29/00	0.448	0	188	0.00		
MUSSEL	1	3/29/00	0.794	0	188	0.00	0.00	0.00
MUSSEL	1	3/29/00	0.794	0	188	0.00		
MUSSEL	1	3/29/00	0.794	0	188	0.00		
MUSSEL	2	3/29/00	0.000	210	222	0.95	0.94	0.09
MUSSEL	2	3/29/00	0.000	189	222	0.85		
MUSSEL	2	3/29/00	0.000	228	222	1.03		
MUSSEL	2	3/29/00	0.031	254	222	1.14	1.02	0.11
MUSSEL	2	3/29/00	0.031	214	222	0.96		
MUSSEL	2	3/29/00	0.031	211	222	0.95		
MUSSEL	2	3/29/00	0.044	225	222	1.01	0.97	0.09
MUSSEL	2	3/29/00	0.044	192	222	0.86		
MUSSEL	2	3/29/00	0.044	226	222	1.02		
MUSSEL	2	3/29/00	0.084	213	222	0.96	1.04	0.10
MUSSEL	2	3/29/00	0.084	255	222	1.15		
MUSSEL	2	3/29/00	0.084	223	222	1.00		
MUSSEL	2	3/29/00	0.142	24	222	0.11	0.12	0.01
MUSSEL	2	3/29/00	0.142	26	222	0.12		
MUSSEL	2	3/29/00	0.142	27	222	0.12		
MUSSEL	2	3/29/00	0.255	0	222	0.00	0.00	0.00
MUSSEL	2	3/29/00	0.255	0	222	0.00		
MUSSEL	2	3/29/00	0.255	0	222	0.00		
MUSSEL	2	3/29/00	0.454	0	222	0.00	0.00	0.00
MUSSEL	2	3/29/00	0.454	0	222	0.00		
MUSSEL	2	3/29/00	0.454	0	222	0.00		
MUSSEL	2	3/29/00	0.648	0	222	0.00	0.00	0.00
MUSSEL	2	3/29/00	0.648	0	222	0.00		
MUSSEL	2	3/29/00	0.648	0	222	0.00		
MUSSEL	3	5/3/00	0.000	227	230	0.99	0.92	0.06
MUSSEL	3	5/3/00	0.000	206	230	0.90		
MUSSEL	3	5/3/00	0.000	204	230	0.89		
MUSSEL	3	5/3/00	0.029	239	230	1.04	0.92	0.10
MUSSEL	3	5/3/00	0.029	200	230	0.87		
MUSSEL	3	5/3/00	0.029	195	230	0.85		
MUSSEL	3	5/3/00	0.058	202	230	0.88	0.88	0.10
MUSSEL	3	5/3/00	0.058	178	230	0.77		
MUSSEL	3	5/3/00	0.058	226	230	0.98		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	NORMAL ALIVE LARVAE	INITIAL DENSITY	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
MUSSEL	3	5/3/00	0.094	232	230	1.01	0.91	0.09
MUSSEL	3	5/3/00	0.094	199	230	0.87		
MUSSEL	3	5/3/00	0.094	195	230	0.85		
MUSSEL	3	5/3/00	0.160	2	230	0.01	0.00	0.00
MUSSEL	3	5/3/00	0.160	0	230	0.00		
MUSSEL	3	5/3/00	0.160	1	230	0.00		
MUSSEL	3	5/3/00	0.270	0	230	0.00	0.00	0.00
MUSSEL	3	5/3/00	0.270	0	230	0.00		
MUSSEL	3	5/3/00	0.270	0	230	0.00		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	NUMBER ALIVE	NUMBER AT START	PROPORTION ALIVE	MEAN	STANDARD DEVIATION
MYSID	1	4/28/99	0.000	5	5	1.00	0.96	0.09
MYSID	1	4/28/99	0.000	4	5	0.80		
MYSID	1	4/28/99	0.000	5	5	1.00		
MYSID	1	4/28/99	0.000	5	5	1.00		
MYSID	1	4/28/99	0.000	5	5	1.00		
MYSID	1	4/28/99	0.169	5	5	1.00	1.00	0.00
MYSID	1	4/28/99	0.169	5	5	1.00		
MYSID	1	4/28/99	0.169	5	5	1.00		
MYSID	1	4/28/99	0.169	5	5	1.00		
MYSID	1	4/28/99	0.169	5	5	1.00		
MYSID	1	4/28/99	0.326	5	5	1.00	0.92	0.11
MYSID	1	4/28/99	0.326	4	5	0.80		
MYSID	1	4/28/99	0.326	5	5	1.00		
MYSID	1	4/28/99	0.326	4	5	0.80		
MYSID	1	4/28/99	0.326	5	5	1.00		
MYSID	1	4/28/99	0.558	4	5	0.80	0.92	0.11
MYSID	1	4/28/99	0.558	5	5	1.00		
MYSID	1	4/28/99	0.558	5	5	1.00		
MYSID	1	4/28/99	0.558	4	5	0.80		
MYSID	1	4/28/99	0.558	5	5	1.00		
MYSID	1	4/28/99	0.949	2	5	0.40	0.72	0.23
MYSID	1	4/28/99	0.949	4	5	0.80		
MYSID	1	4/28/99	0.949	3	5	0.60		
MYSID	1	4/28/99	0.949	5	5	1.00		
MYSID	1	4/28/99	0.949	4	5	0.80		
MYSID	1	4/28/99	1.422	0	5	0.00	0.00	0.00
MYSID	1	4/28/99	1.422	0	5	0.00		
MYSID	1	4/28/99	1.422	0	5	0.00		
MYSID	1	4/28/99	1.422	0	5	0.00		
MYSID	1	4/28/99	1.422	0	5	0.00		
MYSID	2	5/17/99	0.005	5	5	1.00	0.92	0.11
MYSID	2	5/17/99	0.005	5	5	1.00		
MYSID	2	5/17/99	0.005	5	5	1.00		
MYSID	2	5/17/99	0.005	4	5	0.80		
MYSID	2	5/17/99	0.005	4	5	0.80		
MYSID	2	5/17/99	0.283	5	5	1.00	1.00	0.00
MYSID	2	5/17/99	0.283	5	5	1.00		
MYSID	2	5/17/99	0.283	5	5	1.00		
MYSID	2	5/17/99	0.283	5	5	1.00		
MYSID	2	5/17/99	0.283	5	5	1.00		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	NUMBER ALIVE	NUMBER AT START	PROPORTION ALIVE	MEAN	STANDARD DEVIATION
MYSID	2	5/17/99	0.495	5	5	1.00	0.96	0.09
MYSID	2	5/17/99	0.495	5	5	1.00		
MYSID	2	5/17/99	0.495	4	5	0.80		
MYSID	2	5/17/99	0.495	5	5	1.00		
MYSID	2	5/17/99	0.495	5	5	1.00		
MYSID	2	5/17/99	0.785	5	5	1.00	0.80	0.20
MYSID	2	5/17/99	0.785	5	5	1.00		
MYSID	2	5/17/99	0.785	4	5	0.80		
MYSID	2	5/17/99	0.785	3	5	0.60		
MYSID	2	5/17/99	0.785	3	5	0.60		
MYSID	2	5/17/99	1.250	0	5	0.00	0.08	0.18
MYSID	2	5/17/99	1.250	0	5	0.00		
MYSID	2	5/17/99	1.250	0	5	0.00		
MYSID	2	5/17/99	1.250	2	5	0.40		
MYSID	2	5/17/99	1.250	0	5	0.00		
MYSID	2	5/17/99	1.680	0	5	0.00	0.00	0.00
MYSID	2	5/17/99	1.680	0	5	0.00		
MYSID	2	5/17/99	1.680	0	5	0.00		
MYSID	2	5/17/99	1.680	0	5	0.00		
MYSID	2	5/17/99	1.680	0	5	0.00		
MYSID	3	6/7/99	0.000	5	5	1.00	0.96	0.09
MYSID	3	6/7/99	0.000	5	5	1.00		
MYSID	3	6/7/99	0.000	5	5	1.00		
MYSID	3	6/7/99	0.000	4	5	0.80		
MYSID	3	6/7/99	0.000	5	5	1.00		
MYSID	3	6/7/99	0.185	4	5	0.80	0.96	0.09
MYSID	3	6/7/99	0.185	5	5	1.00		
MYSID	3	6/7/99	0.185	5	5	1.00		
MYSID	3	6/7/99	0.185	5	5	1.00		
MYSID	3	6/7/99	0.185	5	5	1.00		
MYSID	3	6/7/99	0.335	5	5	1.00	1.00	0.00
MYSID	3	6/7/99	0.335	5	5	1.00		
MYSID	3	6/7/99	0.335	5	5	1.00		
MYSID	3	6/7/99	0.335	5	5	1.00		
MYSID	3	6/7/99	0.335	5	5	1.00		
MYSID	3	6/7/99	0.538	3	5	0.60	0.72	0.18
MYSID	3	6/7/99	0.538	3	5	0.60		
MYSID	3	6/7/99	0.538	3	5	0.60		
MYSID	3	6/7/99	0.538	4	5	0.80		
MYSID	3	6/7/99	0.538	5	5	1.00		
MYSID	3	6/7/99	0.865	0	5	0.00	0.04	0.09
MYSID	3	6/7/99	0.865	0	5	0.00		
MYSID	3	6/7/99	0.865	1	5	0.20		
MYSID	3	6/7/99	0.865	0	5	0.00		
MYSID	3	6/7/99	0.865	0	5	0.00		
MYSID	3	6/7/99	1.275	0	5	0.00	0.00	0.00
MYSID	3	6/7/99	1.275	0	5	0.00		
MYSID	3	6/7/99	1.275	0	5	0.00		
MYSID	3	6/7/99	1.275	0	5	0.00		
MYSID	3	6/7/99	1.275	0	5	0.00		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	NUMBER ALIVE	NUMBER AT START	PROPORTION ALIVE	MEAN	STANDARD DEVIATION
TOPSMELT	1	1/28/99	0.009	5	5	1.00	0.97	0.07
TOPSMELT	1	1/28/99	0.009	5	6	0.83		
TOPSMELT	1	1/28/99	0.009	5	5	1.00		
TOPSMELT	1	1/28/99	0.009	5	5	1.00		
TOPSMELT	1	1/28/99	0.009	5	5	1.00		
TOPSMELT	1	1/28/99	0.386	3	5	0.60	0.80	0.14
TOPSMELT	1	1/28/99	0.386	4	5	0.80		
TOPSMELT	1	1/28/99	0.386	4	5	0.80		
TOPSMELT	1	1/28/99	0.386	4	5	0.80		
TOPSMELT	1	1/28/99	0.386	5	5	1.00		
TOPSMELT	1	1/28/99	0.671	2	5	0.40	0.32	0.11
TOPSMELT	1	1/28/99	0.671	2	5	0.40		
TOPSMELT	1	1/28/99	0.671	1	5	0.20		
TOPSMELT	1	1/28/99	0.671	2	5	0.40		
TOPSMELT	1	1/28/99	0.671	1	5	0.20		
TOPSMELT	1	1/28/99	0.983	0	5	0.00	0.00	0.00
TOPSMELT	1	1/28/99	0.983	0	5	0.00		
TOPSMELT	1	1/28/99	0.983	0	5	0.00		
TOPSMELT	1	1/28/99	0.983	0	5	0.00		
TOPSMELT	1	1/28/99	0.983	0	5	0.00		
TOPSMELT	1	1/28/99	1.583	0	5	0.00	0.00	0.00
TOPSMELT	1	1/28/99	1.583	0	5	0.00		
TOPSMELT	1	1/28/99	1.583	0	5	0.00		
TOPSMELT	1	1/28/99	1.583	0	5	0.00		
TOPSMELT	1	1/28/99	1.583	0	5	0.00		
TOPSMELT	1	1/28/99	2.194	0	5	0.00	0.00	0.00
TOPSMELT	1	1/28/99	2.194	0	5	0.00		
TOPSMELT	1	1/28/99	2.194	0	5	0.00		
TOPSMELT	1	1/28/99	2.194	0	5	0.00		
TOPSMELT	1	1/28/99	2.194	0	5	0.00		
TOPSMELT	2	5/3/99	0.000	5	5	1.00	0.96	0.09
TOPSMELT	2	5/3/99	0.000	5	5	1.00		
TOPSMELT	2	5/3/99	0.000	5	5	1.00		
TOPSMELT	2	5/3/99	0.000	4	5	0.80		
TOPSMELT	2	5/3/99	0.000	5	5	1.00		
TOPSMELT	2	5/3/99	0.180	5	5	1.00	1.00	0.00
TOPSMELT	2	5/3/99	0.180	5	5	1.00		
TOPSMELT	2	5/3/99	0.180	5	5	1.00		
TOPSMELT	2	5/3/99	0.180	5	5	1.00		
TOPSMELT	2	5/3/99	0.180	5	5	1.00		
TOPSMELT	2	5/3/99	0.277	5	5	1.00	1.00	0.00
TOPSMELT	2	5/3/99	0.277	5	5	1.00		
TOPSMELT	2	5/3/99	0.277	5	5	1.00		
TOPSMELT	2	5/3/99	0.277	5	5	1.00		
TOPSMELT	2	5/3/99	0.277	5	5	1.00		
TOPSMELT	2	5/3/99	0.505	4	5	0.80	0.92	0.11
TOPSMELT	2	5/3/99	0.505	5	5	1.00		
TOPSMELT	2	5/3/99	0.505	5	5	1.00		
TOPSMELT	2	5/3/99	0.505	4	5	0.80		
TOPSMELT	2	5/3/99	0.505	5	5	1.00		
TOPSMELT	2	5/3/99	0.742	0	5	0.00	0.00	0.00
TOPSMELT	2	5/3/99	0.742	0	5	0.00		
TOPSMELT	2	5/3/99	0.742	0	5	0.00		
TOPSMELT	2	5/3/99	0.742	0	5	0.00		
TOPSMELT	2	5/3/99	0.742	0	5	0.00		

TEST ORGANISM	TEST NUMBER	DATE	MEASURED UNIONIZED AMMONIA	NUMBER ALIVE	NUMBER AT START	PROPORTION ALIVE	MEAN	STANDARD DEVIATION
TOPSMELT	2	5/3/99	1.057	0	5	0.00	0.00	0.00
TOPSMELT	2	5/3/99	1.057	0	5	0.00		
TOPSMELT	2	5/3/99	1.057	0	5	0.00		
TOPSMELT	2	5/3/99	1.057	0	5	0.00		
TOPSMELT	2	5/3/99	1.057	0	5	0.00		
TOPSMELT	3	6/21/99	0.002	5	5	1.00	0.92	0.11
TOPSMELT	3	6/21/99	0.002	4	5	0.80		
TOPSMELT	3	6/21/99	0.002	5	5	1.00		
TOPSMELT	3	6/21/99	0.002	5	5	1.00		
TOPSMELT	3	6/21/99	0.002	4	5	0.80		
TOPSMELT	3	6/21/99	0.131	5	5	1.00	0.76	0.17
TOPSMELT	3	6/21/99	0.131	3	5	0.60		
TOPSMELT	3	6/21/99	0.131	4	5	0.80		
TOPSMELT	3	6/21/99	0.131	3	5	0.60		
TOPSMELT	3	6/21/99	0.131	4	5	0.80		
TOPSMELT	3	6/21/99	0.250	2	5	0.40	0.80	0.28
TOPSMELT	3	6/21/99	0.250	5	5	1.00		
TOPSMELT	3	6/21/99	0.250	5	5	1.00		
TOPSMELT	3	6/21/99	0.250	5	5	1.00		
TOPSMELT	3	6/21/99	0.250	3	5	0.60		
TOPSMELT	3	6/21/99	0.380	4	5	0.80	0.92	0.11
TOPSMELT	3	6/21/99	0.380	5	5	1.00		
TOPSMELT	3	6/21/99	0.380	4	5	0.80		
TOPSMELT	3	6/21/99	0.380	5	5	1.00		
TOPSMELT	3	6/21/99	0.380	5	5	1.00		
TOPSMELT	3	6/21/99	0.634	1	5	0.20	0.24	0.17
TOPSMELT	3	6/21/99	0.634	0	5	0.00		
TOPSMELT	3	6/21/99	0.634	2	5	0.40		
TOPSMELT	3	6/21/99	0.634	1	5	0.20		
TOPSMELT	3	6/21/99	0.634	2	5	0.40		
TOPSMELT	3	6/21/99	0.959	0	5	0.00	0.00	0.00
TOPSMELT	3	6/21/99	0.959	0	5	0.00		
TOPSMELT	3	6/21/99	0.959	0	5	0.00		
TOPSMELT	3	6/21/99	0.959	0	5	0.00		
TOPSMELT	3	6/21/99	0.959	0	5	0.00		

