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THE ASSESSMENT OF SEVEN NORTHERN TERRITORY GASTROPOD SPECIES FOR USE AS BIOLOGICAL MONITORS OF RANGER URANIUM MINE RETENTION POND WATERS

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The Supervising Scientist for the Alligator Rivers Region has research, supervisory and co-ordination responsibilities related to effects on the environment of uranium mining in the Alligator Rivers Region and research and supervisory responsibilities related to effects on the environment of non-uranium mining in a conservation zone declared within the Region.

Supervising Scientist for the Alligator Rivers Region

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ABSTRACT

Seven species of freshwater snails were examined for potential as use for the biological monitoring of Ranger Uranium Mine retention pond waters. Uranium is the main source of toxicity in this water, and because molluscs in general display a sensitivity to, or otherwise react to metal contamination, they were considered likely to respond. To test this, several stages of the life cycle of the species were examined. It was found that some species were unsuitable for use as biological monitors because of handling, rearing or other reasons not related to toxic response. One of the species tested was relatively insensitive to the toxicant. Two species of Amerianna were sensitive to low concentrations of Ranger RP2 waters, and the most sensitive and consistent endpoints were related to fecundity. To persue this effect, electron microscopy was carried out on a selection of tissues possibly affected by toxicants in the waters; it was found that uranium had accumulated in the ovotestis. Other endpoints in the literature commonly seen to be sensitive indicators of metal contaminated conditions, such as juvenile and embryonic mortality, were not observed to be as sensitive as the fecundity endpoints in this series of trials.

INTRODUCTION

A large temporal gap exists between the first bioassay performed by Aristotle testing seawater effects on freshwater organisms and the single species fish bioassay formulated by Hart in 1945 (Cairns and Pratt, 1989). Aristotle's curiosity probably did not encompass the environmental effects of mining, but by the sixteenth century concern had already been expressed. The world's first mining textbook, *De Re Metallica*, by Georguis Agricola in 1556 (Down & Stocks, 1978), contains reference to damage and dissent: "..The strongest argument of the detractors is that the fields are devastated by mining operations...the woods and groves are cut down, for there is need of an endless amount of wood for timbers, machines and the smelting of metals. And when the woods and groves are felled, then are exterminated the beasts and birds, very many of which furnish a pleasant and agreeable food for man. Further, when the ores are washed, the water which has been used poisons the brooks and streams, and either destroys the fish or drives them away... Thus it is said, it is clear to all that there is greater detriment from mining than the value of the metals which the mining produces". *De Re Metallica* does not specify ownership arrangements or ultimate responsibility in those early days.

Mankind's use of metals has increased to the extent at which mineral extraction and associated processes have significantly affected on our natural heritage (Down & Stocks, 1978; Moore & Winner, 1989).

Initially, (partially because classical biologists did not regard industry as a relevant study area,) monitoring of aquatic pollution was physico-chemical, dealing with such parameters as dissolved oxygen, biological oxygen demand, temperature and dissolved solids. In 1945, Hart published the first single species toxicity test protocol, subsequently accepted by the American Society for Testing and Materials (Cairns & Pratt,1989). In 1948, Ruth Patrick (under Hart) was to convince regulatory authorities in the USA that biological methods should be used alongside physico-chemical ones, to adequately protect aquatic ecosystems (Cairns & Pratt, 1989). The rationale was (and is) as follows: physico-chemical methods did not account for periods between sampling; the toxicity of complex mixtures could not be instrumentally quantified; biological effects often occurred below the level of chemical detection; and, the results were in themselves meaningful only in terms of human use of the system (Cairns, 1982). Biologists reply thus: the species inhabiting the water body provide a static, temporal record of events therein; organisms will be exposed to and therefore react to any contaminants present; consistently sensitive endpoints exist; and meaningful extrapolations to any ecological level, including man's needs, are possible. This argument was accepted by industry, regulatory authorities, and the scientific community. After the 1951 establishment of

Doudoroff's protocol (using the test formulated by Hart), many single species toxicity tests were developed, including tests upon invertebrates and algae (Cairns & Pratt, 1989), and were used to some extent in the establishment of emission limits (ie. effluent-based standards).

In the 1970's, a growing awareness on the part of industry and legislators of contamination problems produced pollution-limiting technology. A technological philosophy was particularly attractive to these groups, and the terms Best Available Technology (BAT) and Best Practicable Technology (BPT) were soon encountered in legislative documents (Cairns & Pratt, 1989). BPT (= affordable technology) was often implemented without consideration of an industries local situation. Criticisms of BAT and BPT practices included: the size and assimilative capacity of an ecosystem was not considered; each discharge was regarded uniquely, without factoring other discharges into the same receiving system; there was a chance of over-treatment of no benefit to the ecosystem; there was no incentive to develop better technology, once a BPT was in place (Cairns & Pratt, 1989). The shortfalls inherent in effluent-based and technology-based standards have belatedly resulted in the incorporation of biological evidence to hazard evaluation (Cairns & Pratt, 1989). As such, biological monitoring is in its infancy.

In all, biological monitoring assesses the impact of pollutants and, in association with appropriate regulation, derives standards of release limitation. As well as its regulatory role, biological monitoring should be predictive (Stephan, 1986). By this is meant that conclusions drawn under one regime should be applicable to another, perhaps after some form of transformation.

MINING AND HEAVY METALS

Although mining accounts for only a small percentage of total societal water use (in the US 1960's, 2% of industrial water use, or around 1.8 billion litres/day), and returns around 78% of this to the environment, the water used in the various stages of processing is often highly contaminated. Mining effluent can contain 2 to 10 times the amount of contaminant metal than untreated ore (Down & Stocks, 1978).

Contamination due to metal extraction *per se* of aquatic systems is of several forms:

- dissolved solids - soluble salts
- organic reagents - frothers, collectors, flocculants etc
- suspended solids
- acidic drainage
- heavy metals (Down & Stocks, 1978).

Other impacts of the mining process can arise from site runoff water, mine drainage, pumped mine water, contamination of ground water flows and deposition into the aquatic system of airborne contaminants from smelting (Down & Stocks; 1978, Humphrey *et al.*, 1990). Estimations of anthropogenic mobilisation of heavy metals into the biosphere is presented below (Nriagu & Pacyna, 1988).

Estimated annual heavy metal input into biosphere

	Total input	Mining and processing
Arsenic	120kt	6kt
Cadmium	20kt	2kt
Chromium		11kt
Copper	2150kt	14kt
Manganese		43kt
Mercury	11kt	.01kt
Molybdenum	110kt	.5kt
Nickel	470kt	13kt
Lead	1160kt	6kt
Antimony	72kt	4kt
Selenium	79kt	12kt
Vanadium	71kt	1.2kt
Zinc	2340kt	28kt

The total toxicity of these metals (in terms of water needed to dilute to safe drinking standard) is more than radioactive and organic waste toxicity combined (Nriagu & Pacyna, 1988).

THE FATE OF METALS IN THE AQUATIC ECOSYSTEM

Heavy metals are generally less toxic in hard waters (high Ca^{2+}, high $CO_3{}^{2-}$) due, in some part, to competition between the heavy metal and Ca^{2+} for membrane binding sites (Persoone *et al.*, 1989; Rozsa & Salanki, 1989).

Many of the toxic mechanisms of heavy metals remain uncertain although some work has been carried out.

Inhibition of metabolic coupling via gap junctions was demonstrated using cell culture (Loch-Caruso *et al.*, 1991). The metals investigated were arsenic, cadmium, lead and zinc. Wild-type Chinese hamster V79 cells proficient in the phosphorylation of 6-thioguanine (6-TG) by hypoxanthine phosphoribosyltransferase were cultured with mutant V79 cells lacking the enzyme. The phosphorylation of 6-TG produces a toxic compound, and inhibition of the gap junction transfer of 6-TG was shown by an increased survival of the mutant cells compared to the proficient cells. This implies that heavy metals inhibit the intercellular transfer of metabolites and possibly other types of molecules.

The junction membrane permeability of the silivary glands of *Chironomus* sp. (Diptera) was investigated in terms of the divalent cations of the alkaline earth metals, barium, calcium, magnesium and strontium (Oliviera-Castro & Lowenstein, 1971). It was found that the permeability of the membrane was depressed in the order $Ca^{2+} > Mg^{2+} > Sr^{2+} > Ba^{2+}$. This explains the mitigating role Ca^{2+} (and to a lesser extent Mg^{2+}) displays in the toxicity of heavy metals, in that it has a higher membrane binding potential than the heavier elements in the series. Spehar *et al.*, (1978) also attribute the effect of cadmium on gastropods and trichopterans to a disruption of membrane permeability.

Heavy metals also produce teratogenic effects. Paulij *et al.*, (1990) investigated the effects of copper on the embryogenesis of the squid *Sepia officinalis*. They reported a shortening of the developmental period, but a lowered embryonic viability. Sublethal exposure of lead to Green Frog *(Rama clamitans)* tadpoles was seen to inhibit acquisition and retention of discriminant avoidance learning, (Strickler-Shaw & Taylor, 1990) implying a neurological pathology.

Hyne *et al.*, (1991) report on the deposition of uranium in the discharged nematocyst of *Hydra viridissima*. This was thought to inhibit the growth of new nematocysts resulting in a decreased ability to catch prey. Wrenn *et al.*, (1985) review the literature of uranium toxicity in mammals, including humans. They report no evidence of bone sarcoma having been induced by uranium ingestion, but do report bone sarcomas caused by decay chain products of uranium, and soft tissue sarcoma at sites of particulate uranium deposition. Most damage by uranium ingestion occurs in the proximal renal tubule cells. If the dose is not great enough to cause mortality but massive renal failure, the tubule cells are replaced, although displaying differences from original cells. Uranium in sublethal quantities is rapidly excreted (95% removal over 24hrs), but a small amount may be deposited throughout the skeleton, where it appears to be immobilised. The metabolism of uranium was said to resemble that of the alkaline earth metals.

Because many of the heavy metals are essential trace elements (Chromium, cobalt, copper, iron, manganese, molybdenum, nickel, vanadium) cellular mechanics operate to facilitate their uptake. Therefore, in higher concentrations the uptake of excess metal is guaranteed.

FACTORS AFFECTING THE SPECIATION OF METALS IN THE AQUATIC SYSTEM

In general, it is the speciation of the metal ions which determines the toxicity in a given situation, as well as total metal concentration. Complex organic and inorganic reactions, under the influence of edaphic factors, determine the speciation and toxicity of metals in the aquatic system.

Acidity determines the carbonate activity, and at low pHs the usually stable carbonate/heavy metal complex is largely absent. Low oxygen levels can favour the formation of insoluble sulphides (Kelly, 1988). Naturally occurring organic substances (fulvic and humic acids of plant origin, and various microbial and algal products) are capable of complexing metals, and to varying degrees determine bio availability (Moore & Winner, 1989; McKnight, 1981; McKnight & Morrel, 1979). Clays and silts have a metal binding capacity indirectly proportional to particle size. Norris *et al.*, (1981) observed high metal concentrations in stream water, where the stream bed was sand. A corollary is that the biota of oligotrophic acidic (pH 5 to 6.5) streams are much more sensitive to metal contamination than mesotrophic neutral stream biota.

What follows is a short discourse on the speciation of selected heavy metals, namely copper, lead, zinc and nickel. Uranium is discussed in the last section of this introduction.

Copper

The aqueous chemistry of copper is complex because it can exist in three stable oxidation states. Copper as the divalent cation, tends to disappear quickly, due to complexation, precipitation and adsorption with inorganic, and complexation with organics (Effler *et al.*, 1980). Taub *et al.*, (1986) demonstrated that 25% of the copper recoverable from a laboratory microcosm was adsorbed to quartz sand. In some instances, the chemistry of copper added to natural ecosystems is controlled largely by humic substances. Modelling the speciation $Cu^{2+} + HA \rightarrow CuA^{+} + H^{+}$, McKnight and Morrel (1979) derived an equilibrium constant $K_{eq}=10^{1.5}$. Certain chlorophytic algae are capable of releasing humic material which is a weak copper complexing agent, and the blue-green algae can produce both weak and strong complexing agents (Moore & Winner, 1989). These reactions render the copper biologically unavailable, and reduce toxicity.

The general consensus is that most copper is adsorbed under normal conditions and the concentration of the free ion is very low. The concentration in the filterable fraction (<0.4um) may range from 3 to 80% of total copper, and is largely bound to organics (Kelly, 1988). The tendency for copper to bind to inorganics is more pronounced when the particles are modified by manganese or iron oxide coatings. Concentrations typical of unpolluted rivers range widely (0.6 to 400ppb), with most median concentrations from 5 to 10ppb (Kelly, 1988). Historically, the copper content of available ore has decreased from 40% to around 0.2% processed today (Down & Stocks, 1978).

Lead

Lead, a group IV element along with carbon, germanium, silicon and tin, is capable of forming organoderivatives. These derivatives are considerably more toxic than the free stable ion (Kelly, 1988). Under anaerobic conditions *in vitro*, lead methylation has been observed. This has not been observed in the field (Kelly, 1988). Background levels of lead have been measured as low as 0.006 to 0.05 ppb, although in pristine mineralised areas, concentrations two or three orders of magnitude greater have been measured (Kelly, 1988) The divalent cation is most stable under oxidising conditions, forming carbonate above pH 7.2 and hydroxide above pH 10. The carbonate is assumed to act as the major factor controlling the free ion concentration, although at acidic pH the sulphate may assume this role. Lead and zinc often occur together.

Zinc

Zinc exists in only one stable oxidation state, and its chemistry is more easily understood. Wide use of zinc makes analysis of very dilute solutions difficult because of microcontamination, but measures of filterable fractions in pristine waterbodies range from 1.8 to 20ppb. Adsorption onto particulates is the major factor in determining free ion concentration. Hydroxides and carbonates formed above pH 8 remain readily soluble. Adsorption is strongly pH dependant, almost nil at pH 6, and increasing with pH (Kelly, 1988).

Nickel

In most natural waters, pH 5 to 9, the most prevalent nickel ion is Ni^{2+} or the carbonate, with hydroxide, chloride, sulphate and ammonium also present. A large proportion (5 to 80%) of the total nickel concentration is found in the non-filterable fraction, probably adsorbed onto particulate material. Particulate adsorption, rather than precipitation, is thought to control free ion concentrations (Kelly, 1988).

Particulate phases of the metal, as organic or inorganic precipitant complexes, can enter the sediment (n3). Disturbance, both physical and biological (benthic macroinvertebrates) can at any time remobilise these sediment-bound metals (m8). For both rivers and lakes the nature of the sediment is an important factor in controlling sedimental adsorption. Adsorption and precipitation are functions of surface area, and the capacities of the sediments increase as the particle size decreases (Kelly, 1988). Where there is little retention of fine clay and organics, the concentrations of heavy metals in the sediment is likely to be low (Norris *et al.*, 1981).

BIOLOGICAL MONITORING - METHODOLOGY

A current source of contention in the biological monitoring field centres around the aptness or otherwise of traditional single species toxicity tests to accurately reflect effects in the field. Proponents hold that natural variability in the field precludes use of wider ranging studies for regulatory purposes, that information gained from multispecies testing is difficult to interpret and that the results of the two methods are in any case mostly comparable (Tebo, 1985). Critics say that it cannot predict effects at the population and community levels, that an all-encompassing standard of toxicant limitation is not effective in protecting diverse systems (Tebo, 1985), and that unanticipated effects can be observed in multispecies testing (Cooper & Stout, 1985). All acknowledge that effects of contamination on populations and communities is but poorly understood, and emphasise the need for an escalation of effort in this area (Tebo, 1985; Cairns & Pratt, 1989; Loewengart & Maki, 1985).

Current methodologies in biological monitoring include (Humphrey *et al.* 1990):

- Bioassays - the use of defined species to estimate toxicity *in vitro;*
- Early detection systems - physiological, behavioural biochemical and histopathological techniques (bioassays) used *in situ*;
- Indicator organisms - the presence or absence of sensitive or resistant organisms thought to characterise particular conditions *in vivo*
- Autecological (population) studies - the natural history of populations of species that provides essential baseline data;
- Community structure and function - how species and populations interact in terms of niche structure and energy movement *in vivo* and *in vitro;* and
- Bioaccumulation - the accumulation of contaminants in exposed organisms, serving as a record of ambient contaminant concentrations over time.

There is no ideal biological monitoring method. An ecological impact study or monitoring program should include those methods considered appropriate to the task.

There is a large literature on single species toxicity tests that cover all levels of community structure of the aquatic ecosystem. Extensive reference lists can be found in Phillips, (1980)' Kelly, (1988) and Krenkel, (1975). The literature of vertebrate biological monitoring will not be discussed.

Microorganisms

A commercially available microbial (Microtox) assay uses luminescent bacteria. The bacteria are freeze dried and resuspended for use. Light production is measured for a range of dilutions of the toxicant, and toxicological parameters can be then estimated. Chang *et al.*, (1981) describe the use of this system for pesticides, and Loewengart and Maki (1985) provide results using Microtox in comparison to multispecies methods. In the latter instance, Microtox took 5% of the time, was cheaper, yielded fairly reproducible results, required no culturing and was standardised and easy to handle.

Algae

Algae, the primary producer in many aquatic systems, have been well investigated in terms of metal susceptibility. Also, due to copper sulphate treatment of algal blooms in eutrophied water bodies, copper relations with a variety of alga are well understood. Although a micro-nutrient requirement, copper sensitivity becomes important at concentrations higher than 10mg/L, beyond which more resistant species may become dominant (McKnight & Morrel, 1979; McKnight, 1981). Accidental inoculation of a copper resistant strain of alga into a multispecies trial using ten algae, resulted in a more complex co-dominance pattern compared with those not so treated, with several species able to maintain populations under the dominance of the resistant strain (Taub *et al.*, 1986).

Some authors recommend against the use of algae in single species toxicity tests because they may increase production under stress *et al.*, 1980), and in stationary growth phase are known to release metal binding substances (McKnight & Morrel, 1979). It is also difficult to maintain mono-species cultures in many situations, and there are problems associated with agglutination (Effler *et al.*, 1980). Other authors have reported excellent results and recommend their use as biological monitors (Kallqvist, 1984)Algae tend to be included in most multispecies tests, particularly in microcosm and mesocosm trials, to determine how effects at the bottom of the food chain are transmitted upward, and also how events at higher levels affect the algae (Carpenter *et al.*, 1987).

Copper inhibition of nitrogen fixation by the blue-green algae was investigated by Horne and Goldman (1974), and was more sensitive than either photosynthesis or chlorophyll *a* for the whole lake. Inhibition was seen to occur at 10ug/L.

Macroinvertebrates

Macroinvertebrates have become important in single species toxicity tests, *in situ* sampling and in multispecies tests. They have a wide range of sensitivities and are involved in complex interactions, and hold promise as the best group for biological monitoring purposes (Hellawell, 1986).

Various members of the cladoceran *Daphnia* genus have well established protocols (Mount & Norburg, 1984). The cladocerans as a group are excellent subjects for short-term testing, because they have a rapid life cycle of 4 to 7 days, during which they may produce up to three broods. A 4-day *Ceriodaphnia* test recently published (Masters *et al.*, 1991), shows comparable sensitivity to the 7-day test of Mount and Norburg.

Hydra species have been used in various situations. OSS uses *Hydra viridissima* in its seasonal testing of retention pond waters from Ranger Uranium Mine (OSS, 1988). Goss *et al.*, (1986) provide a protocol for *Hydra* sp. in human health hazard evaluation.

Aquatic Insects

In the past, aquatic insects have been extensively used to assess the status of water bodies Indices such as the Trent Biotic Index (Woodiwiss,1964) and the Chandler Score (Chandler, 1970) were devised to assess organic pollution and are generally disfavoured today, although the concept of indicator species maintains its importance. Multivariate analysis and methods applied to presence/absence or species abundance is the most common contemporary analysis. Several Australian publications report success using this approach (Marchant, 1990: Norris *et al.*, 1981; Weatherly *et al.*, 1967). However, the aptness of accepted methodology and mathematical technique has been questioned, with some authors preferring distance measures such as the Brau-Curtis over the Chi-squared measures used in detrended correspondence analysis, among others (D. Faith *pers comm.*, 1991). Also, natural background fluctuations can often swamp trends if sufficient data through time are not present in the analysis (C. Humphrey *pers comm.*, 1991).

Apart from extensive use as *in situ* biological monitors, aquatic insects have received scant attention. Their size and complex life history (which usually includes several moults) make them unacceptable in single species testing (Smock, 1983). Several authors have included aquatic insects in multispecies microcosm testing, with variable results, and in some cases, tenuous endpoints, e.g. avoidance behaviour (Pontasch & Cairns, 1991).

Gastropods as biological monitors

Much pollution work has been carried out on the marine molluscs, particularly bivalves in the genera *Mytilus*, *Perma* and *Crassostrea*. These species have a broad marine distribution, permitting their use for wide-ranging metal pollution studies. Marine gastropods have been used to a lesser extent, and freshwater gastropods still less.

Ravera (1977) examined the effects of heavy metals on *Biomphlaria glabrata*, a freshwater pulmonate, in terms of mortality and fecundity of the adults, and the viability of the embryos. It was seen that the species was sensitive both as adult and embryo. Larval survival after exposure to chrome and copper at higher concentration (>1.0ppm) was of the same order as adult survival, but was greater than adult survival at concentrations from 0.1 to 0.5ppm. He concluded that the species should be used in toxicity testing because it was easily reared and was sensitive to the heavy metals.

Other early testing includes that of Borgman *et al.*, 1978 (lead effects on *Lymnaea palustris*), Rehwoldt *et al.*, 1973 (copper, zinc, nickel, cadmium, mercury and chromium effects on *Amnicola* sp.) while reference lists can be found in Mance (1987), Phillips (1980) and Simkiss and Mason (1983).

Holcombe *et al.* (1984) provide methods for conducting embryo through to adult exposures. They tested the effects of cadmium and reduced pH on the pulmonate *Aplexa hypnorum* and concluded that the species was suitable for use as a biological monitor in all its life stages. Brown (1980) showed that *Hydrobia jenkensi* responded (mortality) to *in situ* metal levels, but not to dieldrin levels, which reached 30ppb. Marigomez *et al.*, (1986) demonstrated feeding suppression and weight loss in the terrestrial pulmonate (slug) *Arion ater*. Percentage weight loss was linear at high concentrations and exponential at the lower concentrations, suggesting the failure of a compensatory mechanism after 15 days. Watton and Hawkes (1984) report on a series of copper and ammonia trials conducted on the prosobranch *Potamopyrgus jenkinsi*. Juveniles were seen to be less tolerant than adults, and were generally less tolerant than most other invertebrates reported in the literature. They concluded that the species would be useful as a biological monitor of copper and ammonia in the various ionic forms. Munzinger and Guarducci (1988) report on the exposure of *Biomphlaria glagrata* to low levels of zinc. The embryo was seen to be the most sensitive stage. Juveniles were roughly 3 times more sensitive (comparing percentage mortalities after 33 days exposure) than the adult. They concluded that the species was a successful laboratory indicator of low level zinc pollution. Russell *et al.*, (1981) investigated the effect of cadmium on *Helix aspersa* and its accumulation and entry into the food chain.

Among other observations, they noted a disruption of gametogenesis. Ramesh Babu and Venkateswara Rao (1985) investigated the biochemical basis of copper toxicity in *Lymnaea luteola* and concluded that copper altered the redox potential of the snails metabolism by reducing the activity of cytochrome oxidase and NADH to NAD ratio. Skidmore *et al.*, (1988) demonstrated a reduction in fecundity of *Physastra gibbosa* following static exposure to copper concentrations above 16ppb. They recommend the fecundity endpoint as a means of measuring sublethal toxicity of substances to Australian aquatic species.

Although the work performed to date on the pulmonates does not comprise a large part of the molluscan metal-related literature, what does exist indicates their sensitivity to heavy metals and authors frequently recommend them as biological monitors of heavy metals.

URANIUM AND URANIUM MINING

The extraction and on-site processing of uranium ore poses risks to the aquatic environment through the release of uranium and its decay chain products into local systems. On-site processing is invariably carried out because of the saving of transport costs of a semi refined product over raw ore. The Alligator Rivers Region, area of operation for the Ranger Uranium Mine (RUM), receives a highly seasonal rainfall. Dams have been constructed around the mine and mill to receive runoff water during the wet season. Because the rainfall can be intense, RUM is licensed under recommendations of the Fox Report (1977), to release water from its Retention Pond #4 once the flow rate in the nearby Magela Ck exceeds $20m^3$/sec. This retention pond receives runoff from the waste rock dump, and is low in uranium (40ppb) (Hyne, 1989). Retention Pond #2 receives runoff from the milling area and has highly variable uranium concentrations (660-3000ppb). In the 1991 wet season, values of between 1300 and 1700ppm were recorded. RUM is licensed to release from RP2 once every ten years. Release from this dam would only occur if there was a possibility of overflow during the wet season. There has been no release from RP2 to date (Diagrams 1 and 2 show respectively, a map of the Alligator Rivers Region and layout of RUM).

The environmental chemistry of uranium is complicated by the variety of forms the uranyl ion may take. In Magela Ck, slightly acid conditions (pH 6) and low alkalinity (as $CaCO'_3$1.6mg/L) (OSS, 1988) favour UO_2OH^+ (50%) and UO_2^{2+} (10%) over neutral or amnionic forms, the remainder comprising complexed forms of UO_2 (S. Machett *pers. comm.*, 1991). The toxicity of the cations is much higher than the anions because of membrane permeability (R. Hyne *pers. comm.* 1991).

Giesy *et al.*, (1986) report stability constants for various species of the uranyl ion complexed with Aldrich[R] humic acid. The stability constant (K=[ML]/([M][L]) of the neutral and amnionic carbonate forms were 2 to 3 times larger than those of the free uranyl anions. They determined the percentage presence of the various species in a soft, acid, humate rich water (pH=5.5, Ca=5.2mg/l, TDOC=14mg/l). 77.1% of the uranyl ion was present as the free anion (31.1) or the mono-hydroxide (46.0). The remainder (22%) was bound to humic acid, with 0.6 bound to sulphate. These figures compare reasonably well with Machett's figures above, and apart from having a lower dissolved organic carbon level, Magela Ck water is fairly similar to the water used in the Giesy *et al.*, report.

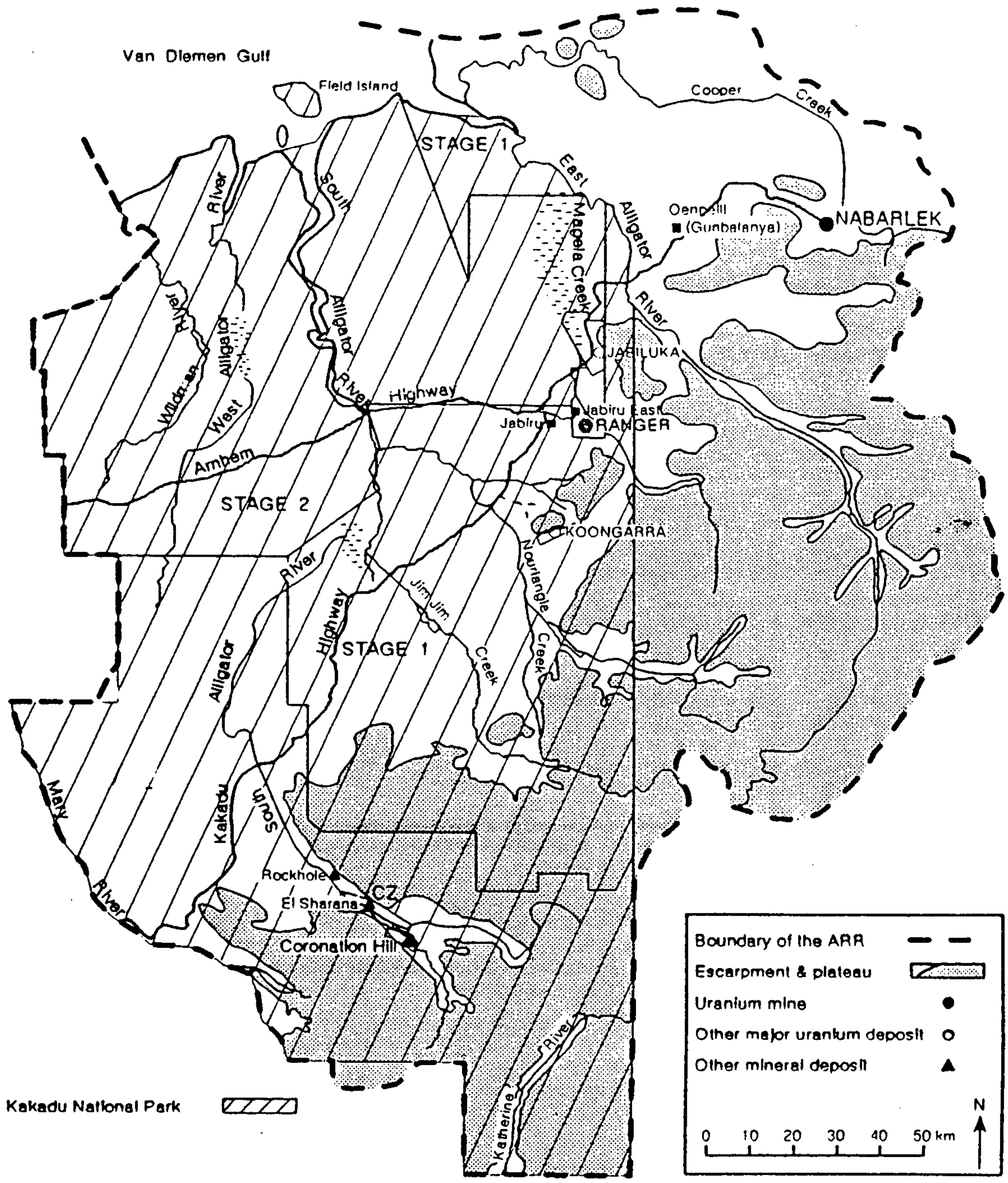

Diagram 1. **The Alligator Rivers Region**

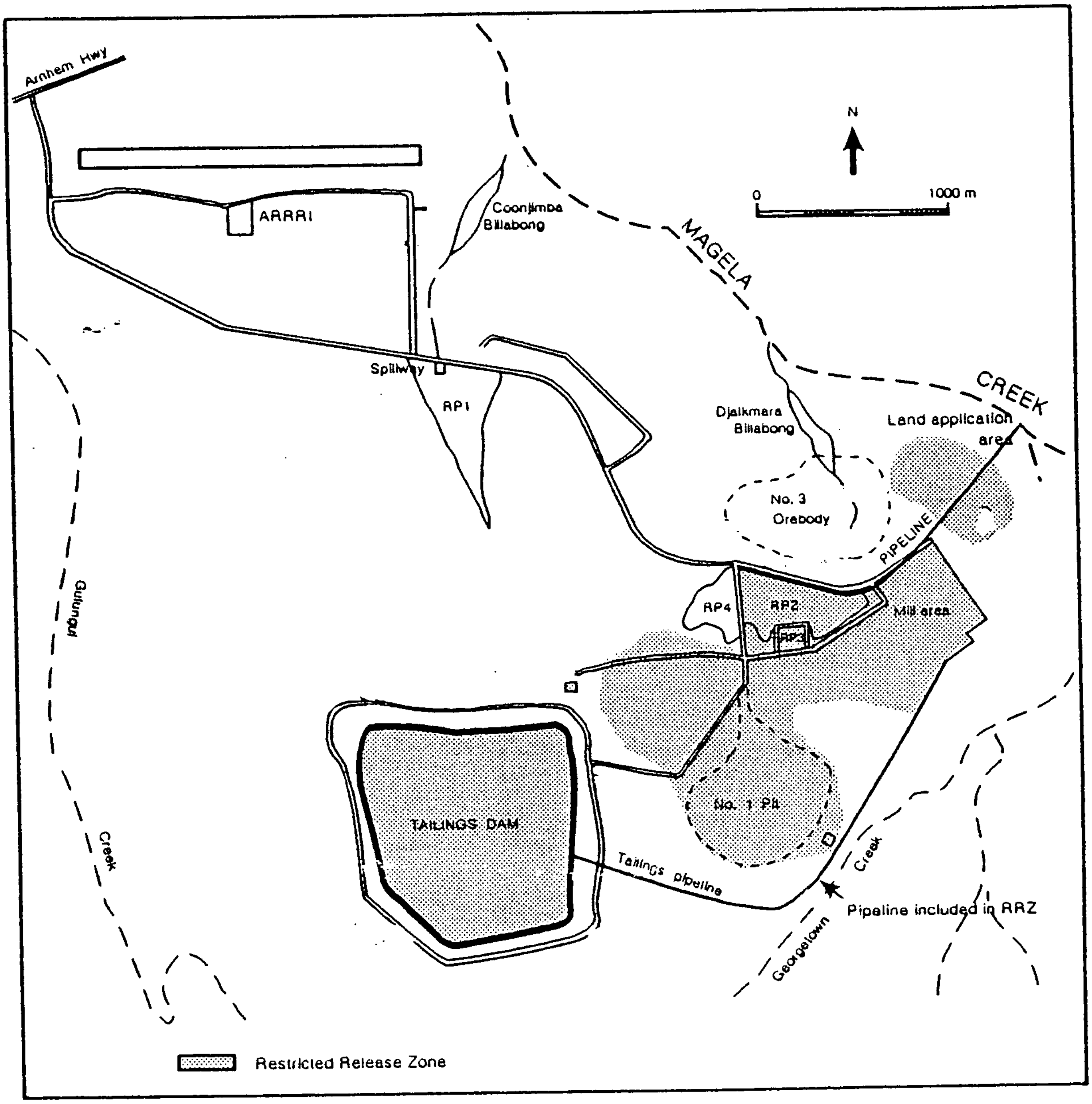

Diagram 2. **Layout of operations and water management system at Ranger**

Hydrous oxides of iron and manganese may also remove the uranyl ion from solution. Soluble manganese will co-precipitate with heavy metals under oxidising conditions. Under slightly acidic and reducing conditions, the manganese will redissolve and release the bound heavy metal back into the water column (OSS, 1988).

Uranium present in retention pond waters released into Magela Ck will be present to a significant extent in toxic cationic forms. Precipitation and remobilisation will presumably occur along the length of the stream. In the cationic form the uranyl ion poses a potential threat to fauna of the creek and floodplain system.

MATERIALS AND METHODS

Species descriptions

The seven local gastropod species selected for assessment are distributed amongst the freshwater bodies of the region. They were:

Amerianna carinata	Pulmonata:Planorbidae
Amerianna cumingii	Pulmonata:Planorbidae
Gabbia sp.	Prosobrancha:Bithyniidae
Glyptophysa sp.	Pulmonata:Planorbidae
Gyraulus sp.	Pulmonata:Planorbidae
Helicorbis sp.	Pulmonata:Planorbidae
Lymnaea sp.	Pulmonata:Lymnaeidae

A. carinata is sinistral with a flattened carinate spire. It measures around 10 mm in length by 8 mm in width at full size. The shell is moderately robust. It is monoecious.

A. cumingii is sinistral with a rounded depressed spire. Mature individuals measure from 8 to 12 mm in length and 8 mm in width. Growth continues into senescence where individuals may be up to 15 mm in length. The shells are moderately robust, slightly stronger than those of *A. carinata*. It is monoecious.

Gabbia sp. is dextral and turbinate. It measures up to 5 mm in length and 4 mm in width. It is dioecious and not sexable by gross morphology. The shell is robust.

Glyptophysa sp. is sinistral with a tall pointed spire. It measures 20 mm in length and 13 in width, although larger individuals are commonly encountered. It is monoecious. The shell is robust but without distinctive sculpturing typical of the genus.

Gyraulus sp. is dextral and discoidal. It measures up to 6 mm in diameter. It is monoecious. The shell is fragile.

Helicorbis sp. is dextral and discoidal. It is up to 7 mm in diameter, and is flattened on the underside. It is monoecious. In habit it is very similar to *Gyraulus* sp., and both species were observed in the wild to be epiphytic grazers on the underside of water lily leaves. The shell is fragile.

Lymnaea sp. was the largest species assessed. It is dextral and turbinate. It measures 30 mm in length by 25 mm in width at full size. It is monoecious. The shell is fragile, and care was needed in handling this species. It produced copious slime and excreta. Individuals tended to cluster together and necrophagy apparently occurred.

REARING CONDITIONS

All species were fed washed outer lettuce leaves as required. An extra calcium source was not supplied. Fine to medium sand (<2mm) was added to the rearing tanks. All rearing tanks were aerated with oil-free compressed air using aquarium stones.

The larger species were reared in wide, slightly tapered, circular tanks 1.5m in diameter and up to 0.6m deep (Plate 1b). The conductivity varied according to the degree of evaporation and the period between cleaning and half replacement which occurred on an irregular basis. No attempt was made to hold conductivity at any particular level. Measurements made indicated 80μS/cm as an average value. Species reared successfully in these tanks were *A. carinata*, *A. cumingii*, *Glyptophysa* sp. and *Lymnaea* sp..

Tanks 1.5m deep by 0.6m square and tanks 0.4m deep by 0.8m by 0.4 m were also used for rearing. The 1.5m deep tanks were quite suitable for *A. carinata*, *Gabbia* sp. and *Glyptophysa* sp., but best conditions appeared to prevail in the wider shallower tanks. *A. carinata* and *A. cumingii* were successfully reared in the 0.8m X 0.8m X 0.4m tanks.

Gabbia sp., *Gyraulus* sp. and *Helicorbis* sp. were reared in Magela Ck water in 20L aquaria. For the large tanks, the rearing water was from the town main supply, which was much higher in conductivity and carbonate than Magela Ck water. Populations of *A. carinata*, *A. cumingii* and *Glyptophysa* sp. were maintained in 40L aquaria of Magela Ck water to provide acclimated adults for sub-lethal testing. This procedure was not wholly successful; cleaning by siphonation sometimes injured individuals and recruitment was low, possibly because (of loss of) juveniles during siphoning.

A. carinata, *A. cumingii*, *Glyptophysa* sp. and *Lymnaea* sp. were in adequate supply throughout the period of testing. The smaller species were not successfully maintained in sufficient numbers. *Gabbia* sp. and *Helicorbis* sp. stocks dwindled to zero.

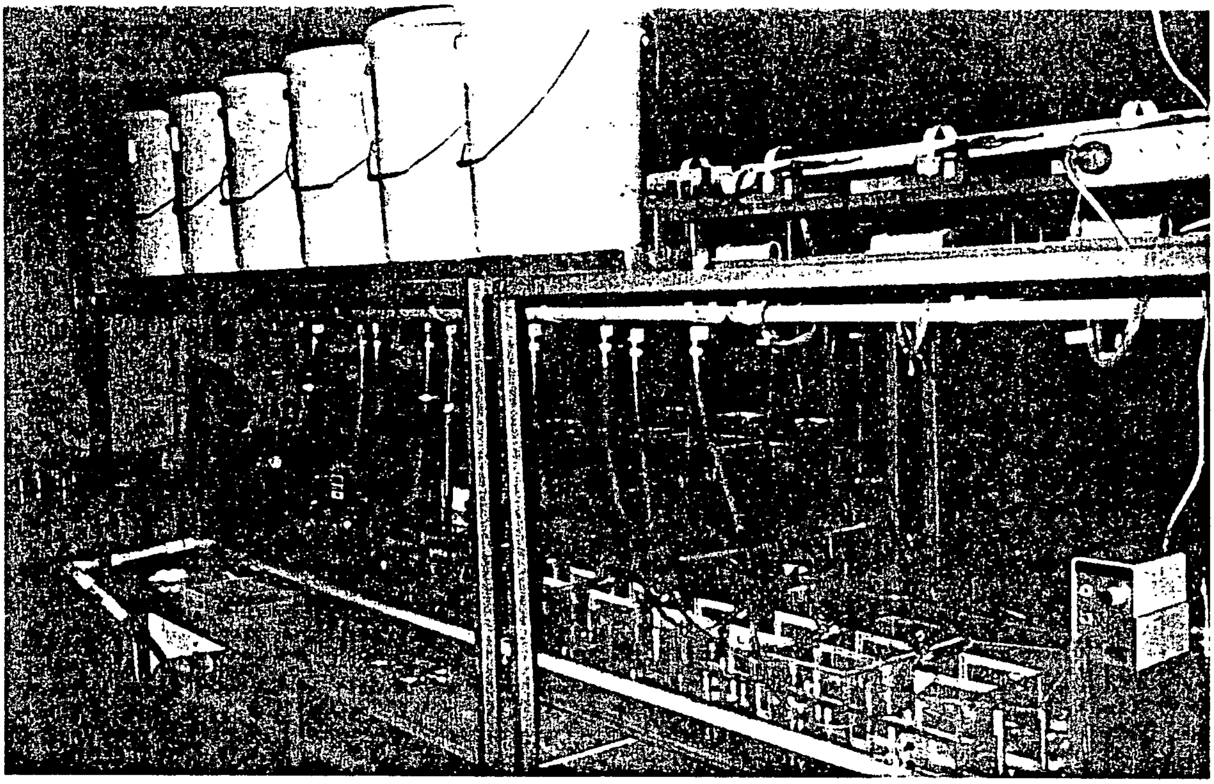

Plate 1a. Dosing apparatus

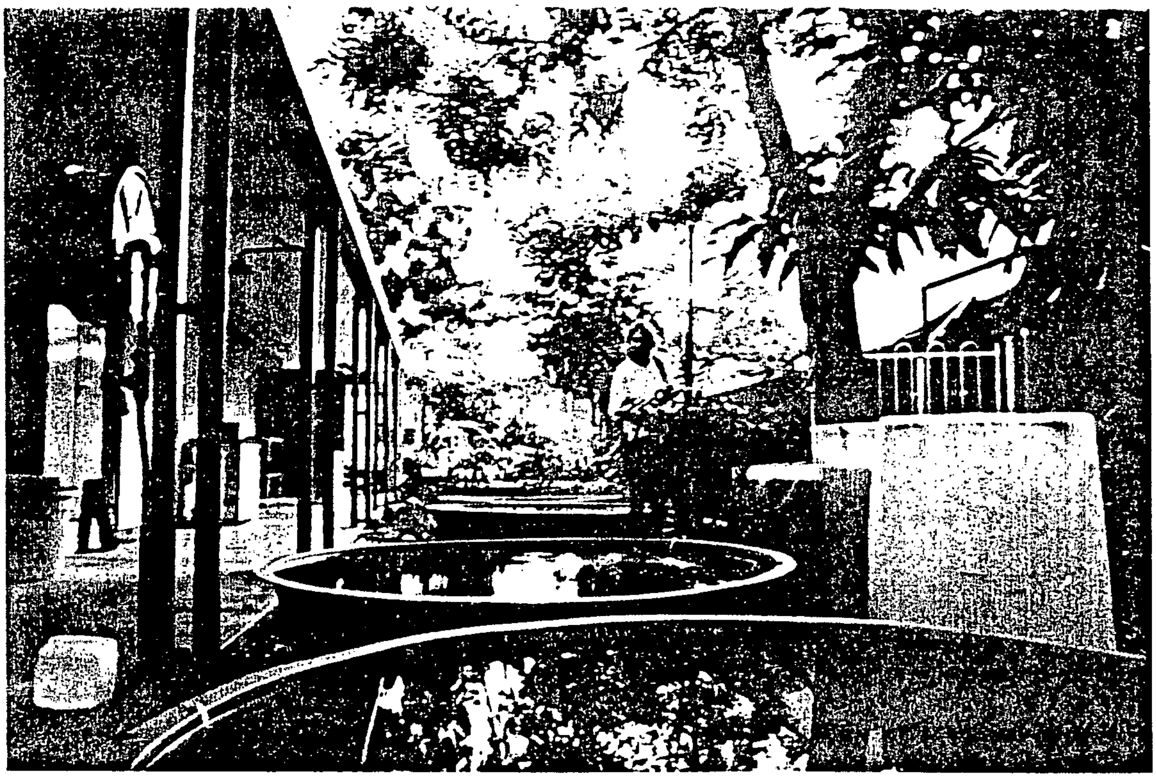

Plate 1b. Rearing tanks

Plate 1c. Magela Ck. High flow

Plate 1d. Magela Ck. Low flow

Confinement of snails, for exposure to toxicant or to obtain eggs for observation or exposure, was in clear open-ended 50 mL plastic sample jars. It had previously been established at OSS that the snail species readily oviposited on the inner surface of the vials. This allowed unobstructed observation of the developing embryos. In the case of adult confinement, open ends were covered with nylon mosquito netting (around 2mm gauge), held in place with rubber bands. For juvenile exposure, nylon netting of between 0.4 and 0.5mm gauge was used.

When confined, pairs of snails were fed daily a standard disc (20mm diameter) of washed outer lettuce leaf. Observations of egg masses were made under a dissecting microscope. To prevent desiccation or overheating of the egg masses during observation, vials were transferred into a glass histology box containing rearing water.

PRELIMINARY OBSERVATION #1

Prior to the commencement of toxicity testing, preliminary observations were undertaken to become familiar with the various species in terms of reproductive capacities and developmental characteristics in the laboratory.

The first observation involved *A. carinata*, *A. cumingii*, *Glyptophysa* sp., *Gyraulus* sp. and *Helicorbis* sp. Four replicates per species were used except for *A. cumingii*, which had seven replicates. Each replicate was a vial containing a pair of snails. These were placed into the breeding tanks. Observations of egg mass and egg numbers were made daily for 5 days, commencing 19/1/91. Plates 2a to 2h show the developmental stages of *A. carinata*, which are typical for the other species examined. Plates 3a to 3d show some of the irregularities seen during embryonic development.

PRELIMINARY OBSERVATION #2

This was conducted in a similar manner to the previous observations (#1) and commenced 25/1/91. At the end of the 5 day laying period, the development of each egg mass was followed through to hatching by taking daily counts of the developmental stages present. This meant that on the first day of developmental observation (i.e. after 5 day laying period), early stages were present from only the previous day's laying, and later stages were from days prior to this. However, since the age of each egg case was known, it was possible to derive percentage data relating to the duration of each stage. The species observed were *A. carinata*, *A. cumingii*, *Gabbia* sp., *Glyptophysa* sp., *Gyraulus* sp. and *Lymnaea* sp..

Preliminary observations #1 and #2 provided information on the reproductive output and developmental characteristics (such as duration and %mortality) of each embryonic stage, and the variation associated with these parameters. In terms of the ensuring toxicity trials, the variation associated with each parameter was considered to be as important as the mean value. On the basis of these observations, it was possible to "score" each species and parameter as:

Good (+=low variability and sufficient quantity of eggs/egg cases)
Moderate (0=moderate variability and sufficient quantity)
Poor (-=high variability and/or low quantity).