Appendix B – Artificial Salt Toxicity Test Raw Data

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
ABALONE	1	10/8/99	Forty Fathoms	100	94	7	0.93	0.91	0.05
ABALONE	1	10/8/99	Forty Fathoms	100	95	5	0.95		
ABALONE	1	10/8/99	Forty Fathoms	100	82	13	0.86		
ABALONE	1	10/8/99	Forty Fathoms	79	93	8	0.92	0.94	0.02
ABALONE	1	10/8/99	Forty Fathoms	79	91	5	0.95		
ABALONE	1	10/8/99	Forty Fathoms	79	100	5	0.95		
ABALONE	1	10/8/99	Forty Fathoms	59	98	6	0.94	0.93	0.01
ABALONE	1	10/8/99	Forty Fathoms	59	89	7	0.93		
ABALONE	1	10/8/99	Forty Fathoms	59	93	7	0.93		
ABALONE	1	10/8/99	Forty Fathoms	38	100	7	0.93	0.93	0.01
ABALONE	1	10/8/99	Forty Fathoms	38	97	8	0.92		
ABALONE	1	10/8/99	Forty Fathoms	38	100	6	0.94		
ABALONE	1	10/8/99	Forty Fathoms	18	93	7	0.93	0.95	0.02
ABALONE	1	10/8/99	Forty Fathoms	18	88	3	0.97		
ABALONE	1	10/8/99	Forty Fathoms	18	100	5	0.95		
ABALONE	1	10/8/99	Forty Fathoms	0	92	7	0.93	0.95	0.02
ABALONE	1	10/8/99	Forty Fathoms	0	105	4	0.96		
ABALONE	1	10/8/99	Forty Fathoms	0	100	6	0.94		
ABALONE	1	10/8/99	GP2	100	96	4	0.96	0.95	0.01
ABALONE	1	10/8/99	GP2	100	95	6	0.94		
ABALONE	1	10/8/99	GP2	100	84	4	0.95		
ABALONE	1	10/8/99	GP2	79	100	3	0.97	0.97	0.01
ABALONE	1	10/8/99	GP2	79	99	2	0.98		
ABALONE	1	10/8/99	GP2	79	98	4	0.96		
ABALONE	1	10/8/99	GP2	59	92	8	0.92	0.95	0.02
ABALONE	1	10/8/99	GP2	59	96	4	0.96		
ABALONE	1	10/8/99	GP2	59	96	4	0.96		
ABALONE	1	10/8/99	GP2	38	98	2	0.98	0.96	0.02
ABALONE	1	10/8/99	GP2	38	100	6	0.94		
ABALONE	1	10/8/99	GP2	38	94	4	0.96		
ABALONE	1	10/8/99	GP2	18	90	10	0.90	0.94	0.04
ABALONE	1	10/8/99	GP2	18	98	4	0.96		
ABALONE	1	10/8/99	GP2	18	98	4	0.96		
ABALONE	1	10/8/99	GP2	0	92	7	0.93	0.95	0.02
ABALONE	1	10/8/99	GP2	0	105	4	0.96		
ABALONE	1	10/8/99	GP2	0	100	6	0.94		
ABALONE	1	10/8/99	Tropic Marin	100	100	13	0.88	0.87	0.01
ABALONE	1	10/8/99	Tropic Marin	100	108	18	0.86		
ABALONE	1	10/8/99	Tropic Marin	100	76	11	0.87		
ABALONE	1	10/8/99	Tropic Marin	79	94	6	0.94	0.94	0.01
ABALONE	1	10/8/99	Tropic Marin	79	96	6	0.94		
ABALONE	1	10/8/99	Tropic Marin	79	93	7	0.93		
ABALONE	1	10/8/99	Tropic Marin	59	88	3	0.97	0.96	0.01
ABALONE	1	10/8/99	Tropic Marin	59	93	3	0.97		
ABALONE	1	10/8/99	Tropic Marin	59	102	6	0.94		
ABALONE	1	10/8/99	Tropic Marin	38	96	5	0.95	0.94	0.03
ABALONE	1	10/8/99	Tropic Marin	38	77	8	0.91		
ABALONE	1	10/8/99	Tropic Marin	38	95	5	0.95		
ABALONE	1	10/8/99	Tropic Marin	18	100	4	0.96	0.95	0.02
ABALONE	1	10/8/99	Tropic Marin	18	97	3	0.97		
ABALONE	1	10/8/99	Tropic Marin	18	96	7	0.93		
ABALONE	1	10/8/99	Tropic Marin	0	92	7	0.93	0.95	0.02
ABALONE	1	10/8/99	Tropic Marin	0	105	4	0.96		
ABALONE	1	10/8/99	Tropic Marin	0	100	6	0.94		
ABALONE	2	1/12/00	Forty Fathoms	100	89	11	0.89	0.87	0.02
ABALONE	2	1/12/00	Forty Fathoms	100	80	11	0.88		
ABALONE	2	1/12/00	Forty Fathoms	100	62	11	0.85		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
ABALONE	2	1/12/00	Forty Fathoms	79	92	8	0.92	0.90	0.03
ABALONE	2	1/12/00	Forty Fathoms	79	91	9	0.91		
ABALONE	2	1/12/00	Forty Fathoms	79	72	11	0.87		
ABALONE	2	1/12/00	Forty Fathoms	59	63	7	0.90	0.94	0.04
ABALONE	2	1/12/00	Forty Fathoms	59	71	2	0.97		
ABALONE	2	1/12/00	Forty Fathoms	59	90	5	0.95		
ABALONE	2	1/12/00	Forty Fathoms	38	85	4	0.96	0.94	0.04
ABALONE	2	1/12/00	Forty Fathoms	38	78	9	0.90		
ABALONE	2	1/12/00	Forty Fathoms	38	86	2	0.98		
ABALONE	2	1/12/00	Forty Fathoms	18	80	3	0.96	0.95	0.01
ABALONE	2	1/12/00	Forty Fathoms	18	89	5	0.95		
ABALONE	2	1/12/00	Forty Fathoms	18	94	6	0.94		
ABALONE	2	1/12/00	Forty Fathoms	0	90	1	0.99	0.96	0.03
ABALONE	2	1/12/00	Forty Fathoms	0	98	2	0.98		
ABALONE	2	1/12/00	Forty Fathoms	0	62	5	0.93		
ABALONE	2	1/12/00	GP2	100	0	100	0.00	0.00	0.00
ABALONE	2	1/12/00	GP2	100	0	100	0.00		
ABALONE	2	1/12/00	GP2	100	0	100	0.00		
ABALONE	2	1/12/00	GP2	79	0	100	0.00	0.00	0.00
ABALONE	2	1/12/00	GP2	79	0	100	0.00		
ABALONE	2	1/12/00	GP2	79	0	100	0.00		
ABALONE	2	1/12/00	GP2	59	68	18	0.79	0.69	0.12
ABALONE	2	1/12/00	GP2	59	72	28	0.72		
ABALONE	2	1/12/00	GP2	59	49	38	0.56		
ABALONE	2	1/12/00	GP2	38	82	8	0.91	0.94	0.04
ABALONE	2	1/12/00	GP2	38	87	7	0.93		
ABALONE	2	1/12/00	GP2	38	85	1	0.99		
ABALONE	2	1/12/00	GP2	18	87	11	0.89	0.93	0.04
ABALONE	2	1/12/00	GP2	18	92	3	0.97		
ABALONE	2	1/12/00	GP2	18	93	7	0.93		
ABALONE	2	1/12/00	GP2	0	90	1	0.99	0.96	0.03
ABALONE	2	1/12/00	GP2	0	98	2	0.98		
ABALONE	2	1/12/00	GP2	0	62	5	0.93		
ABALONE	2	1/12/00	Tropic Marin	100	86	5	0.95	0.93	0.03
ABALONE	2	1/12/00	Tropic Marin	100	77	9	0.90		
ABALONE	2	1/12/00	Tropic Marin	100	89	6	0.94		
ABALONE	2	1/12/00	Tropic Marin	79	68	5	0.93	0.94	0.01
ABALONE	2	1/12/00	Tropic Marin	79	94	6	0.94		
ABALONE	2	1/12/00	Tropic Marin	79	73	3	0.96		
ABALONE	2	1/12/00	Tropic Marin	59	83	7	0.92	0.95	0.03
ABALONE	2	1/12/00	Tropic Marin	59	82	2	0.98		
ABALONE	2	1/12/00	Tropic Marin	59	74	4	0.95		
ABALONE	2	1/12/00	Tropic Marin	38	86	3	0.97	0.96	0.03
ABALONE	2	1/12/00	Tropic Marin	38	88	7	0.93		
ABALONE	2	1/12/00	Tropic Marin	38	88	2	0.98		
ABALONE	2	1/12/00	Tropic Marin	18	84	3	0.97	0.96	0.02
ABALONE	2	1/12/00	Tropic Marin	18	97	3	0.97		
ABALONE	2	1/12/00	Tropic Marin	18	94	6	0.94		
ABALONE	2	1/12/00	Tropic Marin	0	90	1	0.99	0.96	0.03
ABALONE	2	1/12/00	Tropic Marin	0	98	2	0.98		
ABALONE	2	1/12/00	Tropic Marin	0	62	5	0.93		
ABALONE	3	3/15/00	Forty Fathoms	100	67	46	0.59	0.63	0.04
ABALONE	3	3/15/00	Forty Fathoms	100	69	34	0.67		
ABALONE	3	3/15/00	Forty Fathoms	100	48	30	0.62		
ABALONE	3	3/15/00	Forty Fathoms	79	103	6	0.94	0.90	0.06
ABALONE	3	3/15/00	Forty Fathoms	79	93	9	0.91		
ABALONE	3	3/15/00	Forty Fathoms	79	73	15	0.83		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
ABALONE	3	3/15/00	Forty Fathoms	59	88	8	0.92	0.89	0.03
ABALONE	3	3/15/00	Forty Fathoms	59	82	13	0.86		
ABALONE	3	3/15/00	Forty Fathoms	59	83	10	0.89		
ABALONE	3	3/15/00	Forty Fathoms	38	78	8	0.91	0.93	0.02
ABALONE	3	3/15/00	Forty Fathoms	38	112	8	0.93		
ABALONE	3	3/15/00	Forty Fathoms	38	80	5	0.94		
ABALONE	3	3/15/00	Forty Fathoms	18	92	8	0.92	0.93	0.02
ABALONE	3	3/15/00	Forty Fathoms	18	81	7	0.92		
ABALONE	3	3/15/00	Forty Fathoms	18	79	3	0.96		
ABALONE	3	3/15/00	Forty Fathoms	0	104	5	0.95	0.97	0.01
ABALONE	3	3/15/00	Forty Fathoms	0	86	3	0.97		
ABALONE	3	3/15/00	Forty Fathoms	0	79	2	0.98		
ABALONE	3	3/15/00	GP2	100	78	6	0.93	0.92	0.03
ABALONE	3	3/15/00	GP2	100	96	6	0.94		
ABALONE	3	3/15/00	GP2	100	82	10	0.89		
ABALONE	3	3/15/00	GP2	79	112	7	0.94	0.93	0.02
ABALONE	3	3/15/00	GP2	79	101	8	0.93		
ABALONE	3	3/15/00	GP2	79	91	9	0.91		
ABALONE	3	3/15/00	GP2	59	91	3	0.97	0.94	0.03
ABALONE	3	3/15/00	GP2	59	98	9	0.92		
ABALONE	3	3/15/00	GP2	59	98	7	0.93		
ABALONE	3	3/15/00	GP2	38	100	3	0.97	0.94	0.04
ABALONE	3	3/15/00	GP2	38	85	9	0.90		
ABALONE	3	3/15/00	GP2	38	93	4	0.96		
ABALONE	3	3/15/00	GP2	18	95	5	0.95	0.95	0.00
ABALONE	3	3/15/00	GP2	18	107	5	0.96		
ABALONE	3	3/15/00	GP2	18	105	6	0.95		
ABALONE	3	3/15/00	GP2	0	104	5	0.95	0.97	0.01
ABALONE	3	3/15/00	GP2	0	86	3	0.97		
ABALONE	3	3/15/00	GP2	0	79	2	0.98		
ABALONE	3	3/15/00	Tropic Marin	100	76	5	0.94	0.93	0.03
ABALONE	3	3/15/00	Tropic Marin	100	91	4	0.96		
ABALONE	3	3/15/00	Tropic Marin	100	99	11	0.90		
ABALONE	3	3/15/00	Tropic Marin	79	76	15	0.84	0.89	0.05
ABALONE	3	3/15/00	Tropic Marin	79	99	7	0.93		
ABALONE	3	3/15/00	Tropic Marin	79	82	10	0.89		
ABALONE	3	3/15/00	Tropic Marin	59	62	3	0.95	0.91	0.04
ABALONE	3	3/15/00	Tropic Marin	59	83	9	0.90		
ABALONE	3	3/15/00	Tropic Marin	59	77	10	0.89		
ABALONE	3	3/15/00	Tropic Marin	38	87	4	0.96	0.96	0.01
ABALONE	3	3/15/00	Tropic Marin	38	91	4	0.96		
ABALONE	3	3/15/00	Tropic Marin	38	78	2	0.98		
ABALONE	3	3/15/00	Tropic Marin	18	92	4	0.96	0.93	0.03
ABALONE	3	3/15/00	Tropic Marin	18	105	9	0.92		
ABALONE	3	3/15/00	Tropic Marin	18	92	10	0.90		
ABALONE	3	3/15/00	Tropic Marin	0	104	5	0.95	0.97	0.01
ABALONE	3	3/15/00	Tropic Marin	0	86	3	0.97		
ABALONE	3	3/15/00	Tropic Marin	0	79	2	0.98		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL ALIVE LARVAE	INITIAL DENSITY	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
MUSSEL	1	12/20/99	Forty Fathoms	100	207	199	1.04	1.05	0.07
MUSSEL	1	12/20/99	Forty Fathoms	100	197	199	0.99		
MUSSEL	1	12/20/99	Forty Fathoms	100	225	199	1.13		
MUSSEL	1	12/20/99	Forty Fathoms	79	228	199	1.15	1.12	0.13
MUSSEL	1	12/20/99	Forty Fathoms	79	247	199	1.24		
MUSSEL	1	12/20/99	Forty Fathoms	79	195	199	0.98		
MUSSEL	1	12/20/99	Forty Fathoms	59	219	199	1.10	1.06	0.06
MUSSEL	1	12/20/99	Forty Fathoms	59	197	199	0.99		
MUSSEL	1	12/20/99	Forty Fathoms	59	218	199	1.10		
MUSSEL	1	12/20/99	Forty Fathoms	38	206	199	1.04	1.05	0.01
MUSSEL	1	12/20/99	Forty Fathoms	38	210	199	1.06		
MUSSEL	1	12/20/99	Forty Fathoms	38	210	199	1.06		
MUSSEL	1	12/20/99	Forty Fathoms	18	206	199	1.04	0.98	0.05
MUSSEL	1	12/20/99	Forty Fathoms	18	191	199	0.96		
MUSSEL	1	12/20/99	Forty Fathoms	18	186	199	0.93		
MUSSEL	1	12/20/99	Forty Fathoms	0	171	199	0.86	1.01	0.13
MUSSEL	1	12/20/99	Forty Fathoms	0	219	199	1.10		
MUSSEL	1	12/20/99	Forty Fathoms	0	215	199	1.08		
MUSSEL	1	12/20/99	GP2	100	186	199	0.93	1.03	0.10
MUSSEL	1	12/20/99	GP2	100	226	199	1.14		
MUSSEL	1	12/20/99	GP2	100	205	199	1.03		
MUSSEL	1	12/20/99	GP2	79	230	199	1.16	1.09	0.07
MUSSEL	1	12/20/99	GP2	79	220	199	1.11		
MUSSEL	1	12/20/99	GP2	79	203	199	1.02		
MUSSEL	1	12/20/99	GP2	59	194	199	0.97	1.08	0.14
MUSSEL	1	12/20/99	GP2	59	202	199	1.02		
MUSSEL	1	12/20/99	GP2	59	247	199	1.24		
MUSSEL	1	12/20/99	GP2	38	224	199	1.13	1.09	0.04
MUSSEL	1	12/20/99	GP2	38	220	199	1.11		
MUSSEL	1	12/20/99	GP2	38	207	199	1.04		
MUSSEL	1	12/20/99	GP2	18	244	199	1.23	1.18	0.12
MUSSEL	1	12/20/99	GP2	18	253	199	1.27		
MUSSEL	1	12/20/99	GP2	18	209	199	1.05		
MUSSEL	1	12/20/99	GP2	0	171	199	0.86	1.01	0.13
MUSSEL	1	12/20/99	GP2	0	219	199	1.10		
MUSSEL	1	12/20/99	GP2	0	215	199	1.08		
MUSSEL	1	12/20/99	Tropic Marin	100	216	199	1.09	1.08	0.12
MUSSEL	1	12/20/99	Tropic Marin	100	238	199	1.20		
MUSSEL	1	12/20/99	Tropic Marin	100	190	199	0.95		
MUSSEL	1	12/20/99	Tropic Marin	79	201	199	1.01	1.08	0.11
MUSSEL	1	12/20/99	Tropic Marin	79	240	199	1.21		
MUSSEL	1	12/20/99	Tropic Marin	79	206	199	1.04		
MUSSEL	1	12/20/99	Tropic Marin	59	220	199	1.11	1.15	0.07
MUSSEL	1	12/20/99	Tropic Marin	59	245	199	1.23		
MUSSEL	1	12/20/99	Tropic Marin	59	223	199	1.12		
MUSSEL	1	12/20/99	Tropic Marin	38	195	199	0.98	1.05	0.06
MUSSEL	1	12/20/99	Tropic Marin	38	220	199	1.11		
MUSSEL	1	12/20/99	Tropic Marin	38	209	199	1.05		
MUSSEL	1	12/20/99	Tropic Marin	18	218	199	1.10	1.05	0.05
MUSSEL	1	12/20/99	Tropic Marin	18	200	199	1.01		
MUSSEL	1	12/20/99	Tropic Marin	18	208	199	1.05		
MUSSEL	1	12/20/99	Tropic Marin	0	171	199	0.86	1.01	0.13
MUSSEL	1	12/20/99	Tropic Marin	0	219	199	1.10		
MUSSEL	1	12/20/99	Tropic Marin	0	215	199	1.08		
MUSSEL	2	1/12/00	Forty Fathoms	100	204	209	0.98	0.88	0.08
MUSSEL	2	1/12/00	Forty Fathoms	100	176	209	0.84		
MUSSEL	2	1/12/00	Forty Fathoms	100	172	209	0.82		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL ALIVE LARVAE	INITIAL DENSITY	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
MUSSEL	2	1/12/00	Forty Fathoms	79	175	209	0.84	0.87	0.07
MUSSEL	2	1/12/00	Forty Fathoms	79	173	209	0.83		
MUSSEL	2	1/12/00	Forty Fathoms	79	199	209	0.95		
MUSSEL	2	1/12/00	Forty Fathoms	59	184	209	0.88	0.91	0.05
MUSSEL	2	1/12/00	Forty Fathoms	59	186	209	0.89		
MUSSEL	2	1/12/00	Forty Fathoms	59	203	209	0.97		
MUSSEL	2	1/12/00	Forty Fathoms	38	191	209	0.91	0.93	0.06
MUSSEL	2	1/12/00	Forty Fathoms	38	183	209	0.88		
MUSSEL	2	1/12/00	Forty Fathoms	38	208	209	1.00		
MUSSEL	2	1/12/00	Forty Fathoms	18	190	209	0.91	0.92	0.02
MUSSEL	2	1/12/00	Forty Fathoms	18	197	209	0.94		
MUSSEL	2	1/12/00	Forty Fathoms	18	190	209	0.91		
MUSSEL	2	1/12/00	Forty Fathoms	0	171	209	0.82	0.88	0.06
MUSSEL	2	1/12/00	Forty Fathoms	0	194	209	0.93		
MUSSEL	2	1/12/00	Forty Fathoms	0	184	209	0.88		
MUSSEL	2	1/12/00	GP2	100	0	209	0.00	0.00	0.00
MUSSEL	2	1/12/00	GP2	100	0	209	0.00		
MUSSEL	2	1/12/00	GP2	100	0	209	0.00		
MUSSEL	2	1/12/00	GP2	79	0	209	0.00	0.00	0.00
MUSSEL	2	1/12/00	GP2	79	0	209	0.00		
MUSSEL	2	1/12/00	GP2	79	0	209	0.00		
MUSSEL	2	1/12/00	GP2	59	180	209	0.86	0.89	0.06
MUSSEL	2	1/12/00	GP2	59	178	209	0.85		
MUSSEL	2	1/12/00	GP2	59	199	209	0.95		
MUSSEL	2	1/12/00	GP2	38	204	209	0.98	0.91	0.08
MUSSEL	2	1/12/00	GP2	38	172	209	0.82		
MUSSEL	2	1/12/00	GP2	38	194	209	0.93		
MUSSEL	2	1/12/00	GP2	18	193	209	0.92	0.86	0.05
MUSSEL	2	1/12/00	GP2	18	174	209	0.83		
MUSSEL	2	1/12/00	GP2	18	173	209	0.83		
MUSSEL	2	1/12/00	GP2	0	171	209	0.82	0.88	0.06
MUSSEL	2	1/12/00	GP2	0	194	209	0.93		
MUSSEL	2	1/12/00	GP2	0	184	209	0.88		
MUSSEL	2	1/12/00	Tropic Marin	100	191	209	0.91	0.91	0.01
MUSSEL	2	1/12/00	Tropic Marin	100	189	209	0.90		
MUSSEL	2	1/12/00	Tropic Marin	100	188	209	0.90		
MUSSEL	2	1/12/00	Tropic Marin	79	163	209	0.78	0.79	0.05
MUSSEL	2	1/12/00	Tropic Marin	79	156	209	0.75		
MUSSEL	2	1/12/00	Tropic Marin	79	175	209	0.84		
MUSSEL	2	1/12/00	Tropic Marin	59	210	209	1.00	0.94	0.06
MUSSEL	2	1/12/00	Tropic Marin	59	194	209	0.93		
MUSSEL	2	1/12/00	Tropic Marin	59	185	209	0.89		
MUSSEL	2	1/12/00	Tropic Marin	38	184	209	0.88	0.91	0.07
MUSSEL	2	1/12/00	Tropic Marin	38	179	209	0.86		
MUSSEL	2	1/12/00	Tropic Marin	38	205	209	0.98		
MUSSEL	2	1/12/00	Tropic Marin	18	172	209	0.82	0.88	0.05
MUSSEL	2	1/12/00	Tropic Marin	18	188	209	0.90		
MUSSEL	2	1/12/00	Tropic Marin	18	193	209	0.92		
MUSSEL	2	1/12/00	Tropic Marin	0	171	209	0.82	0.88	0.06
MUSSEL	2	1/12/00	Tropic Marin	0	194	209	0.93		
MUSSEL	2	1/12/00	Tropic Marin	0	184	209	0.88		
MUSSEL	3	3/15/00	Forty Fathoms	100	193	231	0.84	0.85	0.03
MUSSEL	3	3/15/00	Forty Fathoms	100	203	231	0.88		
MUSSEL	3	3/15/00	Forty Fathoms	100	192	231	0.83		
MUSSEL	3	3/15/00	Forty Fathoms	79	212	231	0.92	0.89	0.03
MUSSEL	3	3/15/00	Forty Fathoms	79	197	231	0.85		
MUSSEL	3	3/15/00	Forty Fathoms	79	208	231	0.90		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL ALIVE LARVAE	INITIAL DENSITY	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
MUSSEL	3	3/15/00	Forty Fathoms	59	218	231	0.94	0.91	0.06
MUSSEL	3	3/15/00	Forty Fathoms	59	193	231	0.84		
MUSSEL	3	3/15/00	Forty Fathoms	59	218	231	0.94		
MUSSEL	3	3/15/00	Forty Fathoms	38	194	231	0.84	0.89	0.05
MUSSEL	3	3/15/00	Forty Fathoms	38	209	231	0.90		
MUSSEL	3	3/15/00	Forty Fathoms	38	214	231	0.93		
MUSSEL	3	3/15/00	Forty Fathoms	18	171	231	0.74	0.80	0.08
MUSSEL	3	3/15/00	Forty Fathoms	18	205	231	0.89		
MUSSEL	3	3/15/00	Forty Fathoms	18	180	231	0.78		
MUSSEL	3	3/15/00	Forty Fathoms	0	212	231	0.92	0.91	0.01
MUSSEL	3	3/15/00	Forty Fathoms	0	210	231	0.91		
MUSSEL	3	3/15/00	Forty Fathoms	0	207	231	0.90		
MUSSEL	3	3/15/00	GP2	100	175	231	0.76	0.82	0.09
MUSSEL	3	3/15/00	GP2	100	213	231	0.92		
MUSSEL	3	3/15/00	GP2	100	178	231	0.77		
MUSSEL	3	3/15/00	GP2	79	199	231	0.86	0.82	0.05
MUSSEL	3	3/15/00	GP2	79	176	231	0.76		
MUSSEL	3	3/15/00	GP2	79	196	231	0.85		
MUSSEL	3	3/15/00	GP2	59	201	231	0.87	0.83	0.04
MUSSEL	3	3/15/00	GP2	59	182	231	0.79		
MUSSEL	3	3/15/00	GP2	59	195	231	0.84		
MUSSEL	3	3/15/00	GP2	38	188	231	0.81	0.90	0.08
MUSSEL	3	3/15/00	GP2	38	226	231	0.98		
MUSSEL	3	3/15/00	GP2	38	209	231	0.90		
MUSSEL	3	3/15/00	GP2	18	193	231	0.84	0.82	0.06
MUSSEL	3	3/15/00	GP2	18	175	231	0.76		
MUSSEL	3	3/15/00	GP2	18	203	231	0.88		
MUSSEL	3	3/15/00	GP2	0	212	231	0.92	0.91	0.01
MUSSEL	3	3/15/00	GP2	0	210	231	0.91		
MUSSEL	3	3/15/00	GP2	0	207	231	0.90		
MUSSEL	3	3/15/00	Tropic Marin	100	203	231	0.88	0.87	0.02
MUSSEL	3	3/15/00	Tropic Marin	100	194	231	0.84		
MUSSEL	3	3/15/00	Tropic Marin	100	203	231	0.88		
MUSSEL	3	3/15/00	Tropic Marin	79	180	231	0.78	0.83	0.06
MUSSEL	3	3/15/00	Tropic Marin	79	190	231	0.82		
MUSSEL	3	3/15/00	Tropic Marin	79	208	231	0.90		
MUSSEL	3	3/15/00	Tropic Marin	59	199	231	0.86	0.89	0.03
MUSSEL	3	3/15/00	Tropic Marin	59	214	231	0.93		
MUSSEL	3	3/15/00	Tropic Marin	59	207	231	0.90		
MUSSEL	3	3/15/00	Tropic Marin	38	180	231	0.78	0.88	0.10
MUSSEL	3	3/15/00	Tropic Marin	38	201	231	0.87		
MUSSEL	3	3/15/00	Tropic Marin	38	227	231	0.98		
MUSSEL	3	3/15/00	Tropic Marin	18	200	231	0.87	0.81	0.06
MUSSEL	3	3/15/00	Tropic Marin	18	189	231	0.82		
MUSSEL	3	3/15/00	Tropic Marin	18	173	231	0.75		
MUSSEL	3	3/15/00	Tropic Marin	0	212	231	0.92	0.91	0.01
MUSSEL	3	3/15/00	Tropic Marin	0	210	231	0.91		
MUSSEL	3	3/15/00	Tropic Marin	0	207	231	0.90		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	1	5/3/99	Coralife	100	37	63	0.37	0.40	0.04
URCHIN	1	5/3/99	Coralife	100	40	60	0.40		
URCHIN	1	5/3/99	Coralife	100	44	56	0.44		
URCHIN	1	5/3/99	Coralife	100	35	65	0.35		
URCHIN	1	5/3/99	Coralife	100	43	57	0.43		
URCHIN	1	5/3/99	Coralife	79	47	53	0.47	0.57	0.05
URCHIN	1	5/3/99	Coralife	79	60	40	0.60		
URCHIN	1	5/3/99	Coralife	79	60	40	0.60		
URCHIN	1	5/3/99	Coralife	79	58	42	0.58		
URCHIN	1	5/3/99	Coralife	79	58	42	0.58		
URCHIN	1	5/3/99	Coralife	59	83	17	0.83	0.74	0.07
URCHIN	1	5/3/99	Coralife	59	77	23	0.77		
URCHIN	1	5/3/99	Coralife	59	73	27	0.73		
URCHIN	1	5/3/99	Coralife	59	71	29	0.71		
URCHIN	1	5/3/99	Coralife	59	64	36	0.64		
URCHIN	1	5/3/99	Coralife	38	85	15	0.85	0.87	0.04
URCHIN	1	5/3/99	Coralife	38	88	12	0.88		
URCHIN	1	5/3/99	Coralife	38	89	11	0.89		
URCHIN	1	5/3/99	Coralife	38	82	18	0.82		
URCHIN	1	5/3/99	Coralife	38	93	7	0.93		
URCHIN	1	5/3/99	Coralife	18	92	8	0.92	0.91	0.03
URCHIN	1	5/3/99	Coralife	18	87	13	0.87		
URCHIN	1	5/3/99	Coralife	18	91	9	0.91		
URCHIN	1	5/3/99	Coralife	18	95	5	0.95		
URCHIN	1	5/3/99	Coralife	18	89	11	0.89		
URCHIN	1	5/3/99	Coralife	0	99	1	0.99	0.97	0.02
URCHIN	1	5/3/99	Coralife	0	97	3	0.97		
URCHIN	1	5/3/99	Coralife	0	93	7	0.93		
URCHIN	1	5/3/99	Coralife	0	97	3	0.97		
URCHIN	1	5/3/99	Coralife	0	98	2	0.98		
URCHIN	1	5/3/99	Forty Fathoms	100	98	2	0.98	0.98	0.02
URCHIN	1	5/3/99	Forty Fathoms	100	99	1	0.99		
URCHIN	1	5/3/99	Forty Fathoms	100	100	0	1.00		
URCHIN	1	5/3/99	Forty Fathoms	100	99	1	0.99		
URCHIN	1	5/3/99	Forty Fathoms	100	96	4	0.96		
URCHIN	1	5/3/99	Forty Fathoms	79	99	1	0.99	0.99	0.01
URCHIN	1	5/3/99	Forty Fathoms	79	99	1	0.99		
URCHIN	1	5/3/99	Forty Fathoms	79	100	0	1.00		
URCHIN	1	5/3/99	Forty Fathoms	79	98	2	0.98		
URCHIN	1	5/3/99	Forty Fathoms	79	98	2	0.98		
URCHIN	1	5/3/99	Forty Fathoms	59	98	2	0.98	0.97	0.01
URCHIN	1	5/3/99	Forty Fathoms	59	96	4	0.96		
URCHIN	1	5/3/99	Forty Fathoms	59	97	3	0.97		
URCHIN	1	5/3/99	Forty Fathoms	59	97	3	0.97		
URCHIN	1	5/3/99	Forty Fathoms	59	98	2	0.98		
URCHIN	1	5/3/99	Forty Fathoms	38	98	2	0.98	0.98	0.00
URCHIN	1	5/3/99	Forty Fathoms	38	99	1	0.99		
URCHIN	1	5/3/99	Forty Fathoms	38	98	2	0.98		
URCHIN	1	5/3/99	Forty Fathoms	38	98	2	0.98		
URCHIN	1	5/3/99	Forty Fathoms	38	98	2	0.98		
URCHIN	1	5/3/99	Forty Fathoms	18	95	5	0.95	0.97	0.02
URCHIN	1	5/3/99	Forty Fathoms	18	98	2	0.98		
URCHIN	1	5/3/99	Forty Fathoms	18	95	5	0.95		
URCHIN	1	5/3/99	Forty Fathoms	18	97	3	0.97		
URCHIN	1	5/3/99	Forty Fathoms	18	100	0	1.00		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	1	5/3/99	Forty Fathoms	0	99	1	0.99	0.97	0.02
URCHIN	1	5/3/99	Forty Fathoms	0	97	3	0.97		
URCHIN	1	5/3/99	Forty Fathoms	0	93	7	0.93		
URCHIN	1	5/3/99	Forty Fathoms	0	97	3	0.97		
URCHIN	1	5/3/99	Forty Fathoms	0	98	2	0.98		
URCHIN	1	5/3/99	GP2	100	96	4	0.96	0.98	0.02
URCHIN	1	5/3/99	GP2	100	98	2	0.98		
URCHIN	1	5/3/99	GP2	100	96	4	0.96		
URCHIN	1	5/3/99	GP2	100	99	1	0.99		
URCHIN	1	5/3/99	GP2	100	99	1	0.99		
URCHIN	1	5/3/99	GP2	79	96	4	0.96	0.96	0.02
URCHIN	1	5/3/99	GP2	79	94	6	0.94		
URCHIN	1	5/3/99	GP2	79	98	2	0.98		
URCHIN	1	5/3/99	GP2	79	99	1	0.99		
URCHIN	1	5/3/99	GP2	79	94	6	0.94		
URCHIN	1	5/3/99	GP2	59	99	1	0.99	0.97	0.02
URCHIN	1	5/3/99	GP2	59	95	5	0.95		
URCHIN	1	5/3/99	GP2	59	96	4	0.96		
URCHIN	1	5/3/99	GP2	59	99	1	0.99		
URCHIN	1	5/3/99	GP2	59	95	5	0.95		
URCHIN	1	5/3/99	GP2	38	91	9	0.91	0.94	0.03
URCHIN	1	5/3/99	GP2	38	97	3	0.97		
URCHIN	1	5/3/99	GP2	38	93	7	0.93		
URCHIN	1	5/3/99	GP2	38	97	3	0.97		
URCHIN	1	5/3/99	GP2	38	92	8	0.92		
URCHIN	1	5/3/99	GP2	18	91	9	0.91	0.94	0.03
URCHIN	1	5/3/99	GP2	18	94	6	0.94		
URCHIN	1	5/3/99	GP2	18	92	8	0.92		
URCHIN	1	5/3/99	GP2	18	95	5	0.95		
URCHIN	1	5/3/99	GP2	18	99	1	0.99		
URCHIN	1	5/3/99	GP2	0	99	1	0.99	0.97	0.02
URCHIN	1	5/3/99	GP2	0	97	3	0.97		
URCHIN	1	5/3/99	GP2	0	93	7	0.93		
URCHIN	1	5/3/99	GP2	0	97	3	0.97		
URCHIN	1	5/3/99	GP2	0	98	2	0.98		
URCHIN	2	10/6/99	Forty Fathoms	100	99	1	0.99	0.97	0.01
URCHIN	2	10/6/99	Forty Fathoms	100	98	2	0.98		
URCHIN	2	10/6/99	Forty Fathoms	100	97	3	0.97		
URCHIN	2	10/6/99	Forty Fathoms	100	97	3	0.97		
URCHIN	2	10/6/99	Forty Fathoms	100	95	5	0.95		
URCHIN	2	10/6/99	Forty Fathoms	79	90	10	0.90	0.96	0.04
URCHIN	2	10/6/99	Forty Fathoms	79	100	0	1.00		
URCHIN	2	10/6/99	Forty Fathoms	79	99	1	0.99		
URCHIN	2	10/6/99	Forty Fathoms	79	95	5	0.95		
URCHIN	2	10/6/99	Forty Fathoms	79	98	2	0.98		
URCHIN	2	10/6/99	Forty Fathoms	59	99	1	0.99	0.97	0.02
URCHIN	2	10/6/99	Forty Fathoms	59	96	4	0.96		
URCHIN	2	10/6/99	Forty Fathoms	59	95	5	0.95		
URCHIN	2	10/6/99	Forty Fathoms	59	95	5	0.95		
URCHIN	2	10/6/99	Forty Fathoms	59	99	1	0.99		
URCHIN	2	10/6/99	Forty Fathoms	38	97	3	0.97	0.97	0.01
URCHIN	2	10/6/99	Forty Fathoms	38	97	3	0.97		
URCHIN	2	10/6/99	Forty Fathoms	38	95	5	0.95		
URCHIN	2	10/6/99	Forty Fathoms	38	98	2	0.98		
URCHIN	2	10/6/99	Forty Fathoms	38	99	1	0.99		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	2	10/6/99	Forty Fathoms	18	100	0	1.00	0.99	0.01
URCHIN	2	10/6/99	Forty Fathoms	18	98	2	0.98		
URCHIN	2	10/6/99	Forty Fathoms	18	99	1	0.99		
URCHIN	2	10/6/99	Forty Fathoms	18	98	2	0.98		
URCHIN	2	10/6/99	Forty Fathoms	18	98	2	0.98		
URCHIN	2	10/6/99	Forty Fathoms	0	96	4	0.96	0.98	0.01
URCHIN	2	10/6/99	Forty Fathoms	0	99	1	0.99		
URCHIN	2	10/6/99	Forty Fathoms	0	99	1	0.99		
URCHIN	2	10/6/99	Forty Fathoms	0	98	2	0.98		
URCHIN	2	10/6/99	Forty Fathoms	0	98	2	0.98		
URCHIN	2	10/6/99	GP2	100	95	5	0.95	0.96	0.02
URCHIN	2	10/6/99	GP2	100	98	2	0.98		
URCHIN	2	10/6/99	GP2	100	93	7	0.93		
URCHIN	2	10/6/99	GP2	100	99	1	0.99		
URCHIN	2	10/6/99	GP2	100	97	3	0.97		
URCHIN	2	10/6/99	GP2	79	92	8	0.92	0.93	0.04
URCHIN	2	10/6/99	GP2	79	89	11	0.89		
URCHIN	2	10/6/99	GP2	79	90	10	0.90		
URCHIN	2	10/6/99	GP2	79	94	6	0.94		
URCHIN	2	10/6/99	GP2	79	98	2	0.98		
URCHIN	2	10/6/99	GP2	59	98	2	0.98	0.98	0.03
URCHIN	2	10/6/99	GP2	59	100	0	1.00		
URCHIN	2	10/6/99	GP2	59	98	2	0.98		
URCHIN	2	10/6/99	GP2	59	100	0	1.00		
URCHIN	2	10/6/99	GP2	59	87	8	0.92		
URCHIN	2	10/6/99	GP2	38	83	1	0.99	0.97	0.02
URCHIN	2	10/6/99	GP2	38	98	1	0.99		
URCHIN	2	10/6/99	GP2	38	96	4	0.96		
URCHIN	2	10/6/99	GP2	38	94	4	0.96		
URCHIN	2	10/6/99	GP2	38	96	4	0.96		
URCHIN	2	10/6/99	GP2	18	93	7	0.93	0.96	0.02
URCHIN	2	10/6/99	GP2	18	96	4	0.96		
URCHIN	2	10/6/99	GP2	18	98	2	0.98		
URCHIN	2	10/6/99	GP2	18	95	5	0.95		
URCHIN	2	10/6/99	GP2	18	96	4	0.96		
URCHIN	2	10/6/99	GP2	0	96	4	0.96	0.98	0.01
URCHIN	2	10/6/99	GP2	0	99	1	0.99		
URCHIN	2	10/6/99	GP2	0	99	1	0.99		
URCHIN	2	10/6/99	GP2	0	98	2	0.98		
URCHIN	2	10/6/99	GP2	0	98	2	0.98		
URCHIN	2	10/6/99	Tropic Marin	100	97	3	0.97	0.96	0.04
URCHIN	2	10/6/99	Tropic Marin	100	100	0	1.00		
URCHIN	2	10/6/99	Tropic Marin	100	99	1	0.99		
URCHIN	2	10/6/99	Tropic Marin	100	95	5	0.95		
URCHIN	2	10/6/99	Tropic Marin	100	88	11	0.89		
URCHIN	2	10/6/99	Tropic Marin	79	95	5	0.95	0.93	0.04
URCHIN	2	10/6/99	Tropic Marin	79	89	11	0.89		
URCHIN	2	10/6/99	Tropic Marin	79	87	13	0.87		
URCHIN	2	10/6/99	Tropic Marin	79	96	4	0.96		
URCHIN	2	10/6/99	Tropic Marin	79	96	4	0.96		
URCHIN	2	10/6/99	Tropic Marin	59	94	6	0.94	0.96	0.02
URCHIN	2	10/6/99	Tropic Marin	59	95	5	0.95		
URCHIN	2	10/6/99	Tropic Marin	59	98	2	0.98		
URCHIN	2	10/6/99	Tropic Marin	59	96	4	0.96		
URCHIN	2	10/6/99	Tropic Marin	59	97	3	0.97		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	2	10/6/99	Tropic Marin	38	96	4	0.96	0.98	0.02
URCHIN	2	10/6/99	Tropic Marin	38	100	0	1.00		
URCHIN	2	10/6/99	Tropic Marin	38	97	3	0.97		
URCHIN	2	10/6/99	Tropic Marin	38	100	0	1.00		
URCHIN	2	10/6/99	Tropic Marin	38	98	2	0.98		
URCHIN	2	10/6/99	Tropic Marin	18	99	1	0.99	0.99	0.01
URCHIN	2	10/6/99	Tropic Marin	18	98	2	0.98		
URCHIN	2	10/6/99	Tropic Marin	18	98	2	0.98		
URCHIN	2	10/6/99	Tropic Marin	18	100	0	1.00		
URCHIN	2	10/6/99	Tropic Marin	18	98	2	0.98		
URCHIN	2	10/6/99	Tropic Marin	0	96	4	0.96	0.98	0.01
URCHIN	2	10/6/99	Tropic Marin	0	99	1	0.99		
URCHIN	2	10/6/99	Tropic Marin	0	99	1	0.99		
URCHIN	2	10/6/99	Tropic Marin	0	98	2	0.98		
URCHIN	2	10/6/99	Tropic Marin	0	98	2	0.98		
URCHIN	3	10/18/99	Forty Fathoms	100	97	3	0.97	0.98	0.01
URCHIN	3	10/18/99	Forty Fathoms	100	97	3	0.97		
URCHIN	3	10/18/99	Forty Fathoms	100	99	1	0.99		
URCHIN	3	10/18/99	Forty Fathoms	100	100	0	1.00		
URCHIN	3	10/18/99	Forty Fathoms	100	98	2	0.98		
URCHIN	3	10/18/99	Forty Fathoms	79	95	5	0.95	0.94	0.01
URCHIN	3	10/18/99	Forty Fathoms	79	94	6	0.94		
URCHIN	3	10/18/99	Forty Fathoms	79	93	7	0.93		
URCHIN	3	10/18/99	Forty Fathoms	79	94	6	0.94		
URCHIN	3	10/18/99	Forty Fathoms	79	96	4	0.96		
URCHIN	3	10/18/99	Forty Fathoms	59	93	7	0.93	0.96	0.02
URCHIN	3	10/18/99	Forty Fathoms	59	98	2	0.98		
URCHIN	3	10/18/99	Forty Fathoms	59	95	5	0.95		
URCHIN	3	10/18/99	Forty Fathoms	59	96	4	0.96		
URCHIN	3	10/18/99	Forty Fathoms	59	99	1	0.99		
URCHIN	3	10/18/99	Forty Fathoms	38	98	2	0.98	0.97	0.01
URCHIN	3	10/18/99	Forty Fathoms	38	96	4	0.96		
URCHIN	3	10/18/99	Forty Fathoms	38	96	4	0.96		
URCHIN	3	10/18/99	Forty Fathoms	38	98	2	0.98		
URCHIN	3	10/18/99	Forty Fathoms	38	97	3	0.97		
URCHIN	3	10/18/99	Forty Fathoms	18	97	3	0.97	0.96	0.01
URCHIN	3	10/18/99	Forty Fathoms	18	95	5	0.95		
URCHIN	3	10/18/99	Forty Fathoms	18	97	3	0.97		
URCHIN	3	10/18/99	Forty Fathoms	18	95	5	0.95		
URCHIN	3	10/18/99	Forty Fathoms	18	97	3	0.97		
URCHIN	3	10/18/99	Forty Fathoms	0	93	7	0.93	0.95	0.03
URCHIN	3	10/18/99	Forty Fathoms	0	94	6	0.94		
URCHIN	3	10/18/99	Forty Fathoms	0	94	6	0.94		
URCHIN	3	10/18/99	Forty Fathoms	0	94	6	0.94		
URCHIN	3	10/18/99	Forty Fathoms	0	100	0	1.00		
URCHIN	3	10/18/99	GP2	100	95	5	0.95	0.96	0.03
URCHIN	3	10/18/99	GP2	100	94	6	0.94		
URCHIN	3	10/18/99	GP2	100	97	3	0.97		
URCHIN	3	10/18/99	GP2	100	100	0	1.00		
URCHIN	3	10/18/99	GP2	100	94	6	0.94		
URCHIN	3	10/18/99	GP2	79	95	5	0.95	0.96	0.02
URCHIN	3	10/18/99	GP2	79	100	0	1.00		
URCHIN	3	10/18/99	GP2	79	96	4	0.96		
URCHIN	3	10/18/99	GP2	79	95	5	0.95		
URCHIN	3	10/18/99	GP2	79	96	4	0.96		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	3	10/18/99	GP2	59	93	7	0.93	0.97	0.03
URCHIN	3	10/18/99	GP2	59	98	2	0.98		
URCHIN	3	10/18/99	GP2	59	94	6	0.94		
URCHIN	3	10/18/99	GP2	59	100	0	1.00		
URCHIN	3	10/18/99	GP2	59	98	2	0.98		
URCHIN	3	10/18/99	GP2	38	97	3	0.97	0.96	0.03
URCHIN	3	10/18/99	GP2	38	91	9	0.91		
URCHIN	3	10/18/99	GP2	38	96	4	0.96		
URCHIN	3	10/18/99	GP2	38	97	3	0.97		
URCHIN	3	10/18/99	GP2	38	97	3	0.97		
URCHIN	3	10/18/99	GP2	18	98	2	0.98	0.98	0.01
URCHIN	3	10/18/99	GP2	18	98	2	0.98		
URCHIN	3	10/18/99	GP2	18	96	4	0.96		
URCHIN	3	10/18/99	GP2	18	99	1	0.99		
URCHIN	3	10/18/99	GP2	18	97	3	0.97		
URCHIN	3	10/18/99	GP2	0	93	7	0.93	0.95	0.03
URCHIN	3	10/18/99	GP2	0	94	6	0.94		
URCHIN	3	10/18/99	GP2	0	94	6	0.94		
URCHIN	3	10/18/99	GP2	0	94	6	0.94		
URCHIN	3	10/18/99	GP2	0	100	0	1.00		
URCHIN	3	10/18/99	Tropic Marin	100	96	4	0.96	0.96	0.02
URCHIN	3	10/18/99	Tropic Marin	100	97	3	0.97		
URCHIN	3	10/18/99	Tropic Marin	100	97	3	0.97		
URCHIN	3	10/18/99	Tropic Marin	100	97	3	0.97		
URCHIN	3	10/18/99	Tropic Marin	100	93	7	0.93		
URCHIN	3	10/18/99	Tropic Marin	79	94	6	0.94	0.95	0.04
URCHIN	3	10/18/99	Tropic Marin	79	99	1	0.99		
URCHIN	3	10/18/99	Tropic Marin	79	97	3	0.97		
URCHIN	3	10/18/99	Tropic Marin	79	95	5	0.95		
URCHIN	3	10/18/99	Tropic Marin	79	89	11	0.89		
URCHIN	3	10/18/99	Tropic Marin	59	94	6	0.94	0.95	0.02
URCHIN	3	10/18/99	Tropic Marin	59	93	7	0.93		
URCHIN	3	10/18/99	Tropic Marin	59	94	6	0.94		
URCHIN	3	10/18/99	Tropic Marin	59	97	3	0.97		
URCHIN	3	10/18/99	Tropic Marin	59	95	5	0.95		
URCHIN	3	10/18/99	Tropic Marin	38	96	4	0.96	0.93	0.03
URCHIN	3	10/18/99	Tropic Marin	38	89	11	0.89		
URCHIN	3	10/18/99	Tropic Marin	38	91	9	0.91		
URCHIN	3	10/18/99	Tropic Marin	38	93	7	0.93		
URCHIN	3	10/18/99	Tropic Marin	38	97	3	0.97		
URCHIN	3	10/18/99	Tropic Marin	18	94	6	0.94	0.96	0.02
URCHIN	3	10/18/99	Tropic Marin	18	94	6	0.94		
URCHIN	3	10/18/99	Tropic Marin	18	97	3	0.97		
URCHIN	3	10/18/99	Tropic Marin	18	96	4	0.96		
URCHIN	3	10/18/99	Tropic Marin	18	100	0	1.00		
URCHIN	3	10/18/99	Tropic Marin	0	93	7	0.93	0.95	0.03
URCHIN	3	10/18/99	Tropic Marin	0	94	6	0.94		
URCHIN	3	10/18/99	Tropic Marin	0	94	6	0.94		
URCHIN	3	10/18/99	Tropic Marin	0	94	6	0.94		
URCHIN	3	10/18/99	Tropic Marin	0	100	0	1.00		
URCHIN	4	10/25/99	Tropic Marin	100	98	2	0.98	0.97	0.02
URCHIN	4	10/25/99	Tropic Marin	100	97	3	0.97		
URCHIN	4	10/25/99	Tropic Marin	100	100	0	1.00		
URCHIN	4	10/25/99	Tropic Marin	100	95	5	0.95		
URCHIN	4	10/25/99	Tropic Marin	100	96	4	0.96		