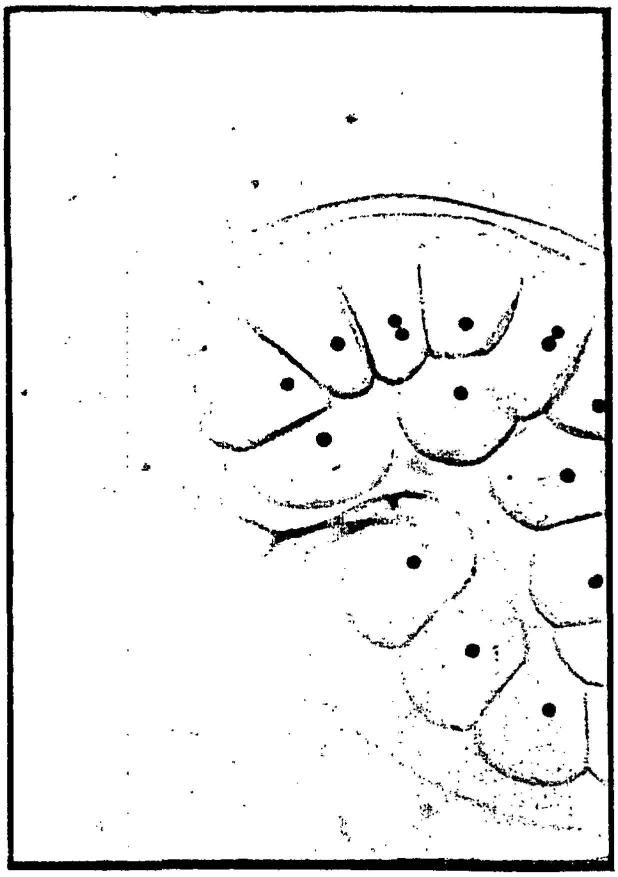

Plate 2a. Gastrula

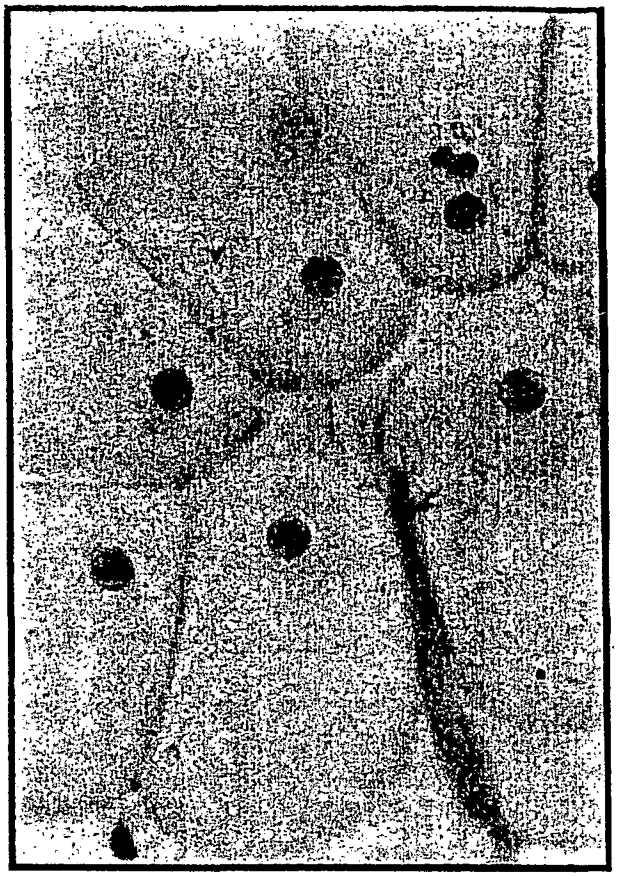

Plate 2b. Early trochophore

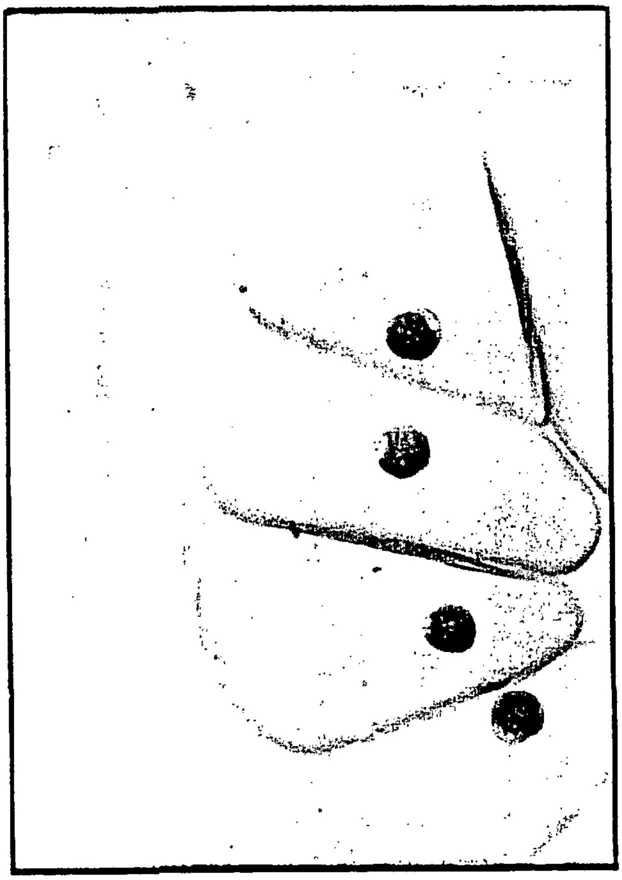

Plate 2c. Late trochophore

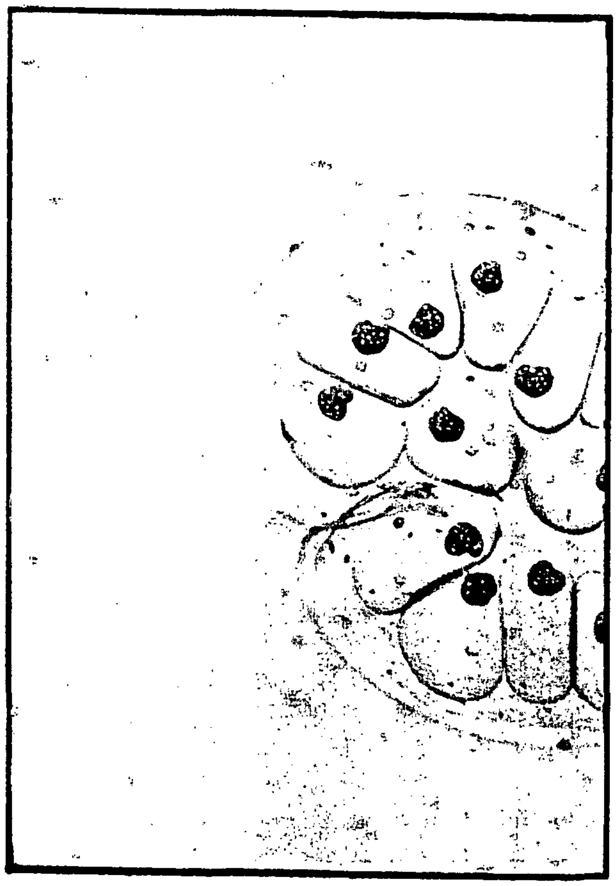

Plate 2d. Veliger

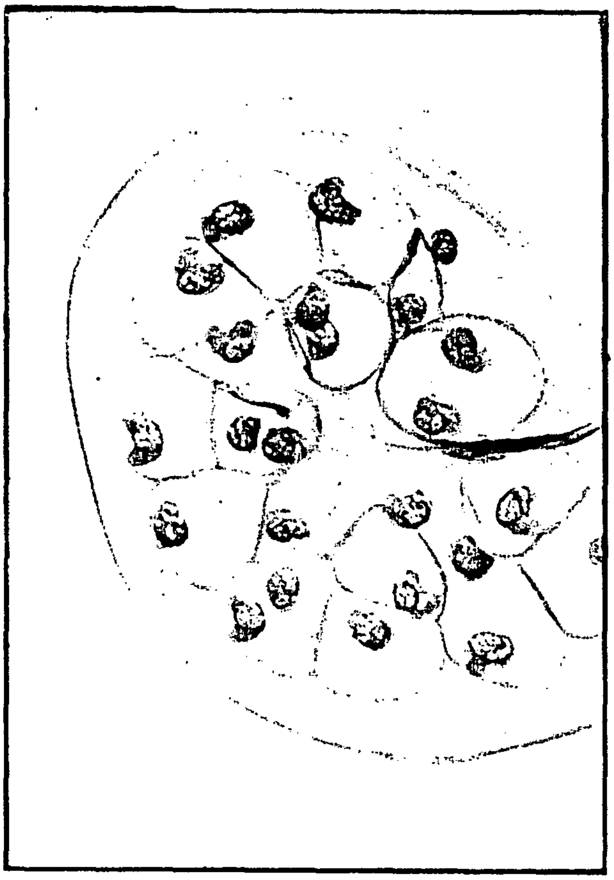

Plate 2e. Hippo

Plate 2f. Early hatchling

Plate 2g. Mid hatchling

Plate 2h. Late hatchling

Photographs courtesy of H. Allson and R. Hyne. OSS

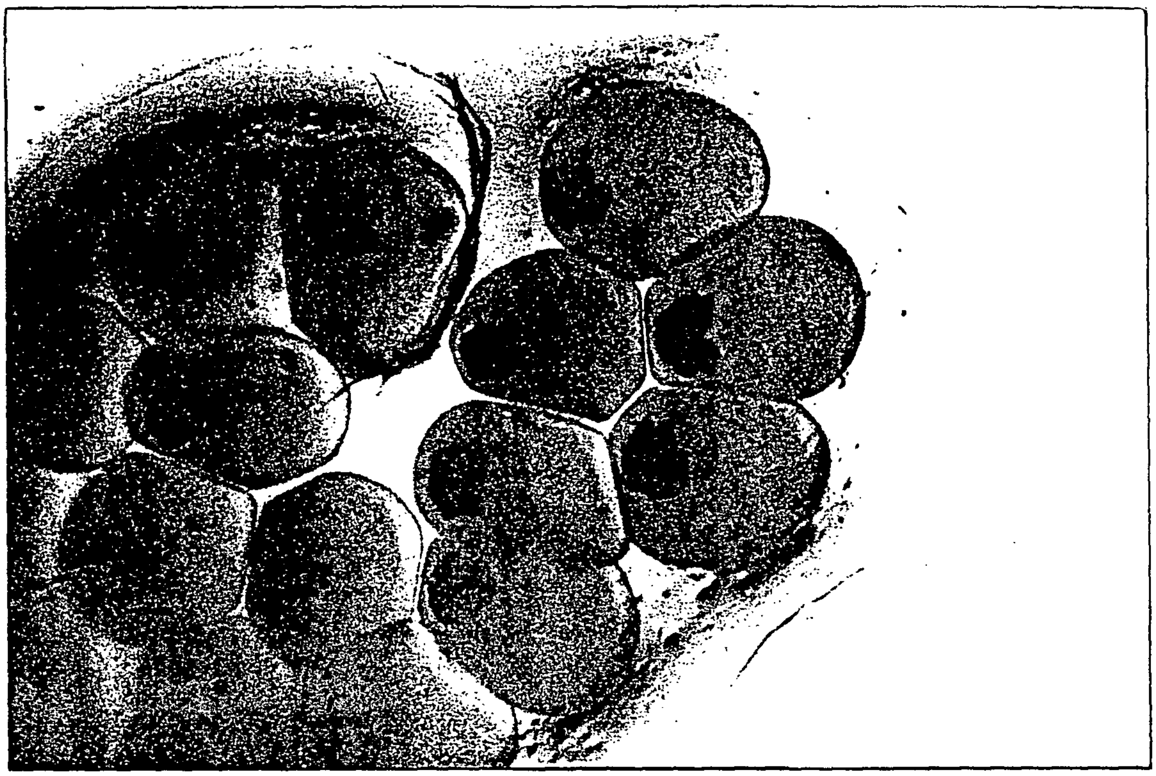

Plate 3c. Coagulation at hippo stage. A.cummingii

Plate 3d. Fungal infection. Glyptoplysa sp.

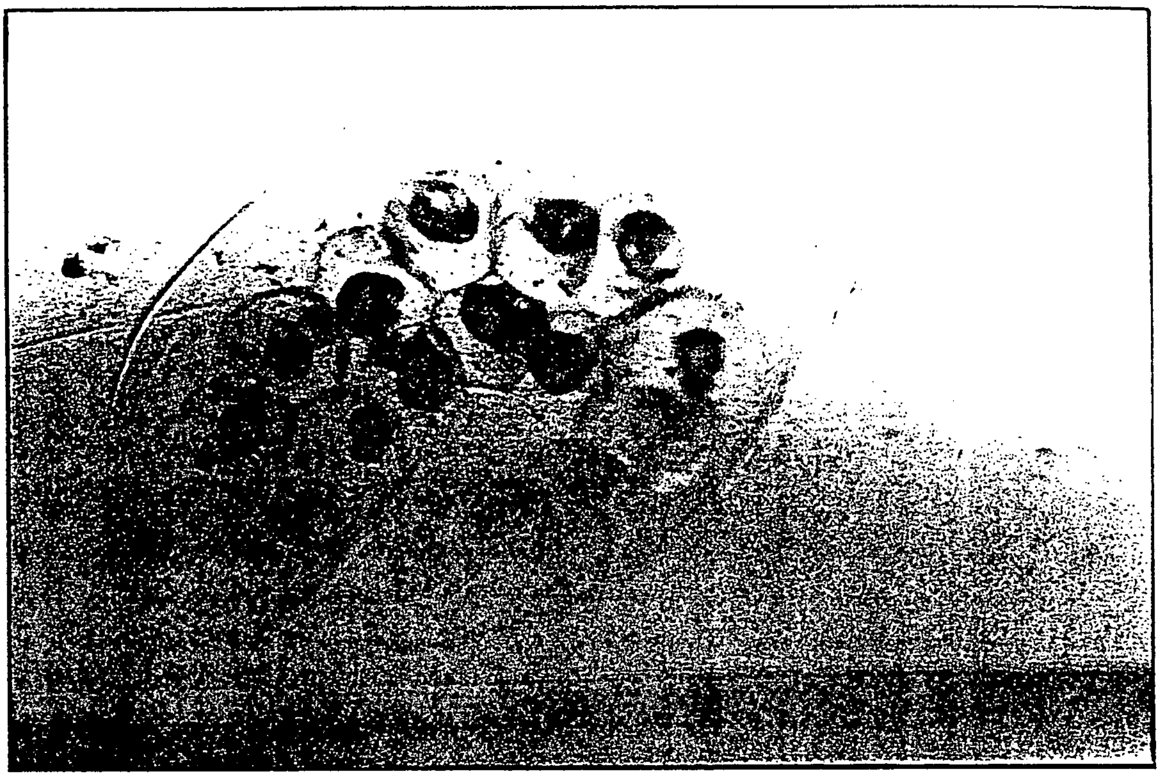

Plate 3a. Normal and ghost hatchlings. A.carinata

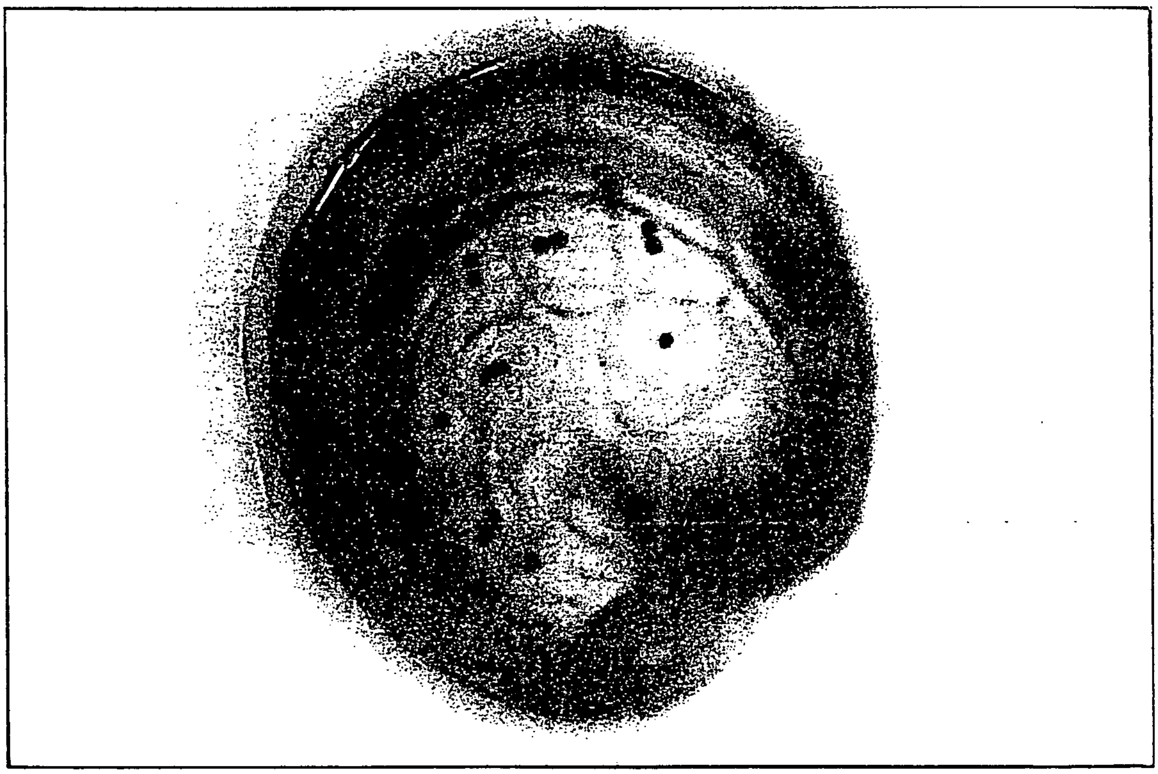

Plate 3b. Polyvitelliny. A.carinata

TOXICITY TRIALS

SCHEDULE 1 CONDUCT OF TOXICITY TRIALS

Trial no.	Endpoints tested	Species tested	Toxicant regime
1	Developmental period	*A. carinata*	Control
	Juvenile mortality	*A. cumingii*	0.3% RP4
		Glyptophysa sp.	1.0% RP4
			3.2% RP4
			10% RP4
			32% RP4
		Commenced 18/2/91	Terminated 27/2/91
2	Developmental period	*A. cumingii*	Control
	Embryonic mortality	*Gyraulus* sp.	1.0% RP2
	Juvenile mortality	*Lymnaea* sp.	3.2% RP2
			10% RP2
			32% RP2
			100% RP2
		Commenced 28/2/91	Terminated 12/3/91
3	Developmental period	*A. carinata*	Control
	Embryonic mortality	*A. cumingii*	1.0% RP2
	Juvenile mortality	*Glyptophysa* sp.	3.2% RP2
			10% RP2
			32% RP2
			100% RP2
		Commenced 13/3/91	Terminated 25/3/91
4	Developmental period as:	*A. carinata*	Control
	pre-hatchling	*A. cumingii*	32% RP2
	hatchling	*Glyptophysa* sp.	42% RP2
	total		56% RP2
			75% RP2
			100% RP2
		Commenced 17/3/91	Terminated 31/3/91

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SCHEDULE 1 contd **CONDUCT OF TOXICITY TRIALS**

Trial no.	Endpoints tested	Species tested	Toxicant regime
5	Egg mass laying	*A. carinata*	Control
	Egg laying	*A. cumingii*	1.0% RP2
			3.2% RP2
			10% RP2
			32% RP2
			100% RP2
		Commenced 31/3/91	Terminated 7/4/91
6	Egg mass laying	*A. carinata*	Control
	Egg laying	*A. cumingii*	1.0% RP2
	Adult weight change	*Glyptophysa* sp.	3.2% RP2
	Juvenile mortality		10% RP2
	Control reared		32% RP2
	juvenile mortality		100% RP2
		Commenced 12/4/91	Terminated 29/4/91
Known parent			
	Fertility	*A. carinata*	32% RP2
	Juvenile mortality	*A. cumingii*	
		Commenced 11/4/91	Terminated 13/4/91
7	Egg mass laying	*A. carinata*	1.0% RP2
	Egg laying	*A. cumingii*	17ppb totU
	Juvenile mortality		10% RP2
	Control reared		170ppb totU
	juvenile mortality		32% RP2
			540ppb totU
		Commenced 1/5/91	Terminated 15/5/91
Algae/size	Juvenile mortality	*A. carinata*	32% RP2
		A. cumingii	
		Commenced 2/5/91	Terminated 14/5/91

Water collection

Control water was collected from Magela Ck, upstream from the Ranger outlet pipe at the Georgetown creekside monitoring site. This was pumped into a 2,000L tanker and transported back to the lab. This tanker, pump and hoses was used exclusively for collecting control water. The retention pond waters were collected similarly, using a tanker, pump and hoses expressly for that purpose, or in an acid washed, 500L polythene tank, using the same pump and hoses collected, the water was transferred via the appropriate pump and hoses from the tankers into 3,000L polythene storage tanks. These had been thoroughly scrubbed and rinsed, and were flushed out between trials with town supply water. The stored water was aerated with a rapidly bubbling aquarium stone, using oil free compressed air. It was assumed that this would keep redox precipitation of manganese to a minimum, but htis was not tested at any stage.

The toxicity testing was carried out using the apparatus depicted in Diagram 1 and Plate 1. During trials, the header tanks were refilled daily with freshly prepared solutions of designated dilution water. Water from each 20L header tank flowed by gravity into two 4L replicate testing chambers. In Trial #1, the header tanks were aerated with oil free compressed air, but in subsequent trials, the replicate chambers were aerated. Dissolved oxygen concentrations in vials covered with the smaller mesh were measured and observed to be near saturation. Flow rate to each chamber was 7mL per minute. This resulted in around 93% replacement in 24hrs.

During trials, pH, dissolved oxygen concentration and conductivity were measured daily using electronic instruments. The pH of test waters was difficult to determine precisely because of the poorly buffered nature of Magela Ck water. A standard time interval (15 seconds) passed between the time at which the electrode was placed in the solution sample and the time at which the pH valve was read.

Uranium and manganese concentrations were analysed for Trials 1,2, 3, 5, 6, and 7. Uranium was measured by Scintrex Time Delay Flourimetric technique and manganese was measured by Graphite Flameless Atomic Absorption Spectroscopy.

Whole snails and dissected tissue which had been exposed to a range of retention pond water concentrations were preserved for electron microscopy and EDS (Energy Dispersive X-ray Spectroscopy) analysis. Dissection of organs and tissues was carried out using diagrams in Barnes The preservation solution was a double phosphate buffered glutaraldehyde solution.

ELECTRON MICROSCOPY AND EDS

	Treatment	Time
TEM series		
	Phosphate buffer 0.1M/1%OsO_4	1hr
	Phosphate buffer	3X5min. washes
Dehydration for EDS and TEM		
	50% acetone	2X5min.
	70% acetone	1X5min.
	0.5% Uranyl acetate/70% acetone (TEM only)	1X60min.
	70% acetone (EDS only)	1X60min.
	90% acetone	2X10min.
	Abs acetone	2X10min.
	Propylene oxide	2X10min.
	Propylene oxide:Spurrs (film)	2hr
	Cured overnight at 70°C	

Sections were cut with a Reichert - Jung Ultracut E microtone to approximately 80nm. These were stained with Reynolds lead citrate for 10min and #5 uranyl acetate for 10 min. The instrument was a Phillips EM300 set at 60kV. This was fitted with a goniometer and minilens. X-rays generated from the unstained specimens were collected in an EDAX 9100 detector. Background radiation was minimised by a beryllium ring insert. The analogue signal was converted to digital for display and analysis.

Operating voltage	60kV.
Probe diameter	Approx. 1µm.
Count live time	200 sec.
Goniometer angle	35°

DETAILS OF TRIALS

Procurement of egg masses

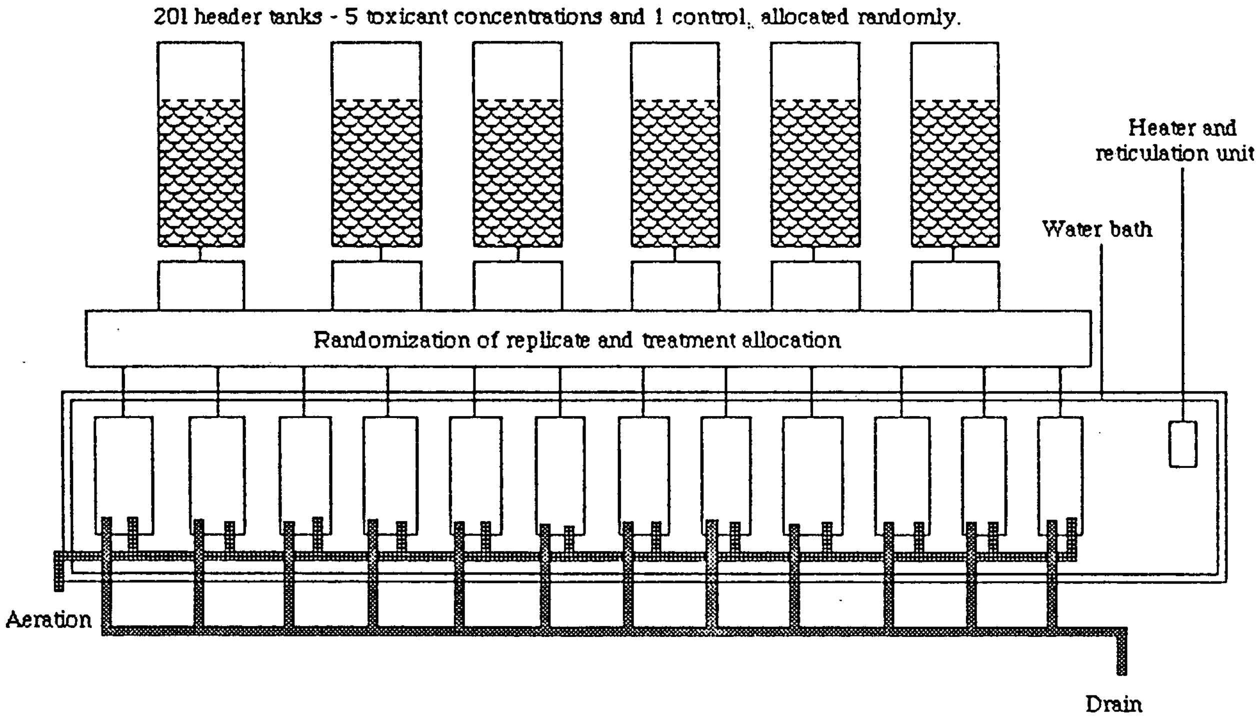
Diagram 3 represents the continuous flow dosing apparatus used throughout most of the trials. For Trials #1 through to #4, egg masses were procured by confining adult pairs in the manner described for a period of 24hrs in control water. An initial suppression of oviposition following confinement was often observed. In order to obtain sufficient embryos (>20 per sample) it was necessary to confine at least twice the number of pairs than samples required. At the start of the trial, the embryos were mostly at the gastrula stage, although some at the blastula stage were also used. Before exposure, the position on the vial wall, the developmental stage and embryo number of each egg mass were determined. Each egg mass was then observed daily and the numbers of embryos at each developmental stage were noted.

When it was necessary to use more than one egg mass per sample, egg masses of similar developmental stage were sought. The vials were distributed across replicates such that similar numbers of embryos were exposed to each treatment.

The developmental period was the interval from the first day of exposure (day 1=1 day of development) until observation of egg mass rupture. For developmental endpoints, termination of the trials occurred when either all egg masses had ruptured (hatching), or it was obvious that rupture would not occur in those still intact. In the appendices, the latter circumstance is denoted by "Termination". Exposure of adults was over an arbitrary period: 7 days for Trial #5; 5 days for Trials #6 and #7.

In Trials 1,2,3,6,7 and `Known parent', juvenile exposure was performed on neonates hatched from exposed egg masses. Trials 6.7 and Algae/size used neonates hatched from egg masses that had been laid and reared in control water. At the observation of egg mass rupture, neonates were exposed for a 48hr period. Trial #7 included both 48 and 96hr exposure. Mortality was determined by subtracting the number of alive at the end of the exposure period from the numbers expected to hatch, as indicated by the last prerupture count. In the case of moribund individuals, the criterion of survival was the retraction of the foot in response to prodding by a dissection needle. Numbers of dead neonates did not appear to be a reliable measure of mortality, possibly because of rapid decay.

DIAGRAM 3. THE DOSING APPARATUS.



For Trials #1 through to #3, 2 vials per replicate were exposed to each treatment. Because of difficulties in pooling data within and amongst replicates, this was increased to 3 vials per replicate in Trials #5 though to #7. Unless otherwise, all tests and control rearing were carried out at 30°C and aeration was by oil free compressed air. A representation of the continuous flow dosing apparatus is shown in Diagram 3.

Trial #1

Trial #1 was undertaken to assess the sensitivity of *A carinata*, *A. cumingii*a and *Glyptophysa* sp. The sensitivity of developmental retardation and juvenile mortality in *A carinata* were observed using RP4 water, RP2 water was used in all subsequent trials, with a 100% treatment replacing the 0.3% treatment.

Trial #2

Trial #2 was undertaken partly to address the problems encountered in Trial #1. This trial also involved the exposure of control laid egg masses. Egg masses were derived from *A. cumingii*, *Gyraulus* sp. and *Lymnaea* sp.. The endpoints examined were the same as Trial #1, but more care was taken in following the embryos through their development. Embryonic mortality in egg masses was quantified at the various stages by daily counts.

Trial #3

Trial #3 was essentially a repeat of Trial #1 using the altered toxicant regime. The species tested were *A. carinata*, *A. cumingii* and *Lymnaea* sp.. The endpoints tested were Developmental period, Embryonic mortality and Juvenile mortality.

Trial #4

Trial #4 was undertaken to determine the toxicant concentration at which developmental retardation would first occur. Since a LOEC had previously been established at 100% RP2, a regime which bracketed 32% and 100% RP2 was used. This series descended by a factor of O.75 between successive treatments. The trial used control laid egg masses and was conducted as a static test without treatment replication in 4L aquaria with daily half replacement.

Trial #5

In previous trials, a single vial each containing one *A. carinata* pair had been exposed to the treatments and an effect of egg laying depression had been observed. Trial #5 aimed to quantify this effect. The species tested were *A. carinata* and *A. cumingii*. Three pairs of snails of each species were used.

Known parent

The 'Known parent' trial was conducted to investigate the influence that parentage might have on embryonic development and juvenile mortality during and after exposure of egg masses and juveniles to RP2 water. The species used were *A. carinata* and *A. cumingii.* Several pairs of snails were confined individually in vials in control water. Snails were observed daily and placed into new vials once egg masses had been deposited. The egg masses, from known parents, were then exposed to 32% RP2 and ensuing development and juvenile mortality recorded in the manner previously described.

Trial #6

To determine the applicability of results from toxicity tests in the laboratory, trial #6 was conducted concurrently in creekside and laboratory trials using the same species and endpoints at each location. Flow rates in the creekside trial were 49mLs/min (cf 7mLs/min in the laboratory), and water temperature at this site was ambient Magela Ck water temperature, (28° to 32°C). Creek aeration was by oil-free compressed air.

Trial #7

Trial #7 aimed to determine whether or not the observed effects of RP2 water were attributable solely to total uranium concentration. No control (creekwater) was run with this trial because of equipment limitations and, within the context of the experiment, a control was deemed unnecessary. Estimates of the total uranium levels of RP2 water were based on Scintrex determinations from previous trials. 100% RP2 was assumed to have a total U level of 1700ppb. Daily solutions using AR grade uranyl sulphate and Magela Ck water were made to correspond to 1% 10% and 100% RP2 total U levels. At the end of day 1, the 100% U treatment was replaced with a 32% treatment, following mortality of all *A. carinata* individuals in that treatment.

Algae/size

The 'Algae/size' trial was carried out to determine whether the presence or absence of algae or the size of the vial, were contributing to variability observed in juvenile mortality. It was similar to the Known parent trial. Two sizes of vial were used: Small - 50mL clear plastic sample jars; large - 400mL sample jars. Vials were placed in the open in control water, and allowed to accumulate epiphytic algae for a few weeks. 20 neonates hatched in control water were used per sample and 4 samples used per treatment (large/small * with/without algae). The species tested were *A. carinata* and *A. cumingii.* Snails were exposed to 32% RP2 in a 40L aquaria with daily half replacement and was for 48hrs.

STATISTICAL ANALYSIS

Time limitations did not permit full statistical treatment of the data set. In particular Chi-squared testing for sample and replicate homogeneity was dispensed with.
Instead, data from replicates of each treatment were pooled and the data assumed to be normally disturbed for analysis of variance testing. The dangers in this approach involve an increased chance of committing a Type 2 error, where the null hypothesis of equality is not rejected when in fact differences do exist. However, in the context of the project, this conservative measure served to highlight significant differences.

Where analysis of variance testing indicated significant differences amongst the treatments of a trial, Dunnett's test was applied to the treatment means. Zar (1984) recommends that the number of replicates in the control treatment be the integer below the square root of the treatment degrees of freedom $[(k-1)^{1/2}]$ times larger than the treatment replicate number. This was not done in these trials, and the discriminatory power of the statistical tests conducted on the data may not have been optimal.

Student-Newman-Keuls testing was employed when significant differences were found using a single treatment (eg fecundity parameters in the preliminary observations).

Statistical testing was performed at the 5% level. Although for regulatory purposes testing at the 10% significance level may be adopted (C. Humphrey pers comm, 1991), the assessment of species and endpoints at 5% makes the final distinctions more complete.

RESULTS

PRELIMINARY OBSERVATIONS #1 COMMENCED 19/1/91.

The first series of preliminary observations on snail reproduction and early development were carried out in the breeding tanks (conductivity around 80µS/cm). Tabulated data are shown in Appendix 1a. Table 1a shows statistics derived from the pooling of all replicate data. In the context of the project, the variation associated with these absolute values was as important as the means.

Table 1a. Egg and egg mass means and coefficients of variation associated with the means.
Data taken over five days. Commenced 19/1/91.

	No. of		Egg/egg mass		Eggmass/pair/day		
Species	Reps	n	Mean	C.V.%	n	Mean	C.V.%
A. carinata	4	41	13.4	53.0	20	1.85	89.1
A. cumingii	7	117	29.9	47.5	35	3.23	82.0
Glyptophysa sp.	4	55	9.36	33.7	16	3.50	101
Gyraulus sp.	4	150	6.55	39.1	20	3.78	55.3
Helicorbis sp.	4	83	4.66	36.1	20	2.1	83.3

Figures 1a to 1e display means across replicates for eggs per egg capsule. Means, the slopes of the cumulative daily means, and r^2 values appear in Table 1b. These values were derived from daily means of pooled replicate data.

Table 1b. Eggs per egg mass statistics.

Using data across replicates over five days.

Species	Mean	Slope of line for cummulative data	(r^2)
A. carinata	12.43[a]	12.19	0.942
	15.54[b]	15.17	0.998
A. cumingii	29.62	28.32	0.998
Glyptophysa sp.	8.87	9.26	0.990
Gyraulus sp.	6.24	6.66	0.999
Helicorbis sp.	4.50	4.45	0.992

[a] Includes zero value of day 5. [b] Excludes zero value of day 5.

Correlation coefficients indicated a degree of predictability associated with egg numbers/capsule over the five days of observations. No species showed large variation except *A. carinata*, whose four replicate pairs did not oviposit on day 5. This species otherwise displayed similar variabilities to the others (Figures 1f to 1h). Discounting this observation showed *Helicorbis* sp. to be slightly more irregular in egg and egg mass production than the other species (Table 1b).

Figure 1f illustrates the variation associated with egg mass laying over four days across replicates. Analysis of variance performed on the coefficients of variation for each replicate over the days of observation revealed no significant difference between species (P>F=0.9305). This was also the case for total daily egg production for each species/replicate (Figure 1g.), and for eggs per eggmass (Figure 1h.).

When replicates were pooled species differed in the mean values of eggs per egg mass and egg masses per day (P>F=0.016 and 0.002 respectively), but no significant difference was found in eggs per day.

Table 1c presents results of Student-Newman-Keuls (SNK) testing on the significantly different parameters.

Table 1c. Results of comparisons from SNK testing.

Parameter		5 day replicate mean
Egg masses/day		
	Gyraulus sp.	7.73
	Helicorbis sp.	4.15
	A. cumingii	3.19
	Glyptophysa sp.	2.9
	A. carinata	2.75
Eggs/egg mass		
	A. cumingii	29.3
	A. carinata	15.43
	Glyptophysa sp.	8.95
	Gyraulus sp.	6.36
	Helicorbis sp.	5

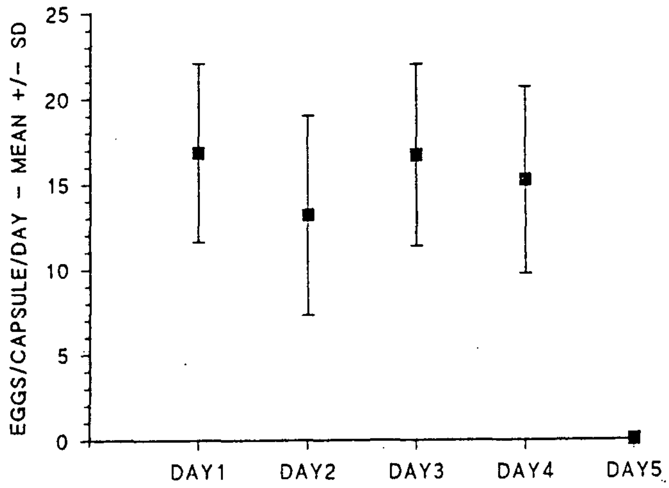


FIG. 1a SNAIL EGG LAYING CHARACTERISTICS
AMERIANNA CARINATA COMM. 19/1/91

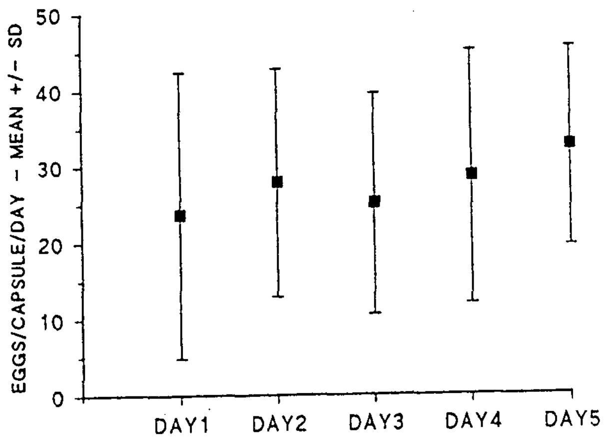


FIG. 1b SNAIL EGG LAYING CHARACTERISTICS
AMERIANNA CUMMINGII COMM. 19/1/91

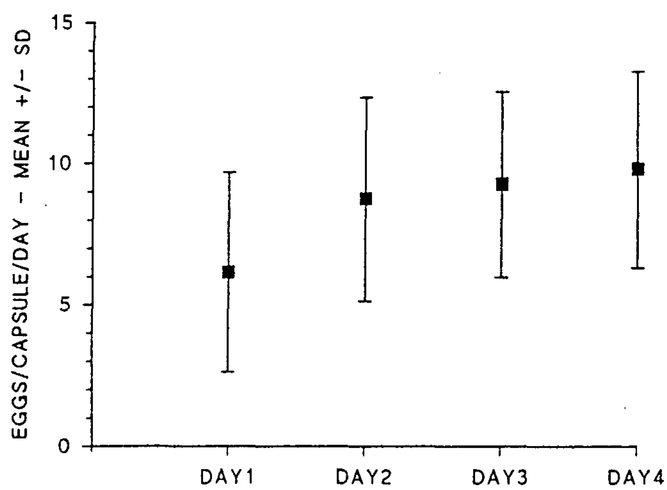


FIG. 1c SNAIL EGG LAYING CHARACTERISTICS
GLYPTOPHYSA SP. COMMENCED 19/1/91

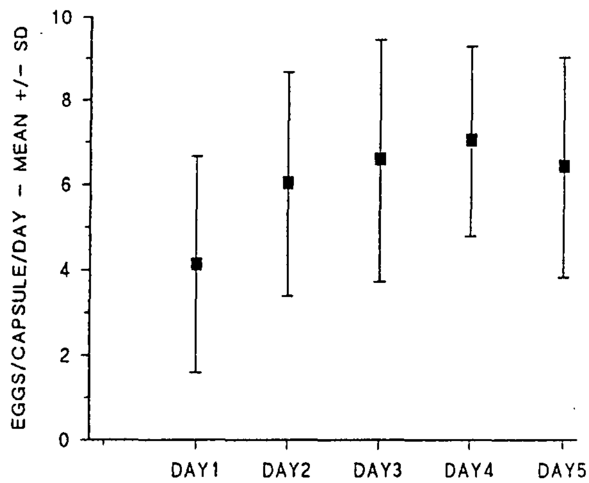


FIG. 1d SNAIL EGG LAYING CHARACTERISTICS
GYRAULUS SP. COMMENCED 19/1/91

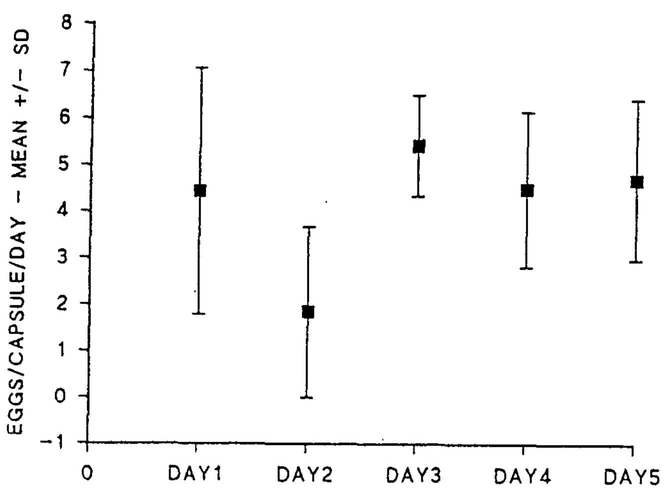


FIG. 1e SNAIL EGG LAYING CHARACTERISTICS
HELICORBIS SP.

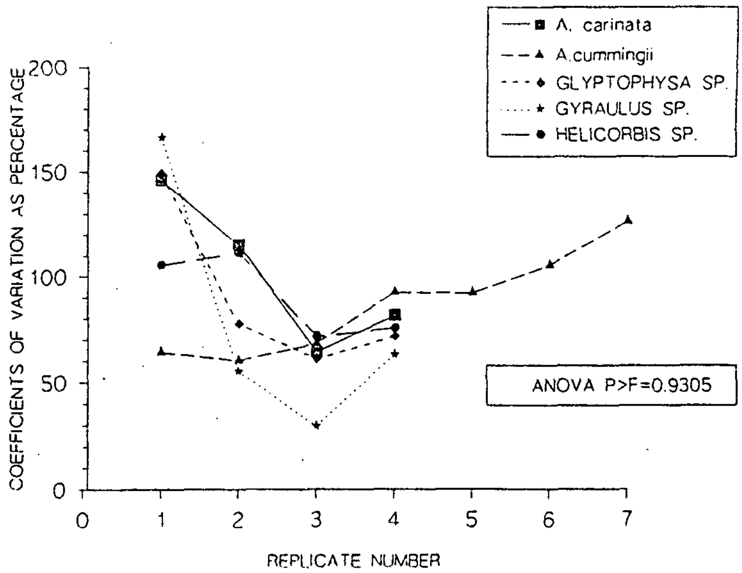


Fig. 1F EGG MASS LAYING COEFFICIENTS OF VARIATION COMM. 19/1/91

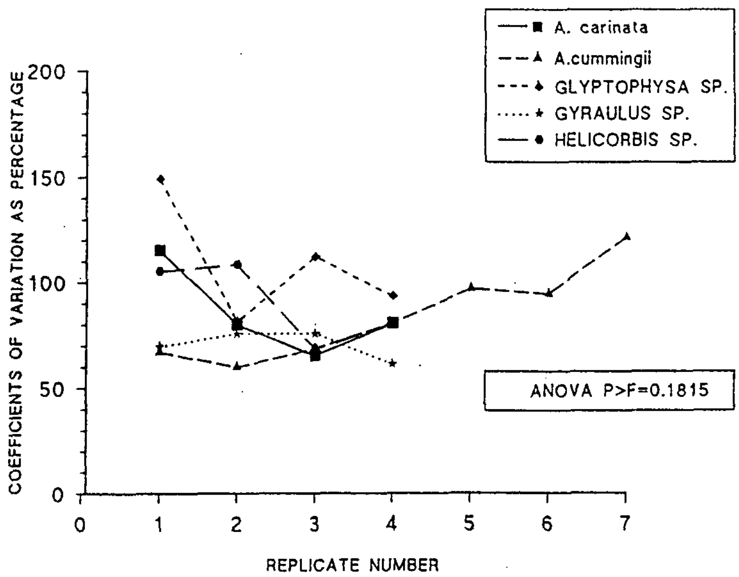


Fig. 1G EGG LAYING COEFFICIENTS OF VARIATION COMM. 19/1/91

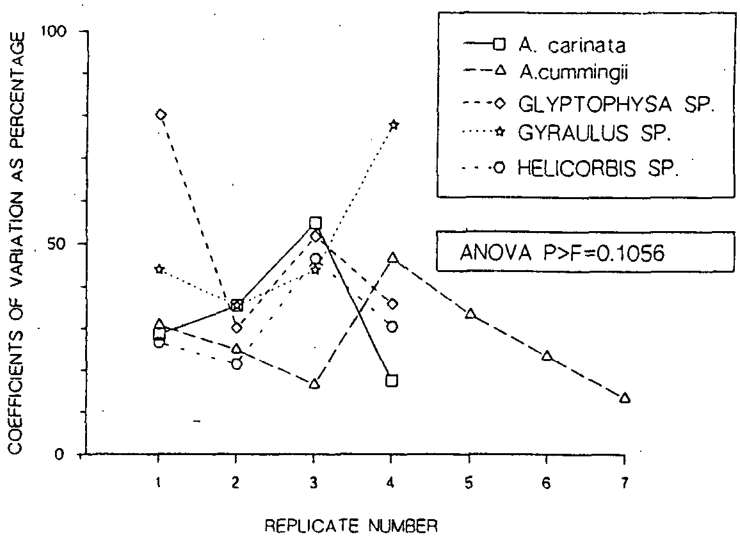


Fig. 1H EGG PER EGGMASS COEFFICIENTS OF VARIATION COMM. 19/1/91

PRELIMINARY OBSERVATIONS #2 COMMENCED 25/1/91

These were performed using Magela Ck water (conductivity of around 20 usem/cm). Tabled data for these observations appear in Appendix 1b. Simple statistics appear in Table 2a. As in the case of Table 1a, these values were derived from pooled data of all replicates and all days.

Table 2a. Egg and egg mass means and coefficients of variation.
Data taken over five days. Commenced 25/1/91.

	No. of	Egg/egg mass			Eggmass/pair/day		
Species	Reps	n	Mean	C.V.%	n	Mean	C.V.%
A. carinata	4	46	3.51	22.8	20	2.3	49.1
A. cumingii	4	26	8.90	28.4	20	1.3	90.3
Gabbia sp.	4	17	0.24	22.9	20	0.85	203
Glyptophysa sp.	4	16	4.38	42.0	20	2.15	165
Gyraulus sp.	4	77	1.84	20.2	20	3.7	54.8
Lymnaea sp.	4	14	32.2	53.9	20	0.7	132

Means, the slopes of cummulative daily means, and r^2 values of eggs per egg mass appear in Table 2b. These values were derived from daily means of pooled replicate data.

Table 2b. Eggs per egg mass statistics.
Using data across replicates over five days.

Species	Mean	Slope of line for cummulative data	(r^2)
A. carinata	14.6	14.5	0.9997
A. cumingii	29.3	30.2	0.997
Gabbia sp.	1.02	1.03	0.9998
Glyptophysa sp.	8.65	6.89	0.970
Gyraulus sp.	9.16	9.20	0.9999
Lymnaea sp.	54.3	49.9	0.996

Analysis of variance was performed on replicate data summed over five days. The results of these analyses appear in Table 2c.

TABLE 2C. RESULTS OF ANALYSIS OF VARIANCE BETWEEN THE SIX SPECIES.

Probability values

Parameter:	Egg masses/day	Eggs/day	Eggs/eggmass
Means	0.0001**	0.0017**	0.0006**
Coefficients of variation	0.0018**	0.0006**	0.0002**

Student Newman Kuels testing was performed on the significantly different data. The results of this appear in Table 2d.

Table 2d. Results of comparisons from SNK testing.

Parameter	5 day replicate means
EGG MASSES PER DAY.	
Means	
Gyraulus sp.	3.75
[3]*A. carinata*	2.30
[3]*A. cumingii*	1.30
[3]*Glyptophysa* sp.	0.80
[3]*Gabbia* sp.	0.70
[3]*Lymnaea* sp.	0.70
Coefficients of variation	
Gabbia sp.	165
Glyptophysa sp.	153
Lymnaea sp.	111
A. cumingii	96.3
A. carinata	50.4
Gyraulus sp.	45.2

pto

Table 2d. contd. Means comparison from SNK testing.

Parameter:	5 day replicate means
EGGS/DAY	
Means	
Lymnaea sp.	41.9
A. cumingii	40.8
A. carinata	35.5
Gyraulus sp.	34.0
Glyptophysa sp.	8.35
Gabbia sp.	0.90
Coefficients of variation	
Lymnaea sp.	126
Glyptophysa sp.	40.2
A. cumingii	25.3
A. carinata	21.8
Gyraulus sp.	19.6
Gabbia sp.	11.0
EGGS/EGGMASS	
Means	
Lymnaea sp.	80.3
A. cumingii	31.4
A. carinata	15.3
Glyptophysa sp.	10.4
Gyraulus sp.	9.33
Gabbia sp.	1.05
Coefficients of variation	
Glyptophysa sp.	178
Gabbia sp.	170
Lymnaea sp.	126
A. carinata	51.2
A. cumingii	98.5
Gyraulus sp.	42.1

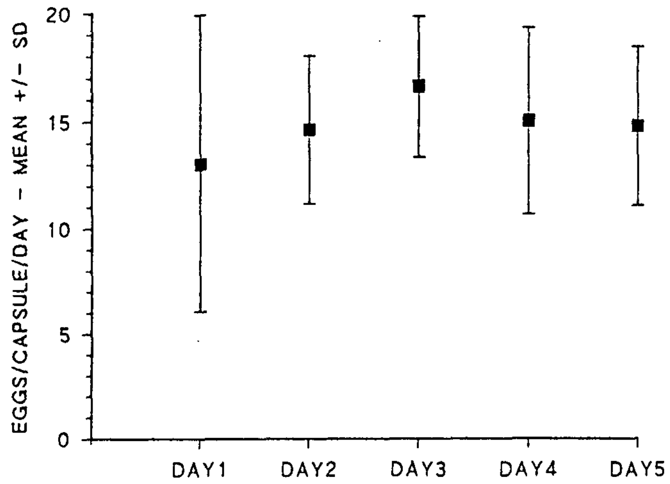


FIG. 2a SNAIL EGG LAYING CHARACTERISTICS

AMERIANA CARINATA COMM. 26/1/91

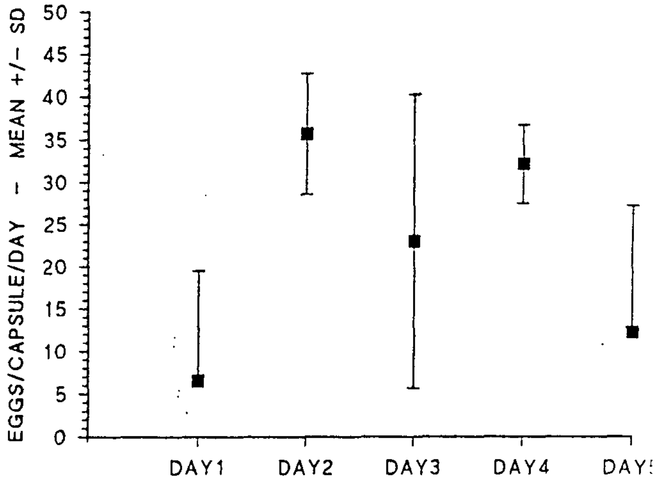


FIG. 2b SNAIL EGG LAYING CHARACTERISTICS

AMERIANA CUMMINGII COMM. 26/1/91

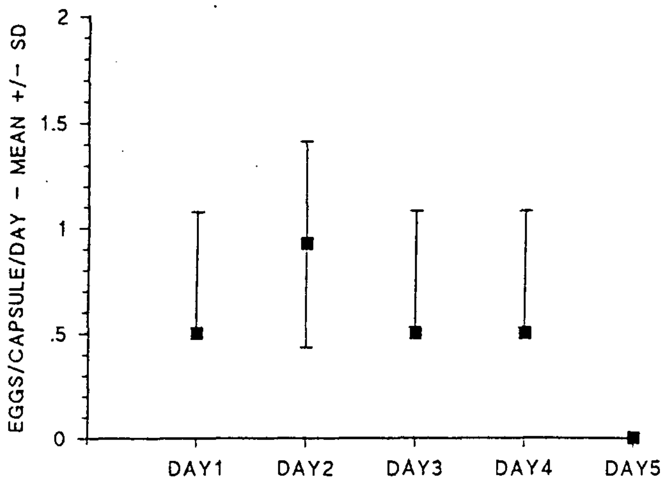


FIG. 2c SNAIL EGG LAYING CHARACTERISTICS

GABBIA SP. COMMENCED 26/1/91

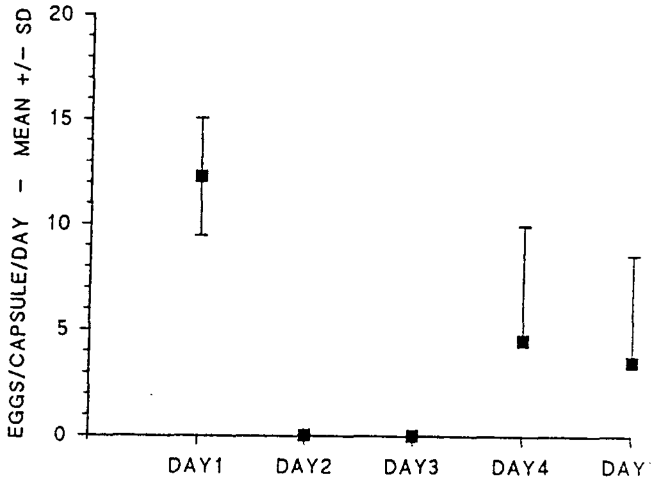


FIG. 2d SNAIL EGG LAYING CHARACTERISTICS

GLYPTOPHYSA SP. COMMENCED

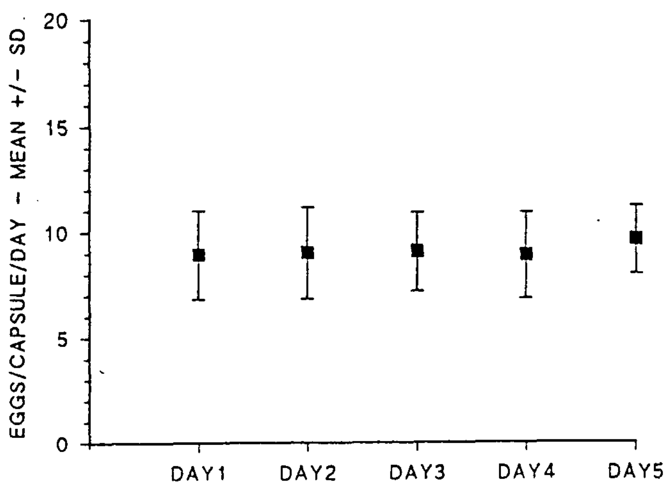


FIG. 2e SNAIL EGG LAYING CHARACTERISTICS

GYRAULUS SP. COMMENCED 26/1/91

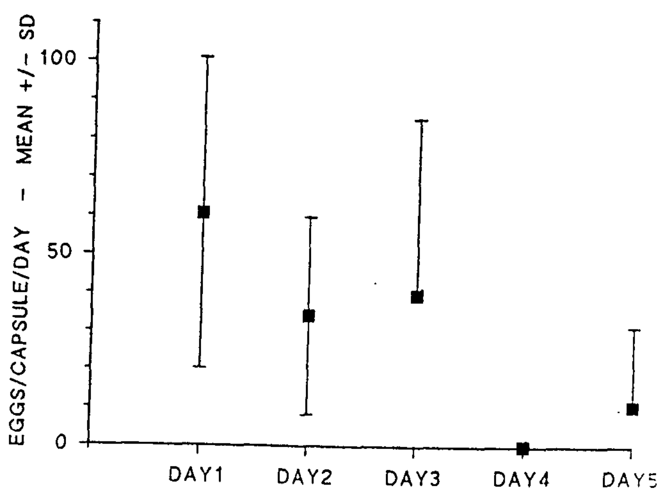


FIG. 2f SNAIL EGG LAYING CHARACTERISTICS

LYMNAEA SP. COMMENCED 26/1/91

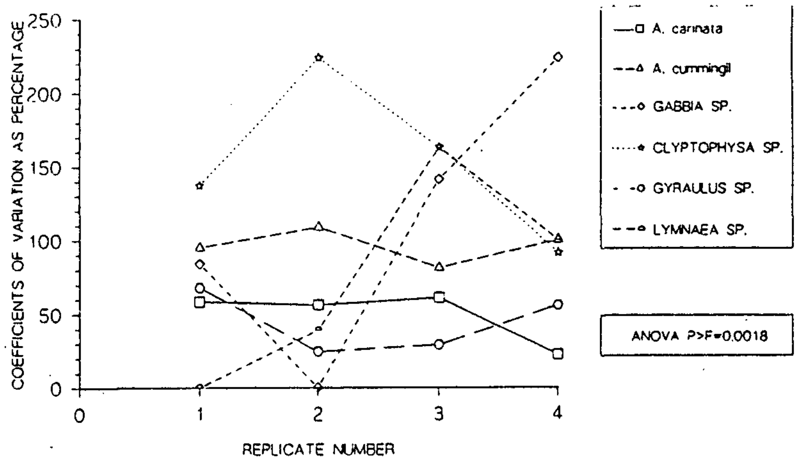


Fig. 2G EGG MASS COEFFICIENTS OF VARIATION COMM. 25/1/91

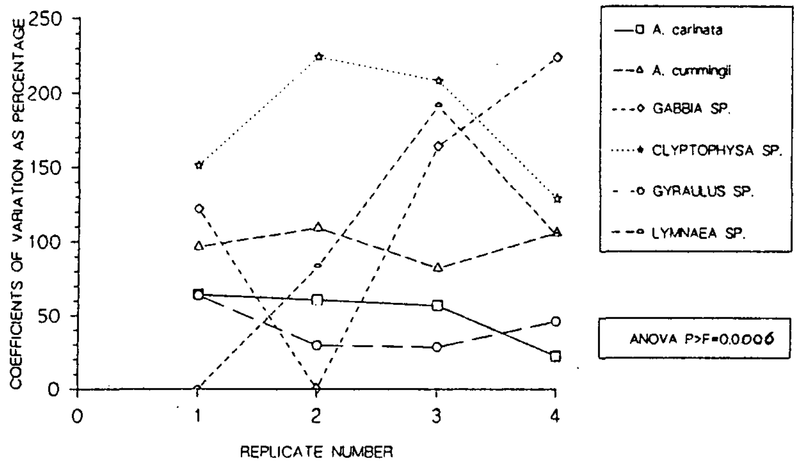


Fig. 2H EGG LAYING COEFFICIENTS OF VARIATION COMM. 25/1/91

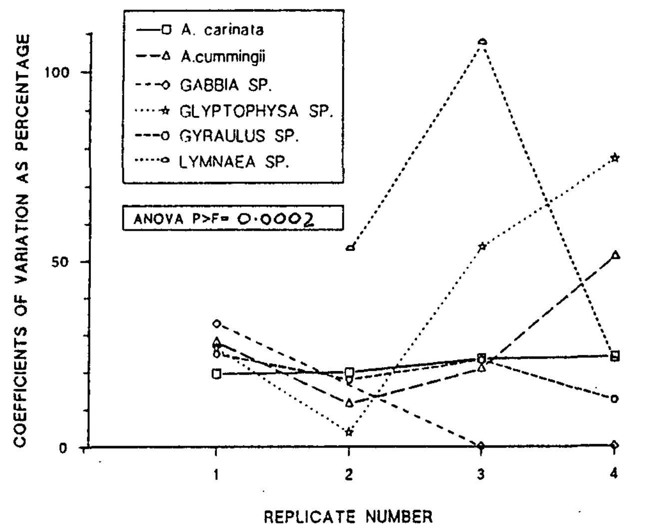


Fig. 2I EGG PER EGGMASS COEFFICIENTS OF VARIATION COMM. 25/1/91

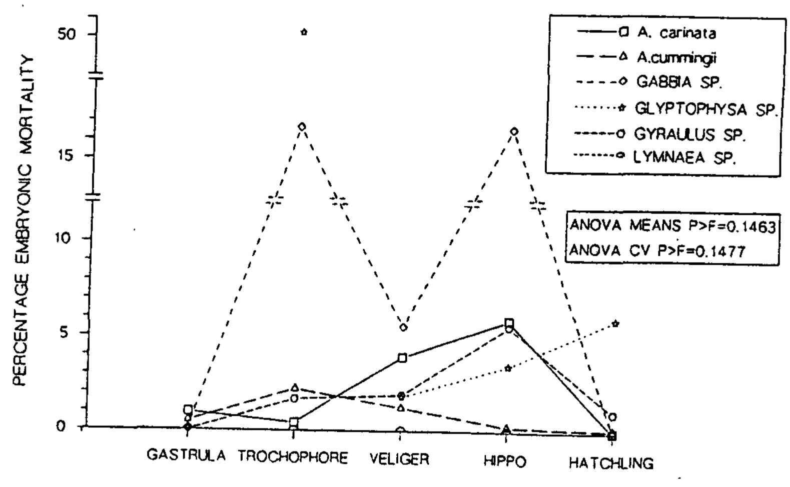


Fig. 2J PERCENTAGE EMBRYONIC MORTALITY COMM. 25/1/91

One way analyses of variance performed on embryonic mortality across embryonic stages and species failed to reveal significant differences (P>F=0.1463 and P>F=1477 respectively).