TEST ORGANISM	TEST NUMBER	DATE	SALT TYPE	DILUTION (%)	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	4	10/25/99	Tropic Marin	79	99	1	0.99	0.98	0.02
URCHIN	4	10/25/99	Tropic Marin	79	95	5	0.95		
URCHIN	4	10/25/99	Tropic Marin	79	98	2	0.98		
URCHIN	4	10/25/99	Tropic Marin	79	98	2	0.98		
URCHIN	4	10/25/99	Tropic Marin	79	100	0	1.00		
URCHIN	4	10/25/99	Tropic Marin	59	93	7	0.93	0.97	0.02
URCHIN	4	10/25/99	Tropic Marin	59	98	2	0.98		
URCHIN	4	10/25/99	Tropic Marin	59	96	4	0.96		
URCHIN	4	10/25/99	Tropic Marin	59	99	1	0.99		
URCHIN	4	10/25/99	Tropic Marin	59	98	2	0.98		
URCHIN	4	10/25/99	Tropic Marin	38	95	5	0.95	0.98	0.02
URCHIN	4	10/25/99	Tropic Marin	38	100	0	1.00		
URCHIN	4	10/25/99	Tropic Marin	38	99	1	0.99		
URCHIN	4	10/25/99	Tropic Marin	38	97	3	0.97		
URCHIN	4	10/25/99	Tropic Marin	38	98	2	0.98		
URCHIN	4	10/25/99	Tropic Marin	18	94	6	0.94	0.96	0.03
URCHIN	4	10/25/99	Tropic Marin	18	91	9	0.91		
URCHIN	4	10/25/99	Tropic Marin	18	99	1	0.99		
URCHIN	4	10/25/99	Tropic Marin	18	97	3	0.97		
URCHIN	4	10/25/99	Tropic Marin	18	97	3	0.97		
URCHIN	4	10/25/99	Tropic Marin	0	98	2	0.98	0.97	0.03
URCHIN	4	10/25/99	Tropic Marin	0	93	7	0.93		
URCHIN	4	10/25/99	Tropic Marin	0	98	2	0.98		
URCHIN	4	10/25/99	Tropic Marin	0	100	0	1.00		
URCHIN	4	10/25/99	Tropic Marin	0	Sample Lost	Sample Lost	Sample Lost		