The difference in results between the first and second series of observations could be due to water quality. In the first series, the vials were always at the bottom of the rearing tanks, and although these were aerated, oxygen levels may have been sub optimal. The second series was performed in 20L aquaria, where the aeration produced levels near saturation. Also, as previously stated, conductivities in the two trials were different. In many ways the first trial was an exercise in familiarisation, whilst the second was more relevant to later toxicity testing, which used Magela Ck water as the control.

From the results, it was concluded that *Gyraulus* sp., *A. carinata* and lesser extent *A. cumingii* showed least variation in the parameters measured. The least variable species was *Gyraulus* sp. However the difficulties in handling and rearing this species did count against it finally for use as a monitoring animal. It strongly maintained its hold on surfaces and was often damaged during routine handling. Also, the stock population underwent a decrease once regular handling of large numbers of individuals commenced. Prior to this decrease, it had been bred to numbers sufficient for toxicity testing. Similar problems occurred more severely with *Helicorbis* sp., and in the first trial it showed a larger, but non-significant variability in comparison to the other species. *A. carinata* and *A. cumingii* were quite robust, easily handled and maintained.

Particularly *Gabbia* sp., but also *Glyptophysa* sp., and *Lymnaea* sp. were seen to be variable in their fecundity parameters. *Gabbia* sp. along with *Helicorbis* sp. were not included in further trials. *A. carinata, A. cumingii, Glyptophysa* sp., *Gyraulus* sp. and *Lymnaea* sp. were tested further.

TRIAL #1 COMMENCED 18/2/91

Trial #1 tested *A. carinata*, *A. cumingii* and *Glyptophysa* sp.The endpoints examined were developmental retardation and juvenile mortality. Full details of testing are presented in Schedule 1. Results of one way analysis of variance performed on pooled replicate data are given in Table 3a. Figures 3a to 3f present means and standard deviations for the species and endpoints assessed. Full results are in Appendix 11.1.a and 11.1.b.

Table 3a. Anova results for Trial #1

Species	Endpoint	P>F	Conclusion
	Days to hatching		
A. carinata		0.1491	No significant difference
A. cumingii		0.6071	No significant difference
Glyptophysa sp.		0.8058	No significant difference
	Juvenile mortality		
A. carinata		0.9122	No significant difference
A. cumingii		0.3855	No significant difference
Glyptophysa sp.		0.5757	No significant difference

The results from this trial indicated that neither endpoint was sensitive at the concentrations used. It was determined to remove the 0.3% RP2 treatment and use a 100% RP2 treatment as the most concentrated treatment.

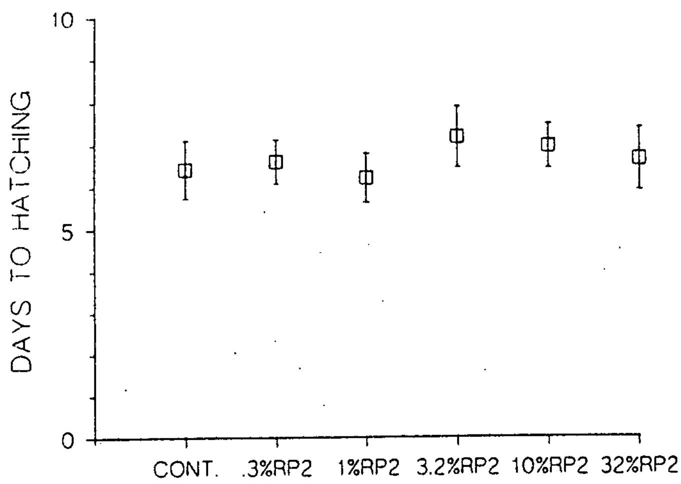


Fig. 3a Trial #1 Days to hatching
A. carinata

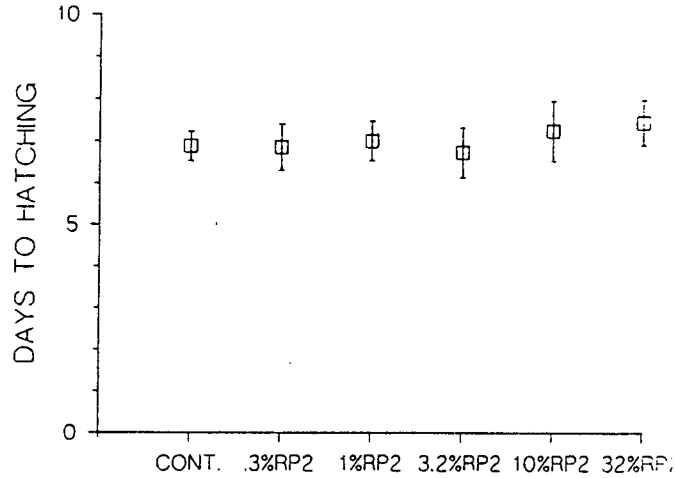


Fig. 3b Trial #1 Days to hatching
A. cummingii

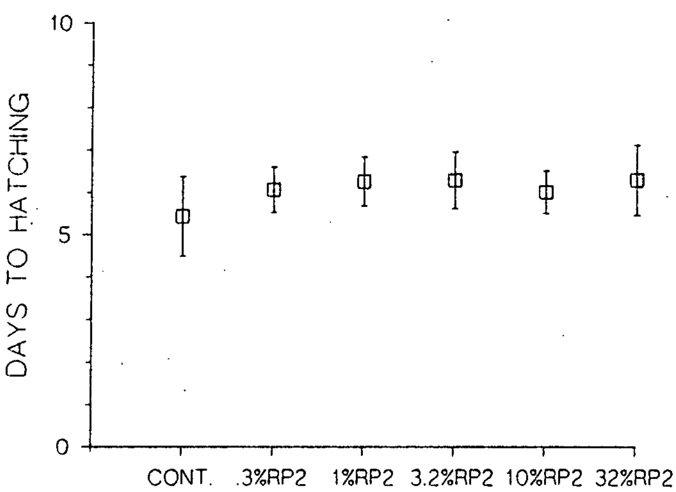


Fig. 3c Trial #1 Days to hatching
GLYPTOPHYSA sp.

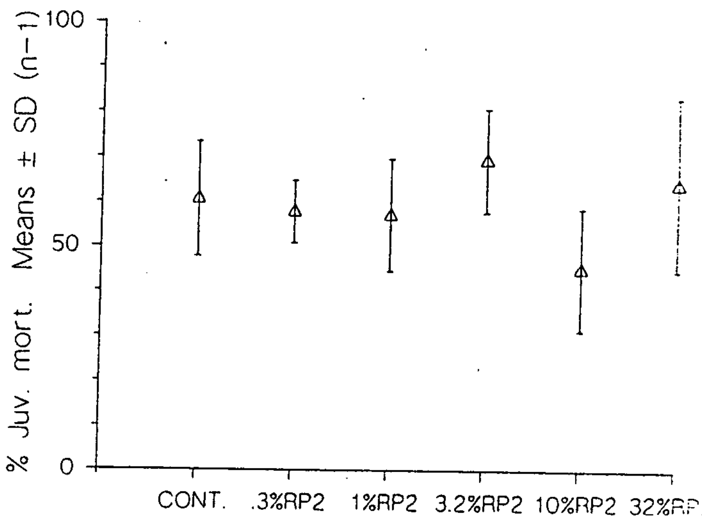


Fig. 3d Trial #1 Percentage juvenile mortali
A. carinata

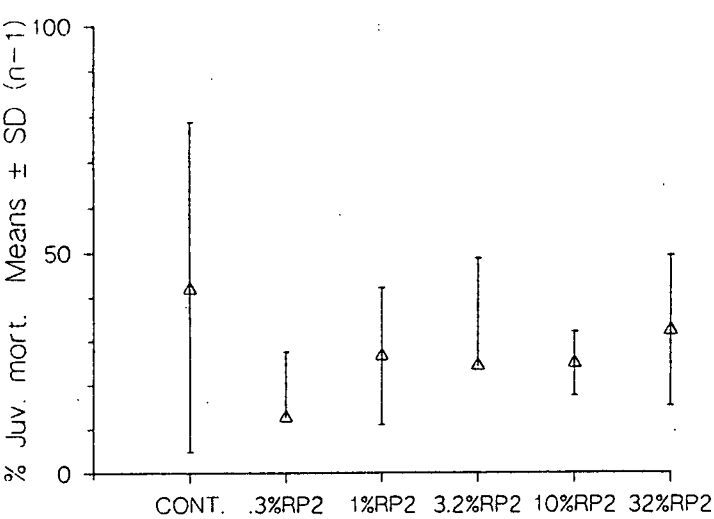


Fig. 3f Trial #1 Percentage juvenile mortality
GLYPTOPHYSA sp.

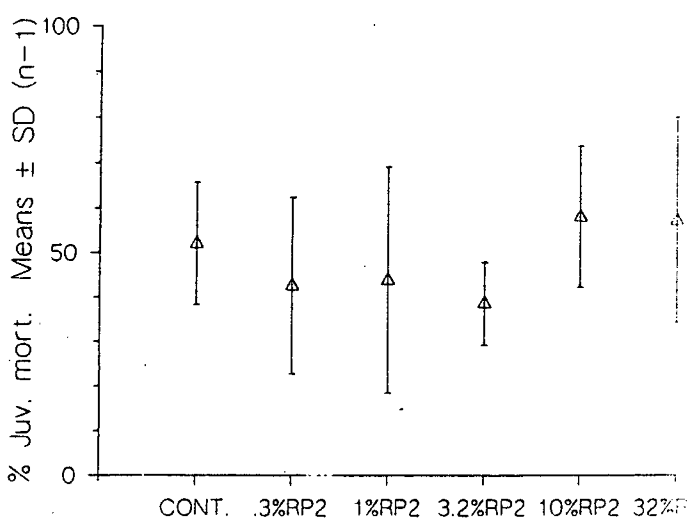


Fig. 3e Trial #1 Percentage juvenile mort
A. cummingii

TRIAL #2 COMMENCED 28/2/91

Trial #2 tested *A. cumingii*, *Gyraulus* sp. and *Lymnaea* sp. The endpoint examined were developmental retardation and embryonic mortality. Tabled data appears in Appendix 3 and full results of statistical analysis appear in Appendix 11.2. Results of analysis of variance performed on pooled replicate data are presented in Table 4a.

Table 4a. Results of analysis of variance. Trial #2.

Species	Endpoint	P>F	Conclusion
	Developmental retardation		
A. cumingii		0.308	No significant difference
Gyraulus sp.		0.0001	Significantly different
Lymnaea sp.		0.0001	Significantly different
	Embryonic mortality		
A. cumingii		0.6490	No significant difference
Gyraulus sp.		0.082	No significant difference
Lymnaea sp.		0.619	No significant difference

Significantly different results were subjected to Dunnett's testing. The results are summarised in Table 4b, and appear in full in Appendix 11.2.c.

Table 4b. Results of Dunnett's testing. Trial #2.

Species	Endpoint	NOEC	LOEC
	Developmental retardation		
Gyraulus sp.		32% RP2	100% RP2
Lymnaea sp.		32% RP2	100% RP2

From these results it was seen that developmental retardation was a more sensitive endpoint than direct mortalities to the growing embryos. The effects of RP2 water in terms of developmental retardation were apparent at 100% concentration.

TRIAL #3 COMMENCED 13/1/91

Trial #3 was conducted in a similar manner to Trial #2. In order to relate the results, *A. cumingii* was included, along with *A. carinata* and *Glyptophysa* sp. Observations on developing egg masses were not carried out on days 2 and 3, and the first developmental class included gastrula, trochophore, veliger and hippo stages. Tables results appear in Appendix 4. Analysis of variance was carried out on pooled data. Full results appear in Appendix 11.3. Table 5a presents a summary of these.

Table 5a Results of analysis of variance. Trial #3.

Species	Endpoint		P>F	Conclusion
	Developmental retardation			
A. carinata			0.0011	Significantly different
A. cumingii			0.027	Significantly different
Glyptophysa sp.			0.0105	Significantly different
	Embryonic mortality			
A. carinata		Treatment	0.1310	No significant diff.
		Stage	0.0872	No significant diff.
		Interaction	0.3582	No significant int'ion.
A. cumingii		Treatment	0.2682	No significant diff.
		Stage	0.7719	No significant diff.
		Interaction	0.9734	No significant int'ion.
Glyptophysa sp.		Treatment	0.8022	No significant diff.
		Stage	0.1252	No significant diff.
		Interaction	0.5397	No significant int'ion.
	Juvenile mortality			
A. carinata			0.0004	Significantly different
A. cumingii			0.0001	Significantly different
Glyptophysa sp.			0.017	Significantly different

Results of Dunnett's testing appears in Appendix 11.3 and is summarised in Table 5b.

Table 5b Results of Dunnett's testing. Trial #3.

Species	Endpoint	NOEC	LOEC
	Developmental retardation		
A. carinata		32%	100%
A. cumingii		100%	undefined
Glyptophysa sp.		100%	undefined
	Juvenile mortality		
A. carinata		32%	100%
A. cumingii		32%	100%
Glyptophysa sp.		100%	undefined

The species which showed undefined LOECs must derive their significant anova terms from treatments producing shorter hatching periods and lower juvenile mortality than control. For *Glyptophysa* sp., 32% juvenile mortality was significantly different from control, but because 100% mortality was not significantly different, the LOEC remained undefined. Effects are displayed in Figures 4a and 4b. From this trial *A. carinata* was seen to be more sensitive than the two other species tested, although *A. cumingii* was seen to be as sensitive in terms of juvenile mortality.

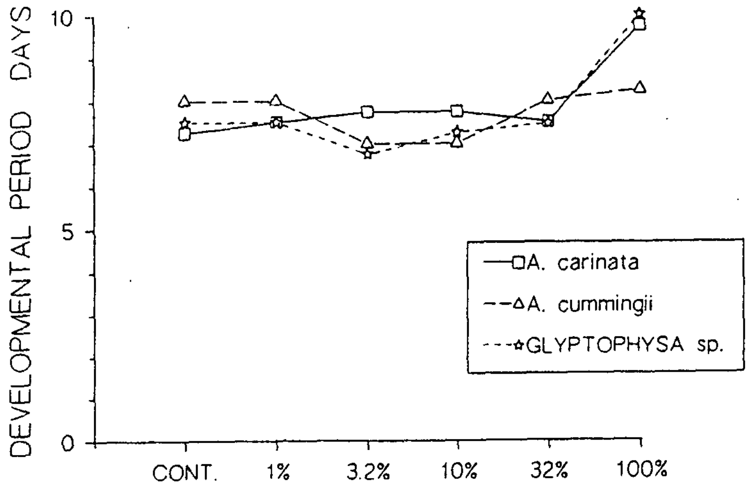


FIG 4A MEAN DEVELOPMENTAL PERIOD TRIAL #3

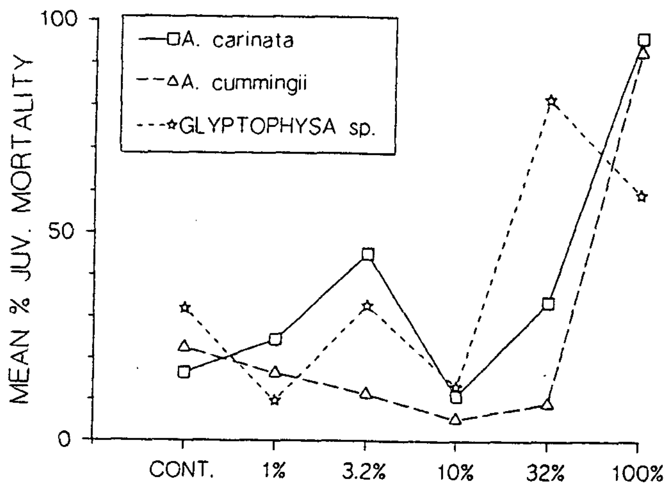


FIG 4B MEAN % JUVENILE MORTALITY TRIAL #3

TRIAL #4 COMMENCED 17/3/91

Trial #4 was conducted to determine the RP2 concentration at which developmental retardation began. For this, a geometric series a five treatments between 100% and 32% inclusive was used. It was attempted to determine the life stage at which effects commenced. Data is tabulated in Appendix 4. From considering the raw data, it appeared that most of the retardation occurred during the hatchling stage, and that stages leading up to this were not affected in that way. Results of analysis of variance performed on pooled replicate data is presented in Table 6a.

Table 6a. Results of analysis of variance. Trial #4

Species	Endpoint	P>F	Conclusion
	Period spent pre-hatchling		
A. carinata		0.6992	No significant difference
A. cumingii		0.0087	Significantly different
	Period spent as hatchling		
A. carinata		0.033	Significantly different
A. cumingii		0.0008	Significantly different
	Period of development (Developmental retardation)		
A. carinata		0.0509	No significant difference
A. cumingii		0.0001	Significantly different
Glyptophysa sp.		0.0067	Significantly different

Although *A. carinata* showed significant difference in analysis of variance, a LOEC was not established by Dunnett's testing. The error term from analysis of variance of period as hatchling (EMSS=2.3665), was large in comparison to the error term of the same parameter of *A cumingii* (EMSS=0.3665). *A. cumingii* was retarded by the higher concentrations in pre-hatchling and hatchling stages (Dunnett's testing Table 6b.), and *Glyptophysa* sp. was retarded over the full developmental period, but the data was unfit for analysis. (This robust species had a low fertility rate, many eggs degenerated or were infected by a fungus). The means of replicate values are illustrated in Figures 5a, 5b and 5c. Figures 5d to f illustrate the retarding effect at the hatchling stage

Table 6b. Results of Dunnett's testing. Trial #4.

Species	Endpoint	NOEC	LOEC
	Period spent pre-hatchling		
A. cumingii		56%	75%
	Period spent as hatchling		
A. carinata		100%	undefined
A. cumingii		75%	100%
	Developmental period		
A. cumingii		<32%	32%

From the *A. carinata* results developmental retardation was seen to occur at neither the pre-hatchling nor the hatchling embryonic stage, although a strong trend towards retardation during the late stages of development was noted. A large error term associated with the analysis of variance obscured this in the Dunnett's testing. For *A. cumingii*, it is possible to say that effects occurred at both pre-hatchling and hatchling stages. From the analysis it would appear that effects are more pronounced at the earlier developmental stages and that effects over the developmental period are cumulative.

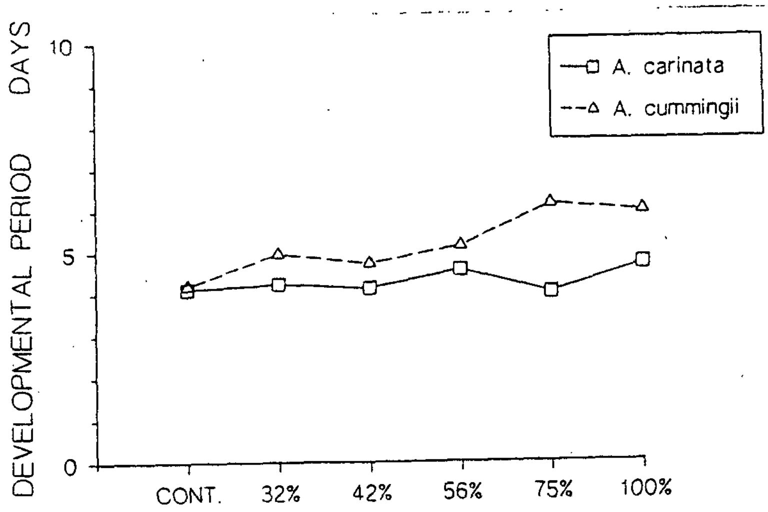


FIGURE 5A PERIOD SPENT PRE-HATCHLING TRIAL #4

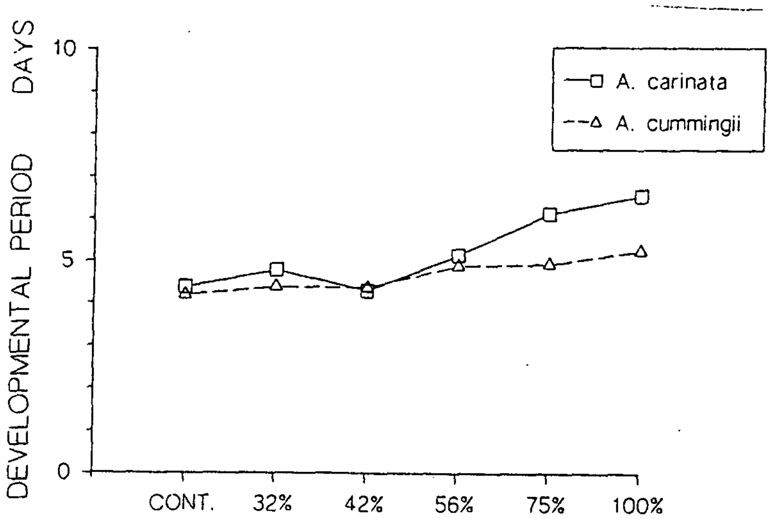


FIGURE 5B PERIOD SPENT AS HATCHLING TRIAL #4

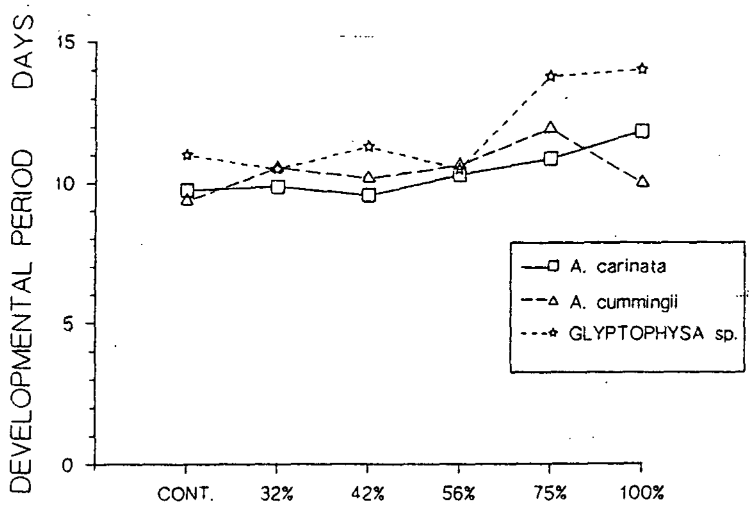


FIGURE 5C DEVELOPMENTAL PERIOD TRIAL #4

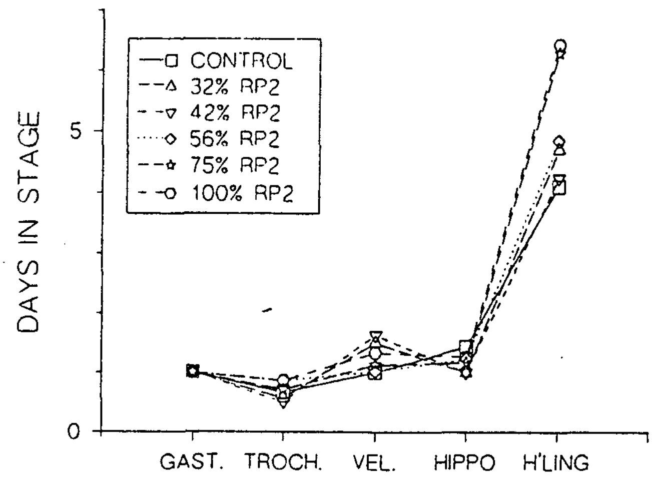


FIG. 5D DEVELOPMENTAL RETARDATION TRIAL #4
A. carinata

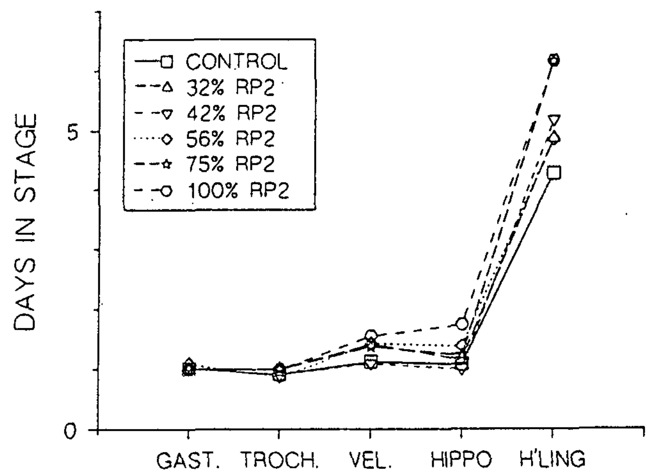


FIG. 5E DEVELOPMENTAL RETARDATION TRIAL #4
A. cummingii

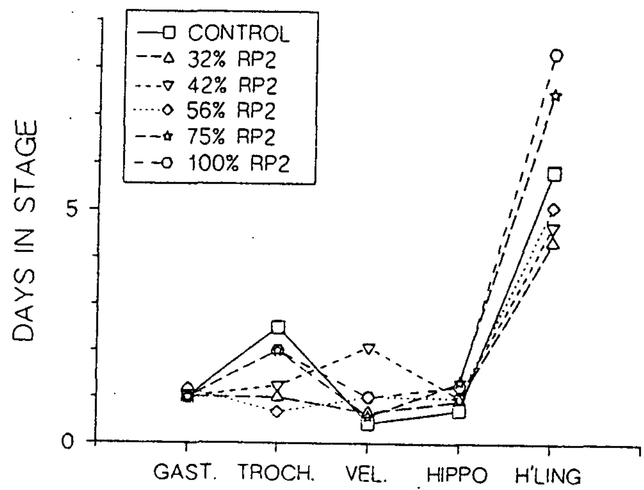


FIG. 5F DEVELOPMENTAL RETARDATION TRIAL #4
GLYPTOPHYSA sp.

Trial #5 Commenced 17/3/91

Trial #5 investigated the effects of RP2 water on the fecundity of *A. carinata*, *A. cumingii* and *Glyptophysa* sp. It was postulated that the metabolic load imposed by toxicity would decrease reproductive output. Tabulated data is presented in Appendix 6. Results of analysis of variance performed on pooled replicate data is presented in Table 7a. Figures 6a to 6c display average daily egg mass production means, and Figures 6d to 6f display average daily total egg production. Full statistical results appear in Appendix 11.4.a-d.

Table 7a. Results of analysis of variance. Trial #5.

Species	Endpoint	P>F	Conclusion
	Average daily egg mass production		
A. carinata		0.001	Significantly different
A. cummingi		0.0001	Significantly different
	Average daily egg mass production		
A. carinata		0.0001	Significantly different
A. cumingii		0.0001	Significantly different

Where significant differences were found Dunnett's testing was carried out to find difference from control means. The results appear in Table 7b.

Table 7b. Results of Dunnett's testing. Trial #5.

Species	Endpoint	NOEC	LOEC
	Average daily egg mass production		
A. carinata		<1% RP2	1% RP2
A. cumingii		3.2% RP2	10% RP2
	Average daily egg production		
A. carinata		<1% RP2	1% RP2
A. cumingii		3.2% RP2	10% RP2

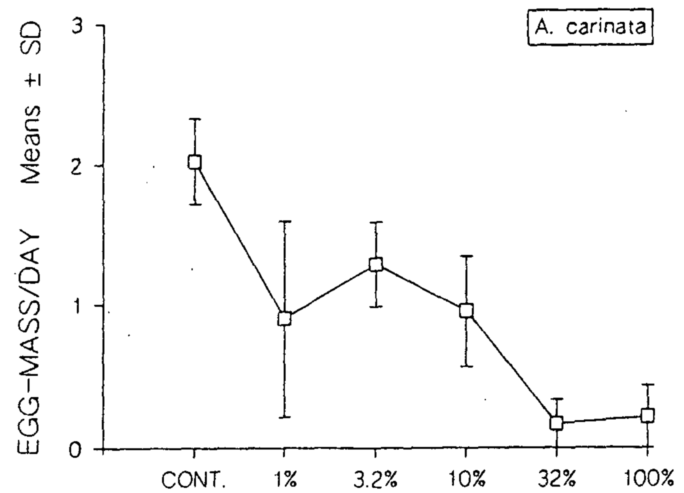


FIG. 6A AVERAGE EGG MASS PRODUCTION TRIAL #5

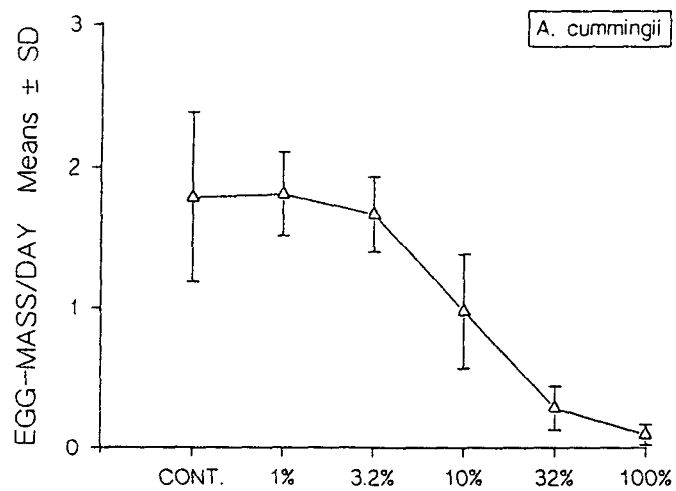


FIG. 6B AVERAGE EGG MASS PRODUCTION TRIAL #5

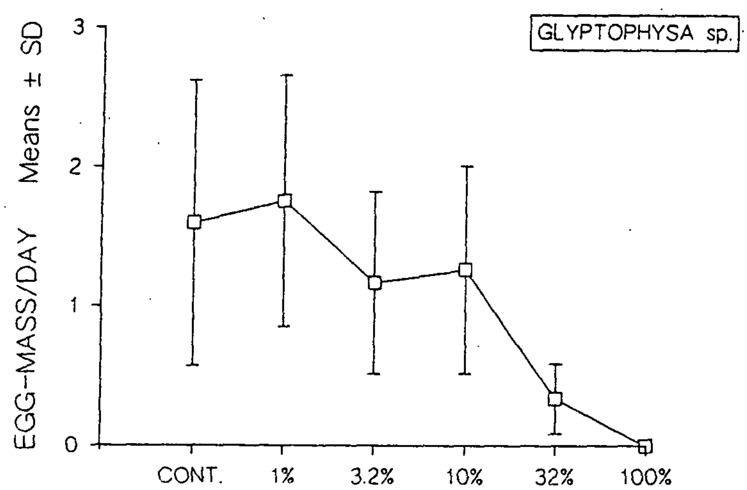


FIG. 6C AVERAGE EGG MASS PRODUCTION TRIAL #5

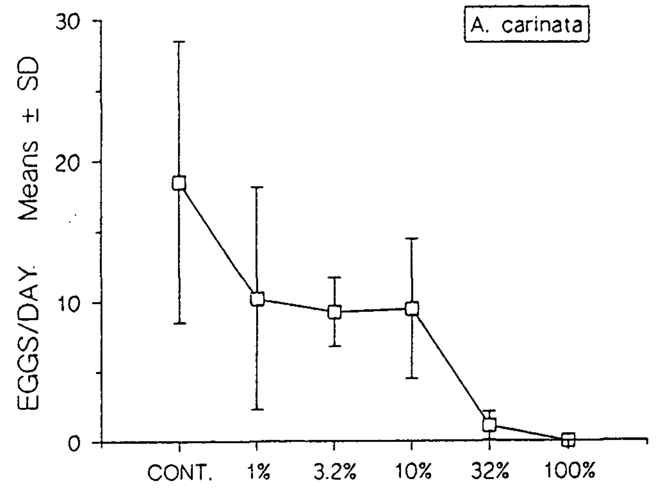


FIG. 6D AVERAGE EGG PRODUCTION TRIAL #5

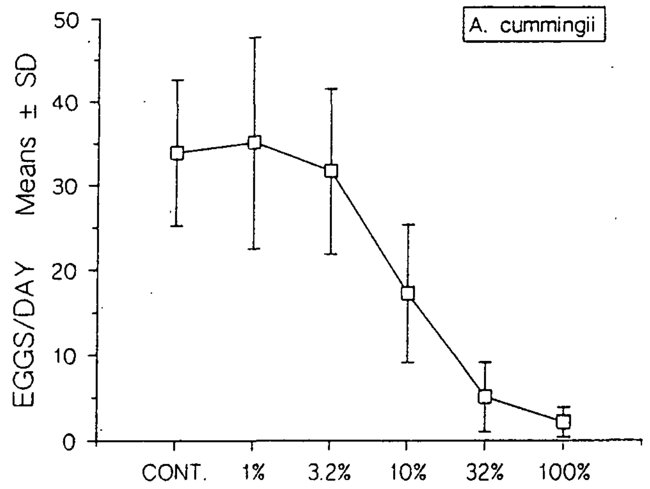


FIG. 6E AVERAGE EGG PRODUCTION TRIAL #5

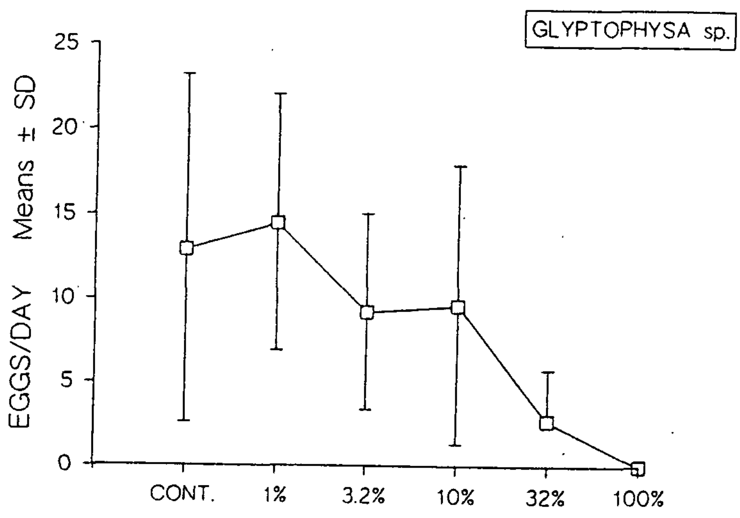


FIG. 6F AVERAGE EGG PRODUCTION TRIAL #5

The results of Trial #5 suggested that the fecundity parameters were sensitive measures of RP2 water effects, and that in terms of these parameters *A. carinata* was the most sensitive of the species examined.

TRIAL KNOWN PARENT

This trial was conducted to investigate whether parentage contributed to the within treatment variation observed in Developmental retardation and Juvenile mortality. The results of analysis of variance performed on data pooled gained from the replicate samples is presented in Table 8a. Raw data appears in Appendix 9a.

Table 8a. Results of analysis of variance. Trial Known parentage.

Species	Endpoint	P>F	Conclusion
	% Hatched/laid		
A. carinata		0.6605	No significant difference
A. cumingii		0.2137	No significant difference
	% Mortality/hatched		
A. carinata		0.7870	No significant difference
A. cumingii		0.6290	No significant difference
	% Mortality/laid		
A. carinata		0.9955	No significant difference
A. cumingii		0.3953	No significant difference

There was no significant difference found between various parameters measured. Although sample numbers were uneven and low (*A. carinata*:4,4,3,3. *A. cumingii*:4,4,3,3,2) the trial indicated that the observed variation in other trials was not due to genetic factor in the population sampled.

The lettuce discs were weighed daily before and after each daily exposure. It was seen to be of little use as an endpoint because of vegetative decay and differences in each disc weight due to internal structure (thick veins etc).

Trial #6. Validation commenced 12/4/91

Trial #6 involved concurrent testing in the laboratory and at the creekside monitoring station. The differences in these two situations were flow rate, temperature and light. The full results from the creekside station testing were unavailable for analysis, and basic statistics and results of T-testing to determine LOECs and NOECs only were available. Tabulated data is in Appendix 7. Results of analysis of variance are in Table 9a. Full results of statistical analysis are in Appendix 11.6. Egg mass production, egg production, weight loss and control reared juvenile mortality are illustrated in Figures 7a-j.

Table 9a. Results of analysis of variance. Trial #6 Laboratory results.

Species	Endpoint	P>F	Conclusion
	Daily egg mass laying		
A. carinata		0.0001	Significantly different
A. cumingii		0.0001	Significantly different
Glyptophysa sp.		0.0001	Significantly different
	Daily egg laying		
A. carinata		0.0001	Significantly different
A. cumingii		0.0001	Significantly different
Glyptophysa sp.		0.0008	Significantly different
	Adult weight change - % loss		
A. carinata		0.1631	No significant diff.
A. cumingii		0.0550	No significant diff.
Glyptophysa sp.		0.0010	Significantly different

pto

Table 9a. contd **Results of analysis of variance. Trial #6 Laboratory results.**

Species	Endpoint	P>F	Conclusion
	Adult weight change - % gain		
A. carinata		0.3241	No significant diff.
A. cumingii		0.2405	No significant diff.
	Juvenile mortality - exposed egg masses		
A. carinata		0.7027	No significant diff.
A. cumingii		0.0558	No significant diff.
Glyptophysa sp.		0.4196	No significant diff.
	Juvenile mortality - control reared egg masses		
A. cumingii		0.3003	No significant diff.

The results of Dunnett's testing following significant differences are in Table 9b.

Table 9b. Results of Dunnett's testing. Trial #6 Laboratory results.

Species	Endpoint	LAB.	CREEK
	Average daily egg mass production		
A. carinata		10% RP2	1.0% RP2
A. cumingii		3.2% RP2	10% RP2
Glyptophysa sp.		32% RP2	10% RP2
	Average daily egg production		
A. carinata		1% RP2	No data
A. cumingii		10% RP2	No data
Glyptophysa sp.		32% RP2	No data
	Percentage weight loss		
Glyptophysa sp.		Undefined	No data
	Juvenile mortality		
A. carinata		Undefined	1.0% RP2

Parameters which produced significant differences from the control values were average daily egg and egg mass production. The NOEC established for *A. carinata* using egg mass production was higher in this trial than the previous. For *A. cumingii* the same parameter produced a LOEC of 3.2% RP2, as opposed to one of 10% RP2 in the previous trial. This cannot be readily explained as the error terms associated with *A. carinata* are similar for egg mass production in Trials 5 and 6 (Standard error=1.450 Vs 1.365 respectively). If the sampling period was too brief, one would expect a larger error term in the shorter period. The same variable for *A. cumingii* is lower in the shorter trial. For total egg production, the two trials yielded identical NOECs and LOECs for *A. carinata* and *A. cumingii*. In trial #6 *Glyptophysa* sp. was seen to be comparatively insensitive in terms of the fecundity parameters. The weight loss parameters presented some difficulty in analysis. The was generally no consistent trend in either weight loss or weight gain within replicates of any treatments. As well as inaccuracies associated with measurement, individual responses to osmotic and metabolic stress may make this parameter too variable for use in short term biological monitoring.

Juvenile mortality was insensitive and in the lab produced no significant differences between treatments for the three species tested. In this trial only egg mass produced by adults exposed to the toxicant were used, in many samples there were no juveniles produced. Juveniles reared in control water and subsequently exposed did not show significant differences under analysis of variance.

Laboratory and field results were generally similar. Fecundity parameters were higher in the field for *A. carinata* and *A. cumingii*, while *Glyptophysa* sp. showed similar responses in lab and field. In terms of response to RP2 water, similar decreases in fecundity were observed, although only *A. carinata* appeared as sensitive in the field (Figures 7k-p). Juvenile mortality did not appear to correspond well in the two situations, mortalities in the field were well above lab mortalities at the lower concentrations.

LOECs from the lab and creekside trials did not correspond exactly. However, lab results from the previous trial for

TRIAL #6

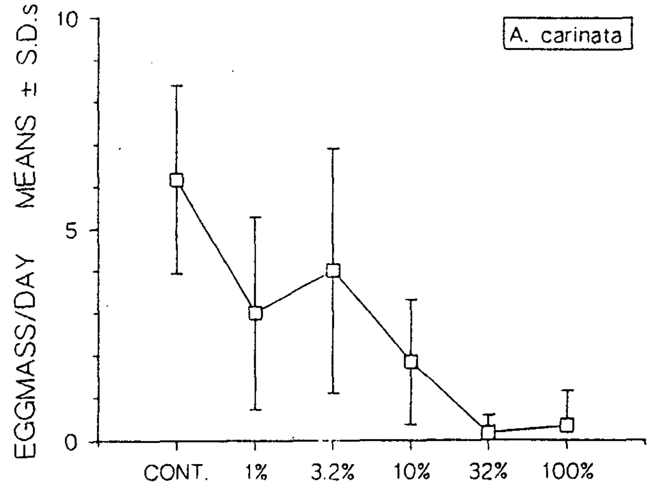


FIGURE 7A AVERAGE DAILY EGGMASS LAYING

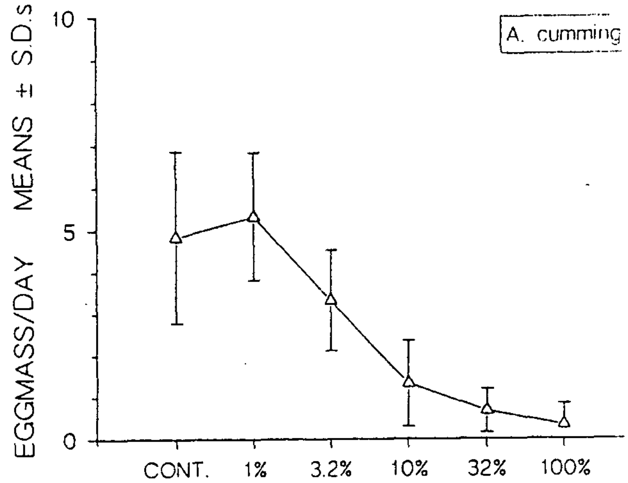


FIGURE 7B AVERAGE DAILY EGGMASS LAYING

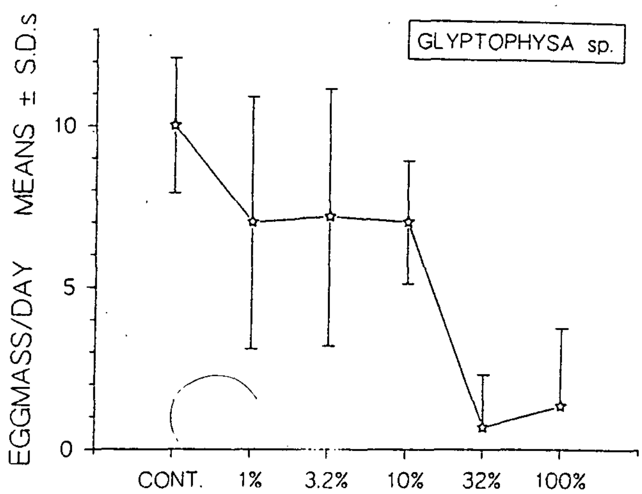


FIGURE 7C AVERAGE DAILY EGGMASS LAYING

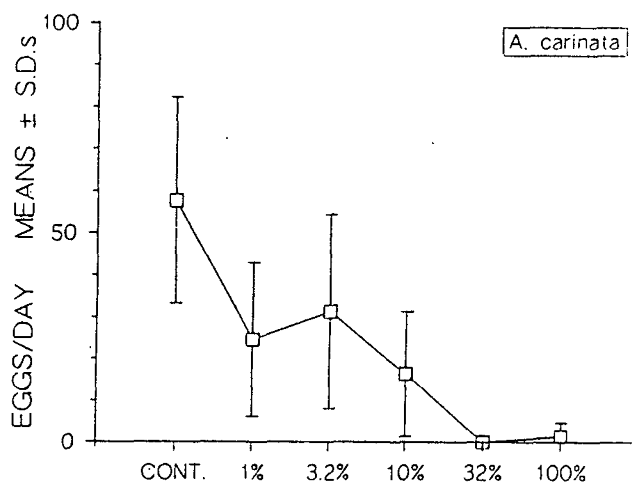


FIGURE 7D AVERAGE DAILY EGG LAYING

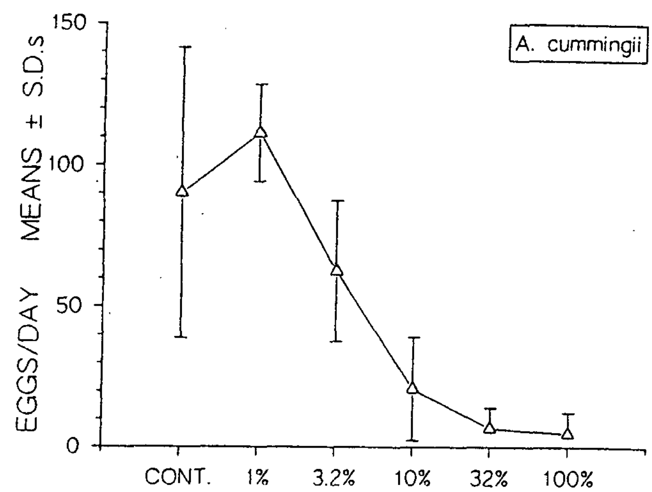


FIGURE 7E AVERAGE DAILY EGG LAYING

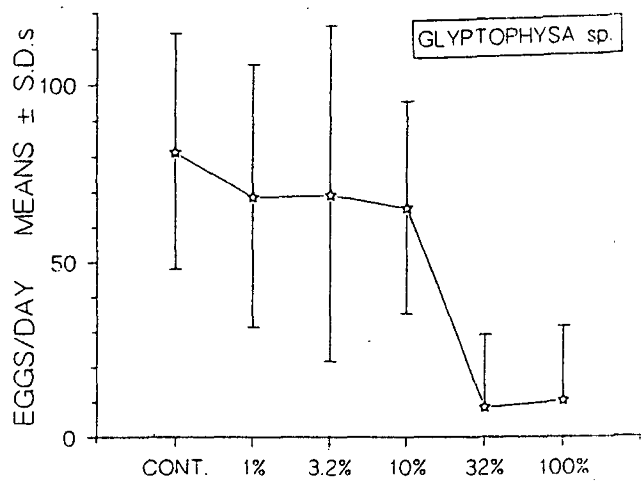


FIGURE 7F AVERAGE DAILY EGG LAYING

TRIAL #6

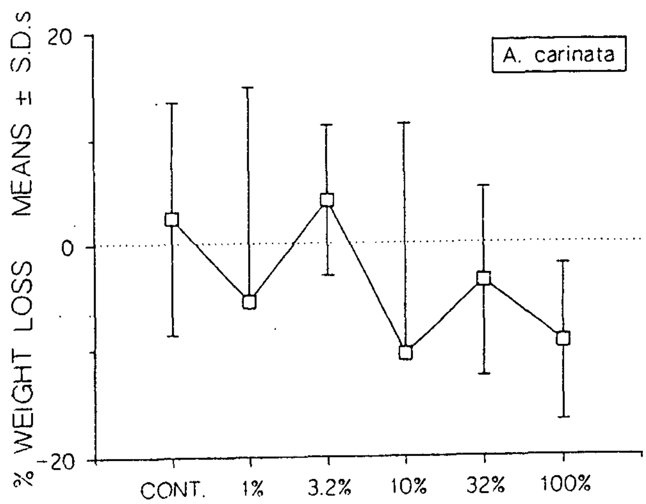


FIGURE 7G AVERAGE WEIGHT LOSS

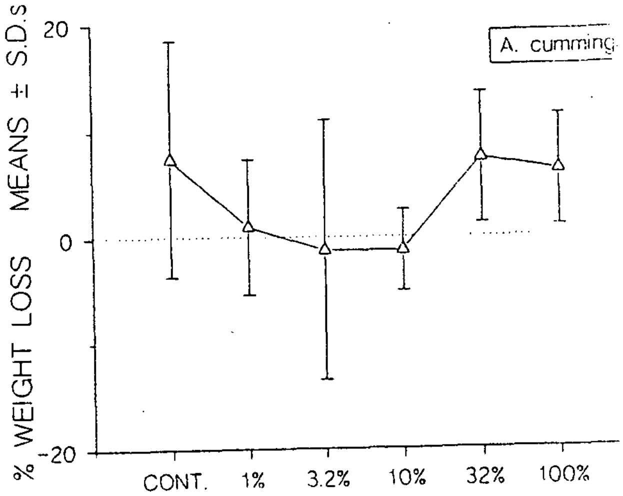


FIGURE 7H AVERAGE WEIGHT LOSS

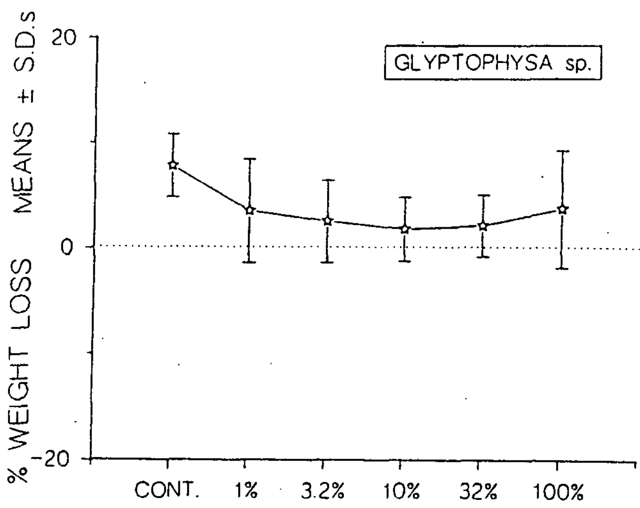


FIGURE 7I AVERAGE WEIGHT LOSS

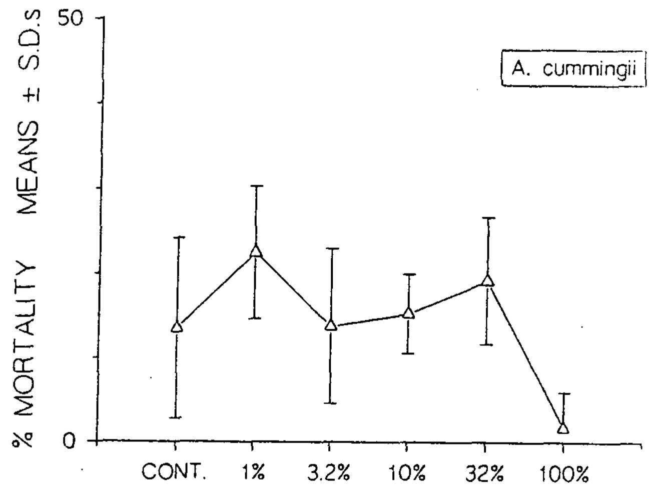


FIGURE 7J CONTROL REARED JUV. MORTALITY

TRIAL #6 LAB/FIELD

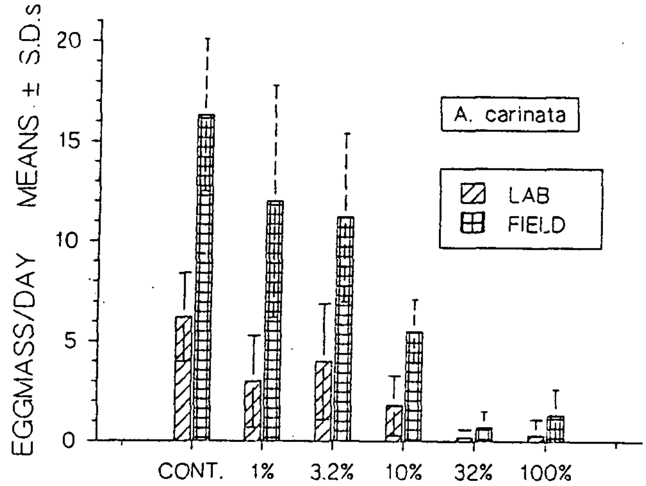


FIGURE 7K AVERAGE DAILY EGGMASS LAYING

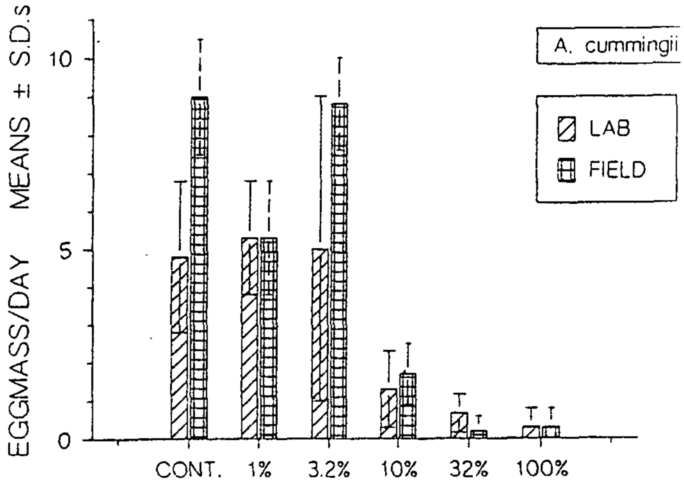


FIGURE 7L AVERAGE DAILY EGGMASS LAYING

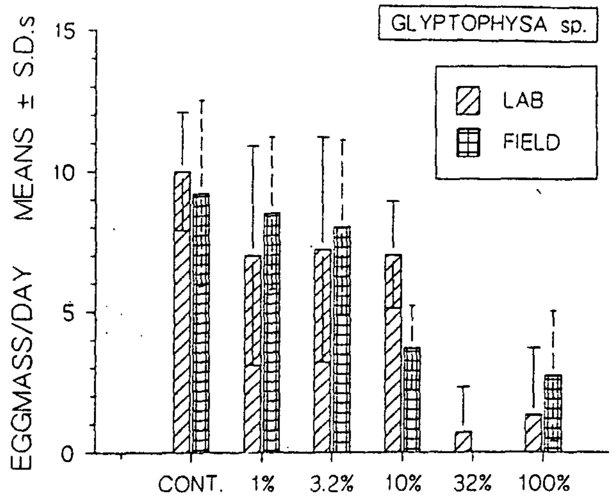


FIGURE 7M AVERAGE DAILY EGGMASS LAYING TRIAL

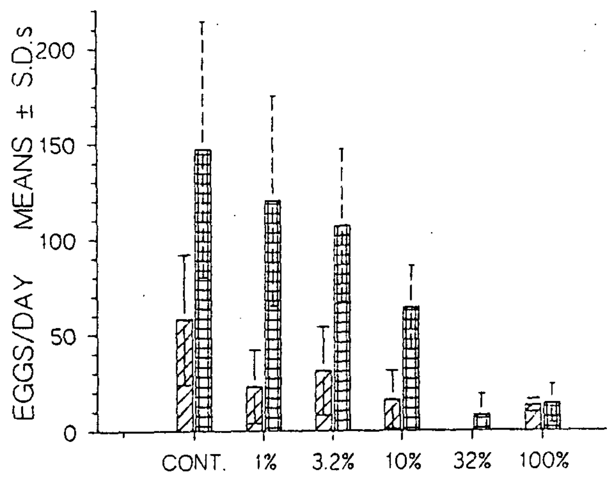


FIGURE 7N AVERAGE DAILY EGG LAYING TRIAL

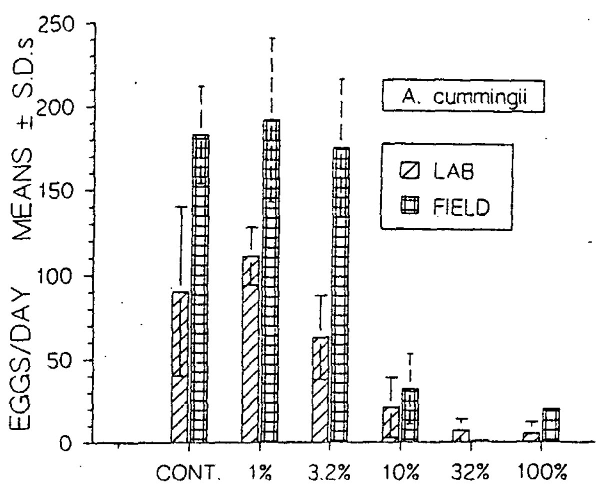


FIGURE 7O AVERAGE DAILY EGG LAYING TRIAL

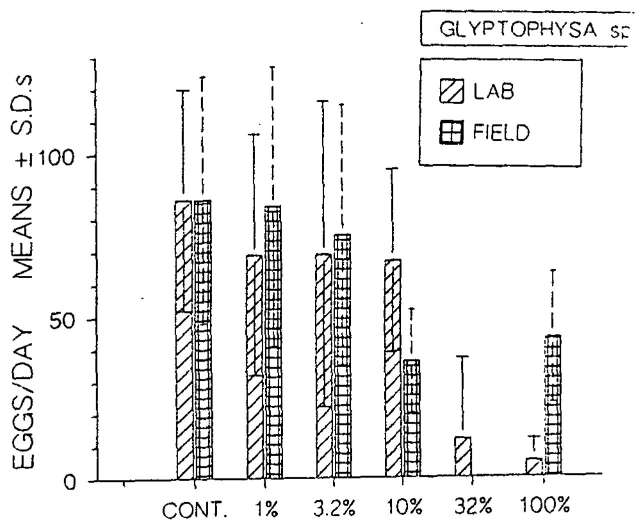


FIGURE 7P AVERAGE DAILY EGG LAYING TRIAL

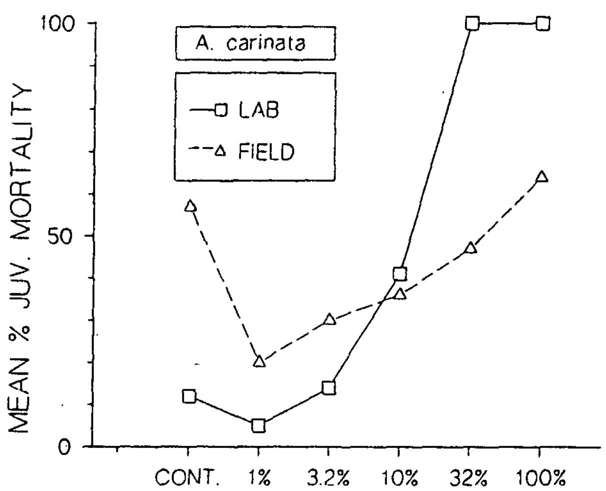


FIGURE 7Q MEAN JUV. MORTALITY TRIAL
FROM EXPOSED EGG MASSES

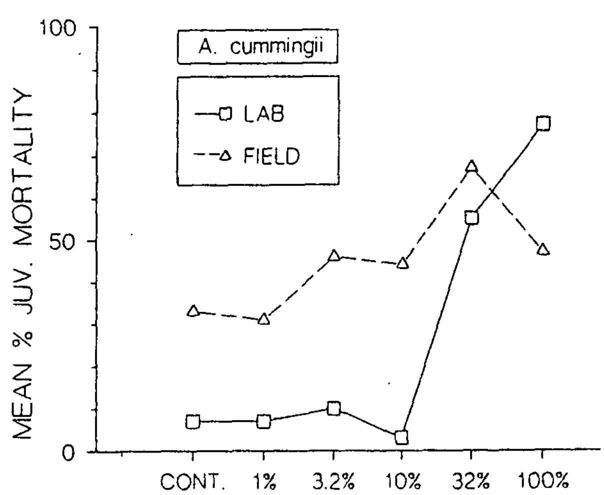


FIGURE 7R MEAN JUV. MORTALITY TRIAL
FROM EXPOSED EGG MASSES

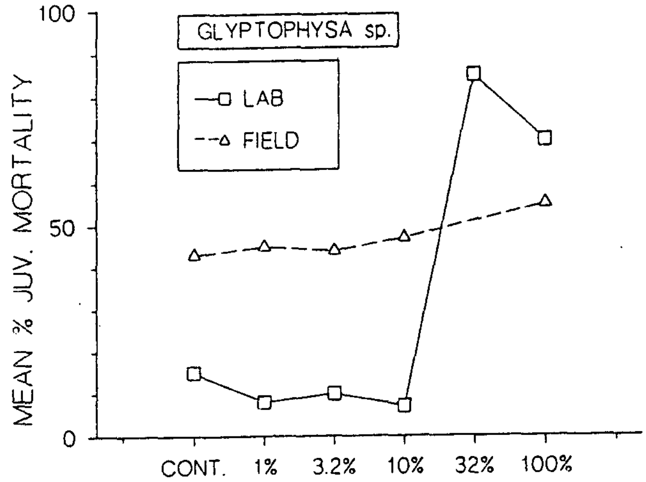


FIGURE 7S MEAN JUV. MORTALITY TRIAL #6 LAB/FIELD FROM EXPOSED EGG MASSES

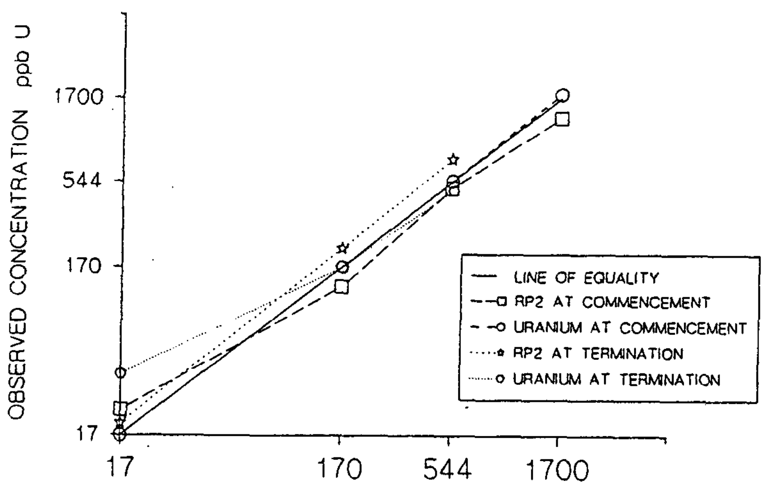


FIGURE 8A NOMINAL URANIUM CONCENTRATIONS ppb U TRIAL #7

Trial #7 Commenced 2/5/91 RP2 - Uranium comparison

This trial was conducted to compare the effects of uranium solutions of similar concentration to the total uranium content of the RP2 dilutions. An initial 100% RP2 was changed to 32% RP2 after mortality of all adult *A. carinata* after 24 hours exposure to this concentration.

Tabulated data is in Appendix 8. Nominal and observed concentrations of RP2 and uranium treatments are illustrated in Figure 10a. Full Scintrex and GFAAS determinations of uranium and manganese are in Appendix 10e. Results of T-tests between the corresponding RP2 and uranium treatments are in Table 9a.

Table 10a Results of T-testing. Trial #7.

Species	Treatment*	P>F (Ho:Var's =)	P>T (Ho:Means =)	Result
	Daily egg mass production			
A. carinata				
	1%	0.499	0.0524	Do not reject Ho.
	10%	1.000	0.0006	Reject Ho.
	32%	0.5345	0.5364	Do not reject Ho.
A. cumingii				
	1%	0.7599	0.1048	Do not reject Ho.
	10%	0.4650	0.0493	Reject Ho.
	32%	0.5276	0.2560	Do not reject Ho.
	Daily egg production			
A. carinata				
	1%	0.9013	0.5434	Do not reject Ho.
	10%	0.7344	0.2087	Do not reject Ho.
	32%	0.4648	0.3453	Do not reject Ho.

* The stated treatments (1, 10 and 32%) refer to testing between RP2 and U treatments of nominally identical U concentrations.

pto

Table 10a contd. Results of T-testing. Trial #7.				
Species	Treatment*	P>F (Ho:Var's =)	P>T (Ho:Means =)	Result
	Daily egg production			
A. cumingii				
	1%	0.7760	0.3642	Do not reject Ho.
	10%	0.2096	0.0614	Do not reject Ho.
	32%	0.7040	0.5477	Do not reject Ho.

For the endpoint average daily egg masses, both species at the 10% treatment showed significant differences. In both cases the RP2 mean was lower than the U mean. The 10% RP2 uranium concentrations as determined by the Scintrex method varied from commencement to termination (130 and 170 ppb U respectively). The reasons for this were not immediately clear. Discounting contamination, a possible explanation might be coprecipitation of the uranium with manganese, and subsequent concentration as that form in the exposure tanks. The pH levels were seen to vary markedly within treatments. Although a standardised procedure was adopted to measure pH, it is unlikely that were accurate. Analysis of variance showed significant difference between replicates and treatments (P>F=0.0002, F=7.88). SNK testing grouped together the two uranium treatments and the two RP2 treatments.

TRIAL ALGAE/SIZE

This was conducted for similar reasons as the known parentage trial. The trial sought to establish whether the presence or absence of algae in the vials, or the size of the vials, had any influence on juvenile mortality. Raw data appears in Appendix 9b. Results of analysis of variance appear in Table 11a.

Table 11a. Results of analysis of variance. Trial Algae/size.

Species	Endpoint	P>F	Conclusion
	Juvenile mortality		
A. carinata			
	Size	0.0008	Significantly different
	+/-Algae	0.8886	No significant difference
	Interaction	0.5477	No significant difference
A. cumingii			
	Size	0.0051	Significantly different
	+/-Algae	0.7327	No significant difference
	Interaction	1.0000	No significant difference

SNK testing produced two groups for each species. The results appear in Table 11b.

Table 11b. Results of comparisons from SNK testing. Trial Algae/size

Species	Result	Parameter	Mean	SD
Juvenile mortality				
A. carinata	[3]Large +Algae		66.8%	2.9%
	[3]Large -Algae			
	[3]Small +Algae		30.9%	1.9%
	[3]Small -Algae			
A. cumingii	[3]Large +Algae		77.5%	5.6%
	[3]Large -Algae			
	[3]Small +Algae		25.7%	5.9%
	[3]Small -Algae			

These results indicated that the size of the container did influence juvenile mortality, but could not apportion the observed variation in juvenile mortality of earlier trials to any one factor. Algae was seen to be an unimportant factor in this analysis.

TABLE 12 CRITERIA AND RESPONSE

ENDPOINT	SPECIES *A. carinata*	*Gl A. cummingii*	*Gabbia* sp.	*Hyptophysa* sp.	*Gyraulus* sp.	*elicorbis* sp.	*Lymnaea* sp.
Natural							
Egg mass prod.	++	+	-	+	++	-	-
Egg prod.	++	+	-	+	++	-	+
Handling	+	+	-	+	+	-	-
Hatchability	+	+	-	-	--	-	+
Rearing	+	++	--	+	-	-	+
Trials							
Adult mortality	0	-	nt	-	nt	nt	nt
Dev'l retard'n	0	+	nt	0	+	nt	+
Embryonic mort.	-	-	nt	-	-	nt	-
Egg mass prod.	++	++	nt	+	nt	nt	nt
Egg prod.	++	+	nt	+	nt	nt	nt
Feeding	-	-	nt	-	nt	nt	nt
Juvenile mort.	0	+	nt	-	nt	nt	nt
Weight change	-	-	nt	+	nt	nt	nt

Key

++	Low variation or sensitivity.	+	Moderate variation or sensitivity.
0	Indifferent.	nt	Not tested.
--	High variation or sensitivity.	-	Low variation or sensitivity.

Table 12 indicates that the fecundity endpoints using *A. carinata* and *A. cumingii* gave the best results in terms of sensitivity and variation. Although *Gyraulus* sp. also showed potential with the fecundity endpoints, handling and rearing this species presented some difficulty. It is possible that these could be overcome. As previously mentioned *Gabbia* sp. and *Helicorbis* sp. were eliminated after the preliminary observations because of high variability in the fecundity parameters, and difficulties in handling and rearing. *Glyptophysa* sp. displayed low fertility and an insensitivity to the toxicant. *Lymnaea* sp. was difficult to handle and laid large egg masses unpredictably. The juveniles appeared to shelter in the egg mass after rupture.

Although some species were not assessed using several endpoints, the success of other species justified this exclusion.

SEQUESTRATION OF URANIUM

EDAX analysis of unstained sections of *A. carinata* from Trial 5 (exposed to 32% RP2 for seven days) identified uranium in the ovotestis. Other tissues examined which did not show uranium accumulation were the digestive gland (hepatopancreas), mantle, kidney, albumin gland, foot and hermaphroditic duct. In the ovotestis, the uranium was deposited as spindle shaped crystals in association with other electron dense amorphous material. Plates 4a to l show photomicrographs of sections from the ovotestis, mantle and kidney. Sections of the digestive gland were unsuitable for proper analysis because overfixation had made the tissue friable. Figure 1b, 1c and 1d show uranium crystals located in multivescicular bodies of the ciliated epithelium. Plate 4F shows typical electron dense granules in the ovotestis. Plate 4g shows mitosis with no apparent involve ment of uranium. Plate 4h shows a multivescicular body at the cell membrane, apparently involved in endocytosis or exocytosis. Plates 4i and 4j show stained and unstained sections of the mantle, the typical electron dense granules are visible in the unstained section. Plate 4k shows a stained section of the kidney. Again normal electron dense granules are present. Plate 4l shows what is probably artifactual uranium crystals associated with the cell membrane. No such deposits were observed in the unstained sections.

The results of the ultrastructural study are somewhat inconclusive. The normal pathway for the deposition of metals in molluscs is via the digestive gland (gastropods) or the kidney (bivalves) (Simkiss and Mason, 1983). It must be assumed that the uranium is taken up, either in solution or associated with a metallothein-like molecule, and deposited in the digestive gland, with which the ovotestis makes close contact. Subsequent movement of the uranium into the digestive gland must then follow.

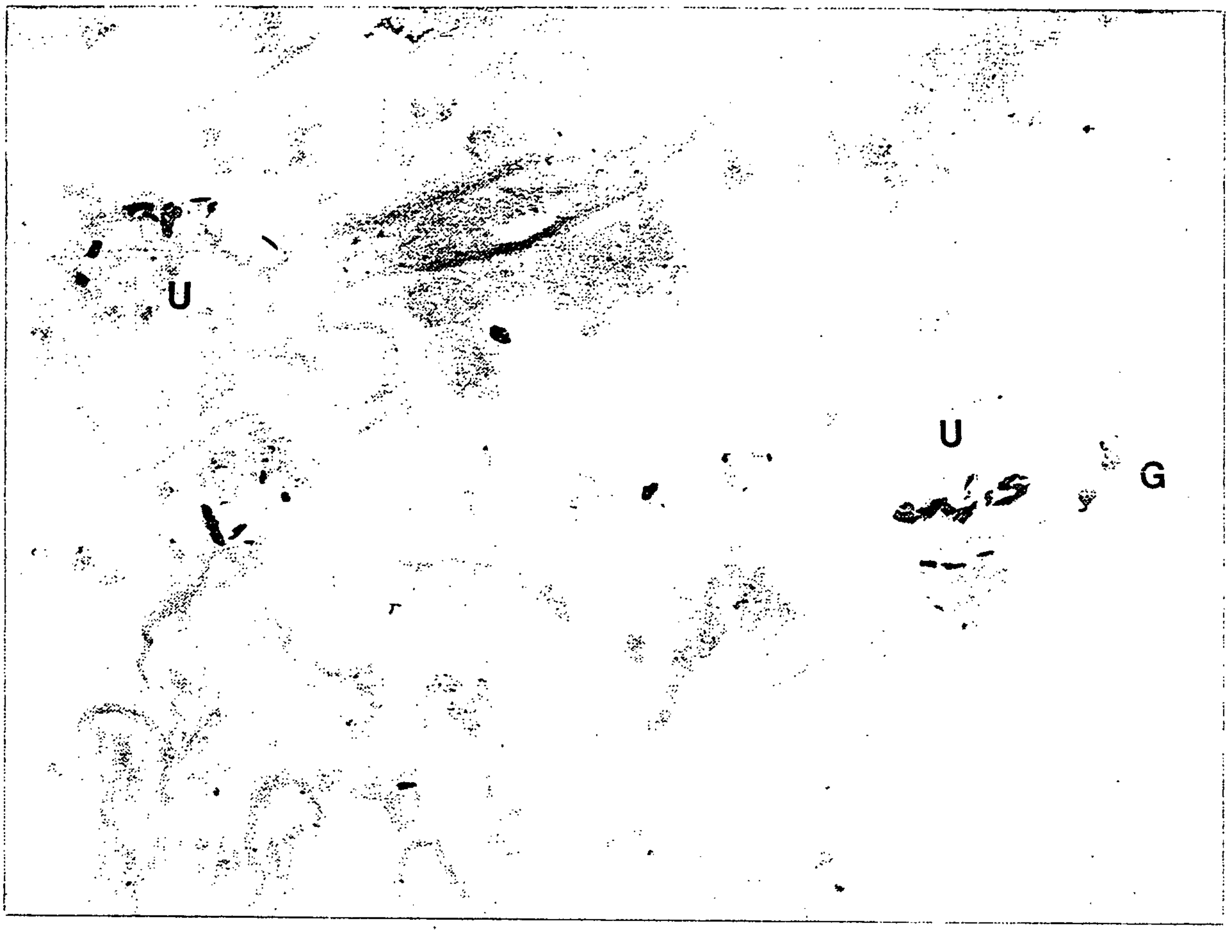


Plate 4a Unstained ovotestes : uranium and granules X 35,000

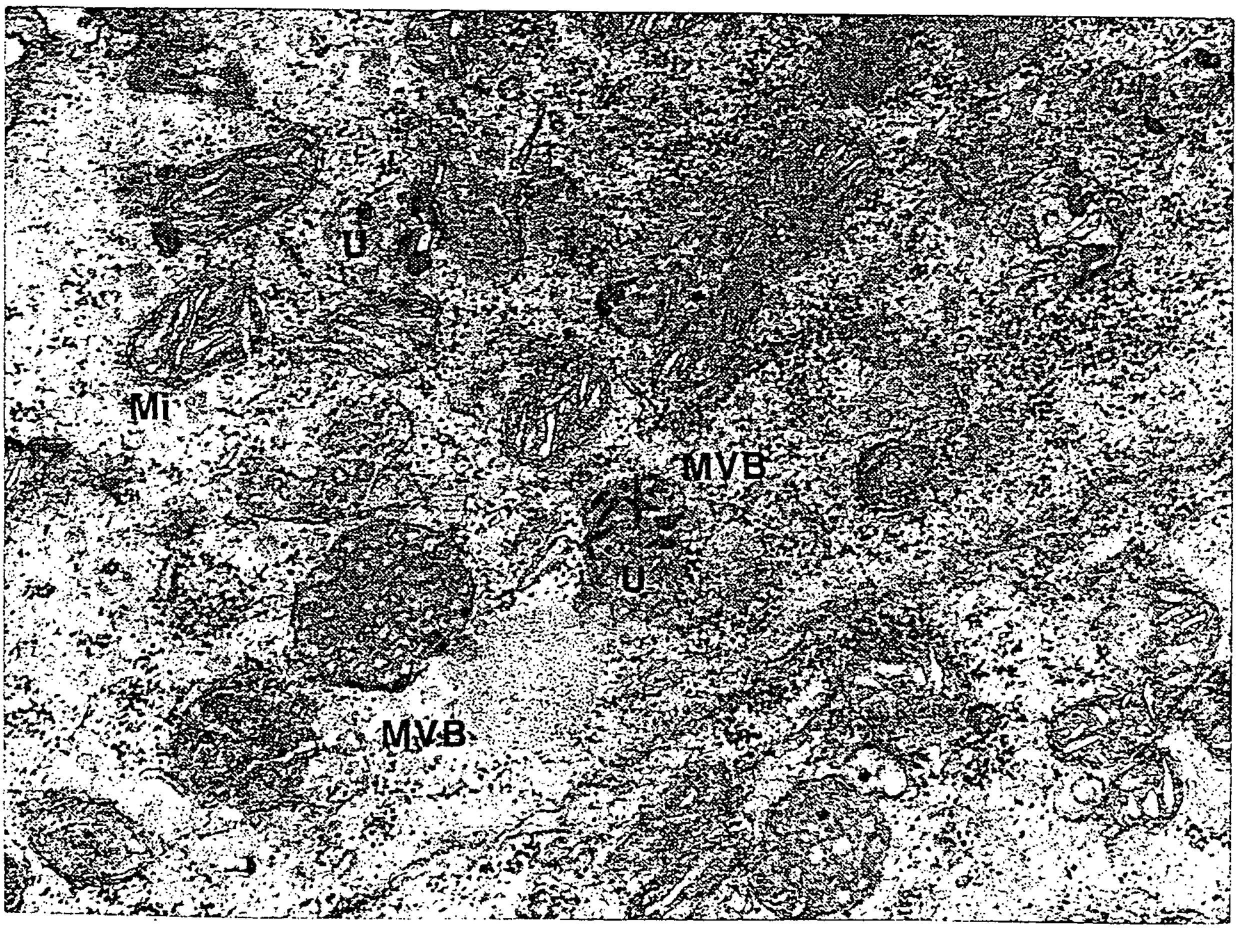


Plate 4b Stained ovotestes : uranium in multivesicular bodies X 35,000

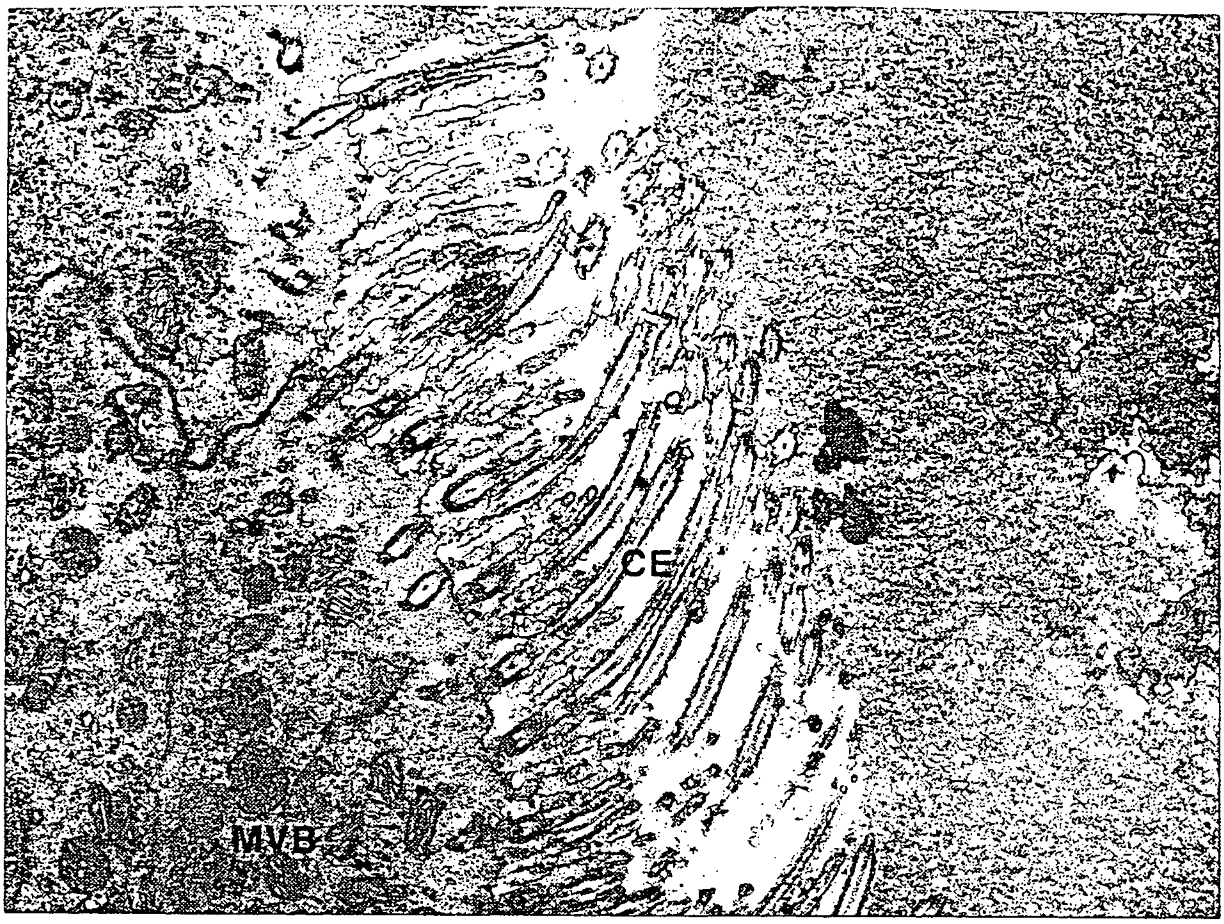


Plate 4c Uranium containing MVB in ovotestes epithelia **X 15,000**

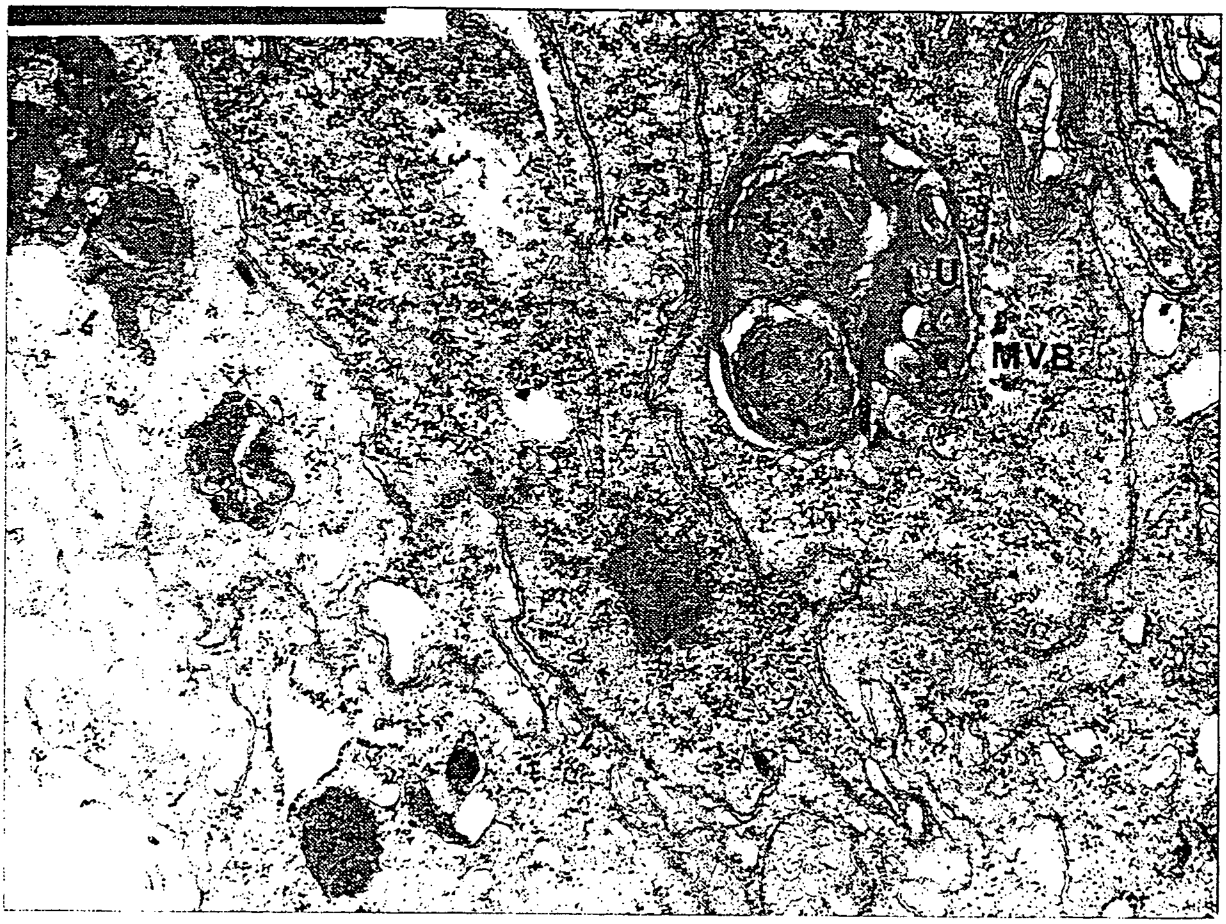


Plate 4d Uranium crystals in a multivesicular body **X 20,000**

Plate 4e Enlargement of Plate 4a X 90,000

Plate 4f Typical granules in the ovotestes X 15,000

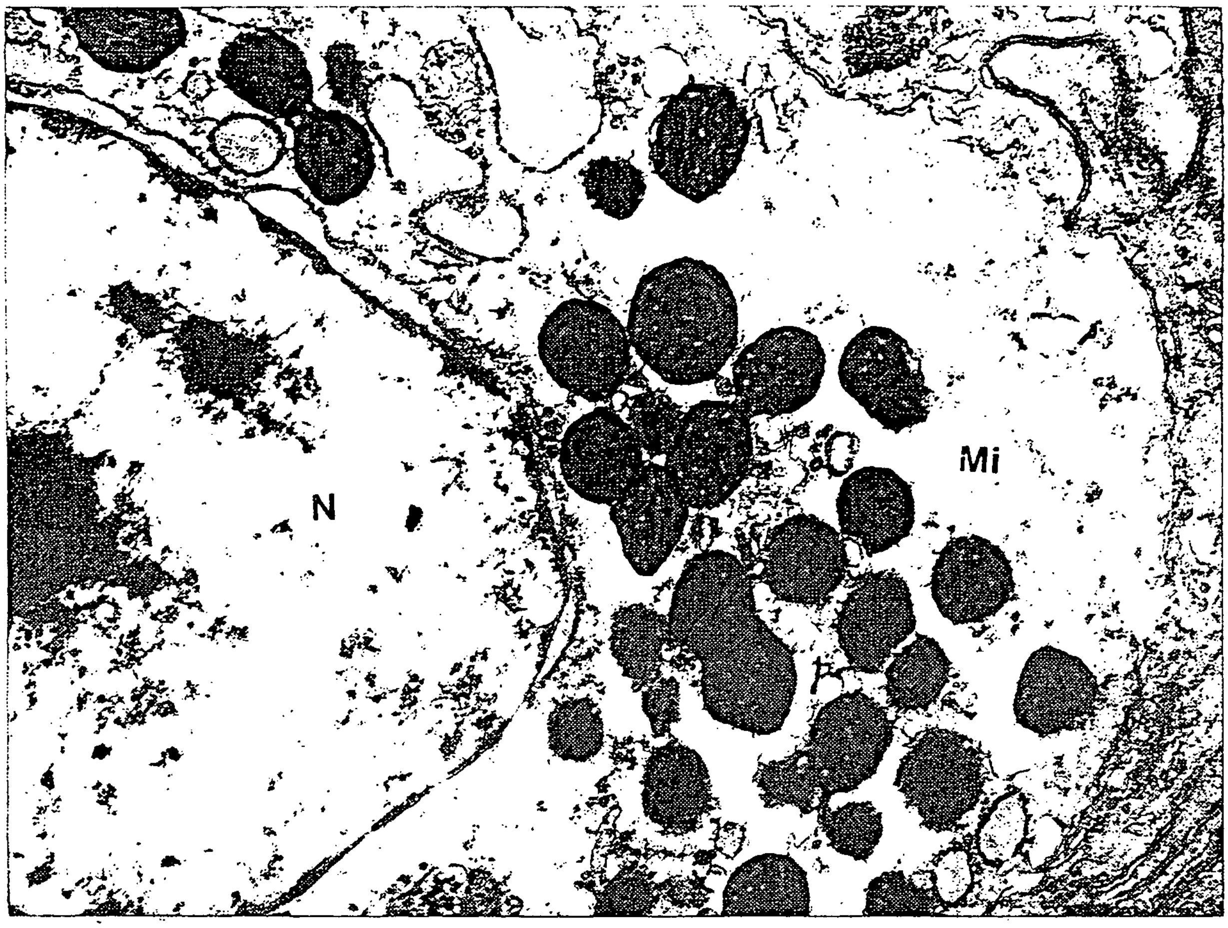


Plate 4g Cell undergoing meiosis : ovotestes X 20,000

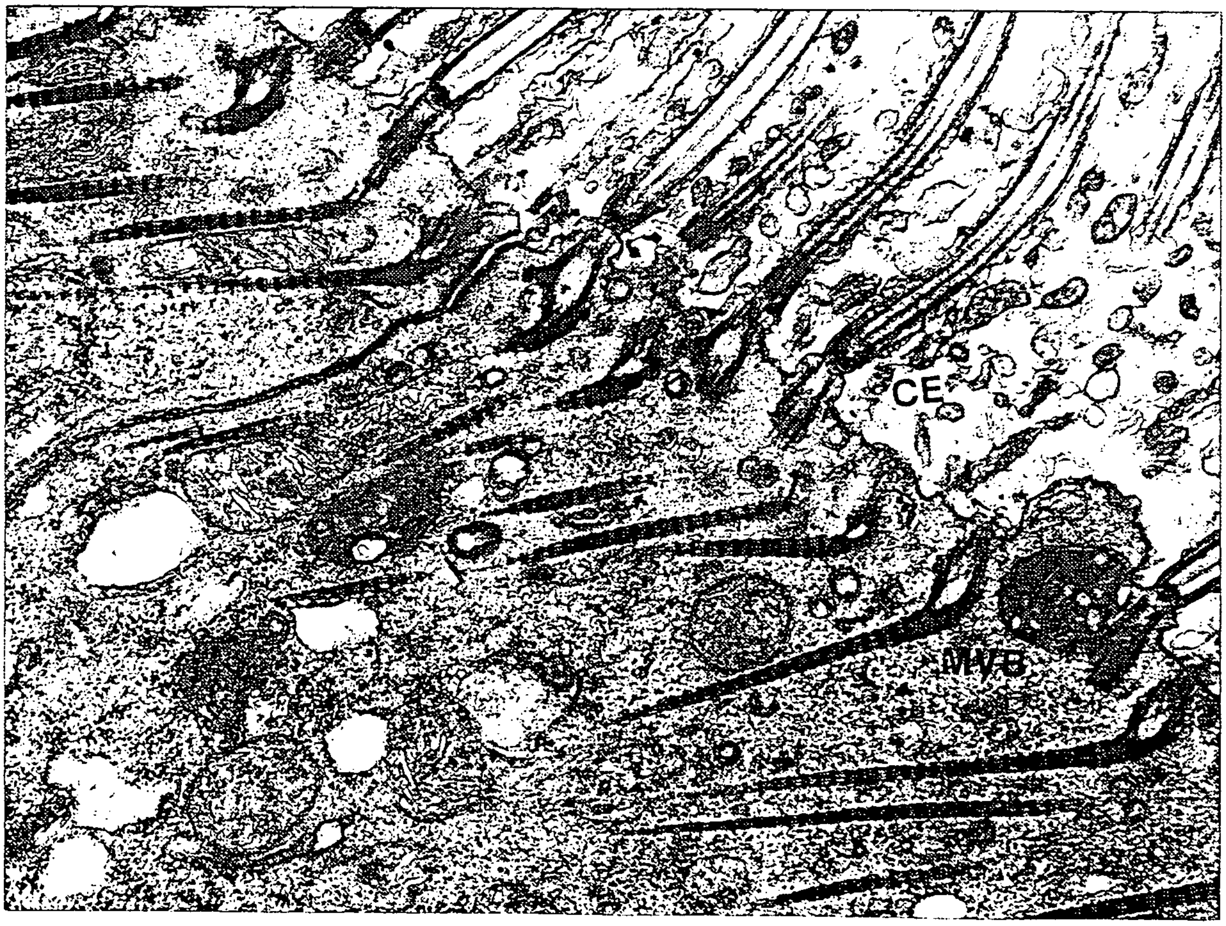


Plate 4h Multivesicular body at cell membrane : ovotestes X 20,000

Plate 4i **Mantle** X 10,000

Plate 4j **Mantle** X 20,000

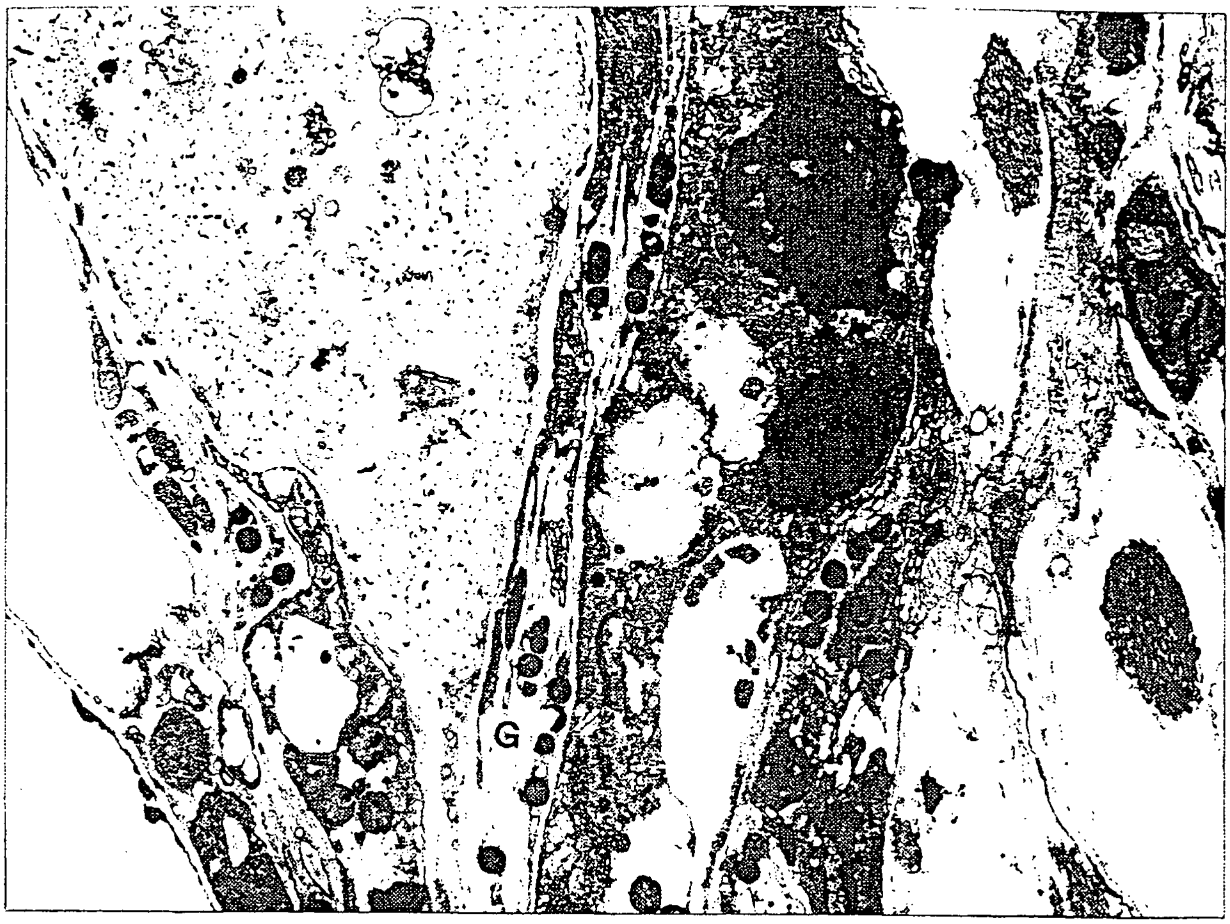


Plate 4k Kidney X 8,000

Plate 4l Uranium in the intercellular space (artifact) X 20,000

DISCUSSION

ENDPOINTS

Adult mortality

The mortality of all *A. carinata* adults after 24hrs exposure at 100% RP2 in Trial #7 and of an *A. carinata* individual at 100% RP2 in Trial #6 were the only instances of adult mortality throughout the trials period. Neither of these occurrences could be explained by dissolved oxygen, pH or conductivity levels, and must be due to RP2 toxicity. Generally, adult mortality was insensitive and inappropriate for short term biological monitoring of the RP2 waters using the species tested. All species tested became moribund at 100% RP2, implying a possible use for adults in longer trials.

Embryonic mortality

Of five species tested with this endpoint, none showed significant differences between treatments upon analysis of variance, although it appeared that the rate of embryonic breakdown increased with RP2 concentration. The reason for this may be that breakdown usually occurred in one of three ways:

1) acute breakdown and death in the transition between stages,
2) acute mortality during the later lengthier stages,
3) chronic deformation during the veliger and hippo phase (ghosting and hydro-cephaly) protracting a number of days until death.

In cases 1 and 2, the acuteness made for easy quantification and provided the bulk of embryonic mortality data. In case 3, quantification was more difficult and beyond the time resources available. Rupture of the egg mass and the hatching of healthy neonates usually occurred before the death of the deformed embryos. Only results from healthy individuals were considered as data for juvenile mortality. As no observations could be made following egg mass rupture (since the period of juvenile exposure required minimum disturbance) the fate of these deformed individuals was not recorded. Mortality due to deformation would have contributed to embryonic mortality, but might also have been a useful endpoint in its own right. Ravera (1991) states that a high proportion of embryonic deformation is common in cases of heavy metal exposure.

Generally, embryonic mortality as an endpoint was insensitive because it tended to occur regardless of concentration, and may be a response to factors outside RP2 exposure.

Juvenile mortality

Trials 1, 3, 6 and 7 tested *A. carinata*, *A. cumingii* and *Glyptophysa* sp. in terms of juvenile mortality. Trial 1 involved RP4 water of low toxicity. Trial 3 established LOECs of 32% for *A. carinata* and *A. cumingii*. In Trials 6 and 7 no significant differences were found upon analysis of variance. The literature emphasises the susceptibility of molluscan juveniles to various metals. In these trials juvenile mortality was seen to be variable in response to RP2 concentration. At 100% RP2, Trial 3 mortalities were close to 100% for *A. carinata* and *A. cumingii*, but in Trial 6, a mean mortality of only 5% was recorded for *A. cumingii* at 100% RP2. A possible explanation for this variability might be the pH dependent speciation and toxicity of the uranate ion UO_2^{2+}. Magela Ck water made up to 900 ppb uranium and of pH range 6.0 to 7.0, was toxic to *Hydra viridissima*, while the same solution carbonate-buffered to pH 8.5 was not toxic (R. Hyne pers comm. 1991). The dominant complex at pH 8.5 would be the tricarbonate $[UO_2(CO_3)_3]^{4-}$, which is membrane impermeable. At lower pHs, the uranate UO_2^{2+} or uranyl carbonate UO_2CO^3 would predominate. These species would be more membrane permeable and therefore more toxic than the anionic forms (R. Hyne *pers comm.* 1991).