Appendix C – Metal Toxicity Test Raw Data

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu 1	6/3/99	Cd	0	99	1	0.99	0.99	0.01
URCHIN	Cd/Cu 1	6/3/99	Cd	0	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cd	0	98	2	0.98		
URCHIN	Cd/Cu 1	6/3/99	Cd	0	100	0	1		
URCHIN	Cd/Cu 1	6/3/99	Cd	0	100	0	1		
URCHIN	Cd/Cu 1	6/3/99	Cd	100	98	2	0.98	0.98	0.02
URCHIN	Cd/Cu 1	6/3/99	Cd	100	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cd	100	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cd	100	97	3	0.97		
URCHIN	Cd/Cu 1	6/3/99	Cd	100	95	5	0.95		
URCHIN	Cd/Cu 1	6/3/99	Cd	180	77	23	0.77	0.77	0.05
URCHIN	Cd/Cu 1	6/3/99	Cd	180	68	32	0.68		
URCHIN	Cd/Cu 1	6/3/99	Cd	180	79	21	0.79		
URCHIN	Cd/Cu 1	6/3/99	Cd	180	80	20	0.8		
URCHIN	Cd/Cu 1	6/3/99	Cd	180	79	21	0.79		
URCHIN	Cd/Cu 1	6/3/99	Cd	320	37	63	0.37	0.41	0.03
URCHIN	Cd/Cu 1	6/3/99	Cd	320	42	58	0.42		
URCHIN	Cd/Cu 1	6/3/99	Cd	320	45	55	0.45		
URCHIN	Cd/Cu 1	6/3/99	Cd	320	42	58	0.42		
URCHIN	Cd/Cu 1	6/3/99	Cd	320	38	62	0.38		
URCHIN	Cd/Cu 1	6/3/99	Cd	560	17	83	0.17	0.15	0.05
URCHIN	Cd/Cu 1	6/3/99	Cd	560	15	85	0.15		
URCHIN	Cd/Cu 1	6/3/99	Cd	560	19	81	0.19		
URCHIN	Cd/Cu 1	6/3/99	Cd	560	16	84	0.16		
URCHIN	Cd/Cu 1	6/3/99	Cd	560	6	94	0.06		
URCHIN	Cd/Cu 1	6/3/99	Cd	1000	0	100	0	0.00	0.00
URCHIN	Cd/Cu 1	6/3/99	Cd	1000	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd	1000	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd	1000	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd	1000	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cu	0	99	1	0.99	0.99	0.01
URCHIN	Cd/Cu 1	6/3/99	Cu	0	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cu	0	98	2	0.98		
URCHIN	Cd/Cu 1	6/3/99	Cu	0	100	0	1		
URCHIN	Cd/Cu 1	6/3/99	Cu	0	100	0	1		
URCHIN	Cd/Cu 1	6/3/99	Cu	3.2	97	3	0.97	0.97	0.01
URCHIN	Cd/Cu 1	6/3/99	Cu	3.2	98	2	0.98		
URCHIN	Cd/Cu 1	6/3/99	Cu	3.2	95	5	0.95		
URCHIN	Cd/Cu 1	6/3/99	Cu	3.2	98	2	0.98		
URCHIN	Cd/Cu 1	6/3/99	Cu	3.2	98	2	0.98		
URCHIN	Cd/Cu 1	6/3/99	Cu	5.6	100	0	1	0.98	0.02
URCHIN	Cd/Cu 1	6/3/99	Cu	5.6	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cu	5.6	96	4	0.96		
URCHIN	Cd/Cu 1	6/3/99	Cu	5.6	96	4	0.96		
URCHIN	Cd/Cu 1	6/3/99	Cu	5.6	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cu	10	93	7	0.93	0.95	0.01
URCHIN	Cd/Cu 1	6/3/99	Cu	10	94	6	0.94		
URCHIN	Cd/Cu 1	6/3/99	Cu	10	96	4	0.96		
URCHIN	Cd/Cu 1	6/3/99	Cu	10	96	4	0.96		
URCHIN	Cd/Cu 1	6/3/99	Cu	10	95	5	0.95		
URCHIN	Cd/Cu 1	6/3/99	Cu	18	36	64	0.36	0.34	0.04
URCHIN	Cd/Cu 1	6/3/99	Cu	18	29	71	0.29		
URCHIN	Cd/Cu 1	6/3/99	Cu	18	30	70	0.3		
URCHIN	Cd/Cu 1	6/3/99	Cu	18	37	63	0.37		
URCHIN	Cd/Cu 1	6/3/99	Cu	18	37	63	0.37		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu 1	6/3/99	Cu	32	0	100	0	0.00	0.00
URCHIN	Cd/Cu 1	6/3/99	Cu	32	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cu	32	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cu	32	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cu	32	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	0	99	1	0.99	0.99	0.01
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	0	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	0	98	2	0.98		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	0	100	0	1		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	0	100	0	1		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	51.6	99	1	0.99	0.98	0.02
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	51.6	95	5	0.95		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	51.6	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	51.6	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	51.6	99	1	0.99		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	92.8	73	27	0.73	0.80	0.10
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	92.8	72	28	0.72		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	92.8	75	25	0.75		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	92.8	95	5	0.95		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	92.8	83	17	0.83		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	165	14	86	0.14	0.19	0.03
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	165	19	81	0.19		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	165	21	79	0.21		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	165	21	79	0.21		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	165	21	79	0.21		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	289	0	100	0	0.00	0.00
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	289	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	289	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	289	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	289	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	516	0	100	0	0.00	0.00
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	516	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	516	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	516	0	100	0		
URCHIN	Cd/Cu 1	6/3/99	Cd/Cu	516	0	100	0		
URCHIN	Cd/Cu 2	6/21/99	Cd	0	99	1	0.99	0.97	0.01
URCHIN	Cd/Cu 2	6/21/99	Cd	0	96	4	0.96		
URCHIN	Cd/Cu 2	6/21/99	Cd	0	97	4	0.96		
URCHIN	Cd/Cu 2	6/21/99	Cd	0	93	3	0.97		
URCHIN	Cd/Cu 2	6/21/99	Cd	100	98	7	0.93	0.95	0.02
URCHIN	Cd/Cu 2	6/21/99	Cd	100	93	2	0.98		
URCHIN	Cd/Cu 2	6/21/99	Cd	100	94	7	0.93		
URCHIN	Cd/Cu 2	6/21/99	Cd	100	94	6	0.94		
URCHIN	Cd/Cu 2	6/21/99	Cd	180	82	18	0.82	0.87	0.04
URCHIN	Cd/Cu 2	6/21/99	Cd	180	88	12	0.88		
URCHIN	Cd/Cu 2	6/21/99	Cd	180	88	12	0.88		
URCHIN	Cd/Cu 2	6/21/99	Cd	180	91	9	0.91		
URCHIN	Cd/Cu 2	6/21/99	Cd	320	72	28	0.72	0.67	0.06
URCHIN	Cd/Cu 2	6/21/99	Cd	320	72	28	0.72		
URCHIN	Cd/Cu 2	6/21/99	Cd	320	59	41	0.59		
URCHIN	Cd/Cu 2	6/21/99	Cd	320	65	35	0.65		
URCHIN	Cd/Cu 2	6/21/99	Cd	560	35	65	0.35	0.37	0.04
URCHIN	Cd/Cu 2	6/21/99	Cd	560	42	58	0.42		
URCHIN	Cd/Cu 2	6/21/99	Cd	560	37	63	0.37		
URCHIN	Cd/Cu 2	6/21/99	Cd	560	34	66	0.34		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu 2	6/21/99	Cd	1000	13	87	0.13	0.14	0.04
URCHIN	Cd/Cu 2	6/21/99	Cd	1000	9	91	0.09		
URCHIN	Cd/Cu 2	6/21/99	Cd	1000	18	82	0.18		
URCHIN	Cd/Cu 2	6/21/99	Cd	1000	14	86	0.14		
URCHIN	Cd/Cu 2	6/21/99	Cu	0	99	1	0.99	0.97	0.01
URCHIN	Cd/Cu 2	6/21/99	Cu	0	96	4	0.96		
URCHIN	Cd/Cu 2	6/21/99	Cu	0	97	3	0.97		
URCHIN	Cd/Cu 2	6/21/99	Cu	0	96	4	0.96		
URCHIN	Cd/Cu 2	6/21/99	Cu	3.2	97	3	0.97	0.98	0.01
URCHIN	Cd/Cu 2	6/21/99	Cu	3.2	97	3	0.97		
URCHIN	Cd/Cu 2	6/21/99	Cu	3.2	99	1	0.99		
URCHIN	Cd/Cu 2	6/21/99	Cu	3.2	97	3	0.97		
URCHIN	Cd/Cu 2	6/21/99	Cu	5.6	98	2	0.98	0.95	0.03
URCHIN	Cd/Cu 2	6/21/99	Cu	5.6	97	3	0.97		
URCHIN	Cd/Cu 2	6/21/99	Cu	5.6	91	9	0.91		
URCHIN	Cd/Cu 2	6/21/99	Cu	5.6	93	7	0.93		
URCHIN	Cd/Cu 2	6/21/99	Cu	10	85	15	0.85	0.88	0.03
URCHIN	Cd/Cu 2	6/21/99	Cu	10	86	14	0.86		
URCHIN	Cd/Cu 2	6/21/99	Cu	10	92	8	0.92		
URCHIN	Cd/Cu 2	6/21/99	Cu	10	88	12	0.88		
URCHIN	Cd/Cu 2	6/21/99	Cu	18	33	67	0.33	0.34	0.06
URCHIN	Cd/Cu 2	6/21/99	Cu	18	40	60	0.40		
URCHIN	Cd/Cu 2	6/21/99	Cu	18	38	62	0.38		
URCHIN	Cd/Cu 2	6/21/99	Cu	18	26	74	0.26		
URCHIN	Cd/Cu 2	6/21/99	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu 2	6/21/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu 2	6/21/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu 2	6/21/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	0	99	1	0.99	0.97	0.01
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	0	96	4	0.96		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	0	96	4	0.96		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	0	97	3	0.97		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	51.6	97	3	0.97	0.97	0.01
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	51.6	97	3	0.97		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	51.6	96	4	0.96		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	51.6	99	1	0.99		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	92.8	sample lost			0.84	0.05
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	92.8	89	11	0.89		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	92.8	87	20	0.81		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	92.8	81	19	0.81		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	165	46	54	0.46	0.50	0.05
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	165	50	50	0.50		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	165	47	53	0.47		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	165	58	42	0.58		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	289	13	97	0.12	0.19	0.05
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	289	21	79	0.21		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	289	22	78	0.22		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	289	23	77	0.23		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	516	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	516	0	100	0.00		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	516	0	100	0.00		
URCHIN	Cd/Cu 2	6/21/99	Cd/Cu	516	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Cu 3	10/11/99	Cd	0	95	5	0.95		
URCHIN	Cd/Cu 3	10/11/99	Cd	0	91	9	0.91		
URCHIN	Cd/Cu 3	10/11/99	Cd	100	89	11	0.89	0.88	0.03
URCHIN	Cd/Cu 3	10/11/99	Cd	100	90	10	0.90		
URCHIN	Cd/Cu 3	10/11/99	Cd	100	85	15	0.85		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu 3	10/11/99	Cd	180	54	46	0.54	0.47	0.06
URCHIN	Cd/Cu 3	10/11/99	Cd	180	43	57	0.43		
URCHIN	Cd/Cu 3	10/11/99	Cd	180	45	55	0.45		
URCHIN	Cd/Cu 3	10/11/99	Cd	320	0	100	0.00	0.01	0.02
URCHIN	Cd/Cu 3	10/11/99	Cd	320	3	97	0.03		
URCHIN	Cd/Cu 3	10/11/99	Cd	320	1	99	0.01		
URCHIN	Cd/Cu 3	10/11/99	Cd	560	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu 3	10/11/99	Cd	560	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd	560	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu 3	10/11/99	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cu	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Cu 3	10/11/99	Cu	0	95	5	0.95		
URCHIN	Cd/Cu 3	10/11/99	Cu	0	91	9	0.91		
URCHIN	Cd/Cu 3	10/11/99	Cu	3.2	85	15	0.85	0.87	0.04
URCHIN	Cd/Cu 3	10/11/99	Cu	3.2	92	8	0.92		
URCHIN	Cd/Cu 3	10/11/99	Cu	3.2	85	15	0.85		
URCHIN	Cd/Cu 3	10/11/99	Cu	5.6	94	6	0.94	0.91	0.03
URCHIN	Cd/Cu 3	10/11/99	Cu	5.6	89	11	0.89		
URCHIN	Cd/Cu 3	10/11/99	Cu	5.6	91	9	0.91		
URCHIN	Cd/Cu 3	10/11/99	Cu	10	79	21	0.79	0.79	0.01
URCHIN	Cd/Cu 3	10/11/99	Cu	10	79	21	0.79		
URCHIN	Cd/Cu 3	10/11/99	Cu	10	80	20	0.80		
URCHIN	Cd/Cu 3	10/11/99	Cu	18	13	87	0.13	0.13	0.05
URCHIN	Cd/Cu 3	10/11/99	Cu	18	8	92	0.08		
URCHIN	Cd/Cu 3	10/11/99	Cu	18	18	82	0.18		
URCHIN	Cd/Cu 3	10/11/99	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu 3	10/11/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	0	95	5	0.95		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	0	91	9	0.91		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	51.6	88	12	0.88	0.87	0.02
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	51.6	88	12	0.88		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	51.6	84	16	0.84		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	92.8	16	84	0.16	0.23	0.07
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	92.8	25	75	0.25		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	92.8	29	71	0.29		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	165	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	165	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	165	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	289	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	289	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	289	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	516	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	516	0	100	0.00		
URCHIN	Cd/Cu 3	10/11/99	Cd/Cu	516	0	100	0.00		
URCHIN	Cd/Ni 1	1/3/00	Cd	0	96	4	0.96	0.96	0.02
URCHIN	Cd/Ni 1	1/3/00	Cd	0	94	6	0.94		
URCHIN	Cd/Ni 1	1/3/00	Cd	0	97	3	0.97		
URCHIN	Cd/Ni 1	1/3/00	Cd	100	98	2	0.98	0.96	0.03
URCHIN	Cd/Ni 1	1/3/00	Cd	100	96	4	0.96		
URCHIN	Cd/Ni 1	1/3/00	Cd	100	93	7	0.93		
URCHIN	Cd/Ni 1	1/3/00	Cd	180	70	30	0.70	0.71	0.05
URCHIN	Cd/Ni 1	1/3/00	Cd	180	67	33	0.67		
URCHIN	Cd/Ni 1	1/3/00	Cd	180	77	23	0.77		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Ni 1	1/3/00	Cd	320	26	74	0.26	0.22	0.04
URCHIN	Cd/Ni 1	1/3/00	Cd	320	22	78	0.22		
URCHIN	Cd/Ni 1	1/3/00	Cd	320	18	82	0.18		
URCHIN	Cd/Ni 1	1/3/00	Cd	560	5	95	0.05	0.05	0.02
URCHIN	Cd/Ni 1	1/3/00	Cd	560	6	94	0.06		
URCHIN	Cd/Ni 1	1/3/00	Cd	560	3	97	0.03		
URCHIN	Cd/Ni 1	1/3/00	Cd	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni 1	1/3/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Ni 1	1/3/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Ni 1	1/3/00	Ni	0	98	2	0.98	0.97	0.01
URCHIN	Cd/Ni 1	1/3/00	Ni	0	97	3	0.97		
URCHIN	Cd/Ni 1	1/3/00	Ni	0	97	3	0.97		
URCHIN	Cd/Ni 1	1/3/00	Ni	100	95	5	0.95	0.95	0.02
URCHIN	Cd/Ni 1	1/3/00	Ni	100	96	4	0.96		
URCHIN	Cd/Ni 1	1/3/00	Ni	100	93	7	0.93		
URCHIN	Cd/Ni 1	1/3/00	Ni	180	83	17	0.83	0.75	0.07
URCHIN	Cd/Ni 1	1/3/00	Ni	180	72	28	0.72		
URCHIN	Cd/Ni 1	1/3/00	Ni	180	71	29	0.71		
URCHIN	Cd/Ni 1	1/3/00	Ni	320	25	75	0.25	0.17	0.07
URCHIN	Cd/Ni 1	1/3/00	Ni	320	16	84	0.16		
URCHIN	Cd/Ni 1	1/3/00	Ni	320	11	89	0.11		
URCHIN	Cd/Ni 1	1/3/00	Ni	560	10	90	0.10	0.03	0.06
URCHIN	Cd/Ni 1	1/3/00	Ni	560	0	100	0.00		
URCHIN	Cd/Ni 1	1/3/00	Ni	560	0	100	0.00		
URCHIN	Cd/Ni 1	1/3/00	Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni 1	1/3/00	Ni	1000	0	100	0.00		
URCHIN	Cd/Ni 1	1/3/00	Ni	1000	0	100	0.00		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	0	97	3	0.97	0.99	0.02
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	0	100	0	1.00		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	0	100	0	1.00		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	100	99	1	0.99	0.97	0.03
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	100	98	2	0.98		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	100	94	6	0.94		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	180	98	2	0.98	0.96	0.02
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	180	96	4	0.96		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	180	94	6	0.94		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	320	50	50	0.50	0.52	0.08
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	320	60	40	0.60		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	320	45	55	0.45		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	560	7	93	0.07	0.06	0.03
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	560	8	92	0.08		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	560	2	98	0.02		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	1000	0	100	0.00		
URCHIN	Cd/Ni 1	1/3/00	Cd/Ni	1000	0	100	0.00		
URCHIN	Cd/Ni 2	1/10/00	Cd	0	98	2	0.98	0.96	0.03
URCHIN	Cd/Ni 2	1/10/00	Cd	0	92	8	0.92		
URCHIN	Cd/Ni 2	1/10/00	Cd	0	98	2	0.98		
URCHIN	Cd/Ni 2	1/10/00	Cd	100	99	1	0.99	0.99	0.01
URCHIN	Cd/Ni 2	1/10/00	Cd	100	99	1	0.99		
URCHIN	Cd/Ni 2	1/10/00	Cd	100	100	0	1.00		
URCHIN	Cd/Ni 2	1/10/00	Cd	180	92	8	0.92	0.94	0.03
URCHIN	Cd/Ni 2	1/10/00	Cd	180	98	2	0.98		
URCHIN	Cd/Ni 2	1/10/00	Cd	180	92	8	0.92		
URCHIN	Cd/Ni 2	1/10/00	Cd	320	53	47	0.53	0.55	0.03
URCHIN	Cd/Ni 2	1/10/00	Cd	320	54	46	0.54		
URCHIN	Cd/Ni 2	1/10/00	Cd	320	58	42	0.58		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Ni 2	1/10/00	Cd	560	24	76	0.24	0.28	0.04
URCHIN	Cd/Ni 2	1/10/00	Cd	560	32	68	0.32		
URCHIN	Cd/Ni 2	1/10/00	Cd	560	28	72	0.28		
URCHIN	Cd/Ni 2	1/10/00	Cd	1000	3	97	0.03	0.08	0.04
URCHIN	Cd/Ni 2	1/10/00	Cd	1000	10	90	0.10		
URCHIN	Cd/Ni 2	1/10/00	Cd	1000	10	90	0.10		
URCHIN	Cd/Ni 2	1/10/00	Ni	0	100	0	1.00	0.98	0.02
URCHIN	Cd/Ni 2	1/10/00	Ni	0	96	4	0.96		
URCHIN	Cd/Ni 2	1/10/00	Ni	0	99	1	0.99		
URCHIN	Cd/Ni 2	1/10/00	Ni	100	90	10	0.90	0.90	0.04
URCHIN	Cd/Ni 2	1/10/00	Ni	100	94	6	0.94		
URCHIN	Cd/Ni 2	1/10/00	Ni	100	87	13	0.87		
URCHIN	Cd/Ni 2	1/10/00	Ni	180	68	32	0.68	0.70	0.04
URCHIN	Cd/Ni 2	1/10/00	Ni	180	75	25	0.75		
URCHIN	Cd/Ni 2	1/10/00	Ni	180	68	32	0.68		
URCHIN	Cd/Ni 2	1/10/00	Ni	320	52	48	0.52	0.60	0.07
URCHIN	Cd/Ni 2	1/10/00	Ni	320	63	37	0.63		
URCHIN	Cd/Ni 2	1/10/00	Ni	320	64	36	0.64		
URCHIN	Cd/Ni 2	1/10/00	Ni	560	46	54	0.46	0.41	0.05
URCHIN	Cd/Ni 2	1/10/00	Ni	560	42	58	0.42		
URCHIN	Cd/Ni 2	1/10/00	Ni	560	36	64	0.36		
URCHIN	Cd/Ni 2	1/10/00	Ni	1000	17	83	0.17	0.17	0.00
URCHIN	Cd/Ni 2	1/10/00	Ni	1000	17	83	0.17		
URCHIN	Cd/Ni 2	1/10/00	Ni	1000	17	83	0.17		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	0	95	5	0.95	0.94	0.01
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	0	93	7	0.93		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	0	93	7	0.93		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	100	95	5	0.95	0.94	0.04
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	100	90	10	0.90		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	100	98	2	0.98		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	180	88	12	0.88	0.85	0.05
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	180	79	21	0.79		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	180	88	12	0.88		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	320	52	48	0.52	0.52	0.00
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	320	52	48	0.52		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	320	52	48	0.52		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	560	13	87	0.13	0.14	0.01
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	560	15	85	0.15		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	560	13	87	0.13		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	1000	0	100	0.00		
URCHIN	Cd/Ni 2	1/10/00	Cd/Ni	1000	0	100	0.00		
URCHIN	Cd/Ni 3	1/24/00	Cd	0	97	4	0.96	0.97	0.02
URCHIN	Cd/Ni 3	1/24/00	Cd	0	100	1	0.99		
URCHIN	Cd/Ni 3	1/24/00	Cd	0	95	5	0.95		
URCHIN	Cd/Ni 3	1/24/00	Cd	100	100	5	0.95	0.97	0.01
URCHIN	Cd/Ni 3	1/24/00	Cd	100	97	3	0.97		
URCHIN	Cd/Ni 3	1/24/00	Cd	100	100	2	0.98		
URCHIN	Cd/Ni 3	1/24/00	Cd	180	93	8	0.92	0.94	0.02
URCHIN	Cd/Ni 3	1/24/00	Cd	180	99	6	0.94		
URCHIN	Cd/Ni 3	1/24/00	Cd	180	96	5	0.95		
URCHIN	Cd/Ni 3	1/24/00	Cd	320	63	40	0.61	0.64	0.03
URCHIN	Cd/Ni 3	1/24/00	Cd	320	66	34	0.66		
URCHIN	Cd/Ni 3	1/24/00	Cd	320	68	36	0.65		
URCHIN	Cd/Ni 3	1/24/00	Cd	560	14	90	0.13	0.17	0.05
URCHIN	Cd/Ni 3	1/24/00	Cd	560	23	77	0.23		
URCHIN	Cd/Ni 3	1/24/00	Cd	560	16	92	0.15		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Ni 3	1/24/00	Cd	1000	3	97	0.03	0.04	0.01
URCHIN	Cd/Ni 3	1/24/00	Cd	1000	6	95	0.06		
URCHIN	Cd/Ni 3	1/24/00	Cd	1000	4	96	0.04		
URCHIN	Cd/Ni 3	1/24/00	Ni	0	97	3	0.97	0.97	0.00
URCHIN	Cd/Ni 3	1/24/00	Ni	0	100	3	0.97		
URCHIN	Cd/Ni 3	1/24/00	Ni	0	100	3	0.97		
URCHIN	Cd/Ni 3	1/24/00	Ni	100	90	10	0.90	0.93	0.03
URCHIN	Cd/Ni 3	1/24/00	Ni	100	95	5	0.95		
URCHIN	Cd/Ni 3	1/24/00	Ni	100	100	7	0.93		
URCHIN	Cd/Ni 3	1/24/00	Ni	180	89	17	0.84	0.85	0.02
URCHIN	Cd/Ni 3	1/24/00	Ni	180	85	15	0.85		
URCHIN	Cd/Ni 3	1/24/00	Ni	180	87	13	0.87		
URCHIN	Cd/Ni 3	1/24/00	Ni	320	63	49	0.56	0.51	0.05
URCHIN	Cd/Ni 3	1/24/00	Ni	320	55	50	0.52		
URCHIN	Cd/Ni 3	1/24/00	Ni	320	47	56	0.46		
URCHIN	Cd/Ni 3	1/24/00	Ni	560	27	79	0.25	0.21	0.04
URCHIN	Cd/Ni 3	1/24/00	Ni	560	19	81	0.19		
URCHIN	Cd/Ni 3	1/24/00	Ni	560	22	95	0.19		
URCHIN	Cd/Ni 3	1/24/00	Ni	1000	6	99	0.06	0.06	0.01
URCHIN	Cd/Ni 3	1/24/00	Ni	1000	8	97	0.08		
URCHIN	Cd/Ni 3	1/24/00	Ni	1000	6	99	0.06		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	0	99	1	0.99	0.97	0.02
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	0	100	4	0.96		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	0	97	5	0.95		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	100	99	2	0.98	0.96	0.03
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	100	98	2	0.98		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	100	96	7	0.93		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	180	99	4	0.96	0.92	0.04
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	180	99	10	0.91		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	180	95	12	0.89		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	320	59	41	0.59	0.68	0.08
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	320	78	27	0.74		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	320	71	29	0.71		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	560	6	94	0.06	0.07	0.03
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	560	4	97	0.04		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	560	10	90	0.10		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	1000	0	100	0.00		
URCHIN	Cd/Ni 3	1/24/00	Cd/Ni	1000	0	100	0.00		
URCHIN	Cd/Zn 1	6/3/99	Cd	0	98	2	0.98	0.99	0.01
URCHIN	Cd/Zn 1	6/3/99	Cd	0	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Cd	0	98	2	0.98		
URCHIN	Cd/Zn 1	6/3/99	Cd	0	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Cd	0	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Cd	100	98	2	0.98	0.98	0.02
URCHIN	Cd/Zn 1	6/3/99	Cd	100	99	1	0.99		
URCHIN	Cd/Zn 1	6/3/99	Cd	100	99	1	0.99		
URCHIN	Cd/Zn 1	6/3/99	Cd	100	97	3	0.97		
URCHIN	Cd/Zn 1	6/3/99	Cd	100	95	5	0.95		
URCHIN	Cd/Zn 1	6/3/99	Cd	180	77	23	0.77	0.77	0.05
URCHIN	Cd/Zn 1	6/3/99	Cd	180	68	32	0.68		
URCHIN	Cd/Zn 1	6/3/99	Cd	180	79	21	0.79		
URCHIN	Cd/Zn 1	6/3/99	Cd	180	80	20	0.8		
URCHIN	Cd/Zn 1	6/3/99	Cd	180	79	21	0.79		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Zn 1	6/3/99	Cd	320	37	63	0.37	0.41	0.03
URCHIN	Cd/Zn 1	6/3/99	Cd	320	42	58	0.42		
URCHIN	Cd/Zn 1	6/3/99	Cd	320	45	55	0.45		
URCHIN	Cd/Zn 1	6/3/99	Cd	320	42	58	0.42		
URCHIN	Cd/Zn 1	6/3/99	Cd	320	38	62	0.38		
URCHIN	Cd/Zn 1	6/3/99	Cd	560	17	83	0.17	0.15	0.05
URCHIN	Cd/Zn 1	6/3/99	Cd	560	15	85	0.15		
URCHIN	Cd/Zn 1	6/3/99	Cd	560	19	81	0.19		
URCHIN	Cd/Zn 1	6/3/99	Cd	560	16	84	0.16		
URCHIN	Cd/Zn 1	6/3/99	Cd	560	6	94	0.06		
URCHIN	Cd/Zn 1	6/3/99	Cd	1000	0	100	0	0.00	0.00
URCHIN	Cd/Zn 1	6/3/99	Cd	1000	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Cd	1000	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Cd	1000	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Cd	1000	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Zn	0	98	2	0.98	0.99	0.01
URCHIN	Cd/Zn 1	6/3/99	Zn	0	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Zn	0	98	2	0.98		
URCHIN	Cd/Zn 1	6/3/99	Zn	0	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Zn	0	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Zn	32	95	5	0.95	0.98	0.02
URCHIN	Cd/Zn 1	6/3/99	Zn	32	96	4	0.96		
URCHIN	Cd/Zn 1	6/3/99	Zn	32	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Zn	32	99	1	0.99		
URCHIN	Cd/Zn 1	6/3/99	Zn	32	99	1	0.99		
URCHIN	Cd/Zn 1	6/3/99	Zn	56	78	22	0.78	0.79	0.04
URCHIN	Cd/Zn 1	6/3/99	Zn	56	76	24	0.76		
URCHIN	Cd/Zn 1	6/3/99	Zn	56	74	26	0.74		
URCHIN	Cd/Zn 1	6/3/99	Zn	56	80	20	0.8		
URCHIN	Cd/Zn 1	6/3/99	Zn	56	85	15	0.85		
URCHIN	Cd/Zn 1	6/3/99	Zn	100	48	52	0.48	0.43	0.05
URCHIN	Cd/Zn 1	6/3/99	Zn	100	49	51	0.49		
URCHIN	Cd/Zn 1	6/3/99	Zn	100	41	59	0.41		
URCHIN	Cd/Zn 1	6/3/99	Zn	100	40	60	0.4		
URCHIN	Cd/Zn 1	6/3/99	Zn	100	38	62	0.38		
URCHIN	Cd/Zn 1	6/3/99	Zn	180	0	100	0	0.00	0.00
URCHIN	Cd/Zn 1	6/3/99	Zn	180	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Zn	180	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Zn	180	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Zn	180	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Zn	320	0	100	0	0.00	0.00
URCHIN	Cd/Zn 1	6/3/99	Zn	320	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Zn	320	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Zn	320	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Zn	320	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	0	98	2	0.98	0.99	0.01
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	0	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	0	98	2	0.98		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	0	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	0	100	0	1		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	66	99	1	0.99	0.98	0.01
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	66	99	1	0.99		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	66	97	3	0.97		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	66	98	2	0.98		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	66	97	3	0.97		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	118	99	1	0.99	0.97	0.02
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	118	96	4	0.96		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	118	98	2	0.98		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	118	95	5	0.95		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	118	95	5	0.95		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	210	82	18	0.82	0.85	0.02
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	210	86	14	0.86		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	210	87	13	0.87		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	210	85	15	0.85		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	210	85	15	0.85		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	370	39	61	0.39	0.43	0.05
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	370	49	51	0.49		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	370	42	58	0.42		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	370	47	53	0.47		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	370	38	62	0.38		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	660	0	100	0	0.00	0.00
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	660	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	660	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	660	0	100	0		
URCHIN	Cd/Zn 1	6/3/99	Cd/Zn	660	0	100	0		
URCHIN	Cd/Zn 2	6/21/99	Cd	0	99	1	0.99	0.97	0.01
URCHIN	Cd/Zn 2	6/21/99	Cd	0	96	4	0.96		
URCHIN	Cd/Zn 2	6/21/99	Cd	0	97	4	0.96		
URCHIN	Cd/Zn 2	6/21/99	Cd	0	93	3	0.97		
URCHIN	Cd/Zn 2	6/21/99	Cd	100	98	7	0.93	0.95	0.02
URCHIN	Cd/Zn 2	6/21/99	Cd	100	93	2	0.98		
URCHIN	Cd/Zn 2	6/21/99	Cd	100	94	7	0.93		
URCHIN	Cd/Zn 2	6/21/99	Cd	100	94	6	0.94		
URCHIN	Cd/Zn 2	6/21/99	Cd	180	82	18	0.82	0.87	0.04
URCHIN	Cd/Zn 2	6/21/99	Cd	180	88	12	0.88		
URCHIN	Cd/Zn 2	6/21/99	Cd	180	88	12	0.88		
URCHIN	Cd/Zn 2	6/21/99	Cd	180	91	9	0.91		
URCHIN	Cd/Zn 2	6/21/99	Cd	320	72	28	0.72	0.67	0.07
URCHIN	Cd/Zn 2	6/21/99	Cd	320	72	28	0.72		
URCHIN	Cd/Zn 2	6/21/99	Cd	320	59	42	0.58		
URCHIN	Cd/Zn 2	6/21/99	Cd	320	65	35	0.65		
URCHIN	Cd/Zn 2	6/21/99	Cd	560	35	65	0.35	0.37	0.04
URCHIN	Cd/Zn 2	6/21/99	Cd	560	42	58	0.42		
URCHIN	Cd/Zn 2	6/21/99	Cd	560	37	63	0.37		
URCHIN	Cd/Zn 2	6/21/99	Cd	560	34	66	0.34		
URCHIN	Cd/Zn 2	6/21/99	Cd	1000	13	87	0.13	0.14	0.04
URCHIN	Cd/Zn 2	6/21/99	Cd	1000	9	91	0.09		
URCHIN	Cd/Zn 2	6/21/99	Cd	1000	18	82	0.18		
URCHIN	Cd/Zn 2	6/21/99	Cd	1000	14	86	0.14		
URCHIN	Cd/Zn 2	6/21/99	Zn	0	99	1	0.99	0.99	0.02
URCHIN	Cd/Zn 2	6/21/99	Zn	0	96	4	0.96		
URCHIN	Cd/Zn 2	6/21/99	Zn	0	99	1	0.99		
URCHIN	Cd/Zn 2	6/21/99	Zn	0	100	0	1		
URCHIN	Cd/Zn 2	6/21/99	Zn	32	95	5	0.95	0.97	0.02
URCHIN	Cd/Zn 2	6/21/99	Zn	32	96	4	0.96		
URCHIN	Cd/Zn 2	6/21/99	Zn	32	99	1	0.99		
URCHIN	Cd/Zn 2	6/21/99	Zn	32	97	3	0.97		
URCHIN	Cd/Zn 2	6/21/99	Zn	56	96	4	0.96	0.94	0.02
URCHIN	Cd/Zn 2	6/21/99	Zn	56	95	5	0.95		
URCHIN	Cd/Zn 2	6/21/99	Zn	56	93	7	0.93		
URCHIN	Cd/Zn 2	6/21/99	Zn	56	92	8	0.92		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Zn 2	6/21/99	Zn	100	53	47	0.53	0.54	0.04
URCHIN	Cd/Zn 2	6/21/99	Zn	100	49	51	0.49		
URCHIN	Cd/Zn 2	6/21/99	Zn	100	55	45	0.55		
URCHIN	Cd/Zn 2	6/21/99	Zn	100	58	42	0.58		
URCHIN	Cd/Zn 2	6/21/99	Zn	180	5	95	0.05	0.06	0.01
URCHIN	Cd/Zn 2	6/21/99	Zn	180	6	94	0.06		
URCHIN	Cd/Zn 2	6/21/99	Zn	180	7	93	0.07		
URCHIN	Cd/Zn 2	6/21/99	Zn	180	7	93	0.07		
URCHIN	Cd/Zn 2	6/21/99	Zn	320	0	100	0	0.00	0.00
URCHIN	Cd/Zn 2	6/21/99	Zn	320	0	100	0		
URCHIN	Cd/Zn 2	6/21/99	Zn	320	0	100	0		
URCHIN	Cd/Zn 2	6/21/99	Zn	320	0	100	0		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	0	99	1	0.99	0.97	0.01
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	0	96	4	0.96		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	0	96	4	0.96		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	0	97	3	0.97		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	66	97	3	0.97	0.96	0.01
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	66	96	4	0.96		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	66	95	5	0.95		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	66	96	4	0.96		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	118	94	6	0.94	0.95	0.02
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	118	96	4	0.96		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	118	93	7	0.93		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	118	97	3	0.97		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	210	97	3	0.97	0.97	0.00
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	210	97	3	0.97		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	210	97	3	0.97		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	210	98	2	0.98		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	370	69	31	0.69	0.63	0.05
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	370	62	38	0.62		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	370	57	43	0.57		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	370	65	35	0.65		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	660	4	96	0.04	0.08	0.03
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	660	9	91	0.09		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	660	8	92	0.08		
URCHIN	Cd/Zn 2	6/21/99	Cd/Zn	660	10	90	0.1		
URCHIN	Cd/Zn 3	10/11/99	Cd	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Zn 3	10/11/99	Cd	0	95	5	0.95		
URCHIN	Cd/Zn 3	10/11/99	Cd	0	91	9	0.91		
URCHIN	Cd/Zn 3	10/11/99	Cd	100	89	11	0.89	0.88	0.03
URCHIN	Cd/Zn 3	10/11/99	Cd	100	90	10	0.90		
URCHIN	Cd/Zn 3	10/11/99	Cd	100	85	15	0.85		
URCHIN	Cd/Zn 3	10/11/99	Cd	180	54	46	0.54	0.47	0.06
URCHIN	Cd/Zn 3	10/11/99	Cd	180	43	57	0.43		
URCHIN	Cd/Zn 3	10/11/99	Cd	180	45	55	0.45		
URCHIN	Cd/Zn 3	10/11/99	Cd	320	0	100	0.00	0.01	0.02
URCHIN	Cd/Zn 3	10/11/99	Cd	320	3	97	0.03		
URCHIN	Cd/Zn 3	10/11/99	Cd	320	1	99	0.01		
URCHIN	Cd/Zn 3	10/11/99	Cd	560	0	100	0.00	0.00	0.00
URCHIN	Cd/Zn 3	10/11/99	Cd	560	0	100	0.00		
URCHIN	Cd/Zn 3	10/11/99	Cd	560	0	100	0.00		
URCHIN	Cd/Zn 3	10/11/99	Cd	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Zn 3	10/11/99	Cd	1000	0	100	0.00		
URCHIN	Cd/Zn 3	10/11/99	Cd	1000	0	100	0.00		
URCHIN	Cd/Zn 3	10/11/99	Zn	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Zn 3	10/11/99	Zn	0	95	5	0.95		
URCHIN	Cd/Zn 3	10/11/99	Zn	0	91	9	0.91		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Zn 3	10/11/99	Zn	32	96	4	0.96	0.94	0.03
URCHIN	Cd/Zn 3	10/11/99	Zn	32	95	5	0.95		
URCHIN	Cd/Zn 3	10/11/99	Zn	32	91	9	0.91		
URCHIN	Cd/Zn 3	10/11/99	Zn	56	73	27	0.73	0.76	0.04
URCHIN	Cd/Zn 3	10/11/99	Zn	56	80	20	0.80		
URCHIN	Cd/Zn 3	10/11/99	Zn	56	75	25	0.75		
URCHIN	Cd/Zn 3	10/11/99	Zn	100	29	71	0.29	0.26	0.03
URCHIN	Cd/Zn 3	10/11/99	Zn	100	24	76	0.24		
URCHIN	Cd/Zn 3	10/11/99	Zn	100	25	75	0.25		
URCHIN	Cd/Zn 3	10/11/99	Zn	180	1	99	0.01	0.01	0.02
URCHIN	Cd/Zn 3	10/11/99	Zn	180	3	97	0.03		
URCHIN	Cd/Zn 3	10/11/99	Zn	180	0	100	0.00		
URCHIN	Cd/Zn 3	10/11/99	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cd/Zn 3	10/11/99	Zn	320	0	100	0.00		
URCHIN	Cd/Zn 3	10/11/99	Zn	320	0	100	0.00		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	0	95	5	0.95		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	0	91	9	0.91		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	66	89	11	0.89	0.90	0.02
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	66	92	8	0.92		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	66	90	10	0.90		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	118	83	17	0.83	0.65	0.33
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	118	86	14	0.86		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	118	8	22	0.27		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	210	61	39	0.61	0.59	0.02
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	210	57	43	0.57		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	210	60	40	0.60		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	370	24	76	0.24	0.15	0.09
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	370	15	85	0.15		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	370	6	94	0.06		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	660	1	99	0.01	0.01	0.01
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	660	2	98	0.02		
URCHIN	Cd/Zn 3	10/11/99	Cd/Zn	660	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Cu	0	93	7	0.93	0.97	0.04
URCHIN	Cu/Ni 1	1/3/00	Cu	0	100	0	1.00		
URCHIN	Cu/Ni 1	1/3/00	Cu	0	97	3	0.97		
URCHIN	Cu/Ni 1	1/3/00	Cu	3.2	97	3	0.97	0.96	0.01
URCHIN	Cu/Ni 1	1/3/00	Cu	3.2	95	5	0.95		
URCHIN	Cu/Ni 1	1/3/00	Cu	3.2	96	4	0.96		
URCHIN	Cu/Ni 1	1/3/00	Cu	5.6	96	4	0.96	0.97	0.01
URCHIN	Cu/Ni 1	1/3/00	Cu	5.6	98	2	0.98		
URCHIN	Cu/Ni 1	1/3/00	Cu	5.6	96	4	0.96		
URCHIN	Cu/Ni 1	1/3/00	Cu	10	93	7	0.93	0.91	0.02
URCHIN	Cu/Ni 1	1/3/00	Cu	10	90	10	0.90		
URCHIN	Cu/Ni 1	1/3/00	Cu	10	91	9	0.91		
URCHIN	Cu/Ni 1	1/3/00	Cu	18	20	80	0.20	0.17	0.03
URCHIN	Cu/Ni 1	1/3/00	Cu	18	17	83	0.17		
URCHIN	Cu/Ni 1	1/3/00	Cu	18	15	85	0.15		
URCHIN	Cu/Ni 1	1/3/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni 1	1/3/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Ni	0	98	2	0.98	0.97	0.01
URCHIN	Cu/Ni 1	1/3/00	Ni	0	97	3	0.97		
URCHIN	Cu/Ni 1	1/3/00	Ni	0	97	3	0.97		
URCHIN	Cu/Ni 1	1/3/00	Ni	100	95	5	0.95	0.95	0.02
URCHIN	Cu/Ni 1	1/3/00	Ni	100	96	4	0.96		
URCHIN	Cu/Ni 1	1/3/00	Ni	100	93	7	0.93		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Ni 1	1/3/00	Ni	180	83	17	0.83	0.75	0.07
URCHIN	Cu/Ni 1	1/3/00	Ni	180	72	28	0.72		
URCHIN	Cu/Ni 1	1/3/00	Ni	180	71	29	0.71		
URCHIN	Cu/Ni 1	1/3/00	Ni	320	25	75	0.25	0.17	0.07
URCHIN	Cu/Ni 1	1/3/00	Ni	320	16	84	0.16		
URCHIN	Cu/Ni 1	1/3/00	Ni	320	11	89	0.11		
URCHIN	Cu/Ni 1	1/3/00	Ni	560	10	90	0.10	0.03	0.06
URCHIN	Cu/Ni 1	1/3/00	Ni	560	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Ni	560	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni 1	1/3/00	Ni	1000	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Ni	1000	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	0	96	4	0.96	0.98	0.02
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	0	99	1	0.99		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	0	100	0	1.00		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	51.6	82	18	0.82	0.86	0.04
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	51.6	89	11	0.89		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	51.6	88	12	0.88		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	92.8	60	40	0.60	0.52	0.09
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	92.8	42	58	0.42		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	92.8	53	47	0.53		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	165	10	90	0.10	0.11	0.02
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	165	13	87	0.13		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	165	10	90	0.10		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	289	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	289	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	289	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	516	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	516	0	100	0.00		
URCHIN	Cu/Ni 1	1/3/00	Cu/Ni	516	0	100	0.00		
URCHIN	Cu/Ni 2	1/10/00	Cu	0	98	2	0.98	0.96	0.02
URCHIN	Cu/Ni 2	1/10/00	Cu	0	95	5	0.95		
URCHIN	Cu/Ni 2	1/10/00	Cu	0	95	5	0.95		
URCHIN	Cu/Ni 2	1/10/00	Cu	3.2	95	5	0.95	0.95	0.01
URCHIN	Cu/Ni 2	1/10/00	Cu	3.2	95	5	0.95		
URCHIN	Cu/Ni 2	1/10/00	Cu	3.2	96	4	0.96		
URCHIN	Cu/Ni 2	1/10/00	Cu	5.6	98	2	0.98	0.97	0.01
URCHIN	Cu/Ni 2	1/10/00	Cu	5.6	97	3	0.97		
URCHIN	Cu/Ni 2	1/10/00	Cu	5.6	96	4	0.96		
URCHIN	Cu/Ni 2	1/10/00	Cu	10	97	3	0.97	0.96	0.01
URCHIN	Cu/Ni 2	1/10/00	Cu	10	95	5	0.95		
URCHIN	Cu/Ni 2	1/10/00	Cu	10	95	5	0.95		
URCHIN	Cu/Ni 2	1/10/00	Cu	18	29	71	0.29	0.30	0.05
URCHIN	Cu/Ni 2	1/10/00	Cu	18	26	74	0.26		
URCHIN	Cu/Ni 2	1/10/00	Cu	18	36	64	0.36		
URCHIN	Cu/Ni 2	1/10/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni 2	1/10/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni 2	1/10/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni 2	1/10/00	Ni	0	100	0	1.00	0.98	0.02
URCHIN	Cu/Ni 2	1/10/00	Ni	0	96	4	0.96		
URCHIN	Cu/Ni 2	1/10/00	Ni	0	99	1	0.99		
URCHIN	Cu/Ni 2	1/10/00	Ni	100	90	10	0.90	0.90	0.04
URCHIN	Cu/Ni 2	1/10/00	Ni	100	94	6	0.94		
URCHIN	Cu/Ni 2	1/10/00	Ni	100	87	13	0.87		
URCHIN	Cu/Ni 2	1/10/00	Ni	180	68	32	0.68	0.70	0.04
URCHIN	Cu/Ni 2	1/10/00	Ni	180	75	25	0.75		
URCHIN	Cu/Ni 2	1/10/00	Ni	180	68	32	0.68		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Ni 2	1/10/00	Ni	320	52	48	0.52	0.60	0.07
URCHIN	Cu/Ni 2	1/10/00	Ni	320	63	37	0.63		
URCHIN	Cu/Ni 2	1/10/00	Ni	320	64	36	0.64		
URCHIN	Cu/Ni 2	1/10/00	Ni	560	46	54	0.46	0.41	0.05
URCHIN	Cu/Ni 2	1/10/00	Ni	560	42	58	0.42		
URCHIN	Cu/Ni 2	1/10/00	Ni	560	36	64	0.36		
URCHIN	Cu/Ni 2	1/10/00	Ni	1000	17	83	0.17	0.17	0.00
URCHIN	Cu/Ni 2	1/10/00	Ni	1000	17	83	0.17		
URCHIN	Cu/Ni 2	1/10/00	Ni	1000	17	83	0.17		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	0	100	0	1.00	1.00	0.01
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	0	99	1	0.99		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	0	100	0	1.00		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	51.6	62	38	0.62	0.65	0.03
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	51.6	68	32	0.68		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	51.6	66	34	0.66		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	92.8	53	47	0.53	0.32	0.18
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	92.8	25	75	0.25		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	92.8	19	81	0.19		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	165	16	84	0.16	0.14	0.02
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	165	13	87	0.13		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	165	14	86	0.14		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	289	2	98	0.02	0.06	0.05
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	289	11	89	0.11		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	289	5	95	0.05		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	516	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	516	0	100	0.00		
URCHIN	Cu/Ni 2	1/10/00	Cu/Ni	516	0	100	0.00		
URCHIN	Cu/Ni 3	1/24/00	Cu	0	100	1	0.99	0.99	0.01
URCHIN	Cu/Ni 3	1/24/00	Cu	0	100	2	0.98		
URCHIN	Cu/Ni 3	1/24/00	Cu	0	100	0	1.00		
URCHIN	Cu/Ni 3	1/24/00	Cu	3.2	100	3	0.97	0.97	0.02
URCHIN	Cu/Ni 3	1/24/00	Cu	3.2	95	5	0.95		
URCHIN	Cu/Ni 3	1/24/00	Cu	3.2	98	2	0.98		
URCHIN	Cu/Ni 3	1/24/00	Cu	5.6	96	4	0.96	0.98	0.02
URCHIN	Cu/Ni 3	1/24/00	Cu	5.6	100	2	0.98		
URCHIN	Cu/Ni 3	1/24/00	Cu	5.6	100	1	0.99		
URCHIN	Cu/Ni 3	1/24/00	Cu	10	92	9	0.91	0.93	0.02
URCHIN	Cu/Ni 3	1/24/00	Cu	10	99	5	0.95		
URCHIN	Cu/Ni 3	1/24/00	Cu	10	97	7	0.93		
URCHIN	Cu/Ni 3	1/24/00	Cu	18	20	80	0.20	0.20	0.05
URCHIN	Cu/Ni 3	1/24/00	Cu	18	25	75	0.25		
URCHIN	Cu/Ni 3	1/24/00	Cu	18	16	84	0.16		
URCHIN	Cu/Ni 3	1/24/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni 3	1/24/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni 3	1/24/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni 3	1/24/00	Ni	0	97	3	0.97	0.97	0.00
URCHIN	Cu/Ni 3	1/24/00	Ni	0	100	3	0.97		
URCHIN	Cu/Ni 3	1/24/00	Ni	0	100	3	0.97		
URCHIN	Cu/Ni 3	1/24/00	Ni	100	90	10	0.90	0.93	0.03
URCHIN	Cu/Ni 3	1/24/00	Ni	100	95	5	0.95		
URCHIN	Cu/Ni 3	1/24/00	Ni	100	100	7	0.93		
URCHIN	Cu/Ni 3	1/24/00	Ni	180	89	17	0.84	0.85	0.02
URCHIN	Cu/Ni 3	1/24/00	Ni	180	85	15	0.85		
URCHIN	Cu/Ni 3	1/24/00	Ni	180	87	13	0.87		
URCHIN	Cu/Ni 3	1/24/00	Ni	320	63	49	0.56	0.51	0.05
URCHIN	Cu/Ni 3	1/24/00	Ni	320	55	50	0.52		
URCHIN	Cu/Ni 3	1/24/00	Ni	320	47	56	0.46		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Ni 3	1/24/00	Ni	560	27	79	0.25	0.21	0.04
URCHIN	Cu/Ni 3	1/24/00	Ni	560	19	81	0.19		
URCHIN	Cu/Ni 3	1/24/00	Ni	560	22	95	0.19		
URCHIN	Cu/Ni 3	1/24/00	Ni	1000	6	99	0.06	0.06	0.01
URCHIN	Cu/Ni 3	1/24/00	Ni	1000	8	97	0.08		
URCHIN	Cu/Ni 3	1/24/00	Ni	1000	6	99	0.06		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	0	96	4	0.96	0.97	0.01
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	0	99	2	0.98		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	0	96	4	0.96		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	51.6	79	21	0.79	0.74	0.05
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	51.6	74	26	0.74		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	51.6	73	32	0.70		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	92.8	31	69	0.31	0.31	0.06
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	92.8	26	77	0.25		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	92.8	37	63	0.37		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	165	8	97	0.08	0.09	0.02
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	165	12	93	0.11		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	165	8	99	0.07		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	289	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	289	0	100	0.00		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	289	0	100	0.00		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	516	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	516	0	100	0.00		
URCHIN	Cu/Ni 3	1/24/00	Cu/Ni	516	0	100	0.00		
URCHIN	Cu/Zn 1	5/7/99	Cu	0	93	7	0.93	0.94	0.02
URCHIN	Cu/Zn 1	5/7/99	Cu	0	91	9	0.91		
URCHIN	Cu/Zn 1	5/7/99	Cu	0	94	6	0.94		
URCHIN	Cu/Zn 1	5/7/99	Cu	0	94	6	0.94		
URCHIN	Cu/Zn 1	5/7/99	Cu	0	97	3	0.97		
URCHIN	Cu/Zn 1	5/7/99	Cu	3.2	94	6	0.94	0.96	0.02
URCHIN	Cu/Zn 1	5/7/99	Cu	3.2	97	3	0.97		
URCHIN	Cu/Zn 1	5/7/99	Cu	3.2	97	3	0.97		
URCHIN	Cu/Zn 1	5/7/99	Cu	3.2	96	4	0.96		
URCHIN	Cu/Zn 1	5/7/99	Cu	3.2	94	6	0.94		
URCHIN	Cu/Zn 1	5/7/99	Cu	5.6	93	7	0.93	0.96	0.02
URCHIN	Cu/Zn 1	5/7/99	Cu	5.6	97	3	0.97		
URCHIN	Cu/Zn 1	5/7/99	Cu	5.6	98	2	0.98		
URCHIN	Cu/Zn 1	5/7/99	Cu	5.6	97	3	0.97		
URCHIN	Cu/Zn 1	5/7/99	Cu	5.6	96	4	0.96		
URCHIN	Cu/Zn 1	5/7/99	Cu	10	94	6	0.94	0.92	0.03
URCHIN	Cu/Zn 1	5/7/99	Cu	10	95	5	0.95		
URCHIN	Cu/Zn 1	5/7/99	Cu	10	92	8	0.92		
URCHIN	Cu/Zn 1	5/7/99	Cu	10	91	9	0.91		
URCHIN	Cu/Zn 1	5/7/99	Cu	10	88	12	0.88		
URCHIN	Cu/Zn 1	5/7/99	Cu	18	34	66	0.34	0.28	0.06
URCHIN	Cu/Zn 1	5/7/99	Cu	18	29	71	0.29		
URCHIN	Cu/Zn 1	5/7/99	Cu	18	32	68	0.32		
URCHIN	Cu/Zn 1	5/7/99	Cu	18	28	72	0.28		
URCHIN	Cu/Zn 1	5/7/99	Cu	18	19	81	0.19		
URCHIN	Cu/Zn 1	5/7/99	Cu	32	0	100	0	0.00	0.00
URCHIN	Cu/Zn 1	5/7/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 1	5/7/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 1	5/7/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 1	5/7/99	Cu	32	0	100	0		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Zn 1	5/7/99	Zn	0	93	7	0.93	0.94	0.02
URCHIN	Cu/Zn 1	5/7/99	Zn	0	91	9	0.91		
URCHIN	Cu/Zn 1	5/7/99	Zn	0	94	6	0.94		
URCHIN	Cu/Zn 1	5/7/99	Zn	0	94	6	0.94		
URCHIN	Cu/Zn 1	5/7/99	Zn	0	97	3	0.97		
URCHIN	Cu/Zn 1	5/7/99	Zn	32	93	8	0.92	0.93	0.03
URCHIN	Cu/Zn 1	5/7/99	Zn	32	94	6	0.94		
URCHIN	Cu/Zn 1	5/7/99	Zn	32	96	4	0.96		
URCHIN	Cu/Zn 1	5/7/99	Zn	32	96	4	0.96		
URCHIN	Cu/Zn 1	5/7/99	Zn	32	88	12	0.88		
URCHIN	Cu/Zn 1	5/7/99	Zn	56	75	25	0.75	0.80	0.04
URCHIN	Cu/Zn 1	5/7/99	Zn	56	80	20	0.8		
URCHIN	Cu/Zn 1	5/7/99	Zn	56	85	15	0.85		
URCHIN	Cu/Zn 1	5/7/99	Zn	56	81	19	0.81		
URCHIN	Cu/Zn 1	5/7/99	Zn	56	80	20	0.8		
URCHIN	Cu/Zn 1	5/7/99	Zn	100	51	49	0.51	0.50	0.04
URCHIN	Cu/Zn 1	5/7/99	Zn	100	48	52	0.48		
URCHIN	Cu/Zn 1	5/7/99	Zn	100	51	49	0.51		
URCHIN	Cu/Zn 1	5/7/99	Zn	100	45	55	0.45		
URCHIN	Cu/Zn 1	5/7/99	Zn	100	55	45	0.55		
URCHIN	Cu/Zn 1	5/7/99	Zn	180	10	90	0.1	0.06	0.03
URCHIN	Cu/Zn 1	5/7/99	Zn	180	7	93	0.07		
URCHIN	Cu/Zn 1	5/7/99	Zn	180	2	98	0.02		
URCHIN	Cu/Zn 1	5/7/99	Zn	180	4	96	0.04		
URCHIN	Cu/Zn 1	5/7/99	Zn	180	8	92	0.08		
URCHIN	Cu/Zn 1	5/7/99	Zn	320	0	100	0	0.00	0.00
URCHIN	Cu/Zn 1	5/7/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 1	5/7/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 1	5/7/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 1	5/7/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	0	93	7	0.93	0.94	0.02
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	0	91	9	0.91		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	0	94	6	0.94		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	0	94	6	0.94		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	0	97	3	0.97		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	17.6	90	10	0.9	0.93	0.02
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	17.6	95	5	0.95		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	17.6	95	5	0.95		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	17.6	93	7	0.93		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	17.6	93	7	0.93		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	30.8	92	8	0.92	0.92	0.03
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	30.8	89	11	0.89		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	30.8	89	11	0.89		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	30.8	95	5	0.95		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	30.8	94	6	0.94		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	55	93	7	0.93	0.87	0.04
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	55	88	12	0.88		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	55	86	14	0.86		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	55	86	14	0.86		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	55	82	18	0.82		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	99	45	55	0.45	0.43	0.10
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	99	60	40	0.6		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	99	33	67	0.33		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	99	38	62	0.38		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	99	39	61	0.39		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	176	0	100	0	0.01	0.01
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	176	1	99	0.01		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	176	1	99	0.01		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	176	0	100	0		
URCHIN	Cu/Zn 1	5/7/99	Cu/Zn	176	1	99	0.01		
URCHIN	Cu/Zn 2	5/28/99	Cu	0	90	10	0.9	0.96	0.04
URCHIN	Cu/Zn 2	5/28/99	Cu	0	95	5	0.95		
URCHIN	Cu/Zn 2	5/28/99	Cu	0	98	2	0.98		
URCHIN	Cu/Zn 2	5/28/99	Cu	0	100	0	1		
URCHIN	Cu/Zn 2	5/28/99	Cu	0	96	4	0.96		
URCHIN	Cu/Zn 2	5/28/99	Cu	3.2	97	3	0.97	0.97	0.02
URCHIN	Cu/Zn 2	5/28/99	Cu	3.2	94	6	0.94		
URCHIN	Cu/Zn 2	5/28/99	Cu	3.2	98	2	0.98		
URCHIN	Cu/Zn 2	5/28/99	Cu	3.2	99	1	0.99		
URCHIN	Cu/Zn 2	5/28/99	Cu	3.2	99	1	0.99		
URCHIN	Cu/Zn 2	5/28/99	Cu	5.6	96	4	0.96	0.97	0.01
URCHIN	Cu/Zn 2	5/28/99	Cu	5.6	96	4	0.96		
URCHIN	Cu/Zn 2	5/28/99	Cu	5.6	96	4	0.96		
URCHIN	Cu/Zn 2	5/28/99	Cu	5.6	98	2	0.98		
URCHIN	Cu/Zn 2	5/28/99	Cu	5.6	99	1	0.99		
URCHIN	Cu/Zn 2	5/28/99	Cu	10	94	6	0.94	0.85	0.07
URCHIN	Cu/Zn 2	5/28/99	Cu	10	88	12	0.88		
URCHIN	Cu/Zn 2	5/28/99	Cu	10	86	14	0.86		
URCHIN	Cu/Zn 2	5/28/99	Cu	10	80	20	0.8		
URCHIN	Cu/Zn 2	5/28/99	Cu	10	76	24	0.76		
URCHIN	Cu/Zn 2	5/28/99	Cu	18	9	91	0.09	0.07	0.02
URCHIN	Cu/Zn 2	5/28/99	Cu	18	6	94	0.06		
URCHIN	Cu/Zn 2	5/28/99	Cu	18	5	95	0.05		
URCHIN	Cu/Zn 2	5/28/99	Cu	18	9	91	0.09		
URCHIN	Cu/Zn 2	5/28/99	Cu	18	6	94	0.06		
URCHIN	Cu/Zn 2	5/28/99	Cu	32	0	100	0	0.00	0.00
URCHIN	Cu/Zn 2	5/28/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Zn	0	90	10	0.9	0.96	0.04
URCHIN	Cu/Zn 2	5/28/99	Zn	0	95	5	0.95		
URCHIN	Cu/Zn 2	5/28/99	Zn	0	98	2	0.98		
URCHIN	Cu/Zn 2	5/28/99	Zn	0	100	0	1		
URCHIN	Cu/Zn 2	5/28/99	Zn	0	96	4	0.96		
URCHIN	Cu/Zn 2	5/28/99	Zn	32	92	8	0.92	0.94	0.03
URCHIN	Cu/Zn 2	5/28/99	Zn	32	95	5	0.95		
URCHIN	Cu/Zn 2	5/28/99	Zn	32	91	9	0.91		
URCHIN	Cu/Zn 2	5/28/99	Zn	32	97	3	0.97		
URCHIN	Cu/Zn 2	5/28/99	Zn	32	97	3	0.97		
URCHIN	Cu/Zn 2	5/28/99	Zn	56	90	10	0.9	0.88	0.04
URCHIN	Cu/Zn 2	5/28/99	Zn	56	92	8	0.92		
URCHIN	Cu/Zn 2	5/28/99	Zn	56	90	10	0.9		
URCHIN	Cu/Zn 2	5/28/99	Zn	56	85	15	0.85		
URCHIN	Cu/Zn 2	5/28/99	Zn	56	82	18	0.82		
URCHIN	Cu/Zn 2	5/28/99	Zn	100	47	53	0.47	0.49	0.03
URCHIN	Cu/Zn 2	5/28/99	Zn	100	52	48	0.52		
URCHIN	Cu/Zn 2	5/28/99	Zn	100	45	55	0.45		
URCHIN	Cu/Zn 2	5/28/99	Zn	100	51	49	0.51		
URCHIN	Cu/Zn 2	5/28/99	Zn	100	49	51	0.49		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Zn 2	5/28/99	Zn	180	5	95	0.05	0.07	0.03
URCHIN	Cu/Zn 2	5/28/99	Zn	180	3	97	0.03		
URCHIN	Cu/Zn 2	5/28/99	Zn	180	6	94	0.06		
URCHIN	Cu/Zn 2	5/28/99	Zn	180	9	91	0.09		
URCHIN	Cu/Zn 2	5/28/99	Zn	180	10	90	0.1		
URCHIN	Cu/Zn 2	5/28/99	Zn	320	0	100	0	0.00	0.00
URCHIN	Cu/Zn 2	5/28/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	0	90	10	0.9	0.96	0.04
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	0	95	5	0.95		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	0	98	2	0.98		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	0	100	0	1		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	0	96	4	0.96		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	17.6	96	4	0.96	0.96	0.02
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	17.6	98	2	0.98		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	17.6	95	5	0.95		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	17.6	96	4	0.96		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	17.6	93	7	0.93		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	30.8	96	4	0.96	0.95	0.03
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	30.8	97	3	0.97		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	30.8	92	8	0.92		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	30.8	98	2	0.98		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	30.8	92	8	0.92		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	55	76	24	0.76	0.84	0.06
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	55	87	13	0.87		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	55	91	9	0.91		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	55	84	16	0.84		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	55	84	16	0.84		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	99	36	64	0.36	0.34	0.03
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	99	34	66	0.34		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	99	30	70	0.3		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	99	33	67	0.33		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	99	38	62	0.38		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	176	0	100	0	0.00	0.00
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	176	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	176	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	176	0	100	0		
URCHIN	Cu/Zn 2	5/28/99	Cu/Zn	176	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu	0	98	2	0.98	0.97	0.02
URCHIN	Cu/Zn 3	6/11/99	Cu	0	94	6	0.94		
URCHIN	Cu/Zn 3	6/11/99	Cu	0	97	3	0.97		
URCHIN	Cu/Zn 3	6/11/99	Cu	0	95	5	0.95		
URCHIN	Cu/Zn 3	6/11/99	Cu	0	99	1	0.99		
URCHIN	Cu/Zn 3	6/11/99	Cu	1.8	97	3	0.97	0.97	0.02
URCHIN	Cu/Zn 3	6/11/99	Cu	1.8	94	6	0.94		
URCHIN	Cu/Zn 3	6/11/99	Cu	1.8	98	2	0.98		
URCHIN	Cu/Zn 3	6/11/99	Cu	1.8	98	2	0.98		
URCHIN	Cu/Zn 3	6/11/99	Cu	1.8	98	2	0.98		
URCHIN	Cu/Zn 3	6/11/99	Cu	3.2	99	1	0.99	0.98	0.01
URCHIN	Cu/Zn 3	6/11/99	Cu	3.2	97	3	0.97		
URCHIN	Cu/Zn 3	6/11/99	Cu	3.2	99	1	0.99		
URCHIN	Cu/Zn 3	6/11/99	Cu	3.2	98	2	0.98		
URCHIN	Cu/Zn 3	6/11/99	Cu	3.2	97	3	0.97		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Zn 3	6/11/99	Cu	5.6	97	3	0.97	0.97	0.01
URCHIN	Cu/Zn 3	6/11/99	Cu	5.6	98	2	0.98		
URCHIN	Cu/Zn 3	6/11/99	Cu	5.6	96	4	0.96		
URCHIN	Cu/Zn 3	6/11/99	Cu	5.6	97	3	0.97		
URCHIN	Cu/Zn 3	6/11/99	Cu	5.6	96	4	0.96		
URCHIN	Cu/Zn 3	6/11/99	Cu	10	99	1	0.99	0.97	0.01
URCHIN	Cu/Zn 3	6/11/99	Cu	10	96	4	0.96		
URCHIN	Cu/Zn 3	6/11/99	Cu	10	97	3	0.97		
URCHIN	Cu/Zn 3	6/11/99	Cu	10	97	3	0.97		
URCHIN	Cu/Zn 3	6/11/99	Cu	10	95	5	0.95		
URCHIN	Cu/Zn 3	6/11/99	Cu	18	66	34	0.66	0.66	0.10
URCHIN	Cu/Zn 3	6/11/99	Cu	18	68	32	0.68		
URCHIN	Cu/Zn 3	6/11/99	Cu	18	66	34	0.66		
URCHIN	Cu/Zn 3	6/11/99	Cu	18	79	21	0.79		
URCHIN	Cu/Zn 3	6/11/99	Cu	18	50	50	0.5		
URCHIN	Cu/Zn 3	6/11/99	Cu	32	0	100	0	0.00	0.00
URCHIN	Cu/Zn 3	6/11/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu	32	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu	56	0	100	0	0.00	0.00
URCHIN	Cu/Zn 3	6/11/99	Cu	56	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu	56	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu	56	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu	56	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Zn	0	98	2	0.98	0.97	0.02
URCHIN	Cu/Zn 3	6/11/99	Zn	0	94	6	0.94		
URCHIN	Cu/Zn 3	6/11/99	Zn	0	97	3	0.97		
URCHIN	Cu/Zn 3	6/11/99	Zn	0	95	5	0.95		
URCHIN	Cu/Zn 3	6/11/99	Zn	0	99	1	0.99		
URCHIN	Cu/Zn 3	6/11/99	Zn	32	99	1	0.99	0.98	0.01
URCHIN	Cu/Zn 3	6/11/99	Zn	32	99	1	0.99		
URCHIN	Cu/Zn 3	6/11/99	Zn	32	97	3	0.97		
URCHIN	Cu/Zn 3	6/11/99	Zn	32	98	2	0.98		
URCHIN	Cu/Zn 3	6/11/99	Zn	32	96	4	0.96		
URCHIN	Cu/Zn 3	6/11/99	Zn	56	78	22	0.78	0.80	0.04
URCHIN	Cu/Zn 3	6/11/99	Zn	56	85	15	0.85		
URCHIN	Cu/Zn 3	6/11/99	Zn	56	84	16	0.84		
URCHIN	Cu/Zn 3	6/11/99	Zn	56	75	25	0.75		
URCHIN	Cu/Zn 3	6/11/99	Zn	56	77	23	0.77		
URCHIN	Cu/Zn 3	6/11/99	Zn	100	29	71	0.29	0.31	0.06
URCHIN	Cu/Zn 3	6/11/99	Zn	100	24	76	0.24		
URCHIN	Cu/Zn 3	6/11/99	Zn	100	36	64	0.36		
URCHIN	Cu/Zn 3	6/11/99	Zn	100	38	62	0.38		
URCHIN	Cu/Zn 3	6/11/99	Zn	100	30	70	0.3		
URCHIN	Cu/Zn 3	6/11/99	Zn	180	3	97	0.03	0.03	0.02
URCHIN	Cu/Zn 3	6/11/99	Zn	180	1	99	0.01		
URCHIN	Cu/Zn 3	6/11/99	Zn	180	2	98	0.02		
URCHIN	Cu/Zn 3	6/11/99	Zn	180	4	96	0.04		
URCHIN	Cu/Zn 3	6/11/99	Zn	180	5	95	0.05		
URCHIN	Cu/Zn 3	6/11/99	Zn	320	0	100	0	0.00	0.00
URCHIN	Cu/Zn 3	6/11/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Zn	320	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Zn	320	0	100	0		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	0	98	2	0.98	0.97	0.02
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	0	94	6	0.94		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	0	97	3	0.97		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	0	95	5	0.95		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	0	99	1	0.99		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	17.6	97	3	0.97	0.98	0.01
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	17.6	98	2	0.98		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	17.6	99	1	0.99		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	17.6	96	4	0.96		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	17.6	98	2	0.98		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	30.8	98	2	0.98	0.97	0.01
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	30.8	97	3	0.97		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	30.8	95	5	0.95		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	30.8	98	2	0.98		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	30.8	96	4	0.96		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	55	88	12	0.88	0.82	0.07
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	55	74	26	0.74		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	55	75	25	0.75		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	55	90	10	0.9		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	55	82	18	0.82		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	99	31	69	0.31	0.27	0.03
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	99	25	75	0.25		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	99	28	72	0.28		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	99	28	72	0.28		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	99	23	77	0.23		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	176	0	100	0	0.00	0.00
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	176	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	176	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	176	0	100	0		
URCHIN	Cu/Zn 3	6/11/99	Cu/Zn	176	0	100	0		
URCHIN	Ni/Zn 1	1/3/00	Ni	0	98	2	0.98	0.97	0.01
URCHIN	Ni/Zn 1	1/3/00	Ni	0	97	3	0.97		
URCHIN	Ni/Zn 1	1/3/00	Ni	0	97	3	0.97		
URCHIN	Ni/Zn 1	1/3/00	Ni	100	95	5	0.95	0.95	0.02
URCHIN	Ni/Zn 1	1/3/00	Ni	100	96	4	0.96		
URCHIN	Ni/Zn 1	1/3/00	Ni	100	93	7	0.93		
URCHIN	Ni/Zn 1	1/3/00	Ni	180	83	17	0.83	0.75	0.07
URCHIN	Ni/Zn 1	1/3/00	Ni	180	72	28	0.72		
URCHIN	Ni/Zn 1	1/3/00	Ni	180	71	29	0.71		
URCHIN	Ni/Zn 1	1/3/00	Ni	320	25	75	0.25	0.17	0.07
URCHIN	Ni/Zn 1	1/3/00	Ni	320	16	84	0.16		
URCHIN	Ni/Zn 1	1/3/00	Ni	320	11	89	0.11		
URCHIN	Ni/Zn 1	1/3/00	Ni	560	10	90	0.10	0.03	0.06
URCHIN	Ni/Zn 1	1/3/00	Ni	560	0	100	0.00		
URCHIN	Ni/Zn 1	1/3/00	Ni	560	0	100	0.00		
URCHIN	Ni/Zn 1	1/3/00	Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Ni/Zn 1	1/3/00	Ni	1000	0	100	0.00		
URCHIN	Ni/Zn 1	1/3/00	Ni	1000	0	100	0.00		
URCHIN	Ni/Zn 1	1/3/00	Zn	0	96	4	0.96	0.98	0.02
URCHIN	Ni/Zn 1	1/3/00	Zn	0	98	2	0.98		
URCHIN	Ni/Zn 1	1/3/00	Zn	0	100	0	1.00		
URCHIN	Ni/Zn 1	1/3/00	Zn	32	94	6	0.94	0.96	0.03
URCHIN	Ni/Zn 1	1/3/00	Zn	32	99	1	0.99		
URCHIN	Ni/Zn 1	1/3/00	Zn	32	94	6	0.94		
URCHIN	Ni/Zn 1	1/3/00	Zn	56	98	2	0.98	0.98	0.01
URCHIN	Ni/Zn 1	1/3/00	Zn	56	97	3	0.97		
URCHIN	Ni/Zn 1	1/3/00	Zn	56	99	1	0.99		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Ni/Zn 1	1/3/00	Zn	100	55	45	0.55	0.52	0.02
URCHIN	Ni/Zn 1	1/3/00	Zn	100	51	49	0.51		
URCHIN	Ni/Zn 1	1/3/00	Zn	100	51	49	0.51		
URCHIN	Ni/Zn 1	1/3/00	Zn	180	13	87	0.13	0.14	0.02
URCHIN	Ni/Zn 1	1/3/00	Zn	180	14	86	0.14		
URCHIN	Ni/Zn 1	1/3/00	Zn	180	16	84	0.16		
URCHIN	Ni/Zn 1	1/3/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Ni/Zn 1	1/3/00	Zn	320	0	100	0.00		
URCHIN	Ni/Zn 1	1/3/00	Zn	320	0	100	0.00		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	0	96	4	0.96	0.98	0.02
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	0	99	1	0.99		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	0	99	1	0.99		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	66	75	25	0.75	0.79	0.04
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	66	80	20	0.80		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	66	83	17	0.83		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	118	43	57	0.43	0.27	0.14
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	118	16	84	0.16		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	118	21	79	0.21		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	210	2	98	0.02	0.04	0.04
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	210	9	91	0.09		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	210	2	98	0.02		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	370	0	100	0.00	0.00	0.00
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	370	0	100	0.00		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	370	0	100	0.00		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	660	0	100	0.00	0.00	0.00
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	660	0	100	0.00		
URCHIN	Ni/Zn 1	1/3/00	Ni/Zn	660	0	100	0.00		
URCHIN	Ni/Zn 2	1/10/00	Ni	0	100	0	1.00	0.98	0.02
URCHIN	Ni/Zn 2	1/10/00	Ni	0	96	4	0.96		
URCHIN	Ni/Zn 2	1/10/00	Ni	0	99	1	0.99		
URCHIN	Ni/Zn 2	1/10/00	Ni	100	90	10	0.90	0.90	0.04
URCHIN	Ni/Zn 2	1/10/00	Ni	100	94	6	0.94		
URCHIN	Ni/Zn 2	1/10/00	Ni	100	87	13	0.87		
URCHIN	Ni/Zn 2	1/10/00	Ni	180	68	32	0.68	0.70	0.04
URCHIN	Ni/Zn 2	1/10/00	Ni	180	75	25	0.75		
URCHIN	Ni/Zn 2	1/10/00	Ni	180	68	32	0.68		
URCHIN	Ni/Zn 2	1/10/00	Ni	320	52	48	0.52	0.60	0.07
URCHIN	Ni/Zn 2	1/10/00	Ni	320	63	37	0.63		
URCHIN	Ni/Zn 2	1/10/00	Ni	320	64	36	0.64		
URCHIN	Ni/Zn 2	1/10/00	Ni	560	46	54	0.46	0.41	0.05
URCHIN	Ni/Zn 2	1/10/00	Ni	560	42	58	0.42		
URCHIN	Ni/Zn 2	1/10/00	Ni	560	36	64	0.36		
URCHIN	Ni/Zn 2	1/10/00	Ni	1000	17	83	0.17	0.17	0.00
URCHIN	Ni/Zn 2	1/10/00	Ni	1000	17	83	0.17		
URCHIN	Ni/Zn 2	1/10/00	Ni	1000	17	83	0.17		
URCHIN	Ni/Zn 2	1/10/00	Zn	0	99	1	0.99	0.99	0.01
URCHIN	Ni/Zn 2	1/10/00	Zn	0	98	2	0.98		
URCHIN	Ni/Zn 2	1/10/00	Zn	0	100	0	1.00		
URCHIN	Ni/Zn 2	1/10/00	Zn	32	98	2	0.98	0.96	0.02
URCHIN	Ni/Zn 2	1/10/00	Zn	32	97	3	0.97		
URCHIN	Ni/Zn 2	1/10/00	Zn	32	94	6	0.94		
URCHIN	Ni/Zn 2	1/10/00	Zn	56	89	11	0.89	0.89	0.01
URCHIN	Ni/Zn 2	1/10/00	Zn	56	90	10	0.90		
URCHIN	Ni/Zn 2	1/10/00	Zn	56	88	12	0.88		
URCHIN	Ni/Zn 2	1/10/00	Zn	100	52	48	0.52	0.49	0.04
URCHIN	Ni/Zn 2	1/10/00	Zn	100	45	55	0.45		
URCHIN	Ni/Zn 2	1/10/00	Zn	100	50	50	0.50		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Ni/Zn 2	1/10/00	Zn	180	12	88	0.12	0.15	0.04
URCHIN	Ni/Zn 2	1/10/00	Zn	180	19	81	0.19		
URCHIN	Ni/Zn 2	1/10/00	Zn	180	13	87	0.13		
URCHIN	Ni/Zn 2	1/10/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Ni/Zn 2	1/10/00	Zn	320	0	100	0.00		
URCHIN	Ni/Zn 2	1/10/00	Zn	320	0	100	0.00		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	0	99	1	0.99	0.99	0.01
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	0	98	2	0.98		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	0	100	0	1.00		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	66	75	25	0.75	0.78	0.04
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	66	83	17	0.83		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	66	76	24	0.76		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	118	47	53	0.47	0.51	0.09
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	118	44	56	0.44		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	118	61	39	0.61		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	210	27	73	0.27	0.19	0.08
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	210	18	82	0.18		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	210	12	88	0.12		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	370	0	100	0.00	0.00	0.00
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	370	0	100	0.00		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	370	0	100	0.00		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	660	0	100	0.00	0.00	0.00
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	660	0	100	0.00		
URCHIN	Ni/Zn 2	1/10/00	Ni/Zn	660	0	100	0.00		
URCHIN	Ni/Zn 3	1/24/00	Ni	0	97	3	0.97	0.97	0.00
URCHIN	Ni/Zn 3	1/24/00	Ni	0	100	3	0.97		
URCHIN	Ni/Zn 3	1/24/00	Ni	0	100	3	0.97		
URCHIN	Ni/Zn 3	1/24/00	Ni	100	90	10	0.90	0.93	0.03
URCHIN	Ni/Zn 3	1/24/00	Ni	100	95	5	0.95		
URCHIN	Ni/Zn 3	1/24/00	Ni	100	100	7	0.93		
URCHIN	Ni/Zn 3	1/24/00	Ni	180	89	17	0.84	0.85	0.02
URCHIN	Ni/Zn 3	1/24/00	Ni	180	85	15	0.85		
URCHIN	Ni/Zn 3	1/24/00	Ni	180	87	13	0.87		
URCHIN	Ni/Zn 3	1/24/00	Ni	320	63	49	0.56	0.51	0.05
URCHIN	Ni/Zn 3	1/24/00	Ni	320	55	50	0.52		
URCHIN	Ni/Zn 3	1/24/00	Ni	320	47	56	0.46		
URCHIN	Ni/Zn 3	1/24/00	Ni	560	27	79	0.25	0.21	0.04
URCHIN	Ni/Zn 3	1/24/00	Ni	560	19	81	0.19		
URCHIN	Ni/Zn 3	1/24/00	Ni	560	22	95	0.19		
URCHIN	Ni/Zn 3	1/24/00	Ni	1000	6	99	0.06	0.06	0.01
URCHIN	Ni/Zn 3	1/24/00	Ni	1000	8	97	0.08		
URCHIN	Ni/Zn 3	1/24/00	Ni	1000	6	99	0.06		
URCHIN	Ni/Zn 3	1/24/00	Zn	0	102	3	0.97	0.97	0.01
URCHIN	Ni/Zn 3	1/24/00	Zn	0	97	3	0.97		
URCHIN	Ni/Zn 3	1/24/00	Zn	0	100	4	0.96		
URCHIN	Ni/Zn 3	1/24/00	Zn	32	99	5	0.95	0.93	0.04
URCHIN	Ni/Zn 3	1/24/00	Zn	32	94	6	0.94		
URCHIN	Ni/Zn 3	1/24/00	Zn	32	92	12	0.88		
URCHIN	Ni/Zn 3	1/24/00	Zn	56	86	19	0.82	0.85	0.04
URCHIN	Ni/Zn 3	1/24/00	Zn	56	94	11	0.90		
URCHIN	Ni/Zn 3	1/24/00	Zn	56	85	15	0.85		
URCHIN	Ni/Zn 3	1/24/00	Zn	100	56	47	0.54	0.47	0.06
URCHIN	Ni/Zn 3	1/24/00	Zn	100	48	65	0.42		
URCHIN	Ni/Zn 3	1/24/00	Zn	100	44	56	0.44		
URCHIN	Ni/Zn 3	1/24/00	Zn	180	5	95	0.05	0.05	0.02
URCHIN	Ni/Zn 3	1/24/00	Zn	180	7	94	0.07		
URCHIN	Ni/Zn 3	1/24/00	Zn	180	2	98	0.02		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Ni/Zn 3	1/24/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Ni/Zn 3	1/24/00	Zn	320	0	100	0.00		
URCHIN	Ni/Zn 3	1/24/00	Zn	320	0	100	0.00		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	0	95	5	0.95	0.94	0.02
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	0	95	5	0.95		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	0	91	9	0.91		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	66	76	26	0.75	0.66	0.08
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	66	58	42	0.58		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	66	64	36	0.64		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	118	33	67	0.33	0.26	0.07
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	118	25	75	0.25		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	118	19	81	0.19		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	210	10	92	0.10	0.09	0.05
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	210	5	99	0.05		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	210	14	87	0.14		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	370	2	98	0.02	0.02	0.01
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	370	1	100	0.01		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	370	3	97	0.03		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	660	0	100	0.00	0.00	0.00
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	660	0	100	0.00		
URCHIN	Ni/Zn 3	1/24/00	Ni/Zn	660	0	100	0.00		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	0	100	0	1.00	0.99	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	0	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	0	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	100	99	8	0.93	0.93	0.03
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	100	98	4	0.96		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	100	91	9	0.91		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	180	58	42	0.58	0.57	0.07
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	180	63	37	0.63		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	180	51	52	0.50		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	320	15	98	0.13	0.14	0.03
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	320	11	89	0.11		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	320	18	88	0.17		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	560	6	96	0.06	0.04	0.03
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	560	6	94	0.06		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	560	1	100	0.01		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	0	100	0	1.00	0.99	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	0	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	0	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	3.2	98	2	0.98	0.98	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	3.2	99	1	0.99		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	3.2	97	3	0.97		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	5.6	99	2	0.98	0.98	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	5.6	99	1	0.99		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	5.6	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	10	99	1	0.99	0.98	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	10	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	10	97	3	0.97		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	18	70	30	0.70	0.69	0.06
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	18	75	25	0.75		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	18	63	37	0.63		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cu	32	0	100	0.00		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	0	100	0	1.00	0.99	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	0	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	0	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	100	93	7	0.93	0.93	0.03
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	100	91	9	0.91		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	100	99	4	0.96		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	180	88	12	0.88	0.86	0.02
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	180	84	16	0.84		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	180	85	15	0.85		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	320	69	31	0.69	0.69	0.03
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	320	75	30	0.71		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	320	66	34	0.66		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	560	28	72	0.28	0.32	0.06
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	560	30	70	0.30		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	560	41	64	0.39		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	1000	7	95	0.07	0.07	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	1000	7	93	0.07		
URCHIN	Cd/Cu/Ni 1	3/15/00	Ni	1000	8	92	0.08		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	0	100	0	1.00	0.99	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	0	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	0	99	2	0.98		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	67.7	98	2	0.98	0.97	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	67.7	99	4	0.96		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	67.7	97	3	0.97		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	121.9	78	22	0.78	0.80	0.03
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	121.9	79	22	0.78		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	121.9	85	17	0.83		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	216.7	28	72	0.28	0.24	0.04
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	216.7	26	82	0.24		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	216.7	21	82	0.20		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	379.3	2	99	0.02	0.01	0.01
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	379.3	1	99	0.01		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	379.3	1	99	0.01		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	677.3	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	677.3	0	100	0.00		
URCHIN	Cd/Cu/Ni 1	3/15/00	Cd/Cu/Ni	677.3	0	100	0.00		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	0	99	1	0.99	0.98	0.01
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	0	98	2	0.98		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	0	97	3	0.97		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	100	98	7	0.93	0.98	0.04