However this may not suffice to explain the difference in juvenile mortality between Trials 3 and 6 and between the RP2 and U treatments of Trial 7, since the measured pHs are not disparate to the extent described above, unless the juveniles are particularly sensitive to pH changes.

Other possible sources of extraneous juvenile mortality were examined. Known parentage and the presence or absence of algae were seen as unimportant, while an increase in the size of the exposure vial was seen to increase juvenile mortality. It is possible that a "rim-effect" operated, since the circumference of the larger vials was twice that of the smaller. At the termination of several trials, dead juveniles had been observed between the gauze and outside wall of the exposure vial. In such a position, it was possible that they had died by mechanical damage. This complication had been considered early in the trials, but had not been satisfactorily resolved by the end. The problem of large variation in juvenile mortality within treatments, and high control mortality, will continue to receive attention at OSS. In terms of the project, the question of juvenile sensitivity remains to a certain extent unanswered. Despite these uncertainties, low mortalities observed at high RP2 concentrations counted against the use of juvenile mortality as a suitable endpoint.

Weight change

Analysis of variance revealed a significant difference between treatments for *Glyptophysa* sp. but a LOEC was not established by Dunnet's testing. The responses of *A. carinata* and *A. cumingii* in terms of this endpoint were irregular across the treatments and did not show significant differences upon analysis of variance. Osmoregulatory effects arising from the differing conductivities of the treatments might have interacted with intrinsic RP2 toxicity. Because percentile data was considered most the appropriate form for analysis and since some values were negative, arcsine transformation of the whole data set was not possible. This endpoint might be useful in chronic trials which incorporate a longer exposure period, but in these relatively brief trials, the degree of weight change was seen to be insensitive.

Developmental retardation

Trials 2, 3 and 4 investigated developmental retardation as a response to RP2 toxicity. Although this effect was apparent at 100% RP2 during the trials, Dunnett's testing did not always reveal this. The conservative nature of the statistics employed were probably producing type 2 errors, where large error terms associated with analysis of variance made the q statistic of Dunnett's test insignificant. This occurred for *A. cumingii and Glyptophysa* sp. in Trial 3 and for *A. carinata* in Trial 4. Ravera (1991) states that developmental period of embryos exposed to heavy metals can be up to 4 times the normal period. In these trials, the nature of the observation process (following each egg mass through its full development) meant there a low number (3 to 6) of egg masses available for observation, and as a result large error terms were generated. Even if larger numbers of egg masses were exposed to each treatment, it would still be doubtful whether LOECs below 32% RP2 would be established. In all, developmental retardation was a moderately sensitive endpoint, and repeatability could be increased with a larger sample size.

Egg and egg mass production

The fecundity parameters were seen to be the most sensitive of all endpoints examined. In Trials 5 and 6, LOECs established using egg mass and egg production by *A. carinata* and *A. cumingii* were between 1 and 10% RP2, more or less an order of magnitude more sensitive than any other. However, there existed a large discrepancy between the LOECs established by the egg mass production of *A. carinata* in Trials 5 and 6 (1 and 10% respectively). When daily means were taken it was seen that the selected animals were more productive in Trial 5. This was probably due to the thinning of the *A. carinata* stocks by the time of Trial 6, when smaller, less fecund individuals were used. The 32% LOECs established by *Glyptophysa* sp. highlighted its relative insensitivity. It is possible that the more robust shell of this species mitigated RP2 toxicity. Beeby and Richmond (1989) report the loss of magnesium from the shell of terrestrial pulmonate *Helix aspersa* following lead exposure and postulate that this loss is part of a heavy metal detoxification mechanism.

Considering the validation exercise Trial 6, Lab and Creek results were in reasonable agreement. The species were more fecund in the creek water. The deterioration of water quality through storage is well documented for waters of the region, and a decrease in the quality of the lab water may have been responsible for the lower fecundity. The effects of storage on RP2 water might include co-precipitation of uranium with manganese (P. Cussons. *pers comm.*, 1991) or some change in the speciation of uranium. The higher flow rate in the creekside trial might also have contributed to this effect. But despite differences in flow rate and possible differences in water quality, effects observed in the lab were observed at the creekside. By considering the LOECs established for the fecundity parameters, it was seen that the lab results of Trials 5 and 6 were validated by the results of the creekside trial.

The uncertainties of the assumption of a normally distributed response because of low sample numbers must be taken into consideration. That consecutive and concurrent trials did establish comparatively low LOECs for *A. carinata* and *A. cumingii* indicated that the assumption of normality was not incorrectly taken.

The results of Trials 5 and 6 strongly indicated that the fecundity parameters for either *A. carinata* or *A. cumingii* were consistent and sensitive endpoints for the biological monitoring of RP2 water release into the Magela Ck system.

RP2/URANIUM COMPARISON

The results from this trial were somewhat contradictory. A significant difference existed in the 10% treatments in egg mass production for both *A. carinata* and *A. cumingii*. No difference was found at either 1% or 32% using egg mass production, and no difference was found in any of the three treatments using egg production. Juvenile mortality upon analysis of variance did not indicate significant differences between treatments for *A. carinata* but did indicate a significant interaction between treatments and concentrations for *A. cumingii*. The results indicated a greater toxicity of the 10% RP2 treatments, possibly caused by the lower average pH. In spite of this, the lack of significant difference between uranium and RP2 at 1 and 32% concentrations demonstrated that uranium and RP2 produced similar levels of effects in the species used, indicating that the observed toxicity of RP2 water was due to uranium.

SEQUESTRATION OF URANIUM IN *A.CARINATA*

Ultrastructural studies showed that uranium had accumulated in the ovotestis of *A. carinata* which had been exposed for 7 days at 32% RP2 during Trial 5. The uranium was deposited in multivescicular bodies of squamous ciliated epithelial cells of the ovotestis. These are toward the opening of the acinis into the hermaphroditic duct. It appeared as spindle shaped crystals associated with other electron dense amorphous material. Some evidence suggested that the multivescular bodies were involved in either endocytosis or exocytosis. The actual mechanism of the inhibition of egg production by uranium was not elucidated by this study. The sections studied did not include regions toward the bottom of the acinis where germ cell production occurs. Ravera (1991) states that the effects of cadnium on reproduction in *Biomphlara glabrata* included degeneration of the male germ cells. Female germ cells did not show any alteration.

Other tissues analysed from 32% exposed *A. carinata*, were the kidney, the digestive gland (hepatopancreas), the mantle, the foot, the albumin gland and the hermaphroditic duct. Uranium was not detected in any of these tissues. A variety of metals including gold, lead and zinc was present in the mantle. The absence of uranium from the digestive gland was most probably a spurious result, possibly due to overfixation which resulted the friable sections. This organ is thought to be the site of haemoglobin production and blood processing in the pulmonates. Most of the literature on metal accumulation deals with the digestive gland, and only occasional papers investigate other tissue.

The results obtained conflict with Phillips (1980), who states that accumulation in the gonads is generally low in comparison to that in other tissues. However he cites results from Segar *et al.* (1971) who stated that nickel, cadmium, lead, zinc and chromium were accumulated in the gonads of the mussel *Modiolus modiolus* to a similar or greater extent than in the digestive gland.

Simkiss and Mason (1983) and Heneine *et al.* (1969) state that iron initially appears in the digestive gland and is progressively redistributed to the ovotestis. Johnson *et al.* (1962) report excretion of iron with the eggs of *B. glabrata*. Munzinger and Guarducci (1988) found that zinc is transferred to the embryos of *B. glabrata* from the parent. Developmental retardation and embryonic mortality greater than control were observed in eggs laid in control water from previously exposed adults.

The initial uptake of uranium is thought to occur in conjunction with calcium extraction from the water column (R.Jeffree *pers comm.* 1991). In the metabolic analogue hypothesis, various metals are taken up along with calcium, especially in soft waters. (Jeffree & Simpson, 1984). Metals dissolved or transported in the blood are then removed from the animal's general metabolism by precipitation due to differential solubilities, and accumulate as granules which are not necessarily excreted. The toxicity of the xenobiotic metals is thus reduced by compartmentalisation away from the general metabolism (R.Jeffree *pers comm.* 1991). If this were the sole mechanism operating to deal with uranium in *A. carinata*, the uranium should be present in association with immobilised granules in the digestive gland or mantle, and not appear in tissues away from the major blood vessels, such as the ovotestis.

Although the results of microstructural analysis were tentative, the fact that uranium was located in the ovotestis indicated that the depression of fecundity was directly caused by a toxic effect of uranium on that organ. This reinforces the case for the fecundity endpoints of *A. carinata* and *A. cumingii* as endpoints for biological monitoring of RP2 waters.

CONCLUSION

Of the 7 species examined, *A. carinata* and *A. cumingii* were most sensitive to RP2 water. When fecundity parameters were used as endpoints, LOECs of between 1 and 10% RP2 were established for these species. This was roughly equivalent to uranium concentrations of 17 to 170ppb total uranium. The endpoints embryonic mortality, juvenile mortality and adult mortality were seen to be insensitive or too variable for use in biological monitoring. Developmental retardation was a moderately sensitive endpoint and established LOECs at 32% RP2.

Other species tested were excluded on various grounds, including rearing and handling difficulties, insensitivity and variability in the measured parameter or response.

Uranium solutions of similar concentration to RP2 treatments were seen to be equivalently toxic. The depressed fecundity effect of RP2 water on *A. carinata* and *A. cumingii* was attributed to uranium accumulation in the ovotestis.

Since the fecundity parameters were linked directly to the accumulation of uranium in the snail tissue, the case is strong for the use of this endpoint in biological monitoring of RP2 release into the Magela Ck system using *A. carinata* or *A. cumingii.*

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Appendix 1.a.1.

PRELIMINARY OBSERVATION No.1 COMMENCED 19/1/91
A.carinata NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	REP.3	REP.4
19/1/91	20	19	21	15
			7	19
20/1/91	19	16	5	21
			9	
			9	
			13	
21/1/91	20	15	5	17
		14	22	16
		18		23
22/1/91	27	11	16	17
	19	19		17
	17	13		17
	8	3		15
	17			12
23/1/91	0	0	0	0
EGGMASS PER DAY	2.8	3	2.8	2.4
MEAN	4.09	3.46	1.79	1.95
STD	146	115	63.9	81.2
CV				
EGGS PER DAY				
MEAN	29.4	25.6	21.4	37.8
STD	33.8	20.4	13.9	30.3
CV	115	79.9	65.1	80.2
EGGS PER EGGMASS				
MEAN	18.4	14.2	11.8	17.2
STD	5.24	5.02	6.51	2.99
CV	28.5	35.3	54.7	17.4

TOTAL EGGS PER EGGMASS (USING EACH DAY REPLICATE)

MEAN	29.6
STD	14.2
CV	47.8

	19/1/91	20/1/91	21/1/91	22/1/91	23/1/91
EGG MASS MEAN ACROSS REPS.	2.5	1.75	2.25	7	0.25
STD	1.29	1.5	0.96	2.94	0.5
CV	51.6	85.7	42.6	0	200
EGG MEANS ACROSS REPLICATES	25.3	23	37.5	57	0
STD	7.09	8.91	16.8	32.7	0
CV	28.1	38.7	44.9	57.3	
CUMMULATIVE EGGMASS TOTAL	10	17	26	54	55
MEAN ACROSS CUMM'IVE REPS.	2.5	2.215	2.17	3.38	2.75
STD	1.29	1.36	1.19	2.73	2.75
CV	51.6	63.9	55.1	80.9	100
CUMMULATIVE EGG TOTAL	101	193	343	571	571
MEAN ACROSS CUMM'IVE REPS.	25.6	24.15	28.6	35.7	28.6
STD	7.09	7.55	12.5	22.1	24.5
CV	28.1	31.3	43.8	62	85.9

Appendix 1.a.2.

PRELIMINARY OBSERVATION No.1 COMMENCED 19/1/91
A.cummingii NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	RPE.3	REP.4	REP.5	REP.6	REP.7
19/1/91	15	0	39	0	21	44	0
			45			39	
						33	
20/1/91	18	12	31	22	24	38	50
	18	6	43	47		44	57
	11	18	29	39			
	9	12	39				
	15		31				
21/1/91	23	10	47	52	13	40	44
	18	10	45	21	19		
	15	16	51	25	26		
	8	12	41		25		
	18	13					
22/1/91	22	16	54	24	12	45	50
		15	39	50			
		11		21			
		10		20			
				9			
				20			
				41			
				54			
23/1/91	30	15	38	38	12	47	43
	23	16	37	48	19	35	43
	28	15	41		6	39	50
	25		41		24	24	46
			34		26	40	37
			54		17	27	58
			45		12	28	44
			45		13	23	
			45			32	
			36				

	REP.1	REP.2	RPE.3	REP.4	REP.5	REP.6	REP.7
EM/DAY							
MEAN	3.2	3.2	4.2	3.2	3.1	3.2	2.2
STD	2.05	1.92	3.27	2.95	2.85	3.35	2.77
CV	64	60.1	68.1	92.2	91.8	105	126
EGGS/DAY							
MEAN	61.2	39.4	184	106	55.4	115	104
STD	41	25.6	126	85.7	53.6	108	126
CV	67	59.8	68.4	80.7	96.7	94.1	121
EGGS/EM							
MEAN	19.1	12.3	41.3	31.8	18.5	35.5	47.5
STD	5.86	3.05	6.78	14.8	6.14	8.26	6.3
CV	30.7	24.8	16.4	46.5	33.2	23.3	13.3

TOTAL EGGS PER EGGMASS (USING EACH DAY REPLICATE)

MEAN	29.6
STD	14.2
CV	47.8

	19/1/91	20/1/91	21/1/91	22/1/91	23/1/91
EGG MASS MEANS ACROSS REPS.	1	3.14	3.14	2.57	6.14
STD	1.15	1.57	2.27	2.64	3.13
CV	115	50	72.2	103	51
EGG MEANS ACROSS REPLICATES	32.3	86.1	84.6	57	199
STD	44.1	49.8	45.5	32.7	137
STD AS % OF MEAN	137	57.8	53.8	57.3	68.8
CUMMULATIVE EGGMASS TOTAL	7	29	53	71	114
MEAN ACROSS CUMM'IVE REPS.	1	2.07	2.52	2.54	3.26
STD	1.15	1.73	1.83	2.01	2.66
CV	115	83.5	72.7	79.2	87.1
CUMMULATIVE EGG TOTAL	226	829	1421	1934	3327
MEAN ACROSS CUMM'IVE REPS.	32.3	59.2	67.1	69.1	95.1
STD	44.1	53.1	51	57.2	93.2
CV	137	89.7	75.4	82.8	98.1

Appendix 1.a.3.

PRELIMINARY OBSERVATION No.1 COMMENCED 19/1/91
GLYPTOPHYSA SP. NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	REP.3	REP.4
19/1/91	0	9	4	4
		9		
		9		
		8		
20/1/91	0	12	12	7
		10	12	9
		10	9	5
		10		
21/1/91	5	12	4	8
		12		4
		12		
		11		
		11		
		13		
		10		
		9		
22/1/91	1	9	11	11
	9	9	13	13
		10	13	9
		7	11	3
		11	1	9
		12		8
		12		9
		13		
		13		
		13		
		11		
		14		
		9		

PRELIMINARY OBSERVATION No.1 COMMENCED 19/1/91
GLYPTOPHYSA SP. NUMBERS OF EGGS LAID PER DAY PAGE 2

	REP.1	REP.2	REP.3	REP.4
EGGMASS PER DAY				
MEAN	0.6	6	1.8	3.2
STD	0.89	4.64	1.1	2.28
CV	149	77.3	60.8	71.3
EGGS PER DAY				
MEAN	3	64.4	18.8	22.8
STD	4.47	52.3	21	21.6
CV	149	81.2	112	93.2
EGGS PER EGGMASS				
MEAN	5	10.1	8.54	7.13
STD	4	3.2	4.41	2.25
CV	80	30	51.6	35.8

TOTAL EGGS PER EGGMASS (USING EACH DAY REPLICATE)

MEAN	8.95
STD	3.23
CV	36.1

	19/1/91	20/1/91	21/1/91	22/1/91	23/1/91
EGG MASS MEAN ACROSS REPS.	1.5	2.5	3	1.25	6.25
STD	1.73	1.73	3.37	1.26	4.99
CV	115	69.3	112	101	80
EGG MEANS ACROSS REPLICATES	10.8	24	27.8	8.5	65.3
STD	16.4	18.2	41.7	8.06	56
STD AS % OF MEAN	151	75.7	150	94.9	85.8
CUMMULATIVE EGGMASS TOTAL	6	16	28	33	58
MEAN ACROSS CUMM'IVE REPS.	1.5	2	2.33	2.06	2.9
STD	1.73	1.65	2.27	2.06	3.21
CV	115	84.5	97.3	101	111
CUMMULATIVE EGG TOTAL	43	139	250	284	545
MEAN ACROSS CUMM'IVE REPS.	10.8	17.4	20.8	17.8	27.3
STD	16.28	17.5	26.3	23.5	36.2
CV	151	101	126	132	133

Appendix 1.a.4.

PRELIMINARY OBSERVATION No.1 COMMENCED 19/1/91 PAGE 1
GYRAULUS SP. NUMBERS OF EGGS LAID PER DAY

	REP.1	REP.2	REP.3	REP.4
19/1/91	3	3	9	0
	5		4	
			5	
			4	
20/1/91	5	4	13	4
	2	4	11	4
	4	8	5	5
	4	6	6	7
	11	5	5	7
	6	8	9	8
	1	6		8
	3	4		4
	5			9
	4			8
	3			
	7			
	10			
21/1/91	9	7	5	4
	6	3	13	3
	2	7	5	8
		5	10	7
		6	12	5
			5	9
			9	8
			2	8
				10
				5
				4
				9
				4
				10
				4
22/1/91	9	5	10	6
	6	5	7	6
	5	5	12	9
	7	9	5	2
	7	8	5	4
	4	6	6	10
	8	6		10
	8			10
	9			9
	7			
23/1/91	8	5	3	5
	8	6	5	9
	7	5	5	9
	7	7	6	7
	5	4	12	5
	6	9	7	5
	12	9	11	5
	4	9	6	4
	8	12	5	10
	11	4		4
	4	9		8
				4
				6

	REP.1	REP.2	REP.3	REP.4
EGGMASS PER DAY				
MEAN	8.32	6.2	6.6	9.8
STD	13.8	3.42	1.95	6.14
CV	166	55.2	29.5	62.7
EGGS PER DAY				
MEAN	50.6	42	47.4	65
STD	35.2	38.1	58.1	39.8
CV	69.6	75.6	75.6	61.2
EGGS PER EGGMASS				
MEAN	6.17	6.16	7.18	7.52
STD	2.7	2.16	3.14	5.84
CV	43.8	35.3	43.7	77.6

TOTAL EGGS PER EGGMASS (USING EACH DAY REPLICATE)

MEAN	6.36
STD	2.64
CV	41.5

GYRAULUS SP.

	19/1/91	20/1/91	21/1/91	22/1/91	23/1/91
EGG MASS MEAN ACROSS REPS.	1.75	9.5	7.75	8	12
STD	1.71	3.42	5.25	1.83	2.5
CV	97.6	36	67.8	22.8	20.4
EGG MEANS ACROSS REPLICATES	8.25	58.25	51	56.3	82.5
STD	9.74	13.8	36.5	13.7	16.1
CV	118	23.8	71.5	24.3	19.5
CUMMULATIVE EGGMASS TOTAL	7	45	76	108	156
MEAN ACROSS CUMM'IVE REPS.	1.75	5.63	6.33	6.75	7.8
STD	1.71	4.84	4.84	4.3	4.49
CV	97.6	86	86	63.7	57.6
CUMMULATIVE EGG TOTAL	33	266	470	695	1025
MEAN ACROSS CUMM'IVE REPS.	8.25	33.3	39.2	43.3	51.3
STD	9.74	28.9	31.2	28.4	30.6
CV	118	87	79.6	65.5	59.7

Appendix 1.a.5.

PRELIMINARY OBSERVATION No.1 COMMENCED 19/1/91
HELIOCORBIS SP. NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	REP.3	REP.4
19/1/91	6	0	3	6
	5			8
				3
20/1/91	0	0	5	2
			2	
			2	
21/1/91	5	4	4	4
		6	6	5
			7	6
			5	6
				7
22/1/91	2	4	3	5
	4	4	4	6
	5	4	5	6
	5	4	2	5
		5	2	4
			2	3
			3	4
			6	5
			3	6
			4	8
				8
				8
23/1/91	5	6	5	7
	4	4	7	7
	4	4	1	7
	3	5	5	7
	7	3	6	3
	4	5	3	6
	5	3	1	5
	6		3	

PRELIMINARY OBSERVATION No.1 COMMENCED 19/1/91 PAGE 3
HELIOCORBIS SP. DAILY AND CUMMULATIVE STATISTICS

	19/1/91	20/1/91	21/1/91	22/1/91	23/1/91
EGG MASS MEAN ACROSS REPS.	1.5	1.5	4	7.75	7.75
STD	1.29	1.28	1.41	3.86	0.96
CV	86.1	86.1	35.4	49.8	12.4
EGG MEANS ACROSS REPLICATES	7.75	2.75	16.3	35	36.8
STD	7.72	4.27	10.6	23.4	4.99
CV	99.6	155	65.2	66.9	13.6
CUMMULATIVE EGGMASS TOTAL	6	12	28	59	90
MEAN ACROSS CUMM'IVE REPS.	1.5	1.5	2.33	3.69	4.5
STD	1.29	1.2	1.72	3.32	3.41
CV	86.1	80	73.9	90.1	75.8
CUMMULATIVE EGG TOTAL	31	42	107	247	394
MEAN ACROSS CUMM'IVE REPS.	7.75	5.25	8.92	15.4	19.7
STD	7.72	6.36	9.26	17.6	18
CV	99.6	121	104	114	91.4

PRELIMINARY OBSERVATION No.1 COMMENCED 19/1/91
HELIOCORBIS SP. NUMBERS OF EGGS LAID PER DAY PAGE 2

	REP.1	REP.2	REP.3	REP.4
EGGMASS PER DAY				
MEAN	4.2	2.8	5.4	5.6
STD	2.49	3.11	3.91	4.44
CV	59.3	111	72.4	75.3
EGGS PER DAY	14	12.2	21.1	31.4
MEAN	14.7	13.2	15.2	25.2
STD	105	1.8	71.6	80.2
CV				
EGGS PER EGGMASS	4.67	4.36	3.81	5.61
MEAN	1.23	0.93	1.92	1.69
STD	26.5	21.3	50.4	30.1
CV				

TOTAL EGGS PER EGGMASS (USING EACH DAY REPLICATE)

MEAN	4.7
STD	1.67
CV	35.6

Appendix 1.b.1.

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91 RAW DATA
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES A. carinata

REPLICATE No. 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2		14				
DAY 3		14 21 20				
DAY 4			14 15 16 14	23 23 21 20		
DAY 5				21 20 14	17 15 16 14 15 23 23 16	
DAY 6					13 18 17 15 16 14 15 16 23 23 21 20 14	
DAY 7					13 18 17 15 16 14 15 23 16 23 21 20 14	
DAY 8					13 18 14 15 23 16 23	17 15 16 21 20 14
DAY 9						13 18 14 15 23 16 23 17 15 16 21 20 14

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES A. carinata PERCENTILE DATA

REPLICATE No. 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2		100				
DAY 3		100				
DAY 4			40	60		
DAY 5				28	72	
DAY 6					100	
DAY 7					100	
DAY 8					57	43
DAY 9						100

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91 RAW DATA
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES A. carinata

REPLICATE No. 2
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2						
DAY 3		16 18				
DAY 4			16 16 18			
DAY 5			17 12	15 12 8 6 13	10 20 17 17 12 12 18	
DAY 6				17 10 15	12 20 10 20 17 12 18 15 16 16	
DAY 7					12 20 10 20 17 17 10 18 16	13 15 16
DAY 8					17 20	12 20 10 13 18 16 15 16
DAY 9						12 20 10 20 17 17 10 13 18 15 16 18

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES A. carinata PERCENTILE DATA

REPLICATE No. 2
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2						
DAY 3		100				
DAY 4			100			
DAY 5			11	40	49	
DAY 6				15	85	
DAY 7					76	24
DAY 8					24	76
DAY 9						100

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91 RAW DATA
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES A. carinata

REPLICATE No. 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2		12 13				
DAY 3			13 13 8 12 13			
DAY 4				15 12 6 8 13		
DAY 5				15 13 6 13	13 2 9 11 3	
DAY 6					13 2 8 15 13 11 4 6 13	16 13
DAY 7					13 9 15 13	16 13
DAY 8						13 9 15 13

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES A. carinata PERCENTILE DATA

REPLICATE No. 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2		100				
DAY 3			100			
DAY 4				100		
DAY 5				55	45	
DAY 6					100	
DAY 7					63	37
DAY 8						100
DAY 9						

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91 RAW DATA
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES A. carinata

REPLICATE No. 4
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2		7 17 14				
DAY 3		11 7	16 17 14			
DAY 4			13 18	15 16 11 17 7 14		
DAY 5				15 13 18 16 11 17 7 14	11 17	
DAY 6					19 11 16 17 15 13 18 16 11 17 7 14	
DAY7					19 16 11 17 15 13 18 16 11 17 14	7
DAY 8					19 16 15 13 18	11 17 16 11 17 7 14
DAY 9						16 19 15 13 18

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES A. carinata PERCENTILE DATA

REPLICATE No. 4
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2		100				
DAY 3		28	72			
DAY 4			30	70		
DAY 5				80	20	
DAY 6					100	
DAY 7					96	4
DAY 8					47	53
DAY 9						100

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91 RAW DATA
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES A. cummingii

REPLICATE No. 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2	34 25 13					
DAY 3	13	34 25				
DAY 4		27 31 13	33 34 25			
DAY 5			25 13	30 27 33 35 26 34		
DAY 6				26 30 25	35 33 34 25 13	
DAY 7					34 25 13 25 26 30 33	34
DAY 8						34 25 13 34 25 26 30 33

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES A. cummingii PERCENTILE DATA

REPLICATE No. 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2	100					
DAY 3	18	72				
DAY 4		44	56			
DAY 5			18	72		
DAY 6				37	63	
DAY 7					85	15
DAY 8						100
DAY 9						

Appendix 1.b.2.

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91 RAW DATA
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES A. cummingii

REPLICATE No. 2
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2						
DAY 3		28				
DAY 4		25	27 31 30			
DAY 5				28 34 30 25 31 26		
DAY 6				26	28 34 30 25 31	
DAY 7					28 34 30 25 31 26	
DAY 8						28 34 30 25 31 26

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES A. cummingii PERCENTILE DATA

REPLICATE No. 2
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2						
DAY 3		100				
DAY 4		22	78			
DAY 5				100		
DAY 6				15	85	
DAY 7					100	
DAY 8						100

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91 RAW DATA
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES A. cummingii

REPLICATE No. 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2						
DAY 3		36 27				
DAY 4			24 31 36 27 41			
DAY 5				43 24 41 31 36 27		
DAY 6				31 27	43 24 31 46	24
DAY 7					43 24 41 31 36 27	24
DAY 8						36 27 31 41 24 43 24

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES A. cummingii PERCENTILE DATA

REPLICATE No. 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'N
DAY 1	100					
DAY 2						
DAY 3		100				
DAY 4			100			
DAY 5				100		
DAY 6				26	63	
DAY 7					89	[illegible]
DAY 8						[illegible]

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91 RAW DATA
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES A. cummingii

REPLICATE No. 4
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2						
DAY 3		43				
DAY 3			43 34			
DAY 4				36 43 43 34		
DAY 5					43 43 36 34	
DAY 6					43 43 36 34	
DAY 7						43 43 36 34

PRELIMINARY OBSERVATION No.2 COMMENCED 30/1/91
ENDPOINT:DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES A. cummingii PERCENTILE DATA

REPLICATE No. 4
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2						
DAY 3		100				
DAY 4			100			
DAY 5				100		
DAY 6					100	
DAY 7					100	
DAY 8						100

Appendix 1.b.3.

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES GABBIA SP.

REPLICATE 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	1					
DAY 2	1					
DAY 3		1				
DAY 4		1				
DAY 5			1 1 2 1			
DAY 6			1	1 1 2 1		
DAY 7				1 1 1 1 1 2		
DAY 8				1 1 1 1		
				1 2		
DAY 9				1	1 1 1 1 2	
DAY 10					1 1 1 1 1 2	
DAY 11					1 1 1 1 1 2	
DAY 12					1 1	
					1 1 2	
DAY 13					1 1 1 2	
TERMINATION						

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/,91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES GABBIA SP. PERCENTILE DATA

REPLICATE 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2						
DAY 3		100				
DAY 4		100				
DAY 5			100			
DAY 6			14	86		
DAY 7				100		
DAY 8				100		
DAY 9				14	86	
DAY 10					100	
DAY 11					100	
DAY 12					100	
DAY 13					100	
TERMINATION						

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES GABBIA SP.

REPLICATE 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2						
DAY 3						
DAY 4						
DAY 5		1				
DAY 6			1 1			
DAY 7			1 1			
			1 1 1 1 1 1			
DAY 9			1 1 1 1 1 1 1	1		
DAY 10			1 1 1 1 1 1 1		1	
DAY 11			1 1 1 1 1 1		1	
DAY 12			1 1 1 1 1 1			
DAY 13			1 1		1	
			1 1 1			
TERMINATION						

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES GABBIA SP. PERCENTILE DATA

REPLICATE 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2						
DAY 3						
DAY 4						
DAY 5		100				
DAY 6			100			
DAY 7				100		
DAY 8				100		
DAY 9				87	13	
DAY 10				87		13
DAY 11				86		14
DAY 12				86		14
DAY 13				83		17
TERMINATION						

Appendix 1.b.4.

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES GLYPTOPHYSA SP.

REPLICATE 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2	11					
DAY 3		7 11				
DAY 4			8 7			
DAY 5				6 7		
DAY 6				1	5 1	13 12 5
DAY 7					1	4 6 13 5 1
DAY 8						13 6 4 5 1

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES GLYPTOPHYSA SP. PERCENTILE DATA

REPLICATE 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2	100					
DAY 3		100				
DAY 4			100			
DAY 5				100		
DAY 6				9	16	81
DAY 7					3	97
DAY 8						100

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES GLYPTOPHYSA SP.

REPLICATE 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2	2					
DAY 3		2				
DAY 4			2			
DAY 5					2	
DAY 6					2 3 3	10
DAY 7					2 3	2 10
DAY 8					2	2 3 10
DAY 9						2 3 2 10

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES GLYPTOPHYSA SP. PERCENTILE DATA

REPLICATE 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2	100					
DAY 3		100				
DAY 4			100			
DAY 5					100	
DAY 6					44	56
DAY 7					29	71
DAY 8					12	88

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES GLYPTOPHYSA SP.

REPLICATE 4
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2		1				
DAY 3		1	1			
DAY 4		1	1			
DAY 5		1		1		
DAY 6			1	2	1	
DAY 7				1	2 1	
DAY 8				1	1	
DAY 9					1 1	

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES GLYPTOPHYSA SP. PERCENTILE DATA

REPLICATE 4
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2		100				
DAY 3		50	50			
DAY 4		50	50			
DAY 5		50		50		
DAY 6		25		50	25	
DAY 7				25	75	
DAY 8				50	50	
DAY 9					100	

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES GYRAULUS SP.

REPLICATE 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2	9					
DAY 3			9 6 9 11	9		
DAY 4				7 9 6 9 11 9 13 8		
DAY 5				9 6 9 11	6 13 8 7 11	
DAY 6					6 9 6 9 11 8 8 15 5 13 8 3	7
DAY 7					5 9 6 9 11 13 6	5 3 7 7 5
DAY 8					13 6	9 6 9 11 5
DAY 9						13

Appendix 1.b.5.

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES GYRAULUS SP.
PERCENTILE DATA

REPLICATE 1
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2	100					
DAY 3			80	20		
DAY 4				100		
DAY 5				44	56	
DAY 6					94	6
DAY 7					69	31
DAY 8					32	68
DAY 9						100

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES GYRAULUS SP.
PERCENTILE DATA

REPLICATE 2
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2		100				
DAY 3		13	87			
DAY 4				83	17	
DAY 5				28	72	
DAY 6					92	8
DAY 7					59	41
DAY 8						100

REPLICATE 2
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2		7, 9, 9				
DAY 3			7, 9, 11, 9, 9, 6, 8			
DAY 4				7, 9, 9, 5, 10, 7, 8, 8, 9, 9, 9, 8	12, 8	
DAY 5				9, 9, 5, 8, 10, 7, 1	7, 9, 9, 10, 11, 8, 11, 7, 7, 8, 12, 8, 9, 6	
DAY 6					7, 9, 9, 9, 9, 5, 8, 10, 7, 6, 12, 8, 9, 7, 10, 11, 11, 8, 7, 6, 10, 8, 8	9, 7
DAY 7					7, 5, 8, 10, 7, 12, 8, 8, 9, 10, 7, 9, 10, 11, 3	7, 9, 9, 9, 11, 7, 6, 6, 9, 8, 8
DAY 8						9, 5, 8, 10, 9, 3, 9, 10, 11

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES GYRAULUS SP.

REPLICATE 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2	11, 9	12				
DAY 3		11, 9, 8, 8, 9, 9	12, 6, 11			
DAY 4				11, 9, 12, 6, 8, 11, 9, 10, 10, 10, 9, 8		
DAY 5				11, 8, 9	9, 12, 6, 8, 11, 9, 12, 10, 10, 9, 8, 9, 4, 9, 9	
DAY 6					6, 8, 9, 11, 9, 8, 10, 11, 9, 12, 12, 10, 10, 9, 8	9, 9
DAY 7					11, 12, 6, 8, 8, 11, 9, 10, 9	9, 12, 10, 10, 8, 9, 8, 9
DAY 8					6, 8, 8, 11, 4	11, 9, 12, 9, 10, 9, 9, 9, 9, 4
DAY 9						6, 8, 8, 11, 4

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES *GYRAULUS* PERCENTILE DATA

REPLICATE 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2	62	38				
DAY 3		65	35			
DAY 4				90	10	
DAY 5				20	80	
DAY 6					81	9
DAY 7					55	45
DAY 8					29	71
DAY 9						100

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT: *DEVELOPMENTAL CHARACTERISTICS* PAGE 1
SPECIES LYMNEAE SP.

REPLICATE 2
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2						
DAY 3			42			
DAY 4			42			
DAY 5				35 42		
DAY 6				35 60	42	
DAY 7					35 42 60 124	
DAY 8					35 42 60 124	
DAY 9					35 42 60 124	
DAY 10					60	35 42 124
DAY 11					60	
DAY 12					60	
DAY 13						60

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES LYMNEAE SP PERCENTILE DATA

REPLICATE 2
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2						
DAY 3			100			
DAY 4			100			
DAY 5				100		
DAY 6				69	31	
DAY 7					100	
DAY 8					100	
DAY 9					100	
DAY 10					30	70
DAY 11					30	
DAU 12					30	
DAY 13					30	

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES LYMNEAE SP.

REPLICATE 3

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2						
DAY 3						
DAY 4					46 34	
DAY 5					46 34 30	
DAY 6					46 30 57 32 124	
DAY 7					46 34 30 57 32 124	
DAY 8					46 34 30	57 32 124
DAY 9					46 34 30	
DAY 10						46 34 30

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES LYMNEAE SP. PERCENTILE DATA

REPLICATE 3
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2						
DAY 3						
DAY 4					100	
DAY 5					100	
DAY 6					100	
DAY 7					100	
DAY 8					34	66
DAY 9					34	
DAY 10						34

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91 RAW DATA
ENDPOINT: *DEVELOPMENTAL CHARACTERISTICS* PAGE 1
SPECIES LYMNEAE SP.

REPLICATE 4
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1						
DAY 2						
DAY 3			76			
DAY 4			76			
DAY 5				76 30 48		
DAY 6				30	76 48 46	
DAY 7					76 30 48 46 55 57	
DAY 8					76 30 48 46 55 57	
DAY 9					76 30 48 55	46 57
DAY 10					76 30 48	55
DAY 11					76 48	30
DAY 12					76	48
DAY 13						76

Appendix 1.b.6.

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 2
SPECIES LYMNEAE SP. PERCENTILE DATA

REPLICATE 4
DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY 1	100					
DAY 2						
DAY 3			100			
DAY 4			100			
DAY 5				100		
DAY 6				15	85	
DAY 7					100	
DAY 8					100	
DAY 9					67	33
DAY 10					74	26
DAY 11					81	19
DAY 12					61	39
DAY 13						100

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY RAW DATA
SPECIES A. carinata

REPLICATES 1, 2, 3, 4.

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		1				
REP 2	2		3	5		
REP 3	5	2	25	37		
REP 4						

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		4.4				
REP 2	1.2		1.7	2.9		
REP 3	3.6	1.5	18.2	27		
REP 4						
TOTAL	7	3	28	42	0	0
PERCENT.	8.8	3.8	35	52.5	0	0

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY RAW DATA
SPECIES A. cummingii

REPLICATES 1, 2, 3, 4.

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		2	4		1	
REP 2		2	3			
REP 3		8	2	2		
REP 4	4		1			

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		0.9	1.8		0.4	
REP 2		1	3			
REP 3		3	1	1		
REP 4	2		11			
TOTAL	4	12	10	2	1	0
PERCENT.	13.8	41.4	34.5	6.9	3.4	0

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY RAW DATA
SPECIES GABBIA SP.

REPLICATE 1, 3

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		2				
REP 3		1	1	3		

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		22				
REP 3		10	10	30		
TOTAL	0	3	1	3	0	0
PERCENT.	0	42.9	14.3	42.9	0	0

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY RAW DATA
SPECIES GLYPTOPHYSA SP.

REPLICATE 1, 2, 3, 4.

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		21	2	6	7	
REP 2		39	1			
REP 3		18			1	
REP 4		6			2	

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		32	3	9	11	
REP 2		98	2			
REP 3		50			2.8	
REP 4		60			20	
TOTAL	0	84	3	6	10	0
PERCENT.	0	81.2	2.9	5.8	9.7	0

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY RAW DATA
SPECIES GYRAULUS SP.

REPLICATE 1, 2, 3, 4???.

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		33	2	8	1	
REP 2		1	11	30	4	
REP 3		8			2	
REP 4						

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		20.8	1.3	5	0.6	
REP 2		0.4	4.7	12.8	1.7	
REP 3		4			1	
REP 4						
TOTAL	0	42	13	38	7	0
PERCENT.	0	42	13	38	7	0

NOTE:: LYMNEAE HAD NO OBSERVABLE EMBRYONIC MORTALITY

Appendix 1.c.1.

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91

A. carinata NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	REP.3	REP.4
25/1/91	18	12	0	16
	13			19
26/1/91	16	20	16	17
	15	17	9	11
	17	10	13	
27/1/91	23	18	15	18
	23	15	18	13
	15	12		15
	17	17		
	14			
28/1/91	21	16	8	16
	20		15	11
			13	
29/1/91	14	18	17	7
		18	13	14
				17

	REP.1	REP.2	REP.3	REP.4
EGGMASS PER DAY				
MEAN	2.6	2.2	2	2.4
STD	1.52	1.3	1.22	0.55
STD % OF MEAN	58.3	59.3	61.2	22.8
EGGS PER DAY				
MEAN	45.2	34.6	27.4	34.8
STD	29.1	21	15.6	7.99
STD % OF MEAN	64.4	60.8	57	22.4
EGGS PER EGGMASS	17.4	15.7	13.7	14.5
MEAN	3.4	3.13	3.23	3.48
STD	19.6	19.9	23.6	24
STD % OF MEAN				

TOTAL EGGS PER EGGMASS (USING EACH DAY/REPLICATE)	
MEAN	15.3
STD	3.51
STD % OF MEAN	22.8

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91 PAGE 2
A. carinata DAILY AND CUMMULATIVE STATISTICS

	25/1/91	26/1/91	27/1/91	28/1/91	29/1/91
EGG MASS MEANS ACROSS REPS.	1.25	2.75	3.5	2	2
STD	0.96	0.5	1.29	0.82	0.82
STD AS % OF MEAN	76.7	18.1	36.9	40.8	40.8
EGG MEAN ACROSS REPS.	19.5	40.3	58.3	30	29.5
STD	16.4	9.32	25.4	11	10.9
STD AS % OF MEAN	84.2	23.2	43.7	36.7	36.9
CUMM'IVE VE EGG TOTAL	5	16	30	38	46
MEAN ACROSS CUMM'IVE REPS.	1.25	2	2.5	2.38	2.3
STD	0.96	1.07	1.31	1.2	1.13
STD AS % OF MEAN	76.6	53.5	52.6	50.7	49.1
CUMMULATIVE EGG TOTAL	78	239	472	592	710
MEAN ACROSS CUMM'IVE REPS.	19.5	29.9	39.3	37	35.5
STD	16.4	16.6	23.4	21	19.4
STD AS % OF MEAN	84.2	55.6	59.5	56.9	54.7

Appendix 1.c.2.

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91

A. cummingi NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	REP.3	REP.4
25/1/91	0	0	26	0
26/1/91	37	34	45	37
	26	28		43
27/1/91	35	31	31	32
	31	33	41	
	38	25	32	
28/1/91	0	28	27	4
			36	43
29/1/91	13	0	0	0
	25			
	35			

	REP.1	REP.2	REP.3	REP.4
EGGMASS PER DAY				
MEAN	1.6	1.2	1.4	1
STD	1.52	1.3	1.14	1
STD % OF MEAN	94.8	109	81.4	100
EGGS PER DAY				
MEAN	48	35.8	47.6	31.8
STD	46.4	39.2	39.2	33.8
STD % OF MEAN	96.6	109	82.4	106
EGGS PER EGGMASS				
MEAN	30	29.8	34	31.8
STD	8.4	3.4	7.07	16.2
STD % OF MEAN	28	11.5	20.8	51

TOTAL EGGS PER EGGMASS (USING EACH DAY/REPLICATE)	
MEAN	31.4
STD	8.9
STD % OF MEAN	[illegible]

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91 PAGE 2
A . cummingii DAILY AND CUMMULATIVE STATISTICS

	25/1/91	26/1/91	27/1/91	28/1/91	29/1/91
EGG MASS MEAN ACROSS REPS.	0.25	1.75	2.5	1.25	0.75
STD	0.5	0.5	1	0.96	1.5
STD AS % OF MEAN	200	28.6	40	76.6	200
EGG MEAN ACROSS REPS.	6.5	62.5	82.3	34.5	18.25
STD	13	14.3	34.2	27.1	36.5
STD AS % OF MEAN	200	22.9	41.6	78.6	200
CUMM'IVE EGG MASS TOTAL	1	8	18	23	26
MEAN ACROSS CUMM'IVE REPS.	0.25	1	1.5	1.44	1.3
STD	0.5	0.93	1.17	1.09	1.17
STD AS % OF MEAN	200	92.6	77.8	76	90.3
CUMMULATIVE EGG TOTAL	26	276	605	743	816
MEAN ACROSS CUMM'IVE REPS.	6.5	34.5	50.4	46.4	40.8
STD	13	32.5	39.3	36.5	37.3
STD AS % OF MEAN	200	94.2	77.9	78.5	91.5

Appendix 1.c.3.

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91

GABBIA SP. NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	REP.3	REP.4
25/1/91	1	0	0	1
26/1/91	1	0	1	0
	2		1	
	1		1	
	1		1	
			1	
			1	
			1	
27/1/91	1	0	1	0
28/1/91	1	0	1	0
29/1/91	0	0	0	0

	REP.1	REP.2	REP.3	REP.4
EGGMASS PER DAY				
MEAN	1.4	0	1.8	0.2
STD	1.52	0	2.95	0.45
STD % OF MEAN	108		164	224
EGGS PER DAY				
MEAN	1.6	0	1.8	0.2
STD	1.95	0	2.95	0.45
STD % OF MEAN	122		164	224
EGGS PER EGGMASS				
MEAN	1.14		1	1
STD	0.38		0	0
STD % OF MEAN	33		0	0

TOTAL EGGS PER EGGMASS (USING EACH DAY/REPLICATE)	
MEAN	1.06
STD	0.24
STD % OF MEAN	22.9

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91 PAGE 2
GABBIA SP. DAILY AND CUMMULATIVE STATISTICS

	25/1/91	26/1/91	27/1/91	28/1/91	29/1/91
EGG MASS MEAN ACROSS REPS.	0.5	2.75	0.5	0.5	0
STD	0.57	3.4	0.58	0.58	0
STD AS % OF MEAN	115	124	115	115	
EGG MEAN ACROSS REPLICATES	0.5	3	0.5	0.5	0
STD	0.58	3.56	0.58	0.58	0
STD AS % OF MEAN	115	119	115	115	
CUMM'IVE EGG MASS TOTAL	2	13	15	17	17
MEAN ACROSS CUMM'IVE REPS.	0.5	1.63	1.25	1.06	0.85
STD	0.58	2.56	2.14	1.88	1.73
STD AS % OF MEAN	115	158	171	177	203
CUMMULATIVE EGG TOTAL	2	14	16	18	18
MEAN ACROSS CUMM'IVE REPS.	0.5	1.75	1.33	1.3	9
STD	0.58	2.71	2.27	2	1.83
STD AS % OF MEAN	115	155	170	177	204

Appendix 1.c.4.

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91

GLYPTOPHYSA SP. NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	REP.3	REP.4
25/1/91	9 15 13 10	16 15 15	13 10 11	8
26/1/91	0	0	0	0
27/1/91	0	0	0	0
28/1/91	7	0	0	11
29/1/91	11	0	2	1
EGGMASS PER DAY				
MEAN	1.2	0.6	0.8	0.6
STD	1.64	1.34	1.3	0.55
STD % OF MEAN	137	224	163	91.3
EGGS PER DAY				
MEAN	13	9.2	7.2	4
STD	19.6	20.6	15	5.15
STD % OF MEAN	151	224	208	129
EGGS PER EGGMASS				
MEAN	10.8	15.3	9	6.67
STD	2.86	0.58	4.83	5.13
STD % OF MEAN	26.4	3.8	53.7	77
TOTAL EGGS PER EGGMASS (USING EACH DAY/REPLICATE)				
MEAN				10.44
STD				4.83
STD % OF MEAN				42

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91 PAGE 2
GLYPTOPHYSA DAILY AND CUMMULATIVE STATISTICS

	25/1/91	26/1/91	27/1/91	28/1/91	29/1/91
EGG MASS MEAN ACROSS REPS.	2.75	0	0	0.5	75
STD	1.26	0	0	0.58	0.5
STD AS % OF MEAN	45.8			115	56.7
EGG MEAN ACROSS REPLICATES	33.8	0	0	4.5	3.5
STD	18.2	0	0	5.45	5.07
STD AS % OF MEAN	53.8			121	145
CUMM'IVE EGG MASS TOTAL	2.75	11	11	13	15
MEAN ACROSS CUMM'IVE REPS.	2.75	1.38	0.92	0.81	0.75
STD	1.25	1.69	1.51	1.33	1.21
STD AS % OF MEAN	45.8	123	164	163	161
CUMMULATIVE EGG TOTAL	135	135	135	153	167
MEAN ACROSS CUMM'IVE REPS.	33.8	16.9	11.3	9.56	8.35
STD	18.2	21.6	19.1	16.8	15.3
STD AS % OF MEAN	53.8	128	170	176	183

Appendix 1.c.5.

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91

GYRAULUS SP. NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	REP.3	REP.4
25/1/91	10 8 8 15	9 10 8 8 7 8	9 6 9 8	11
26/1/91	11	10 11 8 7 7	9 4 10 9	11 11
27/1/91	13 8 8 8 9	10 7 8 8 12 8 9	5 12 10 10 9 8	11 8 9
28/1/91	6 9 11 6 9 11	12 9 9 8 6	6 8 8 11 10 9	12
29/1/91	9	7 9 9	11 9 12	11
EGGMASS PER DAY				
MEAN	3.4	5.4	4.6	1.6
STD	2.3	1.52	1.34	0.89
STD % OF MEAN	67.7	28.1	29.2	55.9
EGGS PER DAY				
MEAN	31.3	47	40.4	16.8
STD	20.3	13.9	11.5	7.79
STD % OF MEAN	63.8	29.6	28.5	46.3
EGGS PER EGGMASS				
MEAN	9.35	8.7	8.78	10.5
STD	2.3	1.56	2.04	1.31
STD % OF MEAN	24.8	18	23.2	12.5
TOTAL EGGS PER EGGMASS (USING EACH DAY/REPLICATE)				
MEAN				9.1
STD				1.84
STD % OF MEAN				20.2

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91 PAGE 2
GYRAULUS SP. DAILY AND CUMMULATIVE STATISTICS

	25/1/91	26/1/91	27/1/91	28/1/91	29/1/91
EGG MASS MEAN ACROSS REPS.	3.75	3.25	5.25	4.5	2
STD	2.06	2.22	1.71	2.38	1.15
STD AS % OF MEAN	55	68.2	32.5	53	57.7
EGG MEAN ACROSS REPLICATES	33.5	29.8	47.5	40	19.3
STD	16.7	18.3	14.5	19	11.1
STD AS % OF MEAN	50	61.5	30.6	47.6	57.6
CUMM'IVE EGG MASS TOTAL	15	28	49	67	75
MEAN ACROSS CUMM'IVE REPS.	3.75	3.5	4.08	4.2	3.75
STD	2.06	2	2.02	2.04	2.07
STD AS % OF MEAN	55	57.1	49.5	48.7	55.3
CUMMULATIVE EGG TOTAL	134	253	443	603	680
MEAN ACROSS CUMM'IVE REPS.	33.5	31.6	36.9	37.7	34
STD	16.7	16.3	17	16.9	17.4
STD AS % OF MEAN	50	51.7	46	44.9	51.2

Appendix 1.c.6.

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91

LYMNEAE SP. NUMBERS OF EGGS LAID PER DAY PAGE 1

	REP.1	REP.2	REP.3	REP.4
25/1/91	0	97	34 57 124	55 57
26/1/91	0	60	30	46
27/1/91	0	35 124	0	48 30
28/1/91	0	0	0	0
29/1/91	0	42	0	0
EGGMASS PER DAY				
MEAN	0	1	0.8	1
STD		0.71	1.3	1
STD % OF MEAN		71	163	100
EGGS PER DAY				
MEAN	0	71.6	48.6	47.2
STD		60	92.8	49
STD % OF MEAN		83.9	191	104
EGGS PER EGGMASS				
MEAN		71.6	122	47.2
STD		37.9	130	10.7
STD % OF MEAN		52.9	107	22.6
TOTAL EGGS PER EGGMASS (USING EACH DAY/REPLICATE)				
MEAN				59.8
STD				32.2
STD % OF MEAN				53.9

PRELIMINARY OBSERVATIONS No. 2 COMMENCED 25/1/91 PAGE 2
LYMNEAE SP. DAILY AND CUMMULATIVE STATISTICS

	25/1/91	26/1/91	27/1/91	28/1/91	29/1/91
EGG MASS ACROSS REPS.	1.5	0.75	1	0	25
STD	1.29	0.5	1.15	0	0.5
STD AS % OF MEAN	86.1	66.7	116		200
EGG MEAN ACROSS REPLICATES	106	34	59.3	0	10.5
STD	87.2	25.8	76	0	21
STD AS % OF MEAN	82.6	75.8	128		200
CUMM'IVE EGG MASS TOTAL	6	9	13	13	14
MEAN ACROSS CUMM'IVE REPS.	1.5	1.125	1.08	0.81	0.7
STD	1.29	0.99	1	0.98	0.92
STD AS % OF MEAN	86.1	88.1	92	12.7	132
CUMMULATIVE EGG TOTAL	422	558	795	795	837
MEAN ACROSS CUMM'IVE REPS.	106	69.8	66.3	49.7	41.9
STD	87.2	70.7	69.2	66.2	61.6
STD AS % OF MEAN	82.6	101	104	133	147

Appendix 1.d.