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	100	100	0	1.00		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	100	100	0	1.00		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	180	98	2	0.98	0.97	0.03
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	180	99	1	0.99		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	180	94	6	0.94		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	320	83	17	0.83	0.79	0.04
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	320	75	25	0.75		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	320	79	21	0.79		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	560	57	43	0.57	0.60	0.03
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	560	63	37	0.63		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	560	60	40	0.60		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	1000	40	95	0.30	0.28	0.03
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	1000	24	77	0.24		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd	1000	30	70	0.30		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	0	99	1	0.99	0.98	0.01
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	0	98	2	0.98		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	0	97	3	0.97		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	3.2	100	0	1.00	0.97	0.03
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	3.2	97	3	0.97		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	3.2	94	6	0.94		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	5.6	99	2	0.98	0.98	0.00
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	5.6	99	2	0.98		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	5.6	99	2	0.98		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	10	93	7	0.93	0.95	0.02
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	10	99	4	0.96		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	10	96	4	0.96		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	18	17	83	0.17	0.14	0.02
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	18	13	87	0.13		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	18	13	87	0.13		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	0	99	1	0.99	0.98	0.01
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	0	98	2	0.98		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	0	97	3	0.97		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	100	99	1	0.99	0.98	0.01
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	100	99	1	0.99		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	100	97	3	0.97		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	180	90	10	0.90	0.94	0.03
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	180	97	4	0.96		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	180	99	5	0.95		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	320	67	33	0.67	0.70	0.04
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	320	69	31	0.69		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	320	75	25	0.75		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	560	33	67	0.33	0.31	0.03
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	560	27	73	0.27		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	560	32	68	0.32		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	1000	4	99	0.04	0.03	0.01
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	1000	3	98	0.03		
URCHIN	Cd/Cu/Ni 2	3/15/00	Ni	1000	2	98	0.02		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	0	99	1	0.99	0.98	0.01
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	0	98	2	0.98		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	0	97	3	0.97		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	67.7	99	6	0.94	0.98	0.03
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	67.7	99	1	0.99		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	67.7	100	0	1.00		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	121.9	97	7	0.93	0.94	0.01
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	121.9	95	5	0.95		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	121.9	94	6	0.94		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	216.7	71	30	0.70	0.68	0.03
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	216.7	71	38	0.65		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	216.7	69	32	0.68		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	379.3	9	91	0.09	0.09	0.02
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	379.3	7	98	0.07		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	379.3	10	90	0.10		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	677.3	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	677.3	0	100	0.00		
URCHIN	Cd/Cu/Ni 2	3/15/00	Cd/Cu/Ni	677.3	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	0	99	3	0.97	0.97	0.01
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	0	97	3	0.97		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	0	98	2	0.98		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	100	98	3	0.97	0.98	0.02
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	100	99	4	0.96		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	100	100	0	1.00		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	180	68	32	0.68	0.67	0.04
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	180	62	38	0.62		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	180	70	30	0.70		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	320	21	79	0.21	0.23	0.05
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	320	20	81	0.20		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	320	29	71	0.29		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	560	5	95	0.05	0.05	0.01
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	560	4	98	0.04		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	560	5	99	0.05		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	0	99	3	0.97	0.97	0.01
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	0	97	3	0.97		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	0	98	2	0.98		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	3.2	99	2	0.98	0.98	0.01
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	3.2	98	2	0.98		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	3.2	99	1	0.99		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	5.6	99	1	0.99	0.97	0.02
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	5.6	98	5	0.95		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	5.6	98	2	0.98		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	10	95	5	0.95	0.97	0.02
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	10	98	3	0.97		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	10	98	2	0.98		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	18	5	98	0.05	0.04	0.01
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	18	3	97	0.03		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	18	3	97	0.03		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	0	99	3	0.97	0.97	0.01
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	0	97	3	0.97		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	0	98	2	0.98		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	100	98	8	0.92	0.94	0.02
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	100	95	6	0.94		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	100	99	4	0.96		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	180	89	17	0.84	0.76	0.07
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	180	71	29	0.71		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	180	76	29	0.72		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	320	42	58	0.42	0.40	0.02
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	320	44	67	0.40		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	320	39	62	0.39		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	560	7	99	0.07	0.05	0.03
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	560	7	99	0.07		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	560	2	99	0.02		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Ni	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	0	99	3	0.97	0.97	0.01
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	0	97	3	0.97		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	0	98	2	0.98		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	67.7	96	4	0.96	0.97	0.02
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	67.7	99	1	0.99		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	67.7	99	3	0.97		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	121.9	94	6	0.94	0.93	0.04
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	121.9	89	11	0.89		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	121.9	97	4	0.96		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	216.7	29	73	0.28	0.27	0.03
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	216.7	30	72	0.29		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	216.7	23	77	0.23		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	379.3	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	379.3	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	379.3	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	677.3	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	677.3	0	100	0.00		
URCHIN	Cd/Cu/Ni 3	3/15/00	Cd/Cu/Ni	677.3	0	100	0.00		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	0	99	1	0.99	0.97	0.01
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	0	96	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	0	97	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	0	93	3	0.97		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	100	98	7	0.93	0.95	0.02
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	100	93	2	0.98		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	100	94	7	0.93		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	100	94	6	0.94		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	180	82	18	0.82	0.87	0.04
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	180	88	12	0.88		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	180	88	12	0.88		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	180	91	9	0.91		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	320	72	28	0.72	0.67	0.06
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	320	72	28	0.72		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	320	59	41	0.59		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	320	65	35	0.65		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	560	35	65	0.35	0.37	0.04
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	560	42	58	0.42		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	560	37	63	0.37		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	560	34	66	0.34		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	1000	13	87	0.13	0.14	0.04
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	1000	9	91	0.09		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	1000	18	82	0.18		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd	1000	14	86	0.14		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	0	99	1	0.99	0.97	0.01
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	0	96	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	0	97	3	0.97		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	0	96	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	3.2	97	3	0.97	0.98	0.01
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	3.2	97	3	0.97		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	3.2	99	1	0.99		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	3.2	97	3	0.97		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	5.6	98	2	0.98	0.95	0.03
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	5.6	97	3	0.97		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	5.6	91	9	0.91		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	5.6	93	7	0.93		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	10	85	15	0.85	0.88	0.03
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	10	86	14	0.86		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	10	92	8	0.92		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	10	88	12	0.88		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	18	33	67	0.33	0.34	0.06
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	18	40	60	0.40		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	18	38	62	0.38		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	18	26	74	0.26		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cu	32	0	100	0.00		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	0	99	1	0.99	0.99	0.02
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	0	96	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	0	99	1	0.99		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	0	100	0	1		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	32	95	5	0.95	0.97	0.02
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	32	96	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	32	99	1	0.99		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	32	97	3	0.97		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	56	96	4	0.96	0.94	0.02
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	56	95	5	0.95		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	56	93	7	0.93		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	56	92	8	0.92		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	100	53	47	0.53	0.54	0.04
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	100	49	51	0.49		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	100	55	45	0.55		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	100	58	42	0.58		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	180	5	95	0.05	0.06	0.01
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	180	6	94	0.06		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	180	7	93	0.07		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	180	7	93	0.07		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	320	0	100	0	0.00	0.00
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	320	0	100	0		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	320	0	100	0		
URCHIN	Cd/Cu/Zn 1	6/21/99	Zn	320	0	100	0		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	0	99	1	0.99	0.99	0.02
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	0	96	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	0	99	1	0.99		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	0	100	0	1.00		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	44.6	98	2	0.98	0.97	0.01
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	44.6	95	5	0.95		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	44.6	97	3	0.97		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	44.6	98	2	0.98		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	79.7	99	1		0.95	0.04
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	79.7	93	7	0.93		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	79.7	92	8	0.92		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	79.7	100	0	1.00		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	141.9	95	5	0.95	0.96	0.00
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	141.9	96	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	141.9	96	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	141.9	96	4	0.96		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	250.1	76	24	0.76	0.79	0.04
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	250.1	84	16	0.84		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	250.1	76	24	0.76		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	250.1	78	22	0.78		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	446.2	14	86	0.14	0.12	0.01
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	446.2	11	89	0.11		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	446.2	11	89	0.11		
URCHIN	Cd/Cu/Zn 1	6/21/99	Cd/Cu/Zn	446.2	12	88	0.12		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	0	95	5	0.95		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	0	91	9	0.91		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	100	89	11	0.89	0.88	0.03
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	100	90	10	0.90		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	100	85	15	0.85		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	180	54	46	0.54	0.47	0.06
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	180	43	57	0.43		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	180	45	55	0.45		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	320	0	100	0.00	0.01	0.02
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	320	3	97	0.03		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	320	1	99	0.01		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	560	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	560	0	100	0.00		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	560	0	100	0.00		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	0	95	5	0.95		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	0	91	9	0.91		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	3.2	85	15	0.85	0.87	0.04
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	3.2	92	8	0.92		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	3.2	85	15	0.85		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	5.6	94	6	0.94	0.91	0.03
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	5.6	89	11	0.89		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	5.6	91	9	0.91		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	10	79	21	0.79	0.79	0.01
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	10	79	21	0.79		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	10	80	20	0.80		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	18	13	87	0.13	0.13	0.05
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	18	8	92	0.08		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	18	18	82	0.18		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	0	95	5	0.95		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	0	91	9	0.91		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	32	96	4	0.96	0.94	0.03
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	32	95	5	0.95		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	32	91	9	0.91		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	56	73	27	0.73	0.76	0.04
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	56	80	20	0.80		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	56	75	25	0.75		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	100	50	50	0.50	0.46	0.08
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	100	51	49	0.51		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	100	37	63	0.37		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	180	1	99	0.01	0.01	0.02
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	180	3	97	0.03		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	180	0	100	0.00		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Zn 2	10/11/99	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	0	89	11	0.89	0.92	0.03
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	0	95	5	0.95		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	0	91	9	0.91		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	44.6	79	21	0.79	0.83	0.05
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	44.6	88	12	0.88		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	44.6	83	17	0.83		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	79.7	81	19	0.81	0.82	0.01
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	79.7	83	17	0.83		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	79.7	81	19	0.81		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	141.9	70	30	0.70	0.75	0.04
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	141.9	77	23	0.77		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	141.9	78	22	0.78		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	250.1	59	41	0.59	0.66	0.06
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	250.1	80	33	0.71		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	250.1	68	32	0.68		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	446.2	0	100	0.00	0.01	0.01
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	446.2	2	98	0.02		
URCHIN	Cd/Cu/Zn 2	10/11/99	Cd/Cu/Zn	446.2	1	99	0.01		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	0	98	2	0.98	0.95	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	0	93	7	0.93		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	0	94	6	0.94		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	100	88	12	0.88	0.91	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	100	94	6	0.94		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	100	92	8	0.92		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	180	89	11	0.89	0.85	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	180	84	16	0.84		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	180	83	17	0.83		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	320	50	50	0.50	0.53	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	320	54	46	0.54		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	320	56	44	0.56		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	560	10	90	0.10	0.14	0.04
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	560	14	86	0.14		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	560	17	83	0.17		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	1000	0	100	0.00	0.01	0.02
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	1000	1	99	0.01		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd	1000	3	97	0.03		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	0	98	2	0.98	0.95	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	0	93	7	0.93		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	0	94	6	0.94		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	3.2	94	6	0.94	0.93	0.02
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	3.2	94	6	0.94		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	3.2	90	10	0.90		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	5.6	96	4	0.96	0.83	0.11
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	5.6	76	24	0.76		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	5.6	78	22	0.78		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	10	72	28	0.72	0.76	0.04
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	10	75	25	0.75		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	10	80	20	0.80		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	18	25	75	0.25	0.25	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	18	27	73	0.27		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	18	22	78	0.22		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	0	98	2	0.98	0.95	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	0	93	7	0.93		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	0	94	6	0.94		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	32	94	6	0.94	0.96	0.02
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	32	98	2	0.98		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	32	97	3	0.97		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	56	81	19	0.81	0.83	0.05
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	56	79	21	0.79		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	56	88	12	0.88		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	100	52	48	0.52	0.53	0.02
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	100	55	45	0.55		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	100	51	49	0.51		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	180	4	96	0.04	0.06	0.02
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	180	6	94	0.06		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	180	7	93	0.07		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Zn 3	10/18/99	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	0	98	2	0.98	0.95	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	0	93	7	0.93		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	0	94	6	0.94		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	44.6	95	5	0.95	0.94	0.02
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	44.6	92	8	0.92		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	44.6	96	4	0.96		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	79.7	97	3	0.97	0.95	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	79.7	95	5	0.95		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	79.7	92	8	0.92		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	141.9	95	5	0.95	0.93	0.03
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	141.9	93	7	0.93		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	141.9	90	10	0.90		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	250.1	85	15	0.85	0.85	0.02
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	250.1	87	13	0.87		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	250.1	83	17	0.83		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	446.2	21	79	0.21	0.19	0.02
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	446.2	20	80	0.20		
URCHIN	Cd/Cu/Zn 3	10/18/99	Cd/Cu/Zn	446.2	17	83	0.17		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	0	100	0	1.00	0.99	0.01
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	0	99	2	0.98		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	0	99	2	0.98		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	100	99	8	0.93	0.93	0.03
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	100	98	4	0.96		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	100	91	9	0.91		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	180	58	42	0.58	0.57	0.07
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	180	63	37	0.63		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	180	51	52	0.50		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	320	15	98	0.13	0.14	0.03
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	320	11	89	0.11		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	320	18	88	0.17		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	560	6	96	0.06	0.04	0.03
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	560	6	94	0.06		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	560	1	100	0.01		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	0	100	0	1.00	0.99	0.01
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	0	99	2	0.98		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	0	99	2	0.98		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	100	93	7	0.93	0.93	0.03
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	100	91	9	0.91		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	100	99	4	0.96		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	180	88	12	0.88	0.86	0.02
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	180	84	16	0.84		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	180	85	15	0.85		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	320	69	31	0.69	0.69	0.03
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	320	75	30	0.71		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	320	66	34	0.66		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	560	28	72	0.28	0.32	0.06
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	560	30	70	0.30		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	560	41	64	0.39		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	1000	7	95	0.07	0.07	0.01
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	1000	7	93	0.07		
URCHIN	Cd/Ni/Zn 1	3/15/00	Ni	1000	8	92	0.08		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	0	100	0	1.00	0.99	0.01
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	0	99	2	0.98		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	0	99	2	0.98		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	32	98	2	0.98	0.98	0.01
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	32	99	3	0.97		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	32	99	1	0.99		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	56	95	5	0.95	0.96	0.02
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	56	95	5	0.95		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	56	99	2	0.98		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	100	73	33	0.69	0.64	0.06
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	100	58	42	0.58		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	100	66	34	0.66		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	180	3	99	0.03	0.03	0.01
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	180	2	98	0.02		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	180	3	99	0.03		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cd/Ni/Zn 1	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	0	100	0	1.00	0.99	0.01
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	0	99	2	0.98		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	0	99	2	0.98		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	77.3	93	7	0.93	0.93	0.03
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	77.3	99	4	0.96		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	77.3	99	10	0.91		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	138.7	99	32	0.76	0.77	0.02
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	138.7	77	23	0.77		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	138.7	83	21	0.80		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	246.7	41	60	0.41	0.38	0.02
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	246.7	37	63	0.37		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	246.7	38	65	0.37		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	433.3	8	92	0.08	0.10	0.03
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	433.3	14	91	0.13		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	433.3	9	98	0.08		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	773.3	1	99	0.01	0.01	0.01
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	773.3	1	99	0.01		
URCHIN	Cd/Ni/Zn 1	3/15/00	Cd/Ni/Zn	773.3	0	100	0.00		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	0	99	1	0.99	0.98	0.01
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	0	98	2	0.98		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	0	97	3	0.97		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	100	98	7	0.93	0.98	0.04
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	100	100	0	1.00		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	100	100	0	1.00		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	180	98	2	0.98	0.97	0.03
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	180	99	1	0.99		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	180	94	6	0.94		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	320	83	17	0.83	0.79	0.04
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	320	75	25	0.75		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	320	79	21	0.79		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	560	57	43	0.57	0.60	0.03
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	560	63	37	0.63		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	560	60	40	0.60		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	1000	40	95	0.30	0.28	0.03
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	1000	24	77	0.24		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd	1000	30	70	0.30		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	0	99	1	0.99	0.98	0.01
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	0	98	2	0.98		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	0	97	3	0.97		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	100	99	1	0.99	0.98	0.01
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	100	99	1	0.99		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	100	97	3	0.97		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	180	90	10	0.90	0.94	0.03
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	180	97	4	0.96		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	180	99	5	0.95		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	320	67	33	0.67	0.70	0.04
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	320	69	31	0.69		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	320	75	25	0.75		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	560	33	67	0.33	0.31	0.03
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	560	27	73	0.27		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	560	32	68	0.32		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	1000	4	99	0.04	0.03	0.01
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	1000	3	98	0.03		
URCHIN	Cd/Ni/Zn 2	3/15/00	Ni	1000	2	98	0.02		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	0	99	1	0.99	0.98	0.01
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	0	98	2	0.98		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	0	97	3	0.97		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	32	99	1	0.99	0.99	0.01
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	32	98	2	0.98		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	32	100	0	1.00		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	56	99	1	0.99	0.99	0.01
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	56	99	2	0.98		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	56	99	1	0.99		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	100	69	31	0.69	0.71	0.04
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	100	68	32	0.68		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	100	75	25	0.75		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	180	10	91	0.10	0.09	0.02
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	180	6	94	0.06		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	180	10	92	0.10		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cd/Ni/Zn 2	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	0	99	1	0.99	0.98	0.01
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	0	98	2	0.98		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	0	97	3	0.97		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	77.3	98	6	0.94	0.96	0.02
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	77.3	99	3	0.97		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	77.3	98	2	0.98		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	138.7	80	33	0.71	0.70	0.01
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	138.7	71	29	0.71		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	138.7	69	31	0.69		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	246.7	34	66	0.34	0.28	0.07
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	246.7	30	70	0.30		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	246.7	21	82	0.20		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	433.3	5	98	0.05	0.07	0.02
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	433.3	9	91	0.09		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	433.3	7	96	0.07		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	773.3	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	773.3	0	100	0.00		
URCHIN	Cd/Ni/Zn 2	3/15/00	Cd/Ni/Zn	773.3	0	100	0.00		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	0	99	3	0.97	0.97	0.01
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	0	97	3	0.97		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	0	98	2	0.98		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	100	98	3	0.97	0.98	0.02
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	100	99	4	0.96		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	100	100	0	1.00		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	180	68	32	0.68	0.67	0.04
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	180	62	38	0.62		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	180	70	30	0.70		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	320	21	79	0.21	0.23	0.05
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	320	20	81	0.20		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	320	29	71	0.29		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	560	5	95	0.05	0.05	0.01
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	560	4	98	0.04		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	560	5	99	0.05		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	0	99	3	0.97	0.97	0.01
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	0	97	3	0.97		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	0	98	2	0.98		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	100	98	8	0.92	0.94	0.02
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	100	95	6	0.94		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	100	99	4	0.96		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	180	89	17	0.84	0.76	0.07
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	180	71	29	0.71		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	180	76	29	0.72		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	320	42	58	0.42	0.40	0.02
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	320	44	67	0.40		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	320	39	62	0.39		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	560	7	99	0.07	0.05	0.03
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	560	7	99	0.07		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	560	2	99	0.02		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	1000	0	100	0.00		
URCHIN	Cd/Ni/Zn 3	3/15/00	Ni	1000	0	100	0.00		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	0	99	3	0.97	0.97	0.01
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	0	97	3	0.97		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	0	98	2	0.98		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	32	95	5	0.95	0.96	0.01
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	32	99	4	0.96		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	32	97	3	0.97		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	56	94	7	0.93	0.91	0.02
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	56	91	11	0.89		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	56	99	9	0.92		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	100	56	44	0.56	0.49	0.09
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	100	53	48	0.52		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	100	39	61	0.39		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	180	2	98	0.02	0.01	0.01
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	180	1	99	0.01		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	180	1	99	0.01		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cd/Ni/Zn 3	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	0	99	3	0.97	0.97	0.01
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	0	97	3	0.97		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	0	98	2	0.98		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	77.3	99	11	0.90	0.91	0.02
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	77.3	94	6	0.94		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	77.3	90	10	0.90		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	138.7	41	60	0.41	0.42	0.05
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	138.7	47	53	0.47		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	138.7	38	62	0.38		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	246.7	14	94	0.13	0.12	0.02
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	246.7	10	90	0.10		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	246.7	14	89	0.14		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	433.3	2	99	0.02	0.01	0.01
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	433.3	1	99	0.01		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	433.3	1	99	0.01		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	773.3	0	100	0.00	0.00	0.00
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	773.3	0	100	0.00		
URCHIN	Cd/Ni/Zn 3	3/15/00	Cd/Ni/Zn	773.3	0	100	0.00		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	0	100	0	1.00	0.99	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	0	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	0	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	3.2	98	2	0.98	0.98	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	3.2	99	1	0.99		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	3.2	97	3	0.97		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	5.6	99	2	0.98	0.98	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	5.6	99	1	0.99		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	5.6	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	10	99	1	0.99	0.98	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	10	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	10	97	3	0.97		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	18	70	30	0.70	0.69	0.06
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	18	75	25	0.75		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	18	63	37	0.63		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	0	100	0	1.00	0.99	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	0	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	0	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	100	93	7	0.93	0.93	0.03
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	100	91	9	0.91		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	100	99	4	0.96		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	180	88	12	0.88	0.86	0.02
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	180	84	16	0.84		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	180	85	15	0.85		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	320	69	31	0.69	0.69	0.03
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	320	75	30	0.71		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	320	66	34	0.66		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	560	28	72	0.28	0.32	0.06
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	560	30	70	0.30		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	560	41	64	0.39		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	1000	7	95	0.07	0.07	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	1000	7	93	0.07		
URCHIN	Cu/Ni/Zn 1	3/15/00	Ni	1000	8	92	0.08		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	0	100	0	1.00	0.99	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	0	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	0	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	32	98	2	0.98	0.98	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	32	99	3	0.97		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	32	99	1	0.99		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	56	95	5	0.95	0.96	0.02
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	56	95	5	0.95		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	56	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	100	73	33	0.69	0.64	0.06
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	100	58	42	0.58		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	100	66	34	0.66		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	180	3	99	0.03	0.03	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	180	2	98	0.02		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	180	3	99	0.03		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cu/Ni/Zn 1	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	0	100	0	1.00	0.99	0.01
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	0	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	0	99	2	0.98		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	45.1	99	16	0.86	0.90	0.04
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	45.1	99	6	0.94		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	45.1	89	11	0.89		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	80.5	71	29	0.71	0.63	0.10
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	80.5	52	48	0.52		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	80.5	65	35	0.65		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	143.3	29	71	0.29	0.27	0.02
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	143.3	25	75	0.25		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	143.3	29	80	0.27		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	252.7	5	95	0.05	0.06	0.02
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	252.7	8	92	0.08		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	252.7	6	94	0.06		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	450.7	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	450.7	0	100	0.00		
URCHIN	Cu/Ni/Zn 1	3/15/00	Cu/Ni/Zn	450.7	0	100	0.00		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	0	99	1	0.99	0.98	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	0	98	2	0.98		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	0	97	3	0.97		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	3.2	100	0	1.00	0.97	0.03
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	3.2	97	3	0.97		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	3.2	94	6	0.94		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	5.6	99	2	0.98	0.98	0.00
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	5.6	99	2	0.98		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	5.6	99	2	0.98		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	10	93	7	0.93	0.95	0.02
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	10	99	4	0.96		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	10	96	4	0.96		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	18	17	83	0.17	0.14	0.02
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	18	13	87	0.13		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	18	13	87	0.13		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	0	99	1	0.99	0.98	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	0	98	2	0.98		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	0	97	3	0.97		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	100	99	1	0.99	0.98	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	100	99	1	0.99		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	100	97	3	0.97		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	180	90	10	0.90	0.94	0.03
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	180	97	4	0.96		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	180	99	5	0.95		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	320	67	33	0.67	0.70	0.04
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	320	69	31	0.69		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	320	75	25	0.75		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	560	33	67	0.33	0.31	0.03
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	560	27	73	0.27		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	560	32	68	0.32		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	1000	4	99	0.04	0.03	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	1000	3	98	0.03		
URCHIN	Cu/Ni/Zn 2	3/15/00	Ni	1000	2	98	0.02		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	0	99	1	0.99	0.98	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	0	98	2	0.98		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	0	97	3	0.97		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	32	99	1	0.99	0.99	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	32	98	2	0.98		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	32	100	0	1.00		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	56	99	1	0.99	0.99	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	56	99	2	0.98		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	56	99	1	0.99		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	100	69	31	0.69	0.71	0.04
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	100	68	32	0.68		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	100	75	25	0.75		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	180	10	91	0.10	0.09	0.02
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	180	6	94	0.06		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	180	10	92	0.10		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cu/Ni/Zn 2	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	0	99	1	0.99	0.98	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	0	98	2	0.98		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	0	97	3	0.97		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	45.1	95	5	0.95	0.96	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	45.1	99	3	0.97		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	45.1	99	4	0.96		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	80.5	79	21	0.79	0.69	0.10
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	80.5	68	32	0.68		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	80.5	59	41	0.59		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	143.3	28	75	0.27	0.26	0.04
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	143.3	29	71	0.29		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	143.3	22	83	0.21		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	252.7	5	95	0.05	0.05	0.01
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	252.7	6	99	0.06		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	252.7	4	96	0.04		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	450.7	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	450.7	0	100	0.00		
URCHIN	Cu/Ni/Zn 2	3/15/00	Cu/Ni/Zn	450.7	0	100	0.00		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	0	99	3	0.97	0.97	0.01
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	0	97	3	0.97		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	0	98	2	0.98		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	3.2	99	2	0.98	0.98	0.01
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	3.2	98	2	0.98		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	3.2	99	1	0.99		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	5.6	99	1	0.99	0.97	0.02
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	5.6	98	5	0.95		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	5.6	98	2	0.98		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	10	95	5	0.95	0.97	0.02
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	10	98	3	0.97		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	10	98	2	0.98		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	18	5	98	0.05	0.04	0.01
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	18	3	97	0.03		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	18	3	97	0.03		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	32	0	100	0.00		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu	32	0	100	0.00		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	0	99	3	0.97	0.97	0.01
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	0	97	3	0.97		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	0	98	2	0.98		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	100	98	8	0.92	0.94	0.02
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	100	95	6	0.94		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	100	99	4	0.96		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	180	89	17	0.84	0.76	0.07
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	180	71	29	0.71		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	180	76	29	0.72		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	320	42	58	0.42	0.40	0.02
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	320	44	67	0.40		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	320	39	62	0.39		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	560	7	99	0.07	0.05	0.03
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	560	7	99	0.07		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	560	2	99	0.02		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	1000	0	100	0.00		
URCHIN	Cu/Ni/Zn 3	3/15/00	Ni	1000	0	100	0.00		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	0	99	3	0.97	0.97	0.01
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	0	97	3	0.97		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	0	98	2	0.98		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	32	95	5	0.95	0.96	0.01
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	32	99	4	0.96		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	32	97	3	0.97		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	56	94	7	0.93	0.91	0.02
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	56	91	11	0.89		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	56	99	9	0.92		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	100	56	44	0.56	0.49	0.09
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	100	53	48	0.52		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	100	39	61	0.39		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	180	2	98	0.02	0.01	0.01
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	180	1	99	0.01		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	180	1	99	0.01		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cu/Ni/Zn 3	3/15/00	Zn	320	0	100	0.00		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	0	99	3	0.97	0.97	0.01
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	0	97	3	0.97		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	0	98	2	0.98		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	45.1	93	9	0.91	0.90	0.02
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	45.1	91	9	0.91		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	45.1	99	13	0.88		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	80.5	44	56	0.44	0.38	0.05
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	80.5	39	67	0.37		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	80.5	34	66	0.34		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	143.3	9	91	0.09	0.09	0.01
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	143.3	10	98	0.09		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	143.3	11	99	0.10		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	252.7	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	252.7	0	100	0.00		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	252.7	0	100	0.00		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	450.7	0	100	0.00	0.00	0.00
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	450.7	0	100	0.00		
URCHIN	Cu/Ni/Zn 3	3/15/00	Cu/Ni/Zn	450.7	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	0	96	4	0.96	0.96	0.02
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	0	94	6	0.94		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	0	97	3	0.97		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	100	98	2	0.98	0.96	0.03
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	100	96	4	0.96		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	100	93	7	0.93		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	180	70	30	0.70	0.71	0.05
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	180	67	33	0.67		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	180	77	23	0.77		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	320	26	74	0.26	0.22	0.04
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	320	22	78	0.22		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	320	18	82	0.18		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	560	5	95	0.05	0.05	0.02
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	560	6	94	0.06		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	560	3	97	0.03		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	0	93	7	0.93	0.97	0.04
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	0	100	0	1.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	0	97	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	3.2	97	3	0.97	0.96	0.01
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	3.2	95	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	3.2	96	4	0.96		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	5.6	96	4	0.96	0.97	0.01
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	5.6	98	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	5.6	96	4	0.96		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	10	93	7	0.93	0.91	0.02
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	10	90	10	0.90		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	10	91	9	0.91		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	18	20	80	0.20	0.17	0.03
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	18	17	83	0.17		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	18	15	85	0.15		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	0	98	2	0.98	0.97	0.01
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	0	97	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	0	97	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	100	95	5	0.95	0.95	0.02
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	100	96	4	0.96		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	100	93	7	0.93		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	180	83	17	0.83	0.75	0.07
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	180	72	28	0.72		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	180	71	29	0.71		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	320	25	75	0.25	0.17	0.07
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	320	16	84	0.16		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	320	11	89	0.11		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	560	10	90	0.10	0.03	0.06
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	560	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	560	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	1000	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Ni	1000	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	0	96	4	0.96	0.98	0.02
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	0	98	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	0	100	0	1.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	32	94	6	0.94	0.96	0.03
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	32	99	1	0.99		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	32	94	6	0.94		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	56	98	2	0.98	0.98	0.01
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	56	97	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	56	99	1	0.99		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	100	55	45	0.55	0.52	0.02
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	100	51	49	0.51		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	100	51	49	0.51		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	180	13	87	0.13	0.14	0.02
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	180	14	86	0.14		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	180	16	84	0.16		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	0	99	1	0.99	0.98	0.01
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	0	98	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	0	97	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	58.8	94	6	0.94	0.91	0.03
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	58.8	92	8	0.92		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	58.8	88	12	0.88		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	105.4	76	24	0.76	0.53	0.21
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	105.4	49	51	0.49		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	105.4	35	65	0.35		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	187.5	9	91	0.09	0.07	0.03
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	187.5	4	96	0.04		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	187.5	8	92	0.08		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	329.5	3	97	0.03	0.03	0.02
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	329.5	5	95	0.05		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	329.5	2	98	0.02		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	588	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	588	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 1	1/3/00	Cd/Cu/Ni/Zn	588	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	0	98	2	0.98	0.96	0.03
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	0	92	8	0.92		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	0	98	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	100	99	1	0.99	0.99	0.01
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	100	99	1	0.99		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	100	100	0	1.00		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	180	92	8	0.92	0.94	0.03
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	180	98	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	180	92	8	0.92		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	320	53	47	0.53	0.55	0.03
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	320	54	46	0.54		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	320	58	42	0.58		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	560	24	76	0.24	0.28	0.04
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	560	32	68	0.32		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	560	28	72	0.28		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	1000	3	97	0.03	0.08	0.04
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	1000	10	90	0.10		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd	1000	10	90	0.10		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	0	98	2	0.98	0.96	0.02
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	0	95	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	0	95	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	3.2	95	5	0.95	0.95	0.01
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	3.2	95	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	3.2	96	4	0.96		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	5.6	98	2	0.98	0.97	0.01
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	5.6	97	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	5.6	96	4	0.96		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	10	97	3	0.97	0.96	0.01
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	10	95	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	10	95	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	18	29	71	0.29	0.30	0.05
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	18	26	74	0.26		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	18	36	64	0.36		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	0	100	0	1.00	0.98	0.02
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	0	96	4	0.96		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	0	99	1	0.99		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	100	90	10	0.90	0.90	0.04
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	100	94	6	0.94		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	100	87	13	0.87		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	180	68	32	0.68	0.70	0.04
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	180	75	25	0.75		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	180	68	32	0.68		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	320	52	48	0.52	0.60	0.07
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	320	63	37	0.63		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	320	64	36	0.64		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	560	46	54	0.46	0.41	0.05
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	560	42	58	0.42		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	560	36	64	0.36		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	1000	17	83	0.17	0.17	0.00
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	1000	17	83	0.17		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Ni	1000	17	83	0.17		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	0	99	1	0.99	0.99	0.01
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	0	98	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	0	100	0	1.00		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	32	98	2	0.98	0.96	0.02
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	32	97	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	32	94	6	0.94		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	56	89	11	0.89	0.89	0.01
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	56	90	10	0.90		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	56	88	12	0.88		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	100	52	48	0.52	0.49	0.04
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	100	45	55	0.45		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	100	50	50	0.50		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	180	12	88	0.12	0.15	0.04
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	180	19	81	0.19		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	180	13	87	0.13		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	0	99	1	0.99	0.99	0.01
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	0	98	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	0	100	0	1.00		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	58.8	72	28	0.72	0.68	0.05
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	58.8	62	38	0.62		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	58.8	69	31	0.69		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	105.4	40	60	0.40	0.35	0.07
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	105.4	27	73	0.27		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	105.4	37	63	0.37		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	187.5	21	79	0.21	0.21	0.01
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	187.5	21	79	0.21		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	187.5	20	80	0.20		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	329.5	21	79	0.21	0.18	0.04
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	329.5	19	81	0.19		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	329.5	14	86	0.14		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	588	3	97	0.03	0.05	0.03
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	588	8	92	0.08		
URCHIN	Cd/Cu/Ni/Zn 2	1/10/00	Cd/Cu/Ni/Zn	588	5	95	0.05		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	0	97	4	0.96	0.97	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	0	100	1	0.99		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	0	95	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	100	100	5	0.95	0.97	0.01
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	100	97	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	100	100	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	180	93	8	0.92	0.94	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	180	99	6	0.94		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	180	96	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	320	63	40	0.61	0.64	0.03
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	320	66	34	0.66		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	320	68	36	0.65		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	560	14	90	0.13	0.17	0.05
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	560	23	77	0.23		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	560	16	92	0.15		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	1000	3	97	0.03	0.04	0.01
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	1000	6	95	0.06		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd	1000	4	96	0.04		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	0	100	1	0.99	0.99	0.01
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	0	100	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	0	100	0	1.00		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	3.2	100	3	0.97	0.97	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	3.2	95	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	3.2	98	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	5.6	96	4	0.96	0.98	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	5.6	100	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	5.6	100	1	0.99		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	10	92	9	0.91	0.93	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	10	99	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	10	97	7	0.93		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	18	20	80	0.20	0.20	0.05
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	18	25	75	0.25		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	18	16	84	0.16		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	32	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cu	32	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	0	97	3	0.97	0.97	0.00
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	0	100	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	0	100	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	100	90	10	0.90	0.93	0.03
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	100	95	5	0.95		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	100	100	7	0.93		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	180	89	17	0.84	0.85	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	180	85	15	0.85		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	180	87	13	0.87		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	320	63	49	0.56	0.51	0.05
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	320	55	50	0.52		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	320	47	56	0.46		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	560	27	79	0.25	0.21	0.04
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	560	19	81	0.19		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	560	22	95	0.19		