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY — RAW DATA
SPECIES A. *carinata*

REPLICATES 1, 2, 3, 4.	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		1				
REP 2	2		3	5		
REP 3	5	2	25	37		
REP 4						

PERCENTILE DATA	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		4.4				
REP 2	1.2		1.7	2.9		
REP 3	3.6	1.5	18.2	27		
REP 4						
TOTAL	7	3	28	42	0	0
PERCENT.	8.8	3.8	35	52.5	0	0

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY — RAW DATA
SPECIES A. *cumingii*

REPLICATES 1, 2, 3, 4.	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		2	4		1	
REP 2		2	3			
REP 3		8	2	2		
REP 4	4		1			

PERCENTILE DATA	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		0.9	1.8		0.4	
REP 2		1	3			
REP 3		3	1	1		
REP 4	2		11			
TOTAL	4	12	10	2	1	0
PERCENT.	13.8	41.4	34.5	6.9	3.4	0

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY — RAW DATA
SPECIES GABBIA SP.

REPLICATE 1, 3	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		2				
REP 3		1	1	3		

PERCENTILE DATA	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		22				
REP 3		10	10	30		
TOTAL	0	3	1	3	0	0
PERCENT.	0	42.9	14.3	42.9	0	0

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY — RAW DATA
SPECIES GLYPTOPHYSA SP.

REPLICATE 1, 2, 3, 4.	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		21	2	6	7	
REP 2		39	1			
REP 3		18			1	
REP 4		6			2	

PERCENTILE DATA	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		32	3	9	11	
REP 2		98	2			
REP 3		50			2.8	
REP 4		60			20	
TOTAL	0	84	3	6	10	0
PERCENT.	0	81.2	2.9	5.8	9.7	0

PRELIMINARY OBSERVATION No. 2 COMMENCED 30/1/91
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY — RAW DATA
SPECIES GYRAULUS SP.

REPLICATE 1, 2, 3, 4???.	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		33	2	8	1	
REP 2		1	11	30	4	
REP 3		8			2	
REP 4						

PERCENTILE DATA	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1		20.8	1.3	5	0.6	
REP 2		0.4	4.7	12.8	1.7	
REP 3		4			1	
REP 4						
TOTAL	0	42	13	38	7	0
PERCENT.	0	42	13	38	7	0

NOTE:: LYMNEAE HAD NO OBSERVABLE EMBRYONIC MORTALITY

Appendix 2.a.1.

TRIAL 1 COMMENCED 18/1/91 PAGE 1
ENDPOINT: DEVELOPMENTAL PERIOD DAYS
SPECIES A. carinaca

TREATMENT	CONTROL 1		CONTROL 2	
	A	B	A	B
EGGMASS				
A	7	6	6	6
B	7	5	7	6
C	6			7
D	7			
E	7			
MEAN	6.8	5.5	6.5	6.33
STD	0.45	0.71	0.71	0.58

TREATMENT	0.3% RP2		0.3% RP2	
	A	B	A	B
EGGMASS				
A	7	6	7	6
B	6	7	7	7
C	6			7
MEAN	6.33	6.5	7	6.67
STD	0.58	0.71	0	0.58

TREATMENT	1% RP2		1% RP2	
	A	B	A	B
EGGMASS				
A	6	6	6	7
B	6	7	6	7
C	6	6	7	6
D	6			
E	5			
MEAN	5.8	6.33	6.33	6.67
STD	0.45	0.58	0.58	0.58

TREATMENT	3.2% RP2		3.2% RP2	
	A	B	A	B
EGGMASS				
A	7	7	7	8
B	6	8	7	7
C		8		7
D		6		
E		8		
MEAN	6.5	7.4	7	7.33
STD	0.71	0.89	0	0.58

TREATMENT	10% RP2		10% RP2	
	A	B	A	B
EGGMASS				
A	7	8	6	6
B	7	7	7	6
C	7	7		
D		7		
E		7		
MEAN	7	7.2	6.5	6
STD	0	0.45	0.71	0

TREATMENT	32% RP2		32% RP2	
	A	B	A	B
EGGMASS				
A	7	7	7	7
B	7	5	7	6
C		5	7	
D		7		
E		7		
F		7		
MEAN	7	6.33	7	6.5
STD	0	1.03	0	0.45

Appendix 2.a.2.

TRIAL 1 COMMENCED 18/1/91 PAGE 1
ENDPOINT: DEVELOPMENTAL PERIOD DAYS
SPECIES A. cummingii

TREATMENT	CONTROL 1		CONTROL 2	
	A	B	A	B
EGGMASS				
A	7	7	7	7
B		7	7	7
C		6		
MEAN	7	6.67	7	7
STD		0.58	0	0

TREATMENT	0.3% RP2		0.3% RP2	
	A	B	A	B
EGGMASS				
A	7	6	7	7
B	7	6	7	7
C	8	7		
D	7	6		
E		7		
MEAN	7.25	6.4	7	7
STD	0.5	0.55	0	0

TREATMENT	1% RP2		1% RP2	
	A	B	A	B
EGGMASS				
A	7	7	8	7
B	7	6	7	7
C	7			7
MEAN	7	6.5	7.5	7
STD	0	0.71	0.71	0

TREATMENT	3.2% RP2		3.2% RP2	
	A	B	A	B
EGGMASS				
A	7	7	8	7
B	6	7	7	7
C	7	7		
D	7			
E	6			
F	6			
G	6			
H	6			
MEAN	6.38	7	8.5	7
STD	0.52	0	0.71	0

TREATMENT	10% RP2		10% RP2	
	A	B	A	B
EGGMASS				
A	7	7	8	7
B		8	8	7
C		6		
MEAN	7	7	8	7
STD		1	0	0

TREATMENT	32% RP2		32% RP2	
	A	B	A	B
EGGMASS				
A	7	8	8	7
B	7	7	8	8
C		7		
MEAN	7	7.33	8	7.5
STD	0	0.58	0	0.71

Appendix 2.a.3.

TRIAL 1 COMMENCED 18/1/91 PAGE 1
ENDPOINT: DEVELOPMENTAL PERIOD DAYS
SPECIES GLYPTOPHYSA SP.

TREATMENT	CONTROL 1		CONTROL 2	
	A	B	A	B
EGGMASS				
A	5	5	7	6
B	4	4	6	6
C		6		6
D		5		6
E		4		
F		6		
MEAN	4.5	5	6.5	6
STD	0.71	0.89	0.71	0

TREATMENT	0.3% RP2		0.3% RP2	
	A	B	A	B
EGGMASS				
A	5	6	5	6
B	6	6	6	6
C	6	7	6	7
D	6	6		6
E		7		6
F				6
MEAN	6.75	6.6	5.67	6.17
STD	0.5	0.55	0.58	0.41

TREATMENT	1% RP2		1% RP2	
	A	B	A	B
EGGMASS				
A	7	6	6	5
B	7	5	6	6
C	7		6	6
D	7		6	
E	7			
F	6			
G	6			
MEAN	6.71	5.5	6	6
STD	0.49	0.71	0	0

TREATMENT	3.2% RP2		3.2% RP2	
	A	B	A	B
EGGMASS				
A	6	7	6	5
B	7	7	6	6
C	7	7	6	5
D	7			
E	6			
F	6			
G	6			
H	6			
MEAN	6.38	7	6	5.67
STD	0.52	0	0	0.58

TREATMENT	10% RP2		10% RP2	
	A	B	A	B
EGGMASS				
A	6	6	5	6
B	6	6	6	6
C		7	5	6
D		6		
E		6		
F		6		
G		6		
H		7		
I		6		
MEAN	6	6.22	5.67	6
STD	0	0.44	0.58	0

TREATMENT	32% RP2		32% RP2	
	A	B	A	B
EGGMASS				
A	7	7	6	5
B	7	6	7	6
C		6		5
D		7		5
E		7		
F		7		
MEAN	7	6.67	6.5	5.25
STD	0	0.52	0.71	0.5

Appendix 2.b.1.

TRIAL 1 DATE 18/2/91
ENDPOINT: JUVENILE MORTALITY EXPECTED: FROM NUMBERS OF NEONATES HATCHED
SPECIES A. carinata

REPLICATE 1

TREATMENT	A LIVING	DEAD	% MORT	B LIVING	DEAD	% MORT
CONTROL	9	11	55	54	44	45
0.3% RP2	21	38	64	12	19	61
1% RP2	10	58	85	15	14	48
3.2% RP2	7	24	77	27	38	58
10% RP2	17	8	32	42	39	48
32% RP2	26	53	67	17	11	39

REPLICATE 2

TREATMENT	A LIVING	DEAD	% MORT	B LIVING	DEAD	% MORT
CONTROL	10	23	70	12	31	72
0.3% RP2	16	15	48	22	31	58
1% RP2	11	31	74	20	18	47
3.2% RP2	20	31	61	6	25	81
10% RP2	22	13	37	16	27	63
32% RP2	6	36	86	13	23	64

Appendix 2.b.2.

TRIAL 1 DATE 18/2/91
ENDPOINT: JUVENILE MORTALITY EXPECTED: FROM NUMBEBERS OF NEONATES HATCHED
SPECIES A. cummingii

REPLICATE 1

TREATMENT	A LIVING	DEAD	% MORT	B LIVING	DEAD	% MORT
CONTROL	15	17	53	26	63	71
0.3% RP2	51	59	54	35	5	13
1% RP2	10	25	71	38	38	50
3.2% RP2	21	7	25	68	51	43
10% RP2	15	18	55	32	51	61
32% RP2	18	24	65	10	64	86

REPLICATE 2

TREATMENT	A LIVING	DEAD	% MORT	B LIVING	DEAD	% MORT
CONTROL	32	23	43	27	19	41
0.3% RP2	21	25	54	28	27	49
1% RP2	36	28	44	27	3	10
3.2% RP2	30	20	40	22	28	56
10% RP2	36	23	39	10	33	77
32% RP2	26	19	42	38	21	36

Appendix 2.b.3.

TRIAL 1 DATE 18/2/91
ENDPOINT: JUVENILE MORTALITY OBSERVED: NUMBERS RECORDED AT TERMINATION
SPECIES
Glyptophysa sp.

REPLICATE 1

TREATMENT	A LIVING	DEAD	% MORT	B LIVING	DEAD	% MORT
CONTROL	9	15	63	1	5	83
0.3% RP2	26	0	0	15	0	0
1% RP2	5	2	29	6	2	25
3.2% RP2	4	6	60	4	1	20
10% RP2	28	11	28	6	1	14
32% RP2	2	12	14	25	14	36

REPLICATE 2

TREATMENT	A LIVING	DEAD	% MORT	B LIVING	DEAD	% MORT
CONTROL	8	1	11	9	1	10
0.3% RP2	28	7	20	21	9	30
1% RP2	14	1	7	6	5	45
3.2% RP2	9	1	10	14	1	7
10% RP2	7	3	30	8	3	27
32% RP2	12	4	25	6	7	54

Appendix 2.c.

TRIAL #1 COMMENCED 18/2/91
PHYSICO-CHEMICAL DATA

DISSOLVED OXYGEN mg/L

TREATMENT

	CON.	CON.	0.3%RP2	0.3%RP2	1%RP2	1%RP2	3.2%RP2	3.2%RP2	10%RP2	10%RP2	32%RP2	32%RP2
DAY1	7.1	7	6.9	7	6.8	6.8	6.9	6.4	6.8	6.5	6.5	7
DAY2	6.9	7.7	7.6	7.1	7.4	7.7	7.1	7.6	7.1	7.6	7.6	7.7
DAY3	6.8	7.1	6.8	6.9	6.6	6.3	6.8	6.6	6.6	6.8	7	7.1
DAY4	7.1	7.1	7.2	7	6.9	7.1	6.9	6.9	7.1	7.1	7.1	7.1
DAY5	7.2	7.1	6.8	9.4	7	6.9	7.1	7.3	7.1	6.9	7	7.2
DAY6	7	6.9	6.9	7.1	7.2	6.9	7	7.1	6.8	7.1	7.1	7
DAY7	6.9	7.2	7	6.9	6.8	6.9	7	6.6	6.7	7.1	7	6.8

pH

	CON.	CON.	0.3%RP2	0.3%RP2	1%RP2	1%RP2	3.2%RP2	3.2%RP2	10%RP2	10%RP2	32%RP2	32%RP2
DAY1	6.47	6.44	6.52	6.46	6.58	6.38	6.68	6.32	6.62	6.66	6.76	6.74
DAY2	6.38	6.11	6.43	6.33	6.57	6.52	6.64	6.56	6.62	6.56	6.81	6.75
DAY3	6.47	6.4	6.5	6.49	6.37	6.4	6.55	6.43	6.57	6.48	6.78	6.68
DAY4	6.36	6.42	6.43	6.38	6.53	6.42	6.56	6.44	6.51	6.49	6.73	6.72
DAY5	6.46	6.41	6.48	6.47	6.46	6.49	6.55	6.51	6.57	6.54	6.83	6.84
DAY6	6.07	6.44	6.64	6.52	6.59	6.65	6.59	6.54	6.62	6.54	6.78	6.82
DAY7	6.34	6.25	6.41	6.49	6.58	6.56	6.5	6.47	6.52	6.48	6.83	6.75

CONDUCTIVITY uSem/cm

TREATMENT

	CON.	CON.	0.3%RP2	0.3%RP2	1%RP2	1%RP2	3.2%RP2	3.2%RP2	10%RP2	10%RP2	32%RP2	32%RP2
DAY1	19.7	20.4	26.2	25.2	36.8	38.8	73.4	74.2	178	177	466	461
DAY2	17.7	17.9	23.7	24.6	36	35.6	71.2	72	174	173	452	456
DAY3	19.1	20	24.1	23.9	35.6	36.8	71.7	70.8	174	173	451	453
DAY4	18.3	18.3	24.1	23.9	36.4	36.4	70	70	173	173	456	456
DAY5	18.2	20.8	23.9	24.3	36.3	36.1	70.7	70.3	175	174	461	460
DAY6	18.1	17.9	23.5	23.9	36.1	35.8	70.4	70.1	173	174	460	459
DAY7	20.3	20.9	24.1	24.8	36	36.1	70.5	71	175	175	461	461

Appendix 3.a.1.

TRIAL #2 COMMENCED 28/2/91
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
EGG NUMBERS RAW DATA
SPECIES *A. cummingii*

TREATMENT: CONTROL REPLICATE 1 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	21					
DAY2		21				
DAY3				21		
DAY4				5	16	
DAY5					21	
DAY6					21	
DAY7						21

TREATMENT: CONTROL REPLICATE 1 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	42					
DAY2		42				
DAY3			42			
DAY4			21	21		
DAY5					41	
DAY6					41	
DAY7					41	
DAY8						41

TREATMENT: CONTROL REPLICATE 2 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	23					
DAY2		22				
DAY3				21		
DAY4					21	
DAY5					21	
DAY6					21	
DAY7					21	
DAY8						21

TREATMENT: CONTROL REPLICATE 2 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	38					
DAY2		34				
DAY3			34			
DAY4					31	
DAY5					31	
DAY6					31	
DAY7					31	
DAY8						31

TREATMENT: 1% RP2 REPLICATE 1 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	38					
DAY2		37				
DAY3				37		
DAY4					37	
DAY5					37	
DAY6					37	
DAY7					37	
DAY8						37

TREATMENT: 1% RP2 REPLICATE 1 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	22					
DAY2		2	20			
DAY3		1		21		
DAY4					21	
DAY5					21	
DAY6					21	
DAY7					21	
DAY8						21

TREATMENT: 1% RP2 REPLICATE 2 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	24					
DAY2		24				
DAY3				24		
DAY4					24	
DAY5					24	
DAY6					24	
DAY7					24	
DAY8						24

TREATMENT: 1% RP2 REPLICATE 2 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	33					
DAY2	2	31				
DAY3				31		
DAY4					31	
DAY5					31	
DAY6					31	
DAY7					31	
DAY8						31

TREATMENT: 3.2% RP2 REPLICATE 1 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	22					
DAY2		22				
DAY3				22		
DAY4				22		
DAY5					22	
DAY6					22	
DAY7						22

TREATMENT: 3.2% RP2 REPLICATE 1 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	30					
DAY2	2	28				
DAY3				29		
DAY4					29	
DAY5					29	
DAY6					29	
DAY7					29	
DAY8						29

TREATMENT: 3.2% RP2 REPLICATE 2 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	27					
DAY2		27				
DAY3		1	26			
DAY4					27	
DAY5					27	
DAY6					27	
DAY7					27	
DAY8						27

TREATMENT: 3.2% RP2 REPLICATE 2 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	29					
DAY2		29				
DAY3			27			
DAY4					27	
DAY5					27	
DAY6					27	
DAY7						27

TRIAL #2 COMMENCED 29/2/91
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 7
EGG NUMBERS RAW DATA
SPECIES A. cummingii

TREATMENT: 10% RP2 REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	34					
DAY2		34				
DAY3		14	14			
DAY4			4	24		
DAY5					24	
DAY6					24	
DAY7					24	
DAY8					24	
DAY9						24

TREATMENT: 10% RP2 REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	25					
DAY2		25				
DAY3				25		
DAY4					25	
DAY5					25	
DAY6					25	
DAY7					25	
DAY8						25

TREATMENT: 10% RP2 REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	25					
DAY2		25				
DAY3				25		
DAY4					25	
DAY5					25	
DAY6					25	
DAY7						25

TREATMENT: 10% RP2 REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	31					
DAY2		23				
DAY3		17				
DAY4			4	13		
DAY5				4	13	
DAY6				4	13	
DAY7					13	
DAY8						13

TREATMENT: 32% RP2 REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	31					
DAY2		31				
DAY3				31		
DAY4					31	
DAY5					31	
DAY6					31	
DAY7					31	
DAY8						31

TREATMENT: 32% RP2 REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	26					
DAY2		25				
DAY3				24		
DAY4					24	
DAY5					24	
DAY6					24	
DAY7					24	
DAY8						24

TREATMENT: 32% RP2 REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	33					
DAY2			31			
DAY3				31		
DAY4					31	
DAY5					31	
DAY6					31	
DAY7						31

TREATMENT: 32% RP2 REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	28					
DAY2		28				
DAY3		2		23		
DAY4					23	
DAY5					23	
DAY6					23	
DAY7					23	
DAY8						23

TREATMENT: 100% RP2 REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	22					
DAY2		22				
DAY3			21			
DAY4					21	
DAY5					21	
DAY6					21	
DAY7					21	
DAY8					21	
DAY9						21

TREATMENT: 100% RP2 REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	31					
DAY2		20				
DAY3				20		
DAY4					20	
DAY5					20	
DAY6					20	
DAY7					20	
DAY8						20

TREATMENT: 100% RP2 REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	29					
DAY2		29				
DAY3			29			
DAY4					29	
DAY5					29	
DAY6					29	
DAY7					29	
DAY8					29	
DAY9						29

TREATMENT: 100% RP2 REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	26					
DAY2		21				
DAY3				21		
DAY4					21	
DAY5					21	
DAY6					21	
DAY7					21	
DAY8					21	
DAY9					21	
DAY10					21	
DAY11						21

Appendix 3.a.2.

TRIAL #2 COMMENCED 28/2/91
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
EGG NUMBERS RAW DATA
SPECIES GYRAULUS SP.

TREATMENT:CONTROL REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	2					
	4					
	5					
	3					
	7					
DAY2		2				
	3	1				
		5				
		3				
		7				
DAY3				2		
				1		
				5		
			2	1		
			2	5		
DAY4					2	
					1	
					5	
					3	
					7	
DAY5					2	
					1	
					5	
					3	
						7
DAY5						2
						1
						5
						3

TREATMENT:CONTROL REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	3					
	6					
	6					
	4					
DAY2		3				
		6				
		6				
		4				
DAY3				3		
				6		
				6		
				4		
DAY4					3	
					6	
					6	
					4	
DAY5						3
						6
						6
						4

TREATMENT:CONTROL REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	4					
	8					
	5					
	3					
DAY2		4				
		8				
		5				
		3				
DAY3				4		
				5		
				8		
				3		
DAY4					4	
					8	
					5	
					3	
DAY5						4
						8
						5
						3

TREATMENT:CONTROL REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	5					
	8					
	6					
	4					
	5					
DAY2		4				
		8				
		5				
		4				
		5				
DAY3				4		
				8		
				5		
				4		
				5		
DAY4					4	
					8	
					5	
					4	
					5	
DAY5						4
						8
						5
						4

TREATMENT:1% RP2 REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	4					
	2					
	4					
DAY2		4				
		2				
		4				
DAY3			2	2		
				2		
				4		
DAY4					4	
					2	
					4	
DAY5					4	
						2
					4	
DAY6						4
						4

TREATMENT:1% RP2 REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	2					
	5					
	1					
	5					
	4					
DAY2		2				
		5				
	1					
		5				
		4				
DAY3				2		
				5		
			1			
				5		
				4		
DAY4					2	
					5	
					1	
					5	
					4	
DAY5					2	
					5	
					1	
					5	
					4	
DAY6						2
						5
						1
						5
						4

TREATMENT:1% RP2 REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	5					
	4					
	5					
	3					
	6					
DAY2		5				
		4				
		5				
		3				
		6				
DAY3			2	3		
				4		
				5		
				3		
				6		
DAY4					5	
					4	
					5	
					3	
					6	
DAY5					5	
					4	
					5	
					3	
					6	
DAY6						5
						4
						5
						3
						6

TREATMENT:1% RP2 REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	5					
	4					
	5					
	5					
	6					
	3					
	5					
	5					
	4					
DAY2		5				
		4				
		5				
		5				
			6			
		3				
		5				
		5				
		4				
DAY3				5		
			3	1		
				5		
				5		
				6		
				3		
			1	4		
			3	1		
				5		

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY4					5	
					4	
					5	
					5	
					6	
					3	
					5	
					5	
					4	
DAY5					5	
					4	
					5	
					5	
					6	
					3	
					5	
					5	
					4	
DAY6						5
						4
						5
						5
						6
						3
						5
						5
						4

TREATMENT:3.2% RP2 REPLICATE 1 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	3					
	5					
	5					
	7					
DAY2		3				
		5				
		5				
		6				
DAY3				3		
			3	2		
				5		
			1	5		
DAY4					3	
					5	
					5	
					6	
DAY5						3
						5
						5
						6

TREATMENT:3.2% RP2 REPLICATE 1 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8					
	4					
	4					
	3					
	5					
DAY2		8				
		4				
		4				
		3				
		5				
DAY3				8		
			3	1		
			1	3		
			2	1		
			1	4		
DAY4					8	
					4	
					4	
					3	
					5	
DAY5						8
						4
					4	
						3
					5	
DAY6						4
						5

TREATMENT:3.2% RP2 REPLICATE 2 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6					
	4					
	6					
	7					
DAY2		6				
		4				
		6				
		7				
DAY3			1	5		
				4		
				6		
			2	5		
DAY4					5	
					4	
					6	
					7	
DAY5						5
						4
					6	
					7	
DAY6						6
						7

TREATMENT:3.2% RP2 REPLICATE 2 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	3					
	7					
	4					
	5					
	5					
	3					
DAY2		3				
			7			
			4			
		5				
		5				
		3				
DAY3			3			
				7		
				4		
			2	3		
				5		
				3		
DAY4					2	
					7	
					4	
					5	
					4	
					3	
DAY5						2
						7
						4
						5
						4

TREATMENT:10% RP2 REPLICATE 1 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6					
	3					
	4					
	6					
	3					
DAY2			6			
		3				
		4				
		1	5			
		3				
DAY3				6		
				3		
				4		
				6		
				3		
DAY4					6	
					3	
					4	
					6	
					3	
DAY5					6	
					3	
					4	
					6	
					3	
DAY6						6
						3
						4
						6
						3

TREATMENT:10% RP2 REPLICATE 1 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	9					
	7					
	7					
	6					
	8					
DAY2			9			
		7				
		7				
		5	1			
		6				
DAY3				9		
				7		
			1	6		
				6		
				8		
DAY4					9	
					7	
					7	
				1	5	
					8	
DAY5					9	
					7	
						7
						5
						8
Day6						9
						7

TREATMENT:10% RP2 REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	3					
	3					
	7					
	6					
	3					
DAY2		3				
		3				
		7				
		6				
		3				
DAY3				3		
				3		
				7		
				6		
				3		
DAY4					3	
					3	
					7	
					6	
					3	
DAY5					3	
					3	
					7	
					6	
					3	
DAY6						3
						3
						7
						6
						3

TREATMENT:10% RP2 REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6					
	6					
	4					
	6					
	8					
DAY2		6				
		6				
			4			
			6			
		4	4			
DAY3		1		5		
				6		
				4		
				6		
				8		
DAY4					5	
					6	
					4	
					6	
					8	
DAY5					5	
					6	
						4
						6
						8
DAY6						5
						6

TREATMENT:32% RP2 REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7					
	4					
	1					
	2					
	4					
	4					
DAY2		7				
		4				
		1				
		2				
			4			
			4			
DAY3				7		
				4		
				1		
				2		
			1	3		
				4		
DAY4					7	
					4	
					1	
					2	
					4	
					4	
DAY5					7	
					4	
					1	
					2	
					4	
					4	
DAY6						7
						4
						1
						2
						4
						4

TREATMENT:32% RP2 REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	4					
	5					
	5					
	5					
DAY2		5				
		4				
DAY3				5		
				4		
DAY4					5	
					4	
DAY5					5	4
DAY6						5

TRIAL #2 COMMENCED 28/2/91
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 19
EGG NUMBERS RAW DATA
SPECIES GYRAULUS SP.

TREATMENT:32% RP2 REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6					
	5					
	5					
	4					
DAY2		6				
		5				
	5					
		5				
	4					
DAY3				6		
				5		
				5		
				4		
DAY4					6	
					5	
					5	
					4	
DAY5						6
					5	
					5	
					4	
DAY6						5
						5
						4

TREATMENT:32% RP2 REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6					
	5					
	2					
	3					
	4					
	3					
DAY2			6			
			5			
			2			
			3			
			4			
			3			
DAY3				6		
				5		
				2		
				3		
				4		
				3		
DAY4					6	
					5	
				1	1	
					3	
					4	
				1	2	
DAY5						6
					5	
					1	
					3	
					4	
					3	
DAY6						5
						1
						3
						4
						3

TREATMENT: 100% RP2 REPLICATE 1 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7					
	8					
	5					
DAY2		7				
		8				
		5				
DAY3				7		
				8		
				5		
DAY4					7	
					8	
					5	
DAY5					7	
					8	
					5	
DAY6					7	
					8	
					5	
DAY7					7	
					8	
					5	
DAY8					7	
					8	
					4	
DAY9					7	
					8	
					1	
DAY10						7
						8

TREATMENT: 100% RP2 REPLICATE 1 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	3					
	5					
	4					
	2					
	2					
DAY2		3				
	5					
		4				
	2					
	2					
DAY3				3		
				5		
				4		
				2		
				2		
DAY4					3	
					5	
				4		
					2	
					2	
DAY5					3	
					5	
					4	
					2	
					2	
DAY6					3	
					5	
					4	
					2	
					2	
DAY7					3	
					5	
					4	
					2	
					2	
DAY8					3	
					4	
					4	
					2	
					2	
DAY9					1	
						4
						2
					2	
					2	
DAY 10						1
						2
						2

TREATMENT: 100% RP2 REPLICATE 2 SAMPLE A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6					
	6					
	3					
	6					
	4					
DAY2			6			
			6			
		3				
		6				
			4			
DAY3					6	
					6	
				3		
				6		
					4	
DAY4					6	
					6	
					3	
					6	
					4	
DAY5					6	
					6	
					3	
					6	
DAY6					6	
					6	
					3	
					6	
					4	
DAY7					6	
					6	
					3	
					6	
					4	
DAY8					6	
					6	
					3	
					6	
					4	
DAY9					6	
					3	
					1	
DAY10					3	
					3	
					1	
DAY11						

TREATMENT: 100% RP2 REPLICATE 2 SAMPLE B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7					
	6					
	3					
	4					
	8					
DAY2		7				
		6				
		3				
		4				
		8				
DAY3			1	6		
				6		
				3		
			4			
			1	7		
DAY4					7	
					6	
					3	
					4	
					8	
DAY5					7	
					6	
					3	
					4	
					8	
DAY6					7	
					6	
					3	
					4	
					8	
DAY7						7
					6	
					3	
						4
						8
DAY8						6
						3

Appendix 3.a.3.

TRIAL #2 — COMMENCED 28/2/91
ENDPOINT — DEVELOPMENTAL CHARACTERISTICS — PAGE 1
EGG NUMBERS — RAW DATA
SPECIES — LYMNEAE SP.

TREATMENT:CONTROL — REPLICATE 1 — SAMPLE A

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	52					
DAY2		23	27			
DAY3		7		45		
DAY4					45	
DAY5					45	
DAY6						45

TREATMENT:CONTROL — REPLICATE 1 — SAMPLE B

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	88					
DAY2		40	48			
DAY3		6		82		
DAY4		5		13	70	
DAY5					81	
DAY6					81	
DAY7						81

TREATMENT:CONTROL — REPLICATE 2 — SAMPLE A

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	28					
DAY2		28				
DAY3			14	14		
DAY4					28	
DAY5					28	
DAY6					28	
DAY7						28

TREATMENT:CONTROL — REPLICATE 2 — SAMPLE B

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	85					
DAY2		85				
DAY3				85		
DAY4					82	
DAY5					82	
DAY6					82	
DAY7						82

TREATMENT:1% RP2 — REPLICATE 1 — SAMPLE A

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	55					
DAY2			54			
DAY3				54		
DAY4					54	
DAY5					54	
DAY6					54	
DAY7						54

TREATMENT:1% RP2 — REPLICATE 1 — SAMPLE B

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	58					
DAY2		20	37			
DAY3		10		47		
DAY4		2		5	50	
DAY5				7	50	
DAY6				7	50	
DAY7					3	50
DAY8						3

TREATMENT:1% RP2 — REPLICATE 2 — SAMPLE A

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	44					
DAY2		22	22			
DAY3			8	36		
DAY4					36	
DAY5					36	
DAY6					36	
DAY7					3	33
DAY8						3

TREATMENT:1% RP2 — REPLICATE 2 — SAMPLE B

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	76					
DAY2		38	38			
DAY3		16		60		
DAY4					70	
DAY5					70	
DAY6					70	
DAY7					70	
DAY8						70

TREATMENT:3.2% RP2 — REPLICATE 1 — SAMPLE A

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	87					
DAY2		57				
DAY3		11	46			
DAY4			12		45	
DAY5				12	45	
DAY6				12	45	
DAY7				12		45
DAY8				0		

TREATMENT:3.2% RP2 — REPLICATE 1 — SAMPLE B

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	54					
DAY2		52				
DAY3				52		
DAY4					52	
DAY5					52	
DAY6					52	
DAY7					33	19
DAY8						33

TREATMENT:3.2% RP2 — REPLICATE 2 — SAMPLE A

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	43					
DAY2		43				
DAY3			1	42		
DAY4				43		
DAY5				43		
DAY6				43		
DAY7					43	

TREATMENT:3.2% RP2 — REPLICATE 2 — SAMPLE B

DEVELOPMENTAL STAGE	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	20					
DAY2			10	10		
DAY3			3	17		
DAY4					17	
DAY5					17	
DAY6					17	
DAY7						17

TREATMENT:10% RP2 REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	46					
DAY2		26	20			
DAY3			6	40		
DAY4			3	4	39	
DAY5			3	4	39	
DAY6					39	
DAY7						39

TREATMENT:10% RP2 REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	43 23					
DAY2		43 23				
DAY3			5 5	38 18		
DAY4			5	8	35 18	
DAY5			5	8	35 18	
DAY6					37 18	
DAY7					37 18	
DAY8						37 18

TREATMENT:10% RP2 REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	70					
DAY2		70				
DAY3			70			
DAY4				70		
DAY5					70	
DAY6					70	
DAY7					2	68
DAY8						2

TREATMENT:10% RP2 REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	42					
DAY2		20	22			
DAY3			6	36		
DAY4				8	34	
DAY5					34	
DAY6					28	
DAY7						28

TREATMENT:32% RP2 REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	81					
DAY2		81				
DAY3		2		79		
DAY4					76	
DAY5					76	
DAY6					76	
DAY7					26	50
DAY8						26

TREATMENT:32% RP2 REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	35					
DAY2		32				
DAY3			1	31		
DAY4				2	30	
DAY5				1	30	
DAY6					30	
DAY7					6	24
DAY8						6

TREATMENT:32% RP2 REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	89					
DAY2		44	32			
DAY3				32		
DAY4					32	
DAY5					32	
DAY6					32	
DAY7						32

TREATMENT:32% RP2 REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	36					
DAY2		36				
DAY3			5	31		
DAY4					31	
DAY5					31	
DAY6					31	
DAY7					31	
DAY8						31

TREATMENT:100% RP2 REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	45					
DAY2		45				
DAY3			20	25		
DAY4				1	44	
DAY5					45	
DAY6					45	
DAY7					45	
DAY8					45	
DAY9					45	
DAY10					45	
DAY12					35	

TERMINATION

TREATMENT:100% RP2 REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	69					
DAY2		69				
DAY3			2	67		
DAY4			1	1	67	
DAY5					65	
DAY6					65	
DAY7					65	
DAY8					65	
DAY9					65	
DAY10					65	
DAY12					39	6

TERMINATION

TREATMENT:100% RP2 REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	68					
DAY2		38	30			
DAY3		17		51		
DAY4		17			51	
DAY5			1		51	
DAY6					51	
DAY7					51	
DAY8					51	
DAY9					51	
DAY10					51	
DAY12					51	

TERMINATION

TREATMENT: 100% RP2 REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	50					
DAY2		30	20			
DAY3		6		44		
DAY4			6		44	
DAY5					43	
DAY6					42	
DAY7					42	
DAY8					42	
DAY9					42	
DAY10					42	
DAY12					32	

TERMINATION

Appendix 3.b.

TRIAL 2 DATE 1/3/91
ENDPOINT: DEVELOPMENTAL RETARDATION DAYS TO EGG CAPSULE RUPTURE
SPECIES A. cummingii

	REPLICATE 1 A	REPLICATE 1 B	REPLICATE 2 A	REPLICATE 2 B
TREATMENT				
CONTROL	7	7	8	8
1% RP2	7	7	8	8
3.2% RP2	7	8	8	7
10% RP2	8	9	7	8
32% RP2	8	8	7	8
100% RP2	9	8	9	10

TRIAL 2 DATE 1/3/91.
ENDPOINT: DEVELOPMENTAL RETARDATION DAYS TO EGG CAPSULE RUPTURE
SPECIES LYMNEAE SP.

	REPLICATE 1 A	REPLICATE 1 B	REPLICATE 2 A	REPLICATE 2 B
TREATMENT				
CONTROL	7	7	8	8
1% RP2	7	7	8	8
3.2% RP2	7	7	7	7
10% RP2	7	8	7	7
32% RP2	7	7	7	8
100% RP2	14	13	13	13

TRIAL 2 DATE 1/3/91
DEVELOPMENTAL RETARDATION DAYS TO EGG CAPSULE RUPTURE
SPECIES GYRAULUS SP.

TREATMENT	CONT. #1 A	CONT. #1 B	CONT. #2 A	CONT. #2 B
EGGMASS				
A	5	6	5	5
B	5	6	5	5
C	5	6	5	6
D	5	6	5	6
E	5			6
MEAN	5	6	5	5.6
STD	0	0	0	0.55

TREATMENT	1% RP2 #1 A	1% RP2 #1 B	1% RP2 #2 A	1% RP2 #2 B
EGGMASS				
A	6	5	6	5
B	6	5	6	6
C	6	5	6	6
D	6	6		6
E	5	6		
F		6		
G		6		
H		6		
I		6		
MEAN	5.8	5.67	6	5.75
STD	0.45	0.5	0	0.5

TREATMENT	3.2% RP2 #1 A	3.2% RP2 #1 B	3.2% RP2 #2 A	3.2% RP2 #2 B
EGGMASS				
A	5	5	5	5
B	5	5	5	5
C	5	5	5	5
D	5	6	6	5
E		6	6	5
F				5
G				5
MEAN	5	5.4	5.4	5
STD	0	0.55	0.5	0

TREATMENT	10% RP2 #1 A	10% RP2 #1 B	10% RP2 #2 A	10% RP2 #2 B
EGGMASS				
A	5	5	5	5
B	5	5	5	5
C	5	6	6	5
D	6	6	6	6
E	6	6	6	6
MEAN	5.4	5.6	5.6	5.4
STD	0.55	0.55	0.55	0.55

TREATMENT	32% RP2 #1 A	32% RP2 #1 B	32% RP2 # A	32% RP2 # B
EGGMASS				
A	5	5	6	5
B	5	6	6	6
C	5	6	6	
D	5	6	6	
E	6	6	5	
F			5	
MEAN	5.2	5.8	5.67	5.5
STD	0.45	0.45	0.52	0.71

TREATMENT	100% RP2 #1 A	100% RP2 #1 B	100% RP2 A	100% RP2 B
EGGMASS				
A	10	9	10	7
B	9	9	10	8
C	10	9	10	8
D		10	10	8
E		8		7
F				7
MEAN	9.67	9	10	7.5
STD	0.58	0.71	0	0.55

Appendix 3.c.

TRIAL#2COMMENCED 28/2/91

PHYSICO-CHEMICAL DATA

CONDUCTIVITY uSem/cm

	TREATMENT											
	CON A	CON B	1% A	1% B	3.2% A	3.2% B	10% A	10% B	32% A	32% B	100% A	100% B
DAY1	25.9	27.7	42.2	42.2	71.1	70.7	159	160	409	413	1080	1080
DAY2	26.2	29.5	47.7	45.2	73.2	72.6	170	171	427	433	1100	1100
DAY3	27	38.7	42.7	43	74.7	77.9	173	173	437	438	1100	1100
DAY4	25.1	30	40.7	42.3	73.3	75.9	172	172	433	429	1090	1100
DAY5	26.1	34.3	42.6	42.8	76.2	77.4	177	176	445	442	1120	1120
DAY6	26.2	34.2	42.6	43.1	75.7	77.6	178	185	449	445	1120	1120
DAY7	29.2	29.8	42.2	44.2	77.5	77.5	178	185	448	448	1130	1120
DAY8	27.5	25.8	4104	41.6	75.9	76.2	175	179	447	444	1130	1130
DAY9	27.3	31.4	42.7	44.3	77.5	80.6	185	178	454	448	1150	1120
DAY10	28.3	34.3	43.8	45.6	80.6	82.1	189	188	463	471	1190	1150
DAY11	29.5	32.8	46.7	42	79.1	77.3	179	180	454	452	1130	1130
DAY12	27	30.2	42.3	42.9	76.2	75.6	177	178	450	451	1140	1130

pH

	TREATMENT											
	CON A	CON B	1% A	1% B	3.2% A	3.2% B	10% A	10% B	32% A	32% B	100% A	100% B
DAY1	6.36	6.55	6.59	6.6	6.61	6.6	6.74	6.72	6.75	6.96	7.19	7.31
DAY2	6.42	6.68	6.61	6.64	6.86	6.56	6.97	6.86	6.71	6.97	7.26	7.21
DAY3	6.6	7.63	6.98	6.89	6.85	6.97	7	7	7.08	7.2	7.28	7.3
DAY4	6.34	6.78	6.75	6.93	6.81	6.85	7.01	7.26	7.13	7.15	7.15	7.4
DAY5	6.32	6.73	6.73	6.71	6.6	6.7	6.76	6.86	6.84	6.89	7.09	7.26
DAY6	6.17	6.43	6.77	6.75	6.71	6.85	6.86	7.11	7.16	6.66	6.84	7.17
DAY7	6.68	6.88	6.66	6.8	6.7	6.73	6.91	6.94	6.93	6.92	7.05	7.04
DAY8	6.5	6.58	6.73	6.78	6.78	6.87	6.84	7.01	6.95	6.98	7.2	7.24
DAY9	6.36	6.85	6.77	6.77	6.72	6.73	7.15	7.08	7.05	6.97	7.23	7.29
DAY10	6.24	6.53	6.4	6.56	6.63	6.73	6.87	6.91	6.95	6.92	7.12	7.08
DAY11	6.69	6.66	6.73	6.81	6.83	6.8	6.94	6.94	7.07	7.07	7.21	7.33
DAY12	6.49	6.66	6.56	6.73	6.71	6.78	6.82	6.97	7.02	7.07	7.19	7.42

DISSOLVED OXYGE mg/L

	TREATMENT											
	CON A	CON B	1% A	1% B	3.2% A	3.2% B	10% A	10% B	32% A	32% B	100% A	100% B
DAY1	7.2	7.3	7.4	7.6	7.5	7.5	7.6	7.5	7.6	7.6	7.5	7.6
DAY2	7.7	7.3	7.4	7.5	7.6	7.6	7.6	7.2	7.3	7.5	7.3	7.1
DAY3	7.5	7.3	7.7	7.4	7.5	7.4	7.4	7.4	7.4	7.5	7.2	7.3
DAY4	7.6	7.5	7.4	7.6	7.6	7.6	7.3	7.4	7.5	7.4	7.4	7.6
DAY5	7.2	7.5	7.6	7.3	7.4	7.6	7.3	7.3	7.4	7.2	7.2	7.5
DAY6	7.2	7.3	7.2	7.5	7.6	7.4	7.5	7.5	7.5	6.9	7.1	7.4
DAY7	7.6	7.3	7.5	7.6	7.5	7.5	7.7	7.5	7.5	7.7	7.5	7.5
DAY8	7.1	7.2	7.6	7.4	7.5	7.5	7.4	7.5	7.5	7.1	7.5	7.3
DAY9	7.3	7.3	7.5	7.2	7.4	7.3	7.3	7.1	7.4	7.3	7.3	7.2
DAY10	7.6	7.4	7.3	7.5	7.4	7.3	7.3	7.5	7.3	7.4	7.3	7.5
DAY11	7.1	7.2	7.4	7.3	7.3	7.1	7.4	7.1	7.3	7.4	7.2	7.1
DAY12	7.7	7.6	7.5	7.6	7.3	7.5	7.5	7.5	7.6	7.4	7.1	7.4

Appendix 4.a.1.

TRIAL #3 — COMMENCED 13/3/91
ENDPOINT — DEVELOPMENTAL CHARACTERISTICS — PAGE 1
EGG NUMBERS
SPECIES — *A. carinata* — RAW DATA

TREATMENT :CONTROL
REPLICATE 1 — SAMPLE A

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	13 11			
DAY4			13 11	
DAY5			13 11	
DAY6			13 11	
DAY7				13 11

TREATMENT :CONTROL
REPLICATE 1 — SAMPLE B

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	8 7 12			
DAY4		8 7 12		
DAY5		8 7 12		
DAY6		8 7 12		
DAY7				8 7 12

TREATMENT :CONTROL
REPLICATE 1 — SAMPLE A

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9 8 9			
DAY4			9 8 9	
DAY5			9 8 9	
DAY6			9 8 9	
DAY7			9 8 9	
DAY8				9 8 9

TREATMENT :CONTROL
REPLICATE 2 — SAMPLE B

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	15 9			
DAY4			15 9	
DAY5			15 9	
DAY6			15 9	
DAY7				15 9

TREATMENT :1% RP2
REPLICATE 1 — SAMPLE A

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	30			
DAY4			29	
DAY5			29	
DAY6				29
DAY7				
DAY8				

TREATMENT :1% RP2 — SAMPLE B
REPLICATE 1

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	20			
DAY4			19	
DAY5			19	
DAY6			19	
DAY7			19	
DAY8				19

TREATMENT :1% RP2
REPLICATE 2 — SAMPLE A

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	22			
DAY4			22	
DAY5			22	
DAY6			22	
DAY7			22	
DAY8				22

TREATMENT :1% RP2 — SAMPLE B
REPLICATE 2

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	27			
DAY4			25	
DAY5			24	
DAY6			22	
DAY7			22	
DAY8				22

TREATMENT :3.2% RP2
REPLICATE 1 — SAMPLE A

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9 14 9			
DAY4			9 14 9	
DAY5			9 14 9	
DAY6			9 14 9	
DAY7				9 14 9

TREATMENT :3.2% RP2
REPLICATE 1 — SAMPLE B

	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	8 7 5			
DAY4			8 7 5	
DAY5			8 7 5	
DAY6			8 7 5	
DAY7			8 7 5	
DAY8				8 7 5

TREATMENT :3.2% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9			
	8			
	11			
DAY4			9	
			8	
			11	
DAY5			9	
			8	
			11	
DAY6			9	
			8	
			11	
DAY7			9	
			8	
			11	
DAY8				9
				8
				11

TREATMENT :3.2% RP2
REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	12			
	12			
DAY4			12	
			12	
DAY5			12	
			12	
DAY6			12	
			12	
DAY7			12	
			12	
DAY8				12
				12

TREATMENT :10% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	6			
	9			
	6			
DAY4			6	
			9	
			6	
DAY5			6	
			9	
			6	
DAY6			6	
			9	
			6	
DAY7			6	
			9	
			6	
DAY8				6
				9
				6

TREATMENT :10% RP2
REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	13			
	16			
DAY4			13	
			16	
DAY5			13	
			16	
DAY6			13	
			16	
DAY7				13
				16

TREATMENT :10% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9			
	11			
	9			
DAY4			9	
			11	
			9	
DAY5			9	
			11	
			9	
DAY6			9	
			11	
			9	
DAY7				9
				11
				9

TREATMENT :10% RP2
REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	24			
DAY4			22	
DAY5			22	
DAY6			22	
DAY7			22	
DAY8			22	
DAY9				22

TREATMENT :32% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	29			
DAY4			29	
DAY5			29	
DAY6			29	
DAY7			29	
DAY8				29

TREATMENT :10% RP2
REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	11			
	13			
DAY4			11	
			13	
DAY5			11	
			12	
DAY6			11	
			2	
DAY7			11	
			2	
DAY8				11
				2

TREATMENT :32% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	14			
	12			
DAY4			14	
			12	
DAY5			14	
			12	
DAY6			14	
			12	
DAY7				14
				12

TREATMENT 32% RP2
REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	11			
	13			
DAY4			11	
			13	
DAY5			11	
			13	
DAY6			11	
			13	
DAY7				11
				13

TREATMENT :100% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9			
	12			
	11			
DAY4			9	
			12	
			11	
DAY5			9	
			12	
			11	
DAY6			9	
			12	
			11	

	GASTRULA	HIPPO	H'LING	N'NATE
DAY7			9 12 11	
DAY8			9 12 11	
DAY9			8 12 11	
DAY10				8 12 11

TREATMENT :100% RP2
REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9 11			
DAY4			9 10	
DAY5			9 10	
DAY6			9 10	
DAY7			9 10	
DAY8			9 10	
DAY9			9 10	
DAY10				9 10

TREATMENT :100% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9 9 12			
DAY4		7 9 12		
DAY5			7 9 12	
DAY6			7 9 12	
DAY7			7 9 12	
DAY8			7 9 10	
DAY9				7

REPLICATE 2 SAMPLE

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9 10 5			
DAY4			9 10 5	
DAY5			9 10 5	
DAY6			9 10 5	
DAY7			9 10 5	
DAY8			9 10 5	
DAY9			9 10 5	
DAY10				9 10 5

Appendix 4.a.2.

TRIAL #3 COMMENCED 13/3/91
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
EGG NUMBERS
SPECIES A. cummingii RAW DATA

TREATMENT :CONTROL
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	28			
DAY4		27		
DAY5			27	
DAY6			27	
DAY7			27	
DAY8				27

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	21			
DAY4		21		
DAY5			19	
DAY6			19	
DAY7			19	
DAY8				19

TREATMENT :CONTROL
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	28			
DAY4			28	
DAY5			28	
DAY6			28	
DAY7			28	
DAY8				28

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	21			
DAY4			21	
DAY5			21	
DAY6			21	
DAY7			21	
DAY8				21

TREATMENT :1% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	30			
DAY4			29	
DAY5			29	
DAY6			29	
DAY7				29
DAY8				

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	20			
DAY4			19	
DAY5			19	
DAY6			19	
DAY7			19	
DAY8				19

TREATMENT :1% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	22			
DAY4			22	
DAY5			22	
DAY6.			22	
DAY7			22	
DAY8				22

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	27			
DAY4			22	
DAY5			22	
DAY6			22	
DAY7			22	
DAY8				22

TREATMENT :3.2% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	29			
DAY4			27	
DAY5			26	
DAY6			25	
DAY7				25

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	20			
DAY4			19	
DAY5			19	
DAY6			19	
DAY7			19	
DAY8				19

TREATMENT :3.2% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	23			
DAY4			22	
DAY5			22	
DAY6				22

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	27			
DAY4			24	
DAY5			24	
DAY6			24	
DAY7				24

TREATMENT :10% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	31			
DAY4			31	
DAY5			31	
DAY6				31

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	20			
DAY4		20		
DAY5			20	
DAY6			20	
DAY7			20	
DAY8				20

TREATMENT :10% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	25			
DAY4			25	
DAY5			25	
DAY6			25	
DAY7				25

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	25			
DAY4			25	
DAY5			25	
DAY6			24	
DAY7				24

TREATMENT :32% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	20			
DAY4			19	
DAY5			19	
DAY6			19	
DAY7			19	
DAY8				19

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	31			
DAY4			30	
DAY5			30	
DAY6			30	
DAY7			30	
DAY8				30

TREATMENT :32% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	24			
DAY4			21	
DAY5			21	
DAY6			21	
DAY7			21	
DAY8				21

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	23			
DAY4			23	
DAY5			23	
DAY6			23	
DAY7			23	
DAY8				23

Appendix 4.a.3.