TEST ORGANISM	TEST NUMBER	DATE	METAL(S)	CONC.	NORMAL LARVAE	ABNORMAL LARVAE	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	1000	6	99	0.06	0.06	0.01
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	1000	8	97	0.08		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Ni	1000	6	99	0.06		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	0	102	3	0.97	0.97	0.01
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	0	97	3	0.97		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	0	100	4	0.96		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	32	99	5	0.95	0.93	0.04
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	32	94	6	0.94		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	32	92	12	0.88		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	56	86	19	0.82	0.85	0.04
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	56	94	11	0.90		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	56	85	15	0.85		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	100	56	47	0.54	0.47	0.06
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	100	48	65	0.42		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	100	44	56	0.44		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	180	5	95	0.05	0.05	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	180	7	94	0.07		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	180	2	98	0.02		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	320	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Zn	320	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	0	100	0	1.00	0.98	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	0	100	2	0.98		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	0	100	4	0.96		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	58.8	93	9	0.91	0.86	0.06
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	58.8	87	13	0.87		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	58.8	86	22	0.80		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	105.4	49	64	0.43	0.45	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	105.4	47	53	0.47		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	105.4	45	57	0.44		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	187.5	20	80	0.20	0.17	0.03
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	187.5	14	86	0.14		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	187.5	21	99	0.18		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	329.5	5	95	0.05	0.05	0.02
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	329.5	8	99	0.07		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	329.5	4	96	0.04		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	588	0	100	0.00	0.00	0.00
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	588	0	100	0.00		
URCHIN	Cd/Cu/Ni/Zn 3	1/24/00	Cd/Cu/Ni/Zn	588	0	100	0.00		

Appendix D – Southern California Bight Toxicity Test Raw Data

TEST ORGANISM	LAB CODE	STATION ID	NUMBER ALIVE	NUMBER AT START	PROPORTION ALIVE	MEAN	STANDARD DEVIATION
EOHAUTORIUS	SD	CONTROL	20	20	1.00	0.99	0.02
EOHAUTORIUS	SD	CONTROL	20	20	1.00		
EOHAUTORIUS	SD	CONTROL	19	20	0.95		
EOHAUTORIUS	SD	CONTROL	20	20	1.00		
EOHAUTORIUS	SD	CONTROL	20	20	1.00		
EOHAUTORIUS	SD	LAH1	0	20	0.00	0.03	0.04
EOHAUTORIUS	SD	LAH1	0	20	0.00		
EOHAUTORIUS	SD	LAH1	0	20	0.00		
EOHAUTORIUS	SD	LAH1	2	20	0.10		
EOHAUTORIUS	SD	LAH1	1	20	0.05		
EOHAUTORIUS	SD	LAH2	20	20	1.00	0.89	0.10
EOHAUTORIUS	SD	LAH2	19	20	0.95		
EOHAUTORIUS	SD	LAH2	17	20	0.85		
EOHAUTORIUS	SD	LAH2	18	20	0.90		
EOHAUTORIUS	SD	LAH2	15	20	0.75		
EOHAUTORIUS	SD	LAH3	2	20	0.10	0.19	0.13
EOHAUTORIUS	SD	LAH3	3	20	0.15		
EOHAUTORIUS	SD	LAH3	1	20	0.05		
EOHAUTORIUS	SD	LAH3	6	20	0.30		
EOHAUTORIUS	SD	LAH3	7	20	0.35		
EOHAUTORIUS	SD	LAH4	18	20	0.90	0.91	0.07
EOHAUTORIUS	SD	LAH4	18	20	0.90		
EOHAUTORIUS	SD	LAH4	19	20	0.95		
EOHAUTORIUS	SD	LAH4	20	20	1.00		
EOHAUTORIUS	SD	LAH4	16	20	0.80		
EOHAUTORIUS	SC	CONTROL	20	20	1.00	1.00	0.00
EOHAUTORIUS	SC	CONTROL	20	20	1.00		
EOHAUTORIUS	SC	CONTROL	20	20	1.00		
EOHAUTORIUS	SC	CONTROL	20	20	1.00		
EOHAUTORIUS	SC	CONTROL	20	20	1.00		
EOHAUTORIUS	SC	LAH1	2	20	0.10	0.15	0.08
EOHAUTORIUS	SC	LAH1	3	20	0.15		
EOHAUTORIUS	SC	LAH1	4	20	0.20		
EOHAUTORIUS	SC	LAH1	1	20	0.05		
EOHAUTORIUS	SC	LAH1	5	20	0.25		
EOHAUTORIUS	SC	LAH2	16	20	0.80	0.90	0.06
EOHAUTORIUS	SC	LAH2	19	20	0.95		
EOHAUTORIUS	SC	LAH2	18	20	0.90		
EOHAUTORIUS	SC	LAH2	19	20	0.95		
EOHAUTORIUS	SC	LAH2	18	20	0.90		
EOHAUTORIUS	SC	LAH3	13	20	0.65	0.52	0.10
EOHAUTORIUS	SC	LAH3	9	20	0.45		
EOHAUTORIUS	SC	LAH3	12	20	0.60		
EOHAUTORIUS	SC	LAH3	9	20	0.45		
EOHAUTORIUS	SC	LAH3	9	20	0.45		
EOHAUTORIUS	SC	LAH4	20	20	1.00	0.90	0.07
EOHAUTORIUS	SC	LAH4	17	20	0.85		
EOHAUTORIUS	SC	LAH4	17	20	0.85		
EOHAUTORIUS	SC	LAH4	17	20	0.85		
EOHAUTORIUS	SC	LAH4	19	20	0.95		
EOHAUTORIUS	OC	CONTROL	20	20	1.00	0.98	0.04
EOHAUTORIUS	OC	CONTROL	20	20	1.00		
EOHAUTORIUS	OC	CONTROL	18	20	0.90		
EOHAUTORIUS	OC	CONTROL	20	20	1.00		
EOHAUTORIUS	OC	CONTROL	20	20	1.00		