TRIAL #3 — COMMENCED 13/3/91
ENDPOINT — DEVELOPMENTAL CHARACTERISTICS — PAGE 1
EGG NUMBERS
SPECIES — GLYPTOPHYSA SP. — RAW DATA

TREATMENT :CONTROL
REPLICATE 1 — SAMPLE A

	DEVELOPMENTAL STAGE GASTRULA	HIPPO	H'LING	N'NATE
DAY1	6 6 9 10			
DAY4			6 6 9 9	
DAY5			6 6 9 9	
DAY6			6 6 9 9	
DAY7				6 6 9 9

TREATMENT :CONTROL
REPLICATE 1 — SAMPLE B

	DEVELOPMENTAL STAGE GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9 10 12			
DAY4			9 10 11	
DAY5			9 10 11	
DAY6			9 9 11	
DAY7			9 9 10	
DAY8			9 9 10	
DAY9				9 9 10

TREATMENT :CONTROL
REPLICATE 2 — SAMPLE A

	DEVELOPMENTAL STAGE GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9 10 10			
DAY4			6 10 10	
DAY5			6 7 7	
DAY6				6 7 7

TREATMENT :CONTROL
REPLICATE 2 — SAMPLE B

	DEVELOPMENTAL STAGE GASTRULA	HIPPO	H'LING	N'NATE
DAY1	7 7			
DAY4		7 7		
DAY5			7 7	
DAY6				← (6 7)
DAY7				← (6 7)
DAY8				← [illegible]

TREATMENT :100% RP2
REPLICATE 1 — SAMPLE A

	DEVELOPMENTAL STAGE GASTRULA	HIPPO	H'LING	N'NATE
DAY1	29			
DAY4			29	
DAY5			28	
DAY6			28	
DAY7			28	
DAY8			28	
DAY9				28

SAMPLE B

	DEVELOPMENTAL STAGE GASTRULA	HIPPO	H'LING	N'NATE
DAY1	20			
DAY4			19	
DAY5			19	
DAY6			19	
DAY7			19	
DAY8			19	
DAY9				19

TREATMENT :100% RP2
REPLICATE 2 — SAMPLE A

	DEVELOPMENTAL STAGE GASTRULA	HIPPO	H'LING	N'NATE
DAY1	27			
DAY4			27	
DAY5			27	
DAY6			27	
DAY7			27	
DAY8				27

SAMPLE B

	DEVELOPMENTAL STAGE GASTRULA	HIPPO	H'LING	N'NATE
DAY1	24			
DAY4			24	
DAY5			24	
DAY6			20	
DAY7				20

TREATMENT :1% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	10 12			
DAY4			10 8	
DAY5			10 8	
DAY6				10 8

TREATMENT :1% RP2
REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	11 2			
DAY4			2 2	
DAY5			2 2	
DAY6			2 2	
DAY7			2 2	
DAY8				2 2

TREATMENT :3.2% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	11 2			
DAY4			9 2	
DAY5			9 2	
DAY6			9 2	
DAY7			9 2	
DAY8				9 2

TREATMENT :3.2% RP2
REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	10 11			
DAY4			9 9	
DAY5			9 9	
DAY6				9 9

TREATMENT :1% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	12			
DAY4		12		
DAY5			5	
DAY6			5	
DAY7			5	
DAY8			5	
DAY9				5

TREATMENT :1% RP2
REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	14 15			
DAY4			12 15	
DAY5			12 15	
DAY6			12 15	
DAY7				12 15

TREATMENT :3.2% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	11 12 8			
DAY4			9 7 4	
DAY5			4 7 3	
DAY6				4 7 3

TREATMENT :3.2% RP2
REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	10			
DAY4		9		
DAY5			6	
DAY6			6	
DAY7			5	
DAY8			5	
DAY9				5

TREATMENT :10% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	10 12 8			
DAY4			2 4 4	
DAY5			2 4 4	
DAY6			2 4 4	
DAY7				2 4 4

TREATMENT :10% RP2
REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	8			
DAY4		7		
DAY5			4	
DAY6			4	
DAY7			4	
DAY8			4	
DAY9				4

TREATMENT :10% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	12 12			
DAY4			12 12	
DAY5			12 12	
DAY6				12 12

TREATMENT :10% RP2
REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	11 11			
DAY4		11 11		
DAY5			11 11	
DAY6			11 11	
DAY7			11 11	
DAY8			11 11	
DAY9				11 11

TREATMENT :32% RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	7 11 11 13 14 12			
DAY4		7 10 11 13 7 4		
DAY5			6 2 9 4 2 1	
DAY6			6 2 9 4 2 1	
DAY7			6 2 4 2 1	9
DAY8				6 2 4 1

TREATMENT :32% RP2
REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	9 10			
DAY4			9 10	
DAY5			7 10	
DAY6				7 10

TREATMENT :32% RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	10 12 12			
DAY4			5 3 2	
DAY5			5 3 2	
DAY6			5 3 2	
DAY7				5 3 2

TREATMENT :32% RP2
REPLICATE 2 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	7			
DAY4		7		
DAY5			6	
DAY6			5	
DAY7			4	
DAY8			4	
DAY9				4

TREATMENT :100 % RP2
REPLICATE 1 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	10 12 10			
DAY4			9 1 7	
DAY5			9 1 7	
DAY6			9 1 7	
DAY7			9 1 7	
DAY8			9 1 7	
DAY9			9 1 7	
DAY10				9 1 7

TREATMENT :100% RP2
REPLICATE 1 SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	10			
DAY4		10		
DAY5		10		
DAY6			9	
DAY7			9	
DAY8			9	
DAY9			9	
DAY10				9

TREATMENT :100 % RP2
REPLICATE 2 SAMPLE A

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	4 6 4 5			
DAY4			1 5 2 3	
DAY5			1 3 2 3	
DAY6			1 3 2 3	
DAY7			1 3 2 3	
DAY8			1 3 2 3	
DAY9			1 3 2 3	
DAY10				3 2 3

TREATMENT :100% RP2
REPLICATE 2

SAMPLE B

	DEVELOPMENTAL STAGE			
	GASTRULA	HIPPO	H'LING	N'NATE
DAY1	10 10			
DAY4		10 10		
DAY5			10 10	
DAY6			10 10	
DAY7			10 10	
DAY8			10 10	
DAY9			10 10	
DAY10				10 10

Appendix 4.b.1.

TRIAL #3 COMMENCED 13/3/91 PAGE 1
ENDPOINT:DEVELOPMENTAL EMBRYONIC MORTALITY
SPECIES A. carinata

TREATMENT:CONTROL

RAW DATA	DEVELOPMENTAL STAGE		
	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A			
REP 1B			
REP 2A			
REP 2B			

PERCENTILE	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A			
REP 1B			
REP 2A			
REP 2B			
TOTAL	0	0	0
PERCENT.	0	0	0

TREATMENT:1% RP2

RAW DATA	DEVELOPMENTAL STAGE		
	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	1		
REP 1B	1		
REP 2A			
REP 2B	1	4	

PERCENTILE	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	3.3		
REP 1B	5		
REP 2A			
REP 2B	3.7	14.8	
TOTAL	3	4	0
PERCENT.	3	4	0

TREATMENT:3.2% RP2

RAW DATA	DEVELOPMENTAL STAGE	
	GASTRULA TO HIPPO	H'LING
REP 1A		
REP 1B		
REP 2A		
REP 2B		

PERCENTILE	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A			
REP 1B			
REP 2A			
REP 2B			
TOTAL	0	0	0
PERCENT.	0	0	0

TREATMENT:10% RP2

RAW DATA	DEVELOPMENTAL STAGE		
	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A			
REP 1B			
REP 2A			
REP 2B	2		

PERCENTILE	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A			
REP 1B			
REP 2A			
REP 2B	8.3		
TOTAL	2	0	0
PERCENT.	1.9	0	0

TREATMENT:32% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A		11	
REP 1B			
REP 2A			
REP 2B			

PERCENTILE

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A		45.8	
REP 1B			
REP 2A			
REP 2B			
TOTAL	0	11	0
PERCENT.	0	10.7	0

TREATMENT:100% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	1		
REP 1B		1	
REP 2A	1		
REP 2B	2	2	

PERCENTILE

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	5		
REP 1B		3.1	
REP 2A	4.2		
REP 2B	6.7	6.7	
TOTAL	4	3	0
PERCENT.	3.8	2.9	0

Appendix 4.b.2.

TRIAL #3 COMMENCED 13/3/91 PAGE 1
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY RAW DATA
SPECIES A. cummingii

TREATMENT :CONTROL — DEVELOPMENTAL STAGE

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	1		
REP 1B		2	
REP 2A			
REP 2B			

PERCENTILE DATA

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	3.6		
REP 1B		9.5	
REP 2A			
REP 2B			
TOTAL	1	2	0
PERCENT.	1	2	0

TRIAL #3 COMMENCED 13/3/91 PAGE 2
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY RAW DATA
SPECIES A. cummingii

TREATMENT :1% RP2 — DEVELOPMENTAL STAGE

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	1		
REP 1B	1		
REP 2A			
REP 2B	5		

PERCENTILE DATA

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	3.5		
REP 1B	5		
REP 2A			
REP 2B	18.5		
TOTAL	7	0	0
PERCENT.	7.1	0	0

TREATMENT :3.2% RP2 — DEVELOPMENTAL STAGE

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	2	2	
REP 1B	1		
REP 2A	1		
REP 2B	3		

PERCENTILE DATA

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	6.9	6.9	
REP 1B	5		
REP 2A	4.4		
REP 2B	11.1		
TOTAL	7	2	0
PERCENT.	7	2	0

TREATMENT :10% RP2 — DEVELOPMENTAL STAGE

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A			
REP 1B			
REP 2A		1	
REP 2B			

PERCENTILE DATA

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A			
REP 1B			
REP 2A		4	
REP 2B			
TOTAL	0	1	0
PERCENT.	0	1	0

TRIAL #3 COMMENCED 13/3/91 PAGE 5
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY RAW DATA
SPECIES A. cummingii

TREATMENT :32% RP2 DEVELOPMENTAL STAGE

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	1		
REP 1B	1		
REP 2A	3		
REP 2B			

PERCENTILE DATA

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A	5		
REP 1B	4.2		
REP 2A	12.5		
REP 2B			
TOTAL	5	0	0
PERCENT.	5.4	0	0

TREATMENT :100% RP2 DEVELOPMENTAL STAGE

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A		1	
REP 1B	1		
REP 2A			
REP 2B		4	

PERCENTILE DATA

	GASTRULA TO HIPPO	H'LING	N'NATE
REP 1A		3.4	
REP 1B	5		
REP 2A			
REP 2B		16.7	
TOTAL	1	5	0
PERCENT.	1	5	0

Appendix 4.b.3.

TRIAL #3 COMMENCED 13/3/91 PAGE 1
ENDPOINT:DEVELOPMENTAL EMBRYONIC MORTALITY
SPECIES GLYPTOPHYSA SP.

RAW DATA
TREATMENT:CONTROL DEVELOPMENTAL STAGE

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A	1		
REP 1B	1	2	
REP 2A	9		
REP 2B		1	

PERCENTILE DATA

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A	3.2		
REP 1B	3.2	6.5	
REP 2A	31		
REP 2B		7.1	
TOTAL	11	3	0
PERCENT.	10.5	2.9	0

RAW DATA
TREATMENT:1% RP2 DEVELOPMENTAL STAGE

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A			
REP 1B	2		
REP 2A	4		
REP 2B	9		

PERCENTILE DATA

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A			
REP 1B	6.9		
REP 2A	18.2		
REP 2B	81.1		
TOTAL	15	0	0
PERCENT.	19.7	0	0

RAW DATA
TREATMENT:3.2% RP2 DEVELOPMENTAL STAGE

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A	2		
REP 1B	3		
REP 2A	11	6	
REP 2B	4	1	

PERCENTILE DATA

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A	15.4		
REP 1B	14.3		
REP 2A	35.5	19.4	
REP 2B	40	10	
TOTAL	20	7	0
PERCENT.	26.7	9.3	0

RAW DATA
TREATMENT:10% RP2 DEVELOPMENTAL STAGE

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A	20		
REP 1B	4		
REP 2A			
REP 2B			

PERCENTILE DATA

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A	66.7		
REP 1B	50		
REP 2A			
REP 2B			
TOTAL	24	0	0
PERCENT.	28.6	0	0

RAW DATA
TREATMENT:32% RP2 DEVELOPMENTAL STAGE

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A		2	
REP 1B	25		2
REP 2A	24		
REP 2B	1	2	

PERCENTILE

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A		10.5	
REP 1B	36.8		2.9
REP 2A	70.6		
REP 2B	14.3	28.6	
TOTAL	50	4	2
PERCENT.	39.7	3.2	1.6

RAW DATA
TREATMENT:100% RP2 DEVELOPMENTAL STAGE

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A	15		
REP 1B	1		
REP 2A	8	2	
REP 2B			

PERCENTILE DATA

	BLASTULA TO HIPPO	H'LING	N'NATE
REP 1A	46.9		
REP 1B	10		
REP 2A	42.1	10.5	
REP 2B			
TOTAL	24	2	0
PERCENT.	29.6	2.5	0

Appendix 4.c.

TRIAL #3 COMMENCED 13/3/91 PAGE 1
ENDPOINT: JUVENILE MORTALITY EXPECTED: FROM NUMBERS OF NEONATES HATCHED
SPECIES *A. cumingii*

REPLICATE 1

	SAMPLE A			SAMPLE B		
TREATMENT	LIVING	DEAD	% MORT	LIVING	DEAD	% MORT
CONTROL	16	11	40.7	17	2	10.5
1% RP2	20	9	31	17	2	10.5
3.2% RP2	15	10	40	17	2	10.5
10% RP2	22	9	29	20	0	0
32% RP2	19	0	0	21	9	30
100% RP2	2	26	92.9	2	17	89.5

REPLICATE 2

	SAMPLE A			SAMPLE B		
TREATMENT	LIVING	DEAD	% MORT	LIVING	DEAD	% MORT
CONTROL	18	10	35.7	19	2	9.5
1% RP2	18	4	18.2	20	2	9.1
3.2% RP2	22	0	0	21	3	12.5
10% RP2	23	2	8	21	3	12.5
32% RP2	10	11	52.4	11	12	52.2
100% RP2						

TRIAL #3 COMMENCED 13/3/91 PAGE 1
ENDPOINT: JUVENILE MORTALITY EXPECTED: FROM NUMBERS OF NEONATES HATCHED
SPECIES *A. carinata*

REPLICATE 1

	SAMPLE A			SAMPLE B		
TREATMENT	LIVING	DEAD	% MORT	LIVING	DEAD	% MORT
CONTROL	19	5	20.8	28	4	14.3
1% RP2	20	9	69	17	2	10.5
3.2% RP2	29	3	9.4	1	19	95
10% RP2	18	3	14.3	26	3	10.3
32% RP2	27	2	6.9	8	5	38.5
100% RP2	5	14	73.7	2	29	93.5

REPLICATE 2

	SAMPLE A			SAMPLE B		
TREATMENT	LIVING	DEAD	% MORT	LIVING	DEAD	% MORT
CONTROL	21	5	19.2	21	3	12.5
1% RP2	18	4	18.2	20	2	9.1
3.2% RP2	17	9	34.6	15	9	37.5
10% RP2	26	3	10.3	20	2	9.1
32% RP2	16	10	38.5	10	14	58.3
100% RP2	0	24	100	0	26	100

TRIAL #3 COMMENCED 13/3/91 PAGE 1
ENDPOINT: JUVENILE MORTALITY EXPECTED: FROM NUMBERS OF NEONATES HATCHED
SPECIES GLYPTOPHYSA SP.

REPLICATE 1

	SAMPLE A			SAMPLE B		
TREATMENT	LIVING	DEAD	% MORT	LIVING	DEAD	% MORT
CONTROL	27	3	10	17	11	39.3
1% RP2	3	2	40	24	3	11.1
3.2% RP2	10	1	9.1	11	7	38.9
10% RP2	8	2	20	3	1	25
32% RP2	8	9	52.9	16	6	27.3
100% RP2	6	11	64.7	7	2	22.2

REPLICATE 2

	SAMPLE A			SAMPLE B		
TREATMENT	LIVING	DEAD	% MORT	LIVING	DEAD	% MORT
CONTROL	14	6	30	6	7	53.8
1% RP2	17	1	5.6	4	0	0
3.2% RP2	10	4	28.7	2	3	60
10% RP2	24	0	0	17	5	22.7
32% RP2	0	8	100	0	4	100
100% RP2	1	7	87.5	8	12	60

Appendix 4.d.

TRIAL #3 COMMENCED 15/3/91
PHYSICO-CHEMICAL DATA

DISSOLVED OXYGEN mg/L

	TREATMENT											
	CON	CON	1%RP2	1%RP2	3.2%RP2	3.2%RP2	10%RP2	10%RP2	32%RP2	32%RP2	100%RP2	100%RP2
DAY1	7.5	7.5	7.5	7.5	7.3	7.6	7.3	7.5	7.5	7.2	7.3	7.5
DAY2	7.4	7.5	7.7	7.5	7.5	7.7	7.5	7.7	7.7	7.5	7.5	7.5
DAY3	7.1	7.3	7.4	6.8	7.2	7.5	7.4	7.6	7.6	7.4	7.3	7.2
DAY4	7.1	7.1	7.2	7	7.1	7.1	7.2	7.1	7.1	7.1	7.1	7
DAY5	7.1	6.8	7.2	7.4	77.4	7	6.7	7.1	7.1	7.1	7.1	7
DAY6	7.5	7.6	7.4	7.7	7.6	7.6	7.6	7.6	7.6	7.3	7.5	7.1
DAY7	7.1	7.1	7.2	7.5	7.5	7.5	7.2	7.5	7.5	7.1	7.3	7.2
DAY8	7.4	7.3	7.2	7.5	7.5	7.5	7.2	7.6	7.6	7.6	7.7	7.5
DAY9	7.3	7.3	7.5	7.5	7.5	7.6	7.3	7.3	7.3	7.4	7.3	7.4
DAY10	7.4	7.3	7.4	7.2	7.2	7.2	7.5	7.2	7.2	7.2	7.1	7
DAY11	7.4	7.1	7.1	7.3	7.5	7.3	7.5	7.5	7.1	7.2	7.2	7.2

pH

DAY1	6.24	6.54	6.65	6.67	6.7	6.73	6.76	6.85	6.96	7.09	7.25	7.34
DAY2	6.44	6.73	6.82	6.96	6.92	7.01	7.06	7.18	7.18	7.31	7.48	7.54
DAY3	6.81	6.89	7.01	7.14	6.81	7.07	7.17	7.27	7.39	7.39	7.51	7.56
DAY4	6.57	6.61	6.84	6.89	6.86	6.95	6.9	6.98	6.86	7.04	7.13	7.31
DAY5	6.5	6.79	6.66	6.87	6.72	6.71	6.85	6.91	6.92	7.03	7.02	7.2
DAY6	6.21	6.53	6.71	6.75	6.75	6.72	6.81	6.83	6.9	7	7.11	7.33
DAY7	6.18	6.61	6.7	6.7	6.69	6.71	6.81	6.93	6.87	6.96	7.18	7.4
DAY8	6.14	6.52	7.61	7.15	6.77	6.89	6.93	6.93	6.99	7.04	7.17	7.43
DAY9	6.48	6.67	6.78	6.78	6.66	6.74	6.7	6.84	6.83	6.97	7.05	7.2
DAY10	6.31	6.7	6.69	6.71	6.61	8.41	7.7	6.72	7.15	7.18	7.31	7.4
DAY11	6.66	6.79	6.83	6.76	6.73	7.21	7.18	7.15	7	7.08	7.11	7.4

CONDUCTIVITY uSem/cm

DAY1	19.7	21.2	35	34	68.9	71.8	179	177	462	461	1170	1170
DAY2	19	23.4	39	37.3	73.4	75.2	188	183	469	476	1190	1200
DAY3	21.9	23.4	34.6	35.2	73.8	70.4	174	174	445	449	1150	1180
DAY4	22	23	35.8	38.4	76.1	73.7	179	177	454	463	1190	1200
DAY5	29	24.9	35.4	37.9	75	72.2	178	181	450	456	1170	1200
DAY6	19.8	26.6	36.7	38.1	73	72.6	181	179	461	462	1190	1190
DAY7	22.5	23.5	354.2	37.3	71.3	73.4	182	171	462	460	1190	1190
DAY8	23.1	25.6	106.5	39.5	71.8	72.3	182	176	465	458	1170	1180
DAY9	24.3	35.2	38.9	42.5	77.1	76.4	180	180	460	463	1180	1180
DAY10	24	25	38	39.6	74.6	255	189	183	468	467	1190	1200
DAY11	22.9	24.3	36.6	37.7	72.6	112	179	178	450	453	1160	1170

Appendix 5.a.

TRIAL #4 COMMENCED 17/3/91 CONDUCTED AT 25deg.C
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
DAYS TO EGG CAPSULE RUPTURE RAW DATA
SPECIES A. carinata

TREATMENT	CONTROL	32% RP2	42% RP2	56% RP2	75% RP2	100% RP2
EGG MASS						
A	10	10	9	9	9	11
B	9	9	10	10	10	13
C	10	10	9	10	9	14
D	10	10	9	10	10	9
E	10	9	11	14	14	10
F	10	10	8	9	14	14
G	9	9	9	10	10	
H	10	12	10			

TRIAL #4 COMMENCED 17/3/91 CONDUCTED AT 25deg.C
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
DAYS TO EGG CAPSULE RUPTURE RAW DATA
SPECIES A. cummingii

TREATMENT	CONTROL	32% RP2	42% RP2	56% RP2	75% RP2	100% RP2
EGG MASS						
A	9	12	10	9	14	12
B	9	9	11	10	12	12
C	10	8	9	10	12	11
D	10	10	9	10	11	12
E	9	10	11	12	11	11
F	10	12	11	14	13	11
G	9	10	10	10	14	11
H	10	12	11	10	11	13
I	8	10	9	10	11	14
J	9	11	10	11	11	13
K	10	11	11	11	11	
L		11			12	
M		11				

TRIAL #4 COMMENCED 17/3/91 CONDUCTED AT 25deg.C
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
DAYS TO EGG CAPSULE RUPTURE RAW DATA
SPECIES GLYPTOPHYSA SP.

TREATMENT	CONTROL	32% RP2	42% RP2	56% RP2	75% RP2	100% RP2
EGG MASS						
A	12	10	14	10	13	14
B	10	11	10	10	14	14
C			10	11	14	
D				12	14	
E				9		
F				11		

Appendix 5.b.1.

TRIAL #4 COMMENCED 17/3/91 CONDUCTED AT 25deg.C
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
EGG NUMBERS RAW DATA

SPECIES A. carinata

TREATMENT: CONTROL REPLICATE 1

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	9					
DAY2		9				
DAY3			9			
DAY4				9		
DAY5					9	
DAY6					9	
DAY7					9	
DAY8					9	
DAY9					9	
DAY10						9

TREATMENT: CONTROL REPLICATE 2

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7 5					
DAY2		7 5				
DAY3			5	7		
DAY4				7 5		
DAY5				5	7	
DAY6					7 5	
DAY7					7 5	
DAY8					7 5	
DAY9					5	7
DAY10						5

TREATMENT: CONTROL REPLICATE 3

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11 10 8					
DAY2		8	11 10			
DAY3			8	11 10		
DAY4				11 10 8		
DAY5					11 10 8	
DAY6					11 10 8	
DAY7					11 10 8	
DAY8					11 10 8	
DAY9					8	11 10
DAY10						8

TREATMENT:CONTROL REPLICATE 4

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	24 15					
DAY2		24	13			
DAY3			24 13			
DAY4				24 13		
DAY5					24 13	
DAY6					24 13	
DAY7					24 13	
DAY8					24 13	
DAY9					24	13
DAY10						24

TREATMENT:CONTROL REPLICATE 5

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	4					
DAY2		2				
DAY3			2			
DAY4				1		
DAY5					1	
DAY6					1	
DAY 7					0	

TREATMENT:32% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8					
DAY2		7				
DAY3			7			
DAY4				7		
DAY5					6	
DAY6					6	
DAY7					6	
DAY8					6	
DAY9					6	
DAY10						6

TREATMENT:32% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16 9 7					
DAY2		8	16 9			
DAY3			16 9 8			
DAY4				16 9 8		
DAY5					14 9 8	
DAY6					13 9 8	
DAY7					13 9 8	
DAY8					13 9 8	
DAY9					9 8	13
DAY10						9 8

TREATMENT:32% RP2 REPLICATE 3

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8 9					
DAY2		8	8			
DAY3			8 8			
DAY4				8 8		
DAY5					8 8	
DAY6					8 8	
DAY7					8 8	
DAY8					8 8	
DAY9					8	8
DAY10						9

TREATMENT:32% RP2 REPLICATE 4

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10 17					
DAY2		16	10			
DAY3		16	10			
DAY4			16		10	
DAY5				16	10	
DAY6				16	10	
DAY7					10 16	
DAY8					10 16	
DAY9					16	10
DAY10					16	
DAY11					16	
DAY12						16

TREATMENT:42% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	9 10					
DAY2		9	10			
DAY3			9 10			
DAY4				9 10		
DAY5					9 10	
DAY6					9 9	
DAY7					9 9	
DAY8					9 9	
DAY9					9	9
DAY10						9

TREATMENT:42% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7					
DAY2			7			
DAY3			7			
DAY4				7		
DAY5					7	
DAY6					7	
DAY7					7	
DAY8					7	
DAY9						7

TREATMENT:42% RP2 REPLICATE 3

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	9					
DAY2			9			
DAY3			9			
DAY4				9		
DAY5					9	
DAY6					9	
DAY7					9	
DAY8					9	
DAY9						9

TREATMENT:42% RP2 REPLICATE 4

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	20					
DAY2		20				
DAY3			20			
DAY4			20			
DAY5				20		
DAY6					20	
DAY7					20	
DAY8					20	
DAY9					20	
DAY10					20	
DAY11						20

TREATMENT:42% RP2 REPLICATE 5

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6 5 9					
DAY2		6 5	9			
DAY3			4 5 9			
DAY4				4 5 9		
DAY5					4 5 9	
DAY6					4 5 8	
DAY7					4 5 8	
DAY8					4 5	8
DAY9					4	5
DAY10						4

TREATMENT:56% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	1 5					
DAY2		1 5				
DAY3			1 5			
DAY4				1 5		
DAY5					1 5	
DAY6					1 5	
DAY7					1 5	
DAY8					1 5	
DAY9					1	5
DAY10						1

TREATMENT:56% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	15 10					
DAY2		15 10				
DAY3			15 10			
DAY4				15 10		
DAY5					15 10	
DAY6					15 10	
DAY7					15 10	
DAY8					15 8	
DAY9					15	8
DAY10						15

TREATMENT:56% RP2 REPLICATE 3

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7					
DAY2		7				
DAY3			7			
DAY4			1	6		
DAY5			1	6		
DAY6				4	3	
DAY7				4	3	
DAY8					3	
DAY9					2	
DAY10					2	
DAY11					2	
DAY12					2	
DAY13					2	
DAY14					2 TERMINATION	

TREATMENT:56% RP2 REPLICATE 4

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14 14					
DAY2		14	14			
DAY3			13	14		
DAY4				13 14		
DAY5					13 14	
DAY6					13 14	
DAY7					13 14	
DAY8					13 14	
DAY9					13	14
DAY10						13

TREATMENT:75% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11 8					
DAY2		11 8				
DAY3			11 8			
DAY4				11 8		
DAY5					11 8	
DAY6					11 8	
DAY7					11 8	
DAY8					11 8	
DAY9					11	8
DAY10						11

TREATMENT:75% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8 11					
DAY2		8	11			
DAY3			8	11		
DAY4			8	11		
DAY5				8	11	
DAY6					8 11	
DAY7					8 11	
DAY8					8 11	
DAY9					8 11	
DAY10					8 11	
DAY11					8 11	
DAY12					8 11	
DAY13					8 11	
DAY14					8 11	

TERMINATION

TREATMENT:75% RP2 REPLICATE 3

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10 2					
DAY2		10 2				
DAY3			10 2			
DAY4				10	2	
DAY5					10 2	
DAY6					10 2	
DAY7					8 2	
DAY8					8 2	
DAY9					2	8
DAY10						2

TREATMENT:75% RP2 REPLICATE 4

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
DAY2			11			
DAY3			11			
DAY4				11		
DAY5					11	
DAY6					11	
DAY7					11	
DAY8					11	
DAY9					11	
DAY10						11

TREATMENT:100% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	15					
DAY2		15				
DAY3			15			
DAY4				15		
DAY5				15		
DAY6					15	
DAY7					15	
DAY8					15	
DAY9					15	
DAY10					15	
DAY11						15

TREATMENT:100% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7 4 7					
DAY2		7 4 7				
DAY3			7 4 7			
DAY4			7	7 4		
DAY5				3 4 7	2	
DAY6					2 4 7	
DAY7					2 4 7	
DAY8					2 4 7	
DAY9					2 4 7	
DAY10					2 7	4
DAY11					2 7	
DAY12					2 7	
DAY13					7	2
DAY14					7	

TERMINATION

TREATMENT:100% RP2 REPLICATE 3

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
DAY2			13			
DAY3			13			
DAY4				13		
DAY5					13	
DAY6					13	
DAY7					13	
DAY8					13	
DAY9						13

TREATMENT:100% RP2 REPLICATE

	DEVELOPMENTAL STAGE GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12 3					
DAY2		12 3				
DAY3			12 3			
DAY4				12 3		
DAY5					12 3	
DAY6					12 3	
DAY7					12 3	
DAY8					12 3	
DAY9					12 3	
DAY10					3	12
DAY11					3	
DAY12					3	
DAY13					3	
DAY14					3 TERMINATION	

Appendix 5.b.2.

TRIAL #4 COMMENCED 17/3/91 CONDUCTED AT 25deg.C
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
EGG NUMBERS RAW DATA
SPECIES A. cummingii

TREATMENT:CONTROL REPLICATE 1

	DEVELOPMENTAL STAGE BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	20 13 25					
DAY2		13 25	19			
DAY3			19 13 25			
DAY4			2	18 13 23		
DAY5					15 12 24	
DAY6					13 11 24	
DAY7					13 11 24	
DAY8					13 11 24	
DAY9					24	13 11
DAY10						24

TREATMENT:CONTROL REPLICATE 2

	DEVELOPMENTAL STAGE BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	25					
DAY2		24				
DAY3			24			
DAY4				24		
DAY5					24	
DAY6					24	
DAY7					24	
DAY8					24	
DAY9					24	
DAY10						24

TREATMENT:CONTROL REPLICATE 3

	DEVELOPMENTAL STAGE BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	23 28					
DAY2		23 27				
DAY3			23 27			
DAY4			3	23 24		
DAY5			1	26	23	
DAY6					23 26	
DAY7					23 26	
DAY8					23 26	
DAY9					23 26	
DAY10						2[illegible] 2[illegible]

TREATMENT:CONTROL REPLICATE 4

	DEVELOPMENTAL STAGE BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	21 26					
DAY2		21 25				
DAY3			21 25			
DAY4			1	21 24		
DAY5				25	21	
DAY6					21 25	
DAY7					21 25	
DAY8					21 25	
DAY9					25	21
DAY10						25

TREATMENT:CONTROL REPLICATE 5

	DEVELOPMENTAL STAGE BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	27 23 29					
DAY2		26 23 29				
DAY3			23 29	26		
DAY4			23	29	26	
DAY5				23	26 29	
DAY6					26 23 29	
DAY7					26 23 29	
DAY8					23 29	26
DAY9					23	29
DAY10						23

TREATMENT:32% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	29 24					
DAY2		26 23				
DAY3			25 21			
DAY4			5 21	18		
DAY5			1	4	19 20	
DAY6					23 21	
DAY7					23 21	
DAY8					22 21	
DAY9					22 21	
DAY10					22	21
DAY11					22	
DAY12						22

TREATMENT:32% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	16 20					
DAY2		16 20				
DAY3			16 20			
DAY4			16	20		
DAY5				16	20	
DAY6				1	15 20	
DAY7					16 20	
DAY8					16 20	
DAY9					16	20
DAY10					16	
DAY11					16	
DAY12						16

TREATMENT:32% RP2 REPLICATE 3

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	31 20 34					
DAY2		31 20	34			
DAY3			31 20 34			
DAY4			1 20	29 33		
DAY5				2 20	28 33	
DAY6				1 1	29 19 33	
DAY7					29 20 33	
DAY8					29 20 33	
DAY9					29 20	33
DAY10					29 20	
DAY11						29 20

TREATMENT:32% RP2 REPLICATE 4

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	28 11					
DAY2		28 11				
DAY3			28 11			
DAY4				28 11		
DAY5					28 11	
DAY6					28 11	
DAY7					27 11	
DAY8					27 11	
DAY9					27 9	
DAY10					9	27
DAY11						9

TREATMENT:32% RP2 REPLICATE 5

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	10 24					
DAY2		8 24				
DAY3			8 24			
DAY4			2	4 24		
DAY5			1	5 24		
DAY6				1	4 24	
DAY7					5 24	
DAY8					5 24	
DAY9					5	24
DAY10					5	
DAY11					5	
DAY12						5

TREATMENT:32% RP2 REPLICATE 6

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	28					
DAY2		28				
DAY3			28			
DAY4				28		
DAY5					28	
DAY6					28	
DAY7					28	
DAY8						28

TREATMENT:42% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	22 29					
DAY2		22 29				
DAY3			21 28			
DAY4				21 28		
DAY5					21 28	
DAY6					20 28	
DAY7					20 28	
DAY8					20 28	
DAY9					20 28	
DAY10					20	28
DAY11						20

TREATMENT:42% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	12 34 16 30					
DAY2		12 34 16 30				
DAY3			12 34 16 30			
DAY4				12 34 16 30		
DAY5					12 34 16 30	
DAY6					12 34 16 30	
DAY7					12 34 16 30	
DAY8					12 34 16 30	
DAY9					12 30	34 16
DAY10						12 30

TREATMENT:42% RP2 REPLICATE 3

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	12 26					
DAY2		12	26			
DAY3			12 26			
DAY4				12 26		
DAY5					12 26	
DAY6					12 26	
DAY7					12 26	
DAY8					11 26	
DAY9					11 25	
DAY10					20	11
DAY11						20

TREATMENT:42% RP2 REPLICATE 4

	DEVELOPMENTAL STAGE				
	BLAST	TROCH	VEL	HIPPO	H'LING
DAY1	24 17 22				
DAY2		24 16 22			
DAY3			24 15 22		
DAY4				24 15 22	
DAY5					24 15 22
DAY6					24 15 22
DAY7					24 15 22
DAY8					24 15 22
DAY9					15 22
DAY10					15 22
DAY11					

TREATMENT:56% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'
DAY1	34 25 29					
DAY2		34 25 29				
DAY3			34 25 28			
DAY4			1 15	33 25 10		
DAY5				2 8 11	32 17 8	
DAY6				8 8	34 17 11	
DAY7				6 8	33 19 11	
DAY8				6 6	33 19 13	
DAY9					31 25 16	
DAY10						

TREATMENT:56% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'
DAY1	19 27					
DAY2		19 27				
DAY3			19 25			
DAY4			7 5	12 17		
DAY5			4	8 18	11	
DAY6				6 22	11	
DAY7				2 18	11 4	
DAY8				18	11 4	
DAY9					11 20	
DAY10					11 20	
DAY11					11 20	
DAY12					20	1
DAY13					20	

TREATMENT:56% RP2 REPLICATE 3

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	14 17					
DAY2			14 27			
DAY3			14 27			
DAY4				14 27		
DAY5					14 27	
DAY6					14 27	
DAY7					14 27	
DAY8					14 27	
DAY9					14 27	
DAY10						14 27

TREATMENT:56% RP2 REPLICATE 4

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	9 35 27					
DAY2		9 34 27				
DAY3			9 34 27			
DAY4			9 8 15	26 7		
DAY5			5	4 7 15	26 7	
DAY6				2 7 4	7 26 16	
DAY7					8 25 18	
DAY8					8 25 18	
DAY9					8 25 18	
DAY10					7 18	25
DAY11						7 18

TREATMENT:75% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	12 23 25					
DAY2		12 23 25				
DAY3			12 23 25			
DAY4				12 23 25		
DAY5				12 23 25		
DAY6					12 23 25	
DAY7					11 22 24	
DAY8					11 22 24	
DAY9					11 22 24	
DAY10					11 22 24	
DAY11					11 22 24	
DAY12					11	22
DAY13					11	24

TREATMENT:75% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'
DAY1	23					
DAY2		23				
DAY3			23			
DAY4			8	15		
DAY5			8	15		
DAY6			8		15	
DAY7				7	15	
DAY8					16	
DAY9					16	
DAY10					16	
DAY11					16	
DAY12					16	
DAY13					16	
DAY14					16 TERMINATION	

TREATMENT:75% RP2 REPLICATE 3

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'
DAY1	27 21					
DAY2		27 20				
DAY3			27 20			
DAY4			4	23 20		
DAY5			1	5 19	22	
DAY6				5	22 20	
DAY7					22 20	
DAY8					22 20	
DAY9					22 20	
DAY10					22 20	
DAY11						[illegible]

TREATMENT:75% RP2 REPLICATE 4

	DEVELOPMENTAL STAGE					
	BLAST	TROCH	VEL	HIPPO	H'LING	N'
DAY1	20 22					
DAY2		20 22				
DAY3			20 22			
DAY4				20 21		
DAY5				2 11	18 10	
DAY6				2 11	18 10	
DAY7				6	18 15	
DAY8					17 17	
DAY9					17 17	
DAY10					17 17	
DAY11						

TREATMENT: 100% RP2 REPLICATE 1

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	31 24					
DAY2		30 24				
DAY3			29 24			
DAY4			13 11	16 13		
DAY5			13 10	16 13		
DAY6				18 13	9 10	
DAY7				15	12 9	
DAY8					18 9	
DAY9					18 9	
DAY10					18 9	
DAY11					18 9	
DAY12					18 9	
DAY13					18 9	
DAY14					18 9	

TERMINATION

TREATMENT: 100% RP2 REPLICATE 2

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	7 13 15					
DAY2		7 13 15				
DAY3			7 12 15			
DAY4			12 15	7		
DAY5			4	7 7 15		
DAY6			2	2	7 9 15	
DAY7			1	1	7 9 15	
DAY8					7 9 15	
DAY9					7 9 15	
DAY10					7 9 15	
DAY11					7 9	15
DAY12						7 9

TREATMENT: 100% RP2 REPLICATE 3

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	18 26					
DAY2		18 26				
DAY3			18 26			
DAY4			1 5	17 21		
DAY5			2	1 24	17	
DAY6			2	1 1	17 23	
DAY7			2	1	17 23	
DAY8					17 25	
DAY9					16 25	
DAY10					16 25	

TREATMENT: 100% RP2 REPLICATE 4

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	21 23 21					
DAY2		21 23 21				
DAY3			21 23 21			
DAY4			8 2 3	13 21 18		
DAY5			7	9 16 5	5 7 16	
DAY6				13 8 2	8 15 19	
DAY7				10 8 2	5 12 19	
DAY8					5 12 19	
DAY9					5 12 16	
DAY10					4 12 16	
DAY11					4	12 16
DAY12					4	
DAY13					4	
DAY14					4	

TERMINATION

TREATMENT: 100% RP2 REPLICATE 5

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N
DAY1	12 16					
DAY2		11 16	1			
DAY3		2	9 16			
DAY4		2	9 16			
DAY5			4 8	7 7		
DAY6				7 13	4 2	
DAY7				4 4	6 3	
DAY8					7 2	
DAY9					5 2	
DAY10					5 2	
DAY11					2	
DAY12					2	
DAY13					2	
DAY14					2	

TERMINATION

TREATMENT: 100% RP2 REPLICATE 1

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	31 24					
DAY2		30 24				
DAY3			29 24			
DAY4			13 11	16 13		
DAY5			13 10	16 13		
DAY6				18 13	9 10	
DAY7				15	12 9	
DAY8					18 9	
DAY9					18 9	
DAY10					18 9	
DAY11					18 9	
DAY12					18 9	
DAY13					18 9	
DAY14					18 9	

TERMINATION

TREATMENT: 100% RP2 REPLICATE 2

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	7 13 15					
DAY2		7 13 15				
DAY3			7 12 15			
DAY4			12 15	7		
DAY5			4	7 7 15		
DAY6			2	2	7 9 15	
DAY7			1	1	7 9 15	
DAY8					7 9 15	
DAY9					7 9 15	
DAY10					7 9 15	
DAY11					7 9	15
DAY12						7 9

TREATMENT: 100% RP2 REPLICATE 3

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	18 26					
DAY2		18 26				
DAY3			18 26			
DAY4			1 5	17 21		
DAY5			2	1 24	17	
DAY6			2	1 1	17 23	
DAY7			2	1	17 23	
DAY8					17 25	
DAY9					16 25	
DAY10					16 25	

TREATMENT: 100% RP2 REPLICATE 4

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N'NAT
DAY1	21 23 21					
DAY2		21 23 21				
DAY3			21 23 21			
DAY4			8 2 3	13 21 18		
DAY5			7	9 16 5	5 7 16	
DAY6				13 8 2	8 15 19	
DAY7				10 8 2	5 12 19	
DAY8					5 12 19	
DAY9					5 12 16	
DAY10					4 12 16	
DAY11					4	12 16
DAY12					4	
DAY13					4	
DAY14					4	

TERMINATION

TREATMENT: 100% RP2 REPLICATE 5

DEVELOPMENTAL STAGE

	BLAST	TROCH	VEL	HIPPO	H'LING	N
DAY1	12 16					
DAY2		11 16	1			
DAY3		2	9 16			
DAY4		2	9 16			
DAY5			4 8	7 7		
DAY6				7 13	4 2	
DAY7				4 4	6 3	
DAY8					7 2	
DAY9					5 2	
DAY10					5 2	
DAY11					2	
DAY12					2	
DAY13					2	
DAY14					2	

TERMINATION

Appendix 5.b.3.

TRIAL #4 — COMMENCED 17/3/91 CONDUCTED AT 25deg.C
ENDPOINT — DEVELOPMENTAL CHARACTERISTICS PAGE 1
ECG NUMBERS — RAW DATA
SPECIES — GLYPTOPHYSA SP.

TREATMENT:CONTROL REPLICATE 1

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
	9					
	8					
DAY2		11				
		1				
		7				
DAY3		9				
		1				
		7				
DAY4		2				
			2			
		5				
DAY5		2		2		
		2		3		
DAY6				1	1	
					3	
DAY7					1	
					3	
DAY8					1	
					3	
DAY9					1	
					3	
DAY10					1	
					3	
DAY11					1	
					3	
DAY12					1	
						3
DAY13					1	
DAY14					1	
					TERMINATION	

TREATMENT:CONTROL REPLICATE 2

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8					
DAY2		8				
DAY3		7				
DAY4		5	1			
DAY5			1	4		
DAY6					4	
DAY7					4	
DAY8					4	
DAY9						4

TREATMENT:32% RP2 REPLICATE 1

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
	8					
DAY2		13				
		8				
DAY3				13		
			8			
DAY4					13	
				8		
DAY5					13	
					8	
DAY6					13	
					8	
DAY7					13	
					8	
DAY8						13
					8	
DAY9						8

TREATMENT:32% RP2 REPLICATE 2

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14					
DAY2		10				
DAY3			4			
DAY4				3		
DAY5					3	
DAY6					3	
DAY7					3	
DAY8					3	
DAY9					3	
DAY10						3

TREATMENT:42% RP2 REPLICATE 1

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10					
	10					
	9					
DAY2		9				
		7				
		7				
DAY3			9			
			7			
			6			
DAY4			9			
			7			
			6			
DAY5				9		
				7		
			3	3		
DAY6					9	
					7	
				3	2	
DAY7					9	
					7	
					2	
DAY8					9	
					7	
					2	
DAY9						9
						7
					2	
DAY10					2	
DAY11					2	
DAY12					2	
DAY13					2	
DAY14						2

TREATMENT:42% RP2 REPLICATE 2

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6					
DAY2		6				
DAY3		6				
DAY4			5			
DAY5			4	1		
DAY6			DEAD	DEAD		

TREATMENT:56% RP2 REPLICATE 1

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14					
	12					
	7					
	11					
DAY2			12			
		12				
			7			
		11				
DAY3				1	10	
			12			
				6		
			11			
DAY4				1	10	
			1	11		
					6	
				3	8	
DAY5				1	10	
			1	11		
					6	
				3	7	
DAY6					10	
					11	
					6	
				1	6	
DAY7					10	
					11	
					6	
					7	
DAY8					10	
					11	
					5	
					7	
DAY9						10
					11	
						5
					7	
DAY10					11	
					7	
DAY11						11
						7

TREATMENT:56% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8 9					
DAY2	8	9				
DAY3		8 1	8			
DAY4		1	7	8		
DAY5					7 8	
DAY6					7 8	
DAY7					7 8	
DAY8					7	8
DAY9					7	
DAY10						7

TREATMENT:75% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8 4 14					
DAY2		6 4 14				
DAY3		6 4 13				
DAY4			1 4 1	5 12		
DAY5			1	3 4 11	2	
DAY6					5 4 10	
DAY7					5 4 10	
DAY8					5 4 10	
DAY9					5 4 10	
DAY10					5 4 10	
DAY11					5 4 10	
DAY12					4 10	5
DAY13					4	10
DAY14					4 TERMINATION	

TREATMENT:75% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8					
DAY2		8				
DAY3		8				
DAY4			7			
DAY5				7		
DAY6					6	
DAY7					6	
DAY8					6	
DAY9					5	
DAY10					5	
DAY11					5	
DAY12					5	
DAY13					5	
DAY14					5 TERMINATION	

TREATMENT:100% RP2 REPLICATE 1

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	9 7					
DAY2		8 7				
DAY3		8 6				
DAY4			7	6		
DAY5				7 6		
DAY6					4 6	
DAY7					4 6	
DAY8					4 6	
DAY9					4 6	
DAY10					4 6	
DAY11					4 6	
DAY12					4 6	
DAY13					4 6	
DAY14					6 TERMINATION	4

TREATMENT:100% RP2 REPLICATE 2

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
DAY2		7				
DAY3		7				
DAY4			4			
DAY5				4		
DAY6					1	
DAY7					1	
DAY8					1	
DAY9					1	
DAY10					1	
DAY11					1	
DAY12					1	
DAY13					1	
DAY14					DEAD	

Appendix 5.c.1.

TRIAL #4 COMMENCED 13/3/91 PAGE 1
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY
SPECIES A. carinata

TREATMENT: CONTROL — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2					
REP 3					
REP 4		2			
REP 5	2		1		1

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2					
REP 3					
REP 4		5.1			
REP 5	50		25	25	
TOTAL	2	2	1	0	1
PERCENT.	2.1	2.1	1.1	0	1.1

TREATMENT: 32% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	1			1	
REP 2				2	1
REP 3	1				
REP 4		1			

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	12.5			12.5	
REP 2				6.1	3
REP 3	5.9				
REP 4		3.7			
TOTAL	2	1	0	3	1
PERCENT.	2.4	1.2	0	3.5	1.2

TREATMENT: 42% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					1
REP 2					
REP 3					
REP 4					
REP 5			1		1

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					5.3
REP 2					
REP 3					
REP 4					
REP 5			5		5
TOTAL	0	0	1	0	2
PERCENT.	0	0	1.3	0	2.7

TREATMENT: 56% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2					2
REP 3				4	1
REP 4		1			

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2					
REP 3				57.1	14.3
REP 4		3.6			
TOTAL	0	1	0	4	3
PERCENT.	0	1.5	0	6.1	4.5

TREATMENT: 75% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2					8
REP 3					2
REP 4					

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2					42.1
REP 3					16.7
REP 4					
TOTAL	0	0	0	0	10
PERCENT.	0	0	0	0	16.4

TREATMENT: 100% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2				5	9
REP 3					
REP 4					3

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2				27.8	50
REP 3					
REP 4					20
TOTAL	0	0	0	5	12
PERCENT.	0	0	0	8.2	19.7

Appendix 5.c.2.

TRIAL #4 COMMENCED 13/3/91 PAGE 1
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY
SPECIES A. cummingii

TREATMENT: CONTROL

RAW DATA

	DEVELOPMENTAL STAGE				
	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	2	1	2	4	3
REP 2		1			
REP 3		1			1
REP 4		1			
REP 5	1				

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	3.3	1.7	3.3	6.7	5
REP 2		4			
REP 3		2			2
REP 4		2.1			
REP 5	1.3				
TOTAL	3	4	2	4	4
PERCENT.	1.1	1.5	0.8	1.5	1.5

TREATMENT: 32% RP2

	DEVELOPMENTAL STAGE				
	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	11	3	2		1
REP 2	4				
REP 3			1	1	1
REP 4	2				3
REP 5	1	2	1		
REP 6					

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	11.7	6.7	3.3		1.7
REP 2	10				
REP 3			1.2	1.2	1.2
REP 4	4.9				7.3
REP 5	2.9	5.7	2.9		
REP 6					
TOTAL	18	5	4	1	5
PERCENT.	6.2	1.7	1.4	0.3	1.7

TREATMENT: 42% RP2

RAW DATA

	DEVELOPMENTAL STAGE				
	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	1	2			1
REP 2					
REP 3					7
REP 4	2	1			

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	1.9	3.8			1.9
REP 2					
REP 3					15.8
REP 4	1.6	3.1			
TOTAL	3	3	0	0	8
PERCENT.	1.2	1.2	0	0	3.3

TREATMENT: 56% RP2

RAW DATA

	DEVELOPMENTAL STAGE				
	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1		1	3	6	6
REP 2	1	2		10	
REP 3					
REP 4	1		6	16	2

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1		1.1	3.4	6.8	6.8
REP 2	1.6	3.2		15.6	
REP 3					
REP 4	1.4		8.4	22.5	2.8
TOTAL	2	3	9	32	8
PERCENT.	0.9	1.3	3.8	13.6	3.4

TREATMENT: 75% RP2

RAW DATA

	DEVELOPMENTAL STAGE				
	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	2			1	2
REP 2			1	6	
REP 3	4			5	
REP 4	1			4	1

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	3.2			1.6	3.2
REP 2			4.3	26.1	
REP 3	7.8			9.8	
REP 4	2.3			9.3	2.3
TOTAL	7	0	1	16	3
PERCENT.	3.9	0	0.6	8.9	1.7

TREATMENT: 100% RP2

RAW DATA

	DEVELOPMENTAL STAGE				
	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	1	1	3	22	1
REP 2	6	1	3	2	6
REP 3			1	1	1
REP 4				19	14
REP 5		1	1	17	2

PERCENTILE DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	1.8	1.8	5.5	0.4	1.8
REP 2	14.6	2.4	7.3	4.9	14.6
REP 3			2.4	2.4	2.4
REP 4				29.2	21.5
REP 5		3.6	3.6	60.7	7.1
TOTAL	7	3	8	61	24
PERCENT.	3	1.3	3.4	26.3	10.3

Appendix 5.c.3.

TRIAL #4 COMMENCED 13/3/91 PAGE 1
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY
SPECIES GLYPTOPHYSA SP.

RAW DATA

TREATMENT: CONTROL — DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	8	15	1	1	
REP 2		2	2		
REP 3	2		1		1

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	29.6	55.6	3.7	3.7	
REP 2		25	25		
REP 3	50		25		25
TOTAL	10	17	4	1	1
PERCENT.	25.6	43.6	10.3	2.6	2.6

TREATMENT: 32% RP2 — DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2	4	6	1		

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1					
REP 2	28.6	42.9	7.1		
TOTAL	4	6	1	0	0
PERCENT.	11.4	17.1	2.9	0	0

TREATMENT: 42% RP2 — DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	5	1	1		
REP 2		1	4	1	

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	17.9	3.6	3.6		
REP 2		16.7	66.7	16.7	
TOTAL	5	2	5	1	0
PERCENT.	14.7	5.9	14.7	2.9	0

RAW DATA

TREATMENT: 56% RP2 — DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	2	3	3	2	1
REP 2		2			

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	4.5	6.8	6.8	4.5	2.3
REP 2		11.8			
TOTAL	2	5	3	2	1
PERCENT.	3.3	8.2	4.9	3.3	1.6

TREATMENT: 75% RP2 — DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	2	1	2	2	4
REP 2		1		1	6

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	7.7	3.8	7.7	7.7	15.4
REP 2		12.5		12.5	75
TOTAL	2	2	2	3	10
PERCENT.	5.9	5.9	5.9	8.8	29.4

RAW DATA

TREATMENT: 100% RP2 — DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	1	2		3	6
REP 2	6	3		3	1

PERCENTILE

	GASTRULA	TROCH	VEL	HIPPO	H'LING
REP 1	6.3	12.5		18.8	37.5
REP 2	46.2	23.1		23.1	7.7
TOTAL	7	5	0	6	7
PERCENT.	24.1	17.2	0	20.7	24.1

Appendix 6.a.1.