TEST ORGANISM	LAB CODE	STATION ID	NUMBER ALIVE	NUMBER AT START	PROPORTION ALIVE	MEAN	STANDARD DEVIATION
EOHAUTORIUS	OC	LAH1	0	20	0.00	0.01	0.02
EOHAUTORIUS	OC	LAH1	0	20	0.00		
EOHAUTORIUS	OC	LAH1	1	20	0.05		
EOHAUTORIUS	OC	LAH1	0	20	0.00		
EOHAUTORIUS	OC	LAH1	0	20	0.00		
EOHAUTORIUS	OC	LAH2	19	20	0.95	0.80	0.10
EOHAUTORIUS	OC	LAH2	14	20	0.70		
EOHAUTORIUS	OC	LAH2	15	20	0.75		
EOHAUTORIUS	OC	LAH2	15	20	0.75		
EOHAUTORIUS	OC	LAH2	17	20	0.85		
EOHAUTORIUS	OC	LAH3	6	20	0.30	0.22	0.14
EOHAUTORIUS	OC	LAH3	1	20	0.05		
EOHAUTORIUS	OC	LAH3	8	20	0.40		
EOHAUTORIUS	OC	LAH3	4	20	0.20		
EOHAUTORIUS	OC	LAH3	3	20	0.15		
EOHAUTORIUS	OC	LAH4	18	20	0.90	0.88	0.04
EOHAUTORIUS	OC	LAH4	18	20	0.90		
EOHAUTORIUS	OC	LAH4	16	20	0.80		
EOHAUTORIUS	OC	LAH4	18	20	0.90		
EOHAUTORIUS	OC	LAH4	18	20	0.90		
EOHAUTORIUS	MEC	CONTROL	19	20	0.95	0.96	0.04
EOHAUTORIUS	MEC	CONTROL	18	20	0.90		
EOHAUTORIUS	MEC	CONTROL	19	20	0.95		
EOHAUTORIUS	MEC	CONTROL	20	20	1.00		
EOHAUTORIUS	MEC	CONTROL	20	20	1.00		
EOHAUTORIUS	MEC	LAH1	5	20	0.25	0.33	0.10
EOHAUTORIUS	MEC	LAH1	10	20	0.50		
EOHAUTORIUS	MEC	LAH1	6	20	0.30		
EOHAUTORIUS	MEC	LAH1	5	20	0.25		
EOHAUTORIUS	MEC	LAH1	7	20	0.35		
EOHAUTORIUS	MEC	LAH2	13	20	0.65	0.69	0.12
EOHAUTORIUS	MEC	LAH2	16	20	0.80		
EOHAUTORIUS	MEC	LAH2	15	20	0.75		
EOHAUTORIUS	MEC	LAH2	10	20	0.50		
EOHAUTORIUS	MEC	LAH2	15	20	0.75		
EOHAUTORIUS	MEC	LAH3	14	20	0.70	0.52	0.13
EOHAUTORIUS	MEC	LAH3	9	20	0.45		
EOHAUTORIUS	MEC	LAH3	11	20	0.55		
EOHAUTORIUS	MEC	LAH3	7	20	0.35		
EOHAUTORIUS	MEC	LAH3	11	20	0.55		
EOHAUTORIUS	MEC	LAH4	15	20	0.75	0.77	0.12
EOHAUTORIUS	MEC	LAH4	14	20	0.70		
EOHAUTORIUS	MEC	LAH4	19	20	0.95		
EOHAUTORIUS	MEC	LAH4	16	20	0.80		
EOHAUTORIUS	MEC	LAH4	13	20	0.65		
EOHAUTORIUS	GC	CONTROL	20	20	1.00	1.00	0.00
EOHAUTORIUS	GC	CONTROL	20	20	1.00		
EOHAUTORIUS	GC	CONTROL	20	20	1.00		
EOHAUTORIUS	GC	CONTROL	20	20	1.00		
EOHAUTORIUS	GC	CONTROL	20	20	1.00		
EOHAUTORIUS	GC	LAH1	0	20	0.00	0.00	0.00
EOHAUTORIUS	GC	LAH1	0	20	0.00		
EOHAUTORIUS	GC	LAH1	0	20	0.00		
EOHAUTORIUS	GC	LAH1	0	20	0.00		
EOHAUTORIUS	GC	LAH1	0	20	0.00		

TEST ORGANISM	LAB CODE	STATION ID	NUMBER ALIVE	NUMBER AT START	PROPORTION ALIVE	MEAN	STANDARD DEVIATION
EOHAUTORIUS	GC	LAH2	17	20	0.85	0.86	0.05
EOHAUTORIUS	GC	LAH2	17	20	0.85		
EOHAUTORIUS	GC	LAH2	16	20	0.80		
EOHAUTORIUS	GC	LAH2	17	20	0.85		
EOHAUTORIUS	GC	LAH2	19	20	0.95		
EOHAUTORIUS	GC	LAH3	0	20	0.00	0.20	0.18
EOHAUTORIUS	GC	LAH3	1	20	0.05		
EOHAUTORIUS	GC	LAH3	5	20	0.25		
EOHAUTORIUS	GC	LAH3	9	20	0.45		
EOHAUTORIUS	GC	LAH3	5	20	0.25		
EOHAUTORIUS	GC	LAH4	16	20	0.80	0.79	0.04
EOHAUTORIUS	GC	LAH4	17	20	0.85		
EOHAUTORIUS	GC	LAH4	16	20	0.80		
EOHAUTORIUS	GC	LAH4	15	20	0.75		
EOHAUTORIUS	GC	LAH4	15	20	0.75		
EOHAUTORIUS	ABC	CONTROL	20	20	1.00	0.97	0.04
EOHAUTORIUS	ABC	CONTROL	18	20	0.90		
EOHAUTORIUS	ABC	CONTROL	20	20	1.00		
EOHAUTORIUS	ABC	CONTROL	20	20	1.00		
EOHAUTORIUS	ABC	CONTROL	19	20	0.95		
EOHAUTORIUS	ABC	LAH1	0	20	0.00	0.00	0.00
EOHAUTORIUS	ABC	LAH1	0	20	0.00		
EOHAUTORIUS	ABC	LAH1	0	20	0.00		
EOHAUTORIUS	ABC	LAH1	0	20	0.00		
EOHAUTORIUS	ABC	LAH1	0	20	0.00		
EOHAUTORIUS	ABC	LAH2	13	20	0.65	0.63	0.06
EOHAUTORIUS	ABC	LAH2	12	20	0.60		
EOHAUTORIUS	ABC	LAH2	11	20	0.55		
EOHAUTORIUS	ABC	LAH2	13	20	0.65		
EOHAUTORIUS	ABC	LAH2	14	20	0.70		
EOHAUTORIUS	ABC	LAH3	7	20	0.35	0.19	0.14
EOHAUTORIUS	ABC	LAH3	0	20	0.00		
EOHAUTORIUS	ABC	LAH3	3	20	0.15		
EOHAUTORIUS	ABC	LAH3	3	20	0.15		
EOHAUTORIUS	ABC	LAH3	6	20	0.30		
EOHAUTORIUS	ABC	LAH4	16	20	0.80	0.72	0.06
EOHAUTORIUS	ABC	LAH4	14	20	0.70		
EOHAUTORIUS	ABC	LAH4	13	20	0.65		
EOHAUTORIUS	ABC	LAH4	15	20	0.75		
EOHAUTORIUS	ABC	LAH4	14	20	0.70		
EOHAUTORIUS	LA	CONTROL	20	20	1.00	0.97	0.04
EOHAUTORIUS	LA	CONTROL	18	20	0.90		
EOHAUTORIUS	LA	CONTROL	20	20	1.00		
EOHAUTORIUS	LA	CONTROL	20	20	1.00		
EOHAUTORIUS	LA	CONTROL	19	20	0.95		
EOHAUTORIUS	LA	LAH1	6	20	0.30	0.23	0.10
EOHAUTORIUS	LA	LAH1	7	20	0.35		
EOHAUTORIUS	LA	LAH1	4	20	0.20		
EOHAUTORIUS	LA	LAH1	2	20	0.10		
EOHAUTORIUS	LA	LAH1	4	20	0.20		
EOHAUTORIUS	LA	LAH2	14	20	0.70	0.70	0.11
EOHAUTORIUS	LA	LAH2	17	20	0.85		
EOHAUTORIUS	LA	LAH2	13	20	0.65		
EOHAUTORIUS	LA	LAH2	11	20	0.55		
EOHAUTORIUS	LA	LAH2	15	20	0.75		

TEST ORGANISM	STATION ID	NUMBER ALIVE	NUMBER AT START	PROPORTION ALIVE	MEAN	STANDARD DEVIATION
EOHAUTORIUS	2182	15	20	0.75	0.85	0.07
EOHAUTORIUS	2182	18	20	0.90		
EOHAUTORIUS	2182	18	20	0.90		
EOHAUTORIUS	2182	16	20	0.80		
EOHAUTORIUS	2182	18	20	0.90		
EOHAUTORIUS	2184	14	20	0.70	0.89	0.13
EOHAUTORIUS	2184	16	20	0.80		
EOHAUTORIUS	2184	19	20	0.95		
EOHAUTORIUS	2184	20	20	1.00		
EOHAUTORIUS	2184	20	20	1.00		
EOHAUTORIUS	2185	17	20	0.85	0.87	0.09
EOHAUTORIUS	2185	20	20	1.00		
EOHAUTORIUS	2185	15	20	0.75		
EOHAUTORIUS	2185	18	20	0.90		
EOHAUTORIUS	2185	17	20	0.85		
EOHAUTORIUS	2186	20	20	1.00	0.86	0.16
EOHAUTORIUS	2186	12	20	0.60		
EOHAUTORIUS	2186	17	20	0.85		
EOHAUTORIUS	2186	18	20	0.90		
EOHAUTORIUS	2186	19	20	0.95		
EOHAUTORIUS	2187	19	20	0.95	0.80	0.29
EOHAUTORIUS	2187	6	20	0.30		
EOHAUTORIUS	2187	18	20	0.90		
EOHAUTORIUS	2187	20	20	1.00		
EOHAUTORIUS	2187	17	20	0.85		
EOHAUTORIUS	2311	9	20	0.45	0.60	0.12
EOHAUTORIUS	2311	11	20	0.55		
EOHAUTORIUS	2311	11	20	0.55		
EOHAUTORIUS	2311	14	20	0.70		
EOHAUTORIUS	2311	15	20	0.75		
EOHAUTORIUS	2431	16	20	0.80	0.92	0.09
EOHAUTORIUS	2431	20	20	1.00		
EOHAUTORIUS	2431	20	20	1.00		
EOHAUTORIUS	2431	17	20	0.85		
EOHAUTORIUS	2431	19	20	0.95		
EOHAUTORIUS	2432	19	20	0.95	0.85	0.15
EOHAUTORIUS	2432	20	20	1.00		
EOHAUTORIUS	2432	17	20	0.85		
EOHAUTORIUS	2432	12	20	0.60		
EOHAUTORIUS	2432	17	20	0.85		

TEST ORGANISM	EXPOSURE	STATION ID	NORMAL ALIVE LARVAE	INITIAL DENSITY	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
MYTILUS	Static SWI	HOME	119	115	1.03	0.84	0.15
MYTILUS	Static SWI	HOME	92	115	0.80		
MYTILUS	Static SWI	HOME	72	115	0.63		
MYTILUS	Static SWI	HOME	107	115	0.93		
MYTILUS	Static SWI	HOME	94	115	0.82		
MYTILUS	Static SWI	2152	96	115	0.83	0.68	0.13
MYTILUS	Static SWI	2152	85	115	0.74		
MYTILUS	Static SWI	2152	65	115	0.57		
MYTILUS	Static SWI	2152	68	115	0.59		
MYTILUS	Static SWI	2152	51	115	0.44		
MYTILUS	Static SWI	2153	77	115	0.67	0.47	0.32
MYTILUS	Static SWI	2153	0	115	0.00		
MYTILUS	Static SWI	2153	57	115	0.50		
MYTILUS	Static SWI	2153	80	115	0.70		
MYTILUS	Static SWI	2153	79	115	0.69		
MYTILUS	Static SWI	2154	77	115	0.67	0.72	0.11
MYTILUS	Static SWI	2154	101	115	0.88		
MYTILUS	Static SWI	2154	89	115	0.77		
MYTILUS	Static SWI	2154	81	115	0.70		
MYTILUS	Static SWI	2154	67	115	0.58		
MYTILUS	Static SWI	2155	81	115	0.70	0.69	0.10
MYTILUS	Static SWI	2155	89	115	0.77		
MYTILUS	Static SWI	2155	80	115	0.70		
MYTILUS	Static SWI	2155	60	115	0.52		
MYTILUS	Static SWI	2155	88	115	0.77		
MYTILUS	Static SWI	2156	71	115	0.62	0.77	0.20
MYTILUS	Static SWI	2156	92	115	0.80		
MYTILUS	Static SWI	2156	61	115	0.53		
MYTILUS	Static SWI	2156	115	115	1.00		
MYTILUS	Static SWI	2156	106	115	0.92		
MYTILUS	Static SWI	2157	97	115	0.84	0.71	0.21
MYTILUS	Static SWI	2157	66	115	0.57		
MYTILUS	Static SWI	2157	82	115	0.71		
MYTILUS	Static SWI	2157	113	115	0.98		
MYTILUS	Static SWI	2157	53	115	0.46		
MYTILUS	Static SWI	2158	66	115	0.57	0.73	0.19
MYTILUS	Static SWI	2158	107	115	0.93		
MYTILUS	Static SWI	2158	108	115	0.94		
MYTILUS	Static SWI	2158	72	115	0.63		
MYTILUS	Static SWI	2158	67	115	0.58		
MYTILUS	Static SWI	2159	108	115	0.94	0.61	0.22
MYTILUS	Static SWI	2159	66	115	0.57		
MYTILUS	Static SWI	2159	79	115	0.69		
MYTILUS	Static SWI	2159	61	115	0.53		
MYTILUS	Static SWI	2159	39	115	0.34		
MYTILUS	Static SWI	2160	83	115	0.72	0.59	0.16
MYTILUS	Static SWI	2160	79	115	0.69		
MYTILUS	Static SWI	2160	47	115	0.41		
MYTILUS	Static SWI	2160	83	115	0.72		
MYTILUS	Static SWI	2160	50	115	0.43		
MYTILUS	Static SWI	2161	67	115	0.58	0.70	0.12
MYTILUS	Static SWI	2161	70	115	0.61		
MYTILUS	Static SWI	2161	76	115	0.66		
MYTILUS	Static SWI	2161	100	115	0.87		
MYTILUS	Static SWI	2161	92	115	0.80		

TEST ORGANISM	EXPOSURE	STATION ID	NORMAL ALIVE LARVAE	INITIAL DENSITY	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
MYTILUS	Static SWI	2163	70	115	0.61	0.74	0.14
MYTILUS	Static SWI	2163	72	115	0.63		
MYTILUS	Static SWI	2163	101	115	0.88		
MYTILUS	Static SWI	2163	103	115	0.90		
MYTILUS	Static SWI	2163	82	115	0.71		
MYTILUS	Static SWI	2167	74	115	0.64	0.72	0.13
MYTILUS	Static SWI	2167	79	115	0.69		
MYTILUS	Static SWI	2167	70	115	0.61		
MYTILUS	Static SWI	2167	85	115	0.74		
MYTILUS	Static SWI	2167	107	115	0.93		
MYTILUS	Static SWI	2169	83	115	0.72	0.72	0.04
MYTILUS	Static SWI	2169	88	115	0.77		
MYTILUS	Static SWI	2169	77	115	0.67		
MYTILUS	Static SWI	2169	78	115	0.68		
MYTILUS	Static SWI	2169	86	115	0.75		
MYTILUS	Static SWI	2170	92	115	0.80	0.85	0.10
MYTILUS	Static SWI	2170	83	115	0.72		
MYTILUS	Static SWI	2170	98	115	0.85		
MYTILUS	Static SWI	2170	115	115	1.00		
MYTILUS	Static SWI	2170	102	115	0.89		
MYTILUS	Static SWI	2172	86	115	0.75	0.79	0.13
MYTILUS	Static SWI	2172	87	115	0.76		
MYTILUS	Static SWI	2172	86	115	0.75		
MYTILUS	Static SWI	2172	117	115	1.02		
MYTILUS	Static SWI	2172	81	115	0.70		
MYTILUS	Static SWI	2173	91	115	0.79	0.77	0.15
MYTILUS	Static SWI	2173	114	115	0.99		
MYTILUS	Static SWI	2173	65	115	0.57		
MYTILUS	Static SWI	2173	83	115	0.72		
MYTILUS	Static SWI	2173	88	115	0.77		
MYTILUS	Static SWI	2175	11	115	0.10	0.69	0.34
MYTILUS	Static SWI	2175	80	115	0.70		
MYTILUS	Static SWI	2175	103	115	0.90		
MYTILUS	Static SWI	2175	103	115	0.90		
MYTILUS	Static SWI	2175	100	115	0.87		
MYTILUS	Static SWI	2179	25	115	0.22	0.74	0.31
MYTILUS	Static SWI	2179	80	115	0.70		
MYTILUS	Static SWI	2179	113	115	0.98		
MYTILUS	Static SWI	2179	106	115	0.92		
MYTILUS	Static SWI	2179	104	115	0.90		
MYTILUS	Static SWI	2182	101	115	0.88	0.84	0.23
MYTILUS	Static SWI	2182	127	115	1.10		
MYTILUS	Static SWI	2182	85	115	0.74		
MYTILUS	Static SWI	2182	110	115	0.96		
MYTILUS	Static SWI	2182	58	115	0.50		
MYTILUS	Static SWI	2184	94	115	0.82	0.75	0.11
MYTILUS	Static SWI	2184	90	115	0.78		
MYTILUS	Static SWI	2184	87	115	0.76		
MYTILUS	Static SWI	2184	95	115	0.83		
MYTILUS	Static SWI	2184	63	115	0.55		
MYTILUS	Static SWI	2185	118	115	1.03	0.90	0.12
MYTILUS	Static SWI	2185	87	115	0.76		
MYTILUS	Static SWI	2185	93	115	0.81		
MYTILUS	Static SWI	2185	116	115	1.01		
MYTILUS	Static SWI	2185	106	115	0.92		

TEST ORGANISM	EXPOSURE	STATION ID	NORMAL ALIVE LARVAE	INITIAL DENSITY	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
MYTILUS	Static SWI	2186	85	115	0.74	0.82	0.09
MYTILUS	Static SWI	2186	95	115	0.83		
MYTILUS	Static SWI	2186	104	115	0.90		
MYTILUS	Static SWI	2186	82	115	0.71		
MYTILUS	Static SWI	2186	105	115	0.91		
MYTILUS	Static SWI	2187	81	115	0.70	0.81	0.09
MYTILUS	Static SWI	2187	106	115	0.92		
MYTILUS	Static SWI	2187	88	115	0.77		
MYTILUS	Static SWI	2187	90	115	0.78		
MYTILUS	Static SWI	2187	103	115	0.90		
MYTILUS	Static SWI	2311	66	115	0.57	0.63	0.08
MYTILUS	Static SWI	2311	85	115	0.74		
MYTILUS	Static SWI	2311	67	115	0.58		
MYTILUS	Static SWI	2311	81	115	0.70		
MYTILUS	Static SWI	2311	66	115	0.57		
MYTILUS	Static SWI	2431	64	115	0.56	0.79	0.17
MYTILUS	Static SWI	2431	84	115	0.73		
MYTILUS	Static SWI	2431	113	115	0.98		
MYTILUS	Static SWI	2431	85	115	0.74		
MYTILUS	Static SWI	2431	108	115	0.94		
MYTILUS	Static SWI	2432	110	115	0.96	0.83	0.21
MYTILUS	Static SWI	2432	72	115	0.63		
MYTILUS	Static SWI	2432	118	115	1.03		
MYTILUS	Static SWI	2432	65	115	0.57		
MYTILUS	Static SWI	2432	111	115	0.97		
MYTILUS	Flow SWI	HOME	98	115	0.85	0.78	0.14
MYTILUS	Flow SWI	HOME	108	115	0.94		
MYTILUS	Flow SWI	HOME	74	115	0.64		
MYTILUS	Flow SWI	HOME	72	115	0.63		
MYTILUS	Flow SWI	HOME	94	115	0.82		
MYTILUS	Flow SWI	CONTROL	85	115	0.74	0.67	0.13
MYTILUS	Flow SWI	CONTROL	73	115	0.63		
MYTILUS	Flow SWI	CONTROL	98	115	0.85		
MYTILUS	Flow SWI	CONTROL	72	115	0.63		
MYTILUS	Flow SWI	CONTROL	60	115	0.52		
MYTILUS	Flow SWI	2169	104	115	0.90	0.85	0.13
MYTILUS	Flow SWI	2169	119	115	1.03		
MYTILUS	Flow SWI	2169	82	115	0.71		
MYTILUS	Flow SWI	2169	96	115	0.83		
MYTILUS	Flow SWI	2169	86	115	0.75		
MYTILUS	Flow SWI	2172	89	115	0.77	0.67	0.09
MYTILUS	Flow SWI	2172	70	115	0.61		
MYTILUS	Flow SWI	2172	66	115	0.57		
MYTILUS	Flow SWI	2172	87	115	0.76		
MYTILUS	Flow SWI	2172	75	115	0.65		
MYTILUS	Flow SWI	2173	86	115	0.75	0.69	0.12
MYTILUS	Flow SWI	2173	78	115	0.68		
MYTILUS	Flow SWI	2173	58	115	0.50		
MYTILUS	Flow SWI	2173	82	115	0.71		
MYTILUS	Flow SWI	2173	94	115	0.82		
MYTILUS	Flow SWI	2175	92	115	0.80	0.61	0.12
MYTILUS	Flow SWI	2175	65	115	0.57		
MYTILUS	Flow SWI	2175	63	115	0.55		
MYTILUS	Flow SWI	2175	76	115	0.66		
MYTILUS	Flow SWI	2175	56	115	0.49		

TEST ORGANISM	EXPOSURE	STATION ID	NORMAL ALIVE LARVAE	INITIAL DENSITY	PROPORTION NORMAL	MEAN	STANDARD DEVIATION
MYTILUS	Flow SWI	2179	82	115	0.71	0.64	0.11
MYTILUS	Flow SWI	2179	61	115	0.53		
MYTILUS	Flow SWI	2179	79	115	0.69		
MYTILUS	Flow SWI	2179	85	115	0.74		
MYTILUS	Flow SWI	2179	59	115	0.51		
MYTILUS	Flow SWI	2182	90	115	0.78	0.70	0.07
MYTILUS	Flow SWI	2182	84	115	0.73		
MYTILUS	Flow SWI	2182	68	115	0.59		
MYTILUS	Flow SWI	2182	81	115	0.70		
MYTILUS	Flow SWI	2182	78	115	0.68		
MYTILUS	Flow SWI	2184	88	115	0.77	0.68	0.13
MYTILUS	Flow SWI	2184	69	115	0.60		
MYTILUS	Flow SWI	2184	77	115	0.67		
MYTILUS	Flow SWI	2184	97	115	0.84		
MYTILUS	Flow SWI	2184	60	115	0.52		
MYTILUS	Flow SWI	2185	95	115	0.83	0.73	0.10
MYTILUS	Flow SWI	2185	67	115	0.58		
MYTILUS	Flow SWI	2185	88	115	0.77		
MYTILUS	Flow SWI	2185	91	115	0.79		
MYTILUS	Flow SWI	2185	76	115	0.66		
MYTILUS	Flow SWI	2186	91	115	0.79	0.77	0.09
MYTILUS	Flow SWI	2186	74	115	0.64		
MYTILUS	Flow SWI	2186	101	115	0.88		
MYTILUS	Flow SWI	2186	93	115	0.81		
MYTILUS	Flow SWI	2186	85	115	0.74		
MYTILUS	Flow SWI	2187	63	115	0.55	0.61	0.09
MYTILUS	Flow SWI	2187	55	115	0.48		
MYTILUS	Flow SWI	2187	77	115	0.67		
MYTILUS	Flow SWI	2187	79	115	0.69		
MYTILUS	Flow SWI	2187	75	115	0.65		
MYTILUS	Flow SWI	2431	83	115	0.72	0.67	0.10
MYTILUS	Flow SWI	2431	85	115	0.74		
MYTILUS	Flow SWI	2431	58	115	0.50		
MYTILUS	Flow SWI	2431	81	115	0.70		
MYTILUS	Flow SWI	2431	79	115	0.69		
MYTILUS	Flow SWI	2432	75	115	0.65	0.75	0.10
MYTILUS	Flow SWI	2432	96	115	0.83		
MYTILUS	Flow SWI	2432	88	115	0.77		
MYTILUS	Flow SWI	2432	98	115	0.85		
MYTILUS	Flow SWI	2432	75	115	0.65		