TRIAL #5 COMMENCED 31/3/91 PAGE 1 RAW DATA
ENDPOINT: DAILY EGGMASS NUMBER
SPECIES: A.carinata

TREATMENT :CONTROL

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	1	3	2	1	0	0
DAY2	2	2	0	1	1	4
DAY3	3	4	3	2	2	4
DAY4	1	0	3	1	1	2
DAY5	4	3	2	4	2	2
DAY6	2	2	2	1	2	1
DAY7	2	1	4	2	3	3

TREATMENT :1% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	0	0	0	1
DAY2	1	2	1	0	1	0
DAY3	4	0	2	1	1	1
DAY4	0	0	1	0	1	1
DAY5	6	2	3	0	1	1
DAY6	3	2	1	1	1	0
DAY7	1	3	2	0	0	3

TREATMENT :3.2% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	2	2	1	1
DAY2	1	1	0	0	0	0
DAY3	2	1	3	3	3	3
DAY4	0	1	1	0	0	0
DAY5	0	1	0	4	2	4
DAY6	1	3	2	1	2	1
DAY7	1	2	2	1	1	1

TREATMENT :10% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	1	3	1	0
DAY2	0	2	0	1	0	0
DAY3	3	1	3	4	0	3
DAY4	0	0	1	0	1	1
DAY5	2	1	0	2	2	2
DAY6	1	1	1	0	0	1
DAY7	0	0	0	1	1	2

TREATMENT :32% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	1
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	1
DAY5	0	0	0	1	1	0
DAY6	0	0	0	0	0	1
DAY7	0	1	0	0	1	0

TREATMENT :100% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	1	0
DAY3	0	0	0	2	2	1
DAY4	0	0	0	0	1	0
DAY5	0	0	0	0	0	1
DAY6	0	1	0	0	0	0
DAY7	0	0	0	0	0	0

TRIAL #5 COMMENCED 31/3/91 PAGE 1 RAW DATA
ENDPOINT: DAILY TOTAL EGG PRODUCTION
SPECIES: A.carinata

TREATMENT :CONTROL

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	12	25	45	13	0	0
DAY2	17	18	13	13	3	53
DAY3	0	28	36	32	20	40
DAY4	0	0	22	20	8	28
DAY5	0	10	23	58	14	24
DAY6	0	16	18	17	13	16
DAY7	0	0	36	27	24	35

TREATMENT :1% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	0	0	0	8
DAY2	11	5	11	0	7	14
DAY3	44	0	22	5	7	6
DAY4	0	0	15	0	11	7
DAY5	63	8	37	0	3	1
DAY6	31	18	20	4	10	0
DAY7	9	23	24	0	0	15

TREATMENT :3.2% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	13	9	13	0
DAY2	10	5	0	0	0	9
DAY3	21	0	22	25	23	31
DAY4	11	9	4	0	0	0
DAY5	0	8	0	42	15	32
DAY6	13	14	18	13	24	9
DAY7	5	5	13	11	11	9

TREATMENT :10% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	9	31	15	0
DAY2	0	17	0	10	0	0
DAY3	15	12	19	41	0	27
DAY4	0	0	8	0	15	11
DAY5	13	0	0	21	23	23
DAY6	3	12	5	0	16	10
DAY7	0	0	8	12	13	18

TREATMENT :32% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	2
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	7
DAY5	0	0	0	13	7	0
DAY6	0	0	0	0	0	5
DAY7	0	4	0	0	8	0

TREATMENT :100% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0
DAY6	0	0	0	0	0	0
DAY7	0	0	0	0	0	0

Appendix 6.a.2.

TRIAL #5 COMMENCED 31/3/91 PAGE 1 RAW DATA
ENDPOINT: DAILY EGGMASS NUMBER
SPECIES: A. cummingii

TREATMENT :CONTROL

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	1	3	2	1	1	2
DAY2	2	2	4	1	1	1
DAY3	1	3	4	3	3	3
DAY4	0	1	1	0	1	2
DAY5	0	1	2	3	3	2
DAY6	1	2	2	1	1	2
DAY7	1	3	3	3	2	2

TREATMENT :1% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	1	1	2	1	2	1
DAY2	2	1	2	2	3	3
DAY3	1	3	4	1	1	1
DAY4	2	1	2	2	2	0
DAY5	4	2	2	2	4	2
DAY6	1	0	2	2	2	3
DAY7	2	2	0	1	2	1

TREATMENT :3.2% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	1	0	2	1	0
DAY2	2	2	0	3	5	3
DAY3	2	1	4	3	1	2
DAY4	2	3	0	0	0	0
DAY5	3	1	3	3	0	1
DAY6	2	2	2	2	1	2
DAY7	1	2	2	2	2	2

TREATMENT :10% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	0	1	0	0
DAY2	1	1	2	1	0	1
DAY3	1	3	0	2	2	1
DAY4	1	1	0	0	0	0
DAY5	0	1	0	2	0	1
DAY6	3	1	0	2	2	1
DAY7	2	2	0	2	2	2

TREATMENT :32% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	1	0	0	0	2	0
DAY2	0	0	0	0	0	0
DAY3	0	1	1	0	0	0
DAY4	0	1	0	0	0	0
DAY5	0	0	0	0	0	0
DAY6	0	0	1	1	1	0
DAY7	1	1	0	1	0	0

TREATMENT :100% RP2

SAMPLE	REP 1 A	REP 1 B	REP 1 C	REP 2 A	REP 2 B	REP 2 C
DAY1	0	0	0	0	1	0
DAY2	0	0	1	0	0	0
DAY3	1	1	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0
DAY6	0	0	0	0	0	0
DAY7	0	0	0	0	0	0

TRIAL #5 COMMENCED 31/3/91 PAGE 1 RAW DATA
ENDPOINT: DAILY TOTAL EGG PRODUCTION
SPECIES: A. cummingii

TREATMENT :CONTROL

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	16	54	40	29	25	34
DAY2	28	56	75	20	15	17
DAY3	28	66	61	51	71	49
DAY4	0	26	22	0	16	29
DAY5	0	20	47	83	61	49
DAY6	34	56	30	28	13	27
DAY7	24	10	26	37	36	16

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	18	17	39	22	62	15
DAY2	40	15	45	46	51	36
DAY3	34	41	79	24	65	16
DAY4	38	18	35	35	54	0
DAY5	63	46	41	49	81	36
DAY6	2	0	21	30	39	48
DAY7	34	35	27	14	50	15

TREATMENT :3.2% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	27	0	53	19	0
DAY2	60	44	0	38	77	53
DAY3	83	19	59	63	24	36
DAY4	52	44	0	0	0	0
DAY5	78	18	63	68	24	18
DAY6	53	35	31	10	7	28
DAY7	18	27	35	22	7	38

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	24	0	0
DAY2	18	16	25	22	0	31
DAY3	15	54	0	46	18	30
DAY4	25	25	0	0	0	0
DAY5	0	14	0	48	0	33
DAY6	40	14	0	29	33	14
DAY7	35	24	0	24	42	25

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	16	0	0	0	62	0
DAY2	0	0	0	0	0	0
DAY3	0	21	14	0	0	0
DAY4	0	21	0	0	0	0
DAY5	0	0	0	0	0	0
DAY6	0	0	10	10	19	0
DAY7	14	13	0	13	0	0

TREATMENT :100% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	22	0
DAY2	0	0	22	0	0	0
DAY3	28	18	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0
DAY6	0	0	0	0	0	0
DAY7	0	0	0	0	0	0

Appendix 6.a.3.

TRIAL #5 COMMENCED 31/3/91 PAGE 1 RAW DATA
ENDPOINT:DAILY EGGMASS NUMBER
SPECIES: GLYPTOPHYSA SP.

TREATMENT:CONTROL

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	5	4	0	3	4
DAY2	0	1	2	0	0	3
DAY3	0	2	6	0	0	3
DAY4	0	1	0	1	0	1
DAY5	0	1	5	4	3	4
DAY6	0	0	1	3	1	2
DAY7	0	0	2	2	2	1

TREATMENT:1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	3	2	2	3	0	4
DAY2	1	1	3	3	0	2
DAY3	4	2	2	3	0	1
DAY4	2	2	3	1	0	2
DAY5	4	2	2	1	0	4
DAY6	2	2	0	1	0	1
DAY7	2	1	2	2	0	2

TREATMENT:3.2% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	3	0	1	0
DAY2	3	3	3	0	0	3
DAY3	1	2	3	0	6	1
DAY4	1	0	0	1	1	1
DAY5	1	1	0	0	3	2
DAY6	0	1	2	0	1	2
DAY7	0	1	0	0	2	3

TREATMENT:10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	1	0	0	0
DAY2	1	3	2	2	0	0
DAY3	1	2	3	7	0	0
DAY4	1	1	1	0	0	0
DAY5	0	1	5	0	0	2
DAY6	1	1	2	0	2	0
DAY7	2	4	2	3	2	1

TREATMENT:32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	2	1	1	0	0
DAY2	1	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	1
DAY5	0	2	0	0	0	0
DAY6	1	1	0	1	0	0
DAY7	1	0	0	1	0	1

TREATMENT:100% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0
DAY6	0	0	0	0	0	0
DAY7	0	0	0	0	0	0

TRIAL #5 COMMENCED 31/3/91 PAGE 1 RAW DATA
ENDPOINT: DAILY TOTAL EGG PRODUCTION
SPECIES: GLYPTOPHYSA SP.

TREATMENT :CONTROL

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	49	0	29	54
DAY2	0	26	20	0	0	30
DAY3	0	16	55	0	0	30
DAY4	0	0	0	8	0	7
DAY5	0	5	39	25	27	39
DAY6	0	0	10	26	10	16
DAY7	0	0	15	5	12	9

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	24	23	19	24	0	18
DAY2	3	12	36	24	0	16
DAY3	35	26	3	16	0	18
DAY4	8	24	25	6	0	15
DAY5	32	24	14	4	0	39
DAY6	5	19	0	5	0	6
DAY7	22	10	15	13	0	16

TREATMENT :3.2% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	29	0	4	0
DAY2	14	19	27	0	0	15
DAY3	4	16	31	0	45	7
DAY4	8	0	0	3	0	9
DAY5	9	4	0	0	27	19
DAY6	0	7	15	0	12	14
DAY7	0	7	0	0	15	27

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	13	0	0	0
DAY2	6	10	17	18	0	0
DAY3	5	12	33	69	0	0
DAY4	7	6	9	0	0	0
DAY5	0	0	51	0	0	7
DAY6	6	6	28	0	12	0
DAY7	11	17	16	21	11	4

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	21	7	13	0	0
DAY2	11	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	6
DAY5	0	13	0	0	0	0
DAY6	10	3	0	10	0	0
DAY7	12	0	0	9	0	9

TREATMENT :100% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0
DAY6	0	0	0	0	0	0
DAY7	0	0	0	0	0	0

Appendix 6.b.

TRIAL #5 COMMENCE 31/3/91
PHYSICO-CHEMICAL DATA

DISSOLVED OXYGEN mg/L

	TREATMENT											
	CON	CON	1%RP2	1%RP2	3.2%RP2	3.2%RP2	10%RP2	10%RP2	32%RP2	32%RP2	100%RP2	100%RP2
DAY1	7.5	7.2	7.5	7.4	7.4	7.5	7.4	7.2	7.5	7.3	7.3	7.4
DAY2	7.7	7.5	7.7	7.4	7.5	7.5	7.5	7.5	7.5	7.6	7.6	7.4
DAY3	7.4	7.4	7.5	7.4	7.3	7.3	7.4	7.4	7.4	7.4	7.3	7.4
DAY4	7.5	7.5	7.4	7.3	7.3	7.6	7.3	7.3	7.5	7.4	7.1	7.4
DAY5	7.2	7.3	7.4	7.3	7.2	7.4	7.4	7.5	7.5	7.3	7.4	7.6
DAY6	7.9	7.2	7.8	7.5	7.8	7.9	7.7	7.9	7.8	7.8	7.5	7.9

pH

	6.3	6.35	6.45	6.75	6.65	6.78	6.74	6.84	6.76	6.81	6.9	7.4
DAY1	6.28	6.75	6.66	6.88	6.75	6.81	6.71	6.92	6.81	7.05	7.13	7.43
DAY2	6.35	6.72	6.66	6.63	6.48	6.65	6.67	6.72	6.79	6.99	6.97	6.96
DAY3	6.48	6.84	6.64	6.64	6.57	6.68	6.7	6.96	6.9	7.03	7.04	7.3
DAY4	6.51	6.61	6.59	6.7	6.6	6.71	6.74	6.94	6.85	7.11	7.12	7.34
DAY5	6.25	6.48	6.49	6.76	6.64	6.86	6.57	7.09	6.93	7.15	7.28	7.48

CONDUCTIVITY uSem/cm

	TREATMENT											
	CON	CON	1%RP2	1%RP2	3.2%RP2	3.2%RP2	10%RP2	10%RP2	32%RP2	32%RP2	100%RP2	100%RP2
DAY1	29.2	22.1	44.7	42.1	75.3	74.8	181	187	464	465	1180	1180
DAY2	29.3	27.3	50.4	43	77.2	75.9	186	184	464	466	1190	1190
DAY3	32.6	26.6	39.7	40.1	77.4	77.3	189	183	460	472	1180	1180
DAY4	46.4	27.8	42	42	85	79.9	191	186	469	474	1190	1190
DAY5	38.5	26.2	44.1	44.1	82.8	80.6	183	180	458	462	1170	1170
DAY6	33.5	31.7	46.5	46.5	94.2	88.4	191	191	474	480	1190	1190

Appendix 7.a.1.

TRIAL #6 COMMENCED 12/4/91 PAGE 1 RAW DATA
ENDPOINT: DAILY EGG MASS PRODUCTION
SPECIES: A. carinata

TREATMENT :CONTROL

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	3	0	2	4	1
DAY2	0	1	0	0	0	2
DAY3	0	0	5	1	2	2
DAY4	1	1	0	2	0	1
DAY5	1	1	1	2	2	2

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	1	0	1	0	0	0
DAY2	0	0	1	1	0	0
DAY3	1	0	0	0	1	1
DAY4	1	0	1	0	1	1
DAY5	2	0	2	0	0	3

TREATMENT :3.2% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	1	2	0	5	0	1
DAY2	0	1	0	0	0	0
DAY3	1	0	0	0	0	0
DAY4	2	2	1	2	0	3
DAY5	2	1	0	0	0	0

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	2	0	1	1	0
DAY2	0	1	0	0	0	0
DAY3	0	0	1	0	0	0
DAY4	0	1	0	0	1	1
DAY5	0	0	1	0	1	0

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	1	0	0
DAY5	0	0	0	0	0	0

TREATMENT :100% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	2
DAY5	0	0	0	0	0	0

TRIAL #6 COMMENCED 12/4/91 PAGE 1 RAW DATA
ENDPOINT: DAILY TOTAL EGG PRODUCTION
SPECIES: A. carinata

TREATMENT :CONTROL

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	46	0	12	41	7
DAY2	0	17	0	0	0	16
DAY3	0	0	47	6	24	13
DAY4	0	8	0	12	0	9
DAY5	2	17	11	11	21	16

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	2	0	11	0	0	0
DAY2	0	0	10	6	0	0
DAY3	7	0	0	0	12	8
DAY4	9	0	8	0	15	7
DAY5	17	0	20	0	0	15

TREATMENT :3.2% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	11	14	0	7	0	10
DAY2	0	7	0	0	0	0
DAY3	22	9	0	0	0	0
DAY4	8	18	23	10	0	21
DAY5	18	9	0	0	0	0

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	18	0	14	2	0
DAY2	0	10	0	0	0	0
DAY3	0	0	10	0	0	0
DAY4	0	13	0	0	15	3
DAY5	0	0	13	0	0	0

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0

TREATMENT :100% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	4
DAY4	0	0	0	0	0	4
DAY5	0	0	0	0	0	0

Appendix 7.a.2.

TRIAL #6 COMMENCED 12/4/9 PAGE 1 RAW DATA
ENDPOINT: DAILY EGG MASS PRODUCTION
SPECIES: A. cummingii

TREATMENT:CONTROL

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	1	2	0	0	1	1
DAY2	0	0	0	2	1	0
DAY3	0	1	0	1	3	0
DAY4	2	2	2	2	1	2
DAY5	0	0	0	2	1	2

TREATMENT:1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	2	0	2	2	1	1
DAY3	2	2	0	1	2	2
DAY4	0	1	1	2	2	2
DAY5	0	1	1	2	1	2

TREATMENT:3.2% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	1	0	1	1	1
DAY3	0	0	2	0	0	0
DAY4	1	2	0	2	2	1
DAY5	0	1	2	1	1	1

TREATMENT:10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	2	0	0	0	0
DAY3	1	0	0	0	0	0
DAY4	0	1	0	1	0	0
DAY5	1	0	1	0	1	0

TREATMENT:32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	1	0	0	0	0	0
DAY4	0	0	1	0	0	0
DAY5	0	1	0	0	0	1

TREATMENT:100% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	1	0	0
DAY4	0	0	0	0	0	0
DAY5	0	1	0	0	0	0

TRIAL #6 COMMENCED 12/4/91 PAGE 1 RAW DATA
ENDPOINT: DAILY TOTAL EGG PRODUCTION
SPECIES: A. cummingii

TREATMENT :CONTROL

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	17	37	0	0	25	12
DAY2	0	0	0	45	29	0
DAY3	0	21	0	24	58	0
DAY4	30	46	29	38	18	25
DAY5	0	0	0	38	17	28

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	48	0	52	40	25	17
DAY3	48	55	0	17	51	34
DAY4	0	28	25	35	36	21
DAY5	0	28	15	37	22	34

TREATMENT :3.2% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	19	0	23	21	17
DAY3	0	0	38	0	0	0
DAY4	11	44	0	35	37	6
DAY5	13	26	29	19	19	18

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	40	0	0	0	0
DAY3	14	0	0	0	0	0
DAY4	0	15	0	14	0	0
DAY5	7	0	21	0	14	0

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	13	0	3	0	0	0
DAY5	0	18	0	0	0	3

TREATMENT :100% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	15	0	0
DAY4	0	0	0	0	0	0
DAY5	0	14	0	0	0	0

Appendix 7.a.3.

TRIAL #6 COMMENCED 12/4/91 PAGE 1 RAW DATA
ENDPOINT: DAILY EGG MASS PRODUCTION
SPECIES: GLYPTOPHYSA SP.

TREATMENT :CONTROL

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	4	5	5	3	4	2
DAY2	5	1	0	4	4	2
DAY3	1	2	0	3	2	4
DAY4	0	1	1	1	0	3
DAY5	0	2	0	1	0	0

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	3	1	4	3	0	2
DAY2	1	2	3	2	0	3
DAY3	1	2	0	3	0	1
DAY4	2	2	0	2	0	1
DAY5	1	0	0	2	0	1

TREATMENT :3.2% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	4	5	1	2	6	0
DAY2	4	4	1	1	4	1
DAY3	2	2	0	1	1	1
DAY4	0	0	0	0	0	0
DAY5	0	0	0	1	0	2

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	1	2	2	0	0	0
DAY2	3	4	3	4	2	3
DAY3	0	1	1	0	0	0
DAY4	1	2	2	3	3	1
DAY5	0	0	0	2	1	1

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	2	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	1	0	0	0
DAY5	0	0	1	0	0	0

TREATMENT :100% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	3	0
DAY4	1	0	0	0	2	0
DAY5	1	0	0	0	1	0

TRIAL #6 COMMENCED 12/4/9 PAGE 2 RAW DATA
ENDPOINT:DAILY TOTAL EGG PRODUCTION
SPECIES: GLYPTOPHYSA SP.

TREATMENT:10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	14	31	9	0	0	0
DAY2	32	39	15	51	15	34
DAY3	0	7	6	0	0	0
DAY4	5	14	9	39	27	10
DAY5	0	0	0	22	11	10

TREATMENT:32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	27	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	11	0	0	0
DAY5	0	0	13	0	0	0

TREATMENT:100% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	34	0
DAY4	7	0	0	0	11	0
DAY5	3	0	0	0	8	0

TREATMENT:CONTROL

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	34	50	44	41	0	11
DAY2	46	6	0	41	36	13
DAY3	6	16	0	33	13	26
DAY4	0	0	4	10	0	22
DAY5	15	18	0	12	0	0

TREATMENT:1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	38	12	45	26	0	15
DAY2	14	22	28	21	0	27
DAY3	12	19	0	27	0	10
DAY4	26	16	0	12	0	7
DAY5	0	0	0	24	0	10

TREATMENT:3.2% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	40	57	11	22	66	0
DAY2	35	42	9	8	37	5
DAY3	16	21	0	8	11	7
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	6	12

Appendix 7.b.1.

TRIAL #6 VALIDATION COMMENCED 12/4/91
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
EGG NUMBERS RAW DATA
SPECIES A. carinata

TREATMENT :CONTROL REPLICATE 1A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	18					
	16					
	12					
DAY2		18				
	16					
	12					
DAY3		18				
		16				
		12				
DAY4				18		
				16		
				12		
DAY5					18	
					16	
					12	
DAY6					18	
					16	
					12	
DAY7					18	
					16	
						12
DAY8						18
						16

TREATMENT :CONTROL REPLICATE 1B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
	13					
	9					
	8					
DAY2	11					
		13				
		9				
	8					
DAY3				11		
					13	
				9		
				8		
DAY4					11	
					13	
				9		
				3		
DAY5					11	
					13	
					9	
					8	
DAY6					11	
					13	
					9	
					8	
DAY7						11
						13
						9
						8

TREATMENT :CONTROL REPLICATE 2A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
	10					
DAY2	11					
	10					
DAY3			11			
			10			
DAY4				11		
				10		
DAY5					11	
					10	
DAY6						11
						10

TREATMENT :CONTROL REPLICATE 2B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7					
	9					
DAY2		7				
	9					
DAY3				7		
			9			
DAY4					7	
				9		
DAY5					7	
					9	
DAY6					7	
					9	
DAY7						7
						9

TREATMENT :CONTROL REPLICATE 2C

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11 12 10 8					
DAY2		11 12 10 3				
DAY3				11 12 10 8		
DAY4					11 12 10 8	
DAY5					11 12 10 8	
DAY6					11 12 10 8	
DAY7						11 12 10 8

TREATMENT :1% RP2 REPLICATE 1A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10 7					
DAY2	10 7					
DAY3			10 7			
DAY4				10 7		
DAY5					10 7	
DAY6					10 7	
DAY7					10 7	
DAY8						10 7

TREATMENT :1% RP2 REPLICATE 1B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
DAY2	11					
DAY3		11				
DAY4				11		
DAY5					11	
DAY6					11	
DAY7					11	
DAY8						11

TREATMENT :1% RP2 REPLICATE 2A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6					
DAY2		6				
DAY3				6		
DAY4					6	
DAY5					6	
DAY6					6	
DAY7					6	
DAY8						6

TREATMENT :1% RP2 REPLICATE 2B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12					
DAY2	12					
DAY3			12			
DAY4				12		
DAY5					12	
DAY6					12	
DAY7					12	
DAY8					10	
DAY9						10

TREATMENT :1% RP2 REPLICATE 2C

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	9					
DAY2		8				
DAY3			8			
DAY4				8		
DAY5					8	
DAY6					8	
DAY7					8	
DAY8					8	
DAY9						8

TREATMENT :3.2% RP2 REPLICATE 1A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11 11					
DAY2	11	11				
DAY3		11	11			
DAY4				11 11		
DAY5					11 11	
DAY6					11 11	
DAY7					11 11	
DAY8					11 11	
DAY9						11 11

TREATMENT :3.2% RP2 REPLICATE 1B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8 10					
DAY2	8 9					
DAY3			8 9			
DAY4				8	9	
DAY5					8 9	
DAY6					8 9	
DAY7					8 9	
DAY8						8 9

TREATMENT :3.2% RP2 REPLICATE 2A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7					
DAY2	7					
DAY3		7				
DAY4				7		
DAY5					7	
DAY6					7	
DAY7					7	
DAY8					7	
DAY9						7

TREATMENT :3.2% RP2 REPLICATE 2B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10					
DAY2		10				
DAY3		10				
DAY4				10		
DAY5					10	
DAY6					10	
DAY7					10	
DAY8						10

TREATMENT : 10% RP2 REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
	DEVELOPMENTAL STAGE					
DAY1	8 10					
DAY2		8 10				
DAY3		8 10				
DAY4				8 10		
DAY5					8 10	
DAY6					8 10	
DAY7						8 10

TREATMENT : 10% RP2 REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
	DEVELOPMENTAL STAGE					
DAY1	13					
DAY2		13				
DAY3				13		
DAY4					13	
DAY5					13	
DAY6					13	
DAY7					13	
DAY8						13

TREATMENT : 10% RP2 REPLICATE A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
	DEVELOPMENTAL STAGE					
DAY1	15					
DAY2	15					
DAY3		15				
DAY4			15			
DAY5					14	
DAY6					14	
DAY7					14	
DAY8					14	
DAY9						14

TREATMENT : 100% RP2 REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
	DEVELOPMENTAL STAGE					
DAY1	4					
DAY2	4					
DAY3		4				
DAY4				4		
DAY5				3		
DAY6				3		
DAY7				DEAD		

Appendix 7.b.2.

TRIAL #6 VALIDATION COMMENCED 12/4/91
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
EGG NUMBERS RAW DATA
SPECIES A. cummingii

TREATMENT : CONTROL REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
	DEVELOPMENTAL STAGE					
DAY1	17					
DAY2	17					
DAY3		17				
DAY4				17		
DAY5					17	
DAY6					17	
DAY7					17	
DAY8						17

TREATMENT : CONTROL REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
	DEVELOPMENTAL STAGE					
DAY1	15 22					
DAY2	14 22					
DAY3		14 22				
DAY4			13	22		
DAY5					13 22	
DAY6					13 22	
DAY7					13 22	
DAY8						13 22

TREATMENT : CONTROL REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
	DEVELOPMENTAL STAGE					
DAY1	17					
DAY2	17					
DAY3		17				
DAY4			17			
DAY5				17		
DAY6					17	
DAY7					17	
DAY8					17	
DAY9						17

TREATMENT : CONTROL REPLICATE 2A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
	DEVELOPMENTAL STAGE					
DAY1	24 21					
DAY2	24	21				
DAY3			20 21			
DAY4				17 19		
DAY5					17 19	
DAY6					17 19	
DAY7						17 19

TREATMENT : CONTROL REPLICATE 2B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
	DEVELOPMENTAL STAGE					
DAY1	25					
DAY2	25					
DAY3		25				
DAY4			25			
DAY5				25		
DAY6				25		
DAY7				25		
DAY8					25	

TREATMENT: CONTROL REPLICATE 2C

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12 15					
DAY2	12 15					
DAY3		12 16				
DAY4			12 15			
DAY5				12 16		
DAY6					12 16	
DAY7					12 16	
DAY8					12 16	
DAY9						12 15

TREATMENT: 1% RP2 REPLICATE 1A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	23 24					
DAY2	23 24					
DAY3		23 24				
DAY4				23 24		
DAY5					23 23	
DAY6					23 23	
DAY7						23 23

TREATMENT: 1% RP2 REPLICATE 1B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	30 25					
DAY2	30 25					
DAY3		29 25				
DAY4				25	29	
DAY5					29 23	
DAY6					29 23	
DAY7						29 21

TREATMENT: 1% RP2 REPLICATE 1C

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	28 23					
DAY2	28 23					
DAY3		27 22				
DAY4			22	27		
DAY5					27 22	
DAY6					27 22	
DAY7					26 22	
DAY8						26 22

TREATMENT: 1% RP2 REPLICATE 2A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	20 20					
DAY2	20 20					
DAY3			20 19			
DAY4				20 18		
DAY5					20 18	
DAY6					20 18	
DAY7					20 18	
DAY8						20 18

TREATMENT: 1% RP2 REPLICATE 2B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	27 24					
DAY2		27 24				
DAY3				24 24		
DAY4					21 23	
DAY5					21 23	
DAY6					21 23	
DAY7					21 23	
DAY8						21 23

TREATMENT: 1% RP2 REPLICATE 2C

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	19 15					
DAY2	15	19				
DAY3		19 15				
DAY4				19 15		
DAY5					19 15	
DAY6					19 15	
DAY7					19 15	
DAY8					19 15	
DAY9					19 15	
					FORCED HATCH	
DAY10						19 15

TREATMENT: 3.2% RP2 REPLICATE 1A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
DAY2	13					
DAY3		13				
DAY4			12			
DAY5				12		
DAY6					12	
DAY7					12	
DAY8						12

TREATMENT: 3.2% RP2 REPLICATE 1B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	25 19					
DAY2	25 19					
DAY3			24 19			
DAY4				19	24	
DAY5					24 19	
DAY6					24 19	
DAY7					24 19	
DAY8					24 19	
DAY9						24 19

TREATMENT: 3.2% RP2 REPLICATE 1C

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	27 24					
DAY2		27 24				
DAY3				24 24		
DAY4					21 23	
DAY5					21 23	
DAY6					21 23	
DAY7					21 23	
DAY8						21 23

TREATMENT: 3.2% RP2 REPLICATE 2A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	23					
DAY2	21					
DAY3		21				
DAY4			28			
DAY5					18	
DAY6					18	
DAY7					18	
DAY8					18	
DAY9						18
DAY10						

TREATMENT: 3.2% RP2 REPLICATE 2B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	21					
DAY2	20					
DAY3		19				
DAY4			19			
DAY5					19	
DAY6					19	
DAY7					19	
DAY8						19

TREATMENT: 3.2% RP2 REPLICATE 2C

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	17					
DAY2	17					
DAY3			16			
DAY4				15		
DAY5					15	
DAY6					15	
DAY7					15	
DAY8					15	
DAY9						15

TREATMENT: 10% RP2 REPLICATE 1A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14					
DAY2	14					
DAY3		13				
DAY4			11			
DAY5				11		
DAY6					11	
DAY7					11	
DAY8					11	
DAY9					11	
DAY10						11

TREATMENT: 10% RP2 REPLICATE 1B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	23 17					
DAY2	23 17					
DAY3		23 17				
DAY4			23 16			
DAY5				23 16		
DAY6					23 16	
DAY7					23 16	
DAY8					23 16	
DAY9					23 16	
DAY10						23 16

TREATMENT: 10% RP2 REPLICATE 1C

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	21					
DAY2	20					
DAY3		20				
DAY4				20		
DAY5					20	
DAY6					20	
DAY7					20	
DAY8						20

TREATMENT: 10% RP2 REPLICATE 2A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14					
DAY2	14					
DAY3		14				
DAY4			14			
DAY5				13		
DAY6					13	
DAY7					13	
DAY8					13	
DAY9						13

TREATMENT: 10% RP2 REPLICATE 2B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14					
DAY2	14					
DAY3		14				
DAY4			14			
DAY5				13		
DAY6					13	
DAY7					13	
DAY8					13	
DAY9					13	
DAY10						13

TREATMENT: 32% RP2 REPLICATE 1A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
DAY2	13					
DAY3			11			
DAY4				11		
DAY5					11	
DAY6					11	
DAY7					11	
DAY8					11	
DAY9					11	
DAY10						11

TREATMENT: 32% RP2 REPLICATE 2B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	18					
DAY2	18					
DAY3		18				
DAY4			17			
DAY5				17		
DAY6				17		
DAY7				17		
DAY8				17		
DAY9					17	

TREATMENT: 32% RP2 REPLICATE 2A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	9					
DAY2	9					
DAY3		9				
DAY4				9		
DAY5				9		
DAY6					9	
DAY7					9	
DAY8					9	
DAY9					9	
DAY10						9

TREATMENT: 100% RP2 REPLICATE 1A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	15					
DAY2	15					
DAY3		15				
DAY4			15			
DAY5					15	
DAY6					15	
DAY7					15	
DAY8					15	
DAY9					15	
DAY10						15

Appendix 7.b.3.

TRIAL #6 VALIDATION COMMENCED 12/4/91
ENDPOINT DEVELOPMENTAL CHARACTERISTICS PAGE 1
EGG NUMBERS RAW DATA
SPECIES GLYPTOPHYSA SP.

TREATMENT: CONTROL REPLICATE 1A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6 7					
DAY2	6 5					
DAY3		4 3				
DAY4				2 3		
DAY5					2 3	
DAY6						2 3

TREATMENT: CONTROL REPLICATE 1B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10 8					
DAY2	8 8					
DAY3			8 7			
DAY4					8 7	
DAY5					7 7	
DAY6						7 7

TREATMENT: CONTROL REPLICATE 1C

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	9 11 10					
DAY2	8 7 6					
DAY3		4 4 6				
DAY4				3 4 6		
DAY5					2 3 6	
DAY6					2 2 6	
DAY7						2 2 6

TREATMENT: CONTROL REPLICATE 2A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13 14 14					
DAY2		12 14 11				
DAY3				10 12 11		
DAY4					10 11 8	
DAY5					10 11 8	
DAY6					11 8	10
DAY7						11 8

TREATMENT:CONTROL REPLICATE 2B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
	11					
DAY2	11					
	11					
DAY3			11			
			9			
DAY4				11		
				9		
DAY5					11	
					9	
DAY6					11	
					8	
DAY7						11
						8

TREATMENT:CONTROL REPLICATE 2C

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8					
	5					
	9					
DAY2	8					
	5					
	9					
DAY3		8				
		4				
		9				
DAY4			5			
			4			
				4		
DAY5					5	
					4	
					4	
DAY6					5	
					3	
					4	
DAY7					5	
					3	
					2	
DAY8						5
						3
						2

TREATMENT:1% RP2 REPLICATE 1A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
	13					
	12					
DAY2	7					
	13					
	12					
DAY3		5				
		11				
		9				
DAY4				4		
				10		
				7		
DAY5					2	
					10	
					5	
DAY6					2	
					10	
					5	
DAY7						2
						10
						5

TREATMENT:1% RP2 REPLICATE 1B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10					
	11					
	13					
DAY2	10					
	11					
	13					
DAY3		3				
		11				
		11				
DAY4				3		
				11		
				11		
DAY5					3	
					10	
					11	
DAY6					3	
					10	
					11	
DAY7						3
						10
						11

TREATMENT:1% RP2 REPLICATE 2A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10					
	13					
DAY2	10					
	13					
DAY3		10				
	13					
DAY4				10		
				13		
DAY5					10	
					13	
DAY6					9	
					13	
DAY7					9	
					13	
DAY8						9
						10

TREATMENT:1% RP2 REPLICATE 2B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8					
	9					
	10					
DAY2	8					
	9					
	10					
DAY3		3				
		9				
	10					
DAY4				3		
				9		
				10		
DAY5					3	
					9	
					10	
DAY6					3	
					9	
					10	
DAY7						3
						9
						10

TREATMENT:3.2 % RP2 REPLICATE 1A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10					
	10					
DAY2	10					
	10					
DAY3		10				
		3				
DAY4				10		
				3		
DAY5					10	
					2	
DAY6						10
						2

TREATMENT:3.2 % RP2 REPLICATE 1B

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
DAY2	11					
DAY3		10				
DAY4				10		
DAY5					10	
DAY6					10	
DAY7						10

TREATMENT:3.2 % RP2 REPLICATE 1C

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
DAY2		2				
DAY3		DEAD				

TREATMENT:3.2 % RP2 REPLICATE 2A

	DEVELOPMENTAL STAGE					
	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8					
DAY2	8					
DAY3		8				
DAY4				8		
DAY5					8	
DAY6					8	
DAY7						5

TREATMENT: 3.2 % RP2 REPLICATE 2B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14 14 13					
DAY2	14 14 13					
DAY3		13 14 8				
DAY4				13 14 8		
DAY5					13 14 8	
DAY6					13 14 8	
DAY7						13 14 8

TREATMENT: 3.2 % RP2 REPLICATE 2C

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8 7					
DAY2			8 7			
DAY3				8 7		
DAY4					8 7	
DAY5					8 7	
DAY6						8 7

TREATMENT: 10% RP2 REPLICATE 1A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14					
DAY2		14				
DAY3			14			
DAY4				14		
DAY5					14	
DAY6					14	
DAY7						14

TREATMENT: 10% RP2 REPLICATE 1B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	3 6					
DAY2	3 6					
DAY3	3	6				
DAY4			3	6		
DAY5				2	6	
DAY6					2 6	
DAY7						2 6

TREATMENT: 10% RP2 REPLICATE 2A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12 5 10					
DAY2	10 5 10					
DAY3	10	3	10			
DAY4			8 3	8		
DAY5					8 2 8	
DAY6					8 2 8	
DAY7						8 2 8

TREATMENT: 10% RP2 REPLICATE 2B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11 12 11					
DAY2	11 12 11					
DAY3			11 12 11			
DAY4				11 12 10		
DAY5					11 12 10	
DAY6					11 12 10	
DAY7						11 12 10

TREATMENT: 32% RP2 REPLICATE 1A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13 14					
DAY2	12 13					
DAY3		12 13				
DAY4				12 13		
DAY5					12 13	
DAY6					11 13	
DAY7					11 13	
DAY8						11 13

TREATMENT: 100% RP2 REPLICATE 1A

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7					
DAY2		7				
DAY3				7		
DAY4					7	
DAY5					7	
DAY6					7	
DAY7					7	
DAY8						7

TREATMENT: 100% RP2 REPLICATE 1B

DEVELOPMENTAL STAGE

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13 13					
DAY2	13 13					
DAY3			12 13			
DAY4				11 13		
DAY5					11 13	
DAY6					11 13	
DAY7					11 13	
DAY8						11 13

Appendix 7.c.1.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT: WEIGHT LOSS IN EXPOSED ADULTS IN MILLIGRAMS
SPECIES A. acuminata

TREATMENT :CONTROL

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	256	250	2.3	131	116	11.5
REP 1B	231	213	7.8	144	162	12.5
REP 1C	125	128	-2.4	111	112	-0.9
REP 2A	237	243	-2.5	121	121	0
REP 2B	191	139	27.2	127	141	-11
REP 2C	100	114	-14	113	114	-0.8

TREATMENT :1% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	141	145	-2.8	122	117	4.1
REP 1B	118	197	-66.9	139	162	-16.5
REP 1C	106	101	4.7	101	98	3
REP 2A	243	259	-6.6	112	114	-1.8
REP 2B	151	151	0	125	123	1.6
REP 2C	110	102	7.3	91	84	7.7

TREATMENT :3.2% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	226	221	2.2	109	103	5.5
REP 1B	148	149	-0.7	130	109	16.2
REP 1C	204	191	6.4	116	109	6
REP 2A	191	188	1.6	118	115	2.5
REP 2B	132	131	0.8	122	136	-11.5
REP 2C	114	97	14.9	93	88	5.4

TREATMENT :10% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	187	167	10.7	125	130	4
REP 1B	139	116	16.5	153	201	-31.4
REP 1C	106	149	-40.6	101	158	-56.4
REP 2A	144	148	-2.8	96	95	1
REP 2B	123	131	-6.5	127	131	3.1
REP 2C	108	122	-13	97	102	-5.2

TREATMENT :32% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	179	203	-13.4	99	171	-72.2
REP 1B	175	190	-8.6	121	116	4.1
REP 1C	124	119	4	122	126	-3.3
REP 2A	258	286	-10.9	115	111	3.5
REP 2B	166	164	1.2	152	145	4.6
REP 2C	130	129	0.8	117	DEAD	

TREATMENT :100% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	182	183	-0.5	124	130	-4.8
REP 1B	168	167	0.6	139	155	-11.5
REP 1C	90	106	-17.8	141	149	-5.7
REP 2A	198	205	-3.5	101	114	-12.9
REP 2B	104	126	-21.2	124	135	-8.9
REP 2C	113	DEAD		93	109	-17.2

Appendix 7.c.2.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT: WEIGHT LOSS IN EXPOSED ADULTS IN MILLIGRAMS
SPECIES A. cummingii

TREATMENT:CONTROL

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	292	261	10.6	303	271	7.3
REP 1B	221	230	-4.1	264	231	12.5
REP 1C	253	240	13	233	204	12.4
REP 2A	252	228	24	218	194	12.4
REP 2B	255	245	10	285	275	3.5
REP 2C	177	191	-14	200	200	0

TREATMENT:1% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	263	247	6.1	284	292	-2.8
REP 1B	284	277	2.5	247	248	-0.4
REP 1C	162	186	-14.8	259	230	11.2
REP 2A	239	237	0.8	214	221	-3.2
REP 2B	238	234	1.7	265	263	0.8
REP 2C	201	189	6	223	214	4

TREATMENT:3.2% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	198	186	6.1	242	230	5
REP 1B	229	200	12.7	258	265	-2.7
REP 1C	232	195	15.9	188	212	-12.8
REP 2A	240	253	-5.4	208	268	-28.8
REP 2B	241	221	8.3	248	247	0.4
REP 2C	199	210	-5.5	222	240	-8.1

TREATMENT:10% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	251	258	-2.8	212	221	-4.2
REP 1B	274	256	6.6	256	268	-4.7
REP 1C	229	241	-5.2	203	203	0
REP 2A	277	278	-0.4	234	236	-0.9
REP 2B	234	237	-1.3	227	220	3.1
REP 2C	188	185	1.6	186	199	-7

TREATMENT:32% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	224	219	2.2	239	217	9.2
REP 1B	254	235	7.5	217	174	19.8
REP 1C	197	163	17.3	214	198	7.5
REP 2A	221	207	6.3	215	208	3.2
REP 2B	259	251	3.1	263	241	8.4
REP 2C	208	212	-1.9	237	223	5.9

TREATMENT:100% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	252	245	2.3	273	255	6.6
REP 1B	264	245	7.2	272	235	13.6
REP 1C	192	180	6.3	205	193	6.3
REP 2A	233	225	3.4	222	212	4.5
REP 2B	217	208	4.1	264	258	2.3
REP 2C	188	195	-3.7	207	192	7.2

Appendix 7.c.3.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT: WEIGHT LOSS IN EXPOSED ADULTS IN MILLIGRAMS
SPECIES GLYPTOPHYSA SP.

TREATMENT:CONTROL

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	353	314	11	375	331	11.3
REP 1B	316	297	6	364	329	9.6
REP 1C	333	305	8.4	357	315	11.8
REP 2A	383	350	8.6	421	402	4.5
REP 2B	294	284	3.4	342	310	9.4
REP 2C	316	298	5.7	254	253	3.9

TREATMENT:1% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	386	377	2.3	337	314	6.8
REP 1B	340	321	5.6	368	341	7.3
REP 1C	330	319	3.5	318	296	6.9
REP 2A	424	397	6.4	273	297	-8.8
REP 2B	313	308	1.6	392	388	1
REP 2C	296	297	-0.3	286	258	9.8

TREATMENT:3.2% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	327	302	7.6	320	308	3.8
REP 1B	410	403	1.7	356	349	2
REP 1C	319	292	8.5	307	309	0.7
REP 2A	344	321	6.7	383	369	3.7
REP 2B	367	367	0	426	421	1.2
REP 2C	298	315	-5.7	283	283	0

TREATMENT:10% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	388	392	-1	334	320	4.2
REP 1B	385	373	3.1	378	376	0.5
REP 1C	305	295	3.3	296	286	0.7
REP 2A	391	382	2.3	350	368	-5.1
REP 2B	408	402	1.2	417	400	4.3
REP 2C	346	343	0.9	296	276	6.8

TREATMENT:32% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	307	303	1.3	334	317	5
REP 1B	344	346	-0.6	379	373	1.6
REP 1C	337	329	2.4	350	347	0.9
REP 2A	401	408	-1.7	368	343	6.8
REP 2B	343	320	6.7	374	370	1.1
REP 2C	278	283	-1.8	279	269	3.7

TREATMENT:100% RP2

	MARKED			UNMARKED		
	BEFORE	AFTER	%LOSS	BEFORE	AFTER	%LOSS
REP 1A	363	347	4.4	390	387	0.8
REP 1B	383	381	0.5	354	358	-1.1
REP 1C	240	267	-11.3	308	326	-5.8
REP 2A	368	378	-2.7	292	311	-6.5
REP 2B	378	367	2.9	349	380	-8.9
REP 2C	240	250	-4.2	219	248	-13.2

Appendix 7.d.1.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY
SPECIES A. carinata

TREATMENT :CONTROL — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A						
REP 1B						
PERCENTILE DATA						
REP 1A						
REP 1B						
TOTAL	0	0	0	0	0	0
PERCENT.	0	0	0	0	0	0

TREATMENT :CONTROL — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A						
REP 2B						2
REP 2C						1
PERCENTILE DATA						
REP 2A						
REP 2B						5
REP 2C						5.3
TOTAL	0	0	0	0	0	3
PERCENT.	0	0	0	0	0	3.9

TREATMENT :1% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A						
REP 1B						
PERCENTILE DATA						
REP 1A						
REP 1B						
TOTAL	0	0	0	0	0	0
PERCENT.	0	0	0	0	0	0

TREATMENT :1% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A						
REP 2B						
REP 2C						
PERCENTILE DATA						
REP 2A						
REP 2B						
REP 2C						
TOTAL	0	0	0	0	0	0
PERCENT.	0	0	0	0	0	0

TREATMENT :3.2% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A						
REP 1B	1					
PERCENTILE DATA						
REP 1A						
REP 1B	9.1					
TOTAL	1	0	0	0	0	0
PERCENT.	3.6	0	0	0	0	0

TREATMENT :3.2% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A						
REP 2B						
PERCENTILE DATA						
REP 2A						
REP 2B						
TOTAL	0	0	0	0	0	0
PERCENT.	0	0	0	0	0	0

TREATMENT :10% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A						
REP 1B						
PERCENTILE DATA						
REP 1A						
REP 1B						
TOTAL	0	0	0	0	0	0
PERCENT.	0	0	0	0	0	0

TREATMENT :10% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A						
PERCENTILE DATA						
REP 2A						
TOTAL	0	0	0	0	0	0
PERCENT.	0	0	0	0	0	0

TREATMENT :100% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A				4		
PERCENTILE DATA						
REP 1A				100		
TOTAL				4		
PERCENT.				100		

Appendix 7.d.2.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY
SPECIES A. cummingii

TREATMENT: CONTROL — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A						
REP 1B	1		1			
REP 1C						
PERCENTILE DATA						
REP 1A	5.9		5.9			
REP 1B						
REP 1C						
TOTAL	1	0	1	0	0	0
PERCENT.	1.4	0	1.4	0	0	0

TREATMENT: CONTROL — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A						
REP 2B			4	5		
REP 2C						
PERCENTILE DATA						
REP 2A						
REP 2B			9.3	11.1		
REP 2C						
TOTAL	0	0	4	5	0	0
PERCENT.	0	0	4.1	5.1	0	0

TREATMENT: 1% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A					1	
REP 1B	1				2	
REP 1C		2			1	
PERCENTILE DATA						
REP 1A					2.1	
REP 1B	1.8				3.6	
REP 1C		3.9			2	
TOTAL	1	2	0	0	4	
PERCENT.	0.7	1.3	0	0	2.6	

TREATMENT: 1% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A			1	1		
REP 2B			3	2	1	
REP 2C						
PERCENTILE DATA						
REP 2A			2.5	2.5		
REP 2B			5.9	3.9	2	
REP 2C						
TOTAL	0	0	4	3	1	0
PERCENT.	0	0	3.2	2.4	0.8	0

TREATMENT: 3.2% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A			1			
REP 1B			1			
REP 1C		1		2		
PERCENTILE DATA						
REP 1A			7.7			
REP 1B			2.3			
REP 1C		2.6		5.3		
TOTAL	0	1	2	2	0	0
PERCENT.	0	1.1	2.1	2.1	0	0

TREATMENT: 3.2% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A	2		3			
REP 2B	1	1				
REP 2C			1	1		
PERCENTILE DATA						
REP 2A	8.7		1.3			
REP 2B	4.8	4.8				
REP 2C			5.9	5.9		
TOTAL	3	1	4	1	0	0
PERCENT.	4.9	1.6	6.6	1.6	0	0

TREATMENT: 10% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A		1	2			
REP 1B			1	1		
REP 1C	1					
PERCENTILE DATA						
REP 1A		7.1	1.4			
REP 1B			2.5	2.5		
REP 1C	4.8					
TOTAL	1	1	3	1	0	0
PERCENT.	1.3	1.3	4	1.3	0	0

TREATMENT: 10% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A				1		
REP 2B				1		
PERCENTILE DATA						
REP 2A				7.1		
REP 2B				7.1		
TOTAL	0	0	0	2	0	0
PERCENT.	0	0	0	7.1	0	0

TREATMENT: 32% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A	1		1			
REP 1B				1		
PERCENTILE DATA						
REP 1A	7.7		7.7			
REP 1B				5.6		
TOTAL	1	0	1	1	0	0
PERCENT.	3.2	0	3.2	3.2	0	0

TREATMENT: 32% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A						
PERCENTILE DATA						
REP 2A						
TOTAL	0	0	0	0	0	0
PERCENT.	0	0	0	0	0	0

TREATMENT: 100% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A						
PERCENTILE DATA						
REP 1A						
TOTAL	0	0	0	0	0	0
PERCENT.	0	0	0	0	0	0

Appendix 7.d.3.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT: DEVELOPMENTAL EMBRYONIC MORTALITY
SPECIES GLYPTOPHYSA SP.

TREATMENT: CONTROL — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A	2	4		2		
REP 1B	2		1	1		
REP 1C	9	7		1	3	
PERCENTILE DATA						
REP 1A	15.3	30.8		15.3		
REP 1B	22.2		11.1	11.1		
REP 1C	30	23.3		3.3	10	
TOTAL	13	11	1	4	3	0
PERCENT.	21.3	18	1.6	6.6	4.9	0

TREATMENT: CONTROL — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A		4		4	3	
REP 2B			2	1		
REP 2C		1	8		3	
PERCENTILE DATA						
REP 2A		9.8		9.8	7.3	
REP 2B			9.1	4.5		
REP 2C		4.5	36.4		13.6	
TOTAL	0	5	10	4	6	0
PERCENT.	0	5.3	10.5	4.2	6.3	0

TREATMENT: 1% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A	6	7	4	4		
REP 1B		9			1	
PERCENTILE DATA						
REP 1A	15.8	18.4	10.5			
REP 1B		26.5			2.9	
TOTAL	6	16	4	4	1	0
PERCENT.	8.3	22.2	5.6	5.6	1.4	0

TREATMENT: 1% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A					1	
REP 2B		5				
PERCENTILE DATA						
REP 2A					4.3	
REP 2B		17.9				
TOTAL	0	5	0	0	1	0
PERCENT.	0	9.8	0	0	2	0

TREATMENT: 3.2% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A		7			1	
REP 1B		1				3
REP 1C		11				
PERCENTILE DATA						
REP 1A		35			5	
REP 1B		9.1				27.3
REP 1C		100				
TOTAL	0	19	0	0	1	3
PERCENT.	0	45.2	0	0	2.4	7.1

TREATMENT: 3.2% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A						
REP 2B		6				
REP 2C						
PERCENTILE DATA						
REP 2A						
REP 2B		14.6				
REP 2C						
TOTAL	0	6	0	0	0	0
PERCENT.	0	9.4	0	0	0	0

TREATMENT: 10% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A						
REP 1B				1		
PERCENTILE DATA						
REP 1A				11.1		
REP 1B						
TOTAL	0	0	0	1	0	0
PERCENT.	0	0	0	4.3	0	0

TREATMENT: 10% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A		2	2	2		
REP 2B				1		
PERCENTILE DATA						
REP 2A		7.4	7.4	7.4		
REP 2B				2.9		
TOTAL	0	2	2	3	0	0
PERCENT.	0	3.3	3.3	4.9	0	0

TREATMENT: 32% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A	1				1	
PERCENTILE DATA						
REP 1A	3.7				3.7	
TOTAL	1	0	0	0	1	0
PERCENT.	3.7	0	0	0	3.7	0

TREATMENT: 100% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 1A			1	1		
PERCENTILE DATA						
REP 1A			14.3	14.3		
TOTAL	0	0	1	1	0	0
PERCENT.	0	0	14.3	14.3	0	0

TREATMENT: 100% RP2 — DEVELOPMENTAL STAGE — RAW DATA

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
REP 2A						
PERCENTILE DATA						
REP 2A						
TOTAL	0	0	0	0	0	0
PERCENT.	0	0	0	0	0	0

Appendix 7.e.1.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT: JUVENILE MORTALITY EXPECTED: FROM NUMBERS OF
SPECIES A. carinata NEONATES HATCHED

TREATMENT :CONTROL

		LIVING	DEAD	%MORT.
REP 1A	NOT SUIT.			
REP 1B		29	5	14.7
REP 1C		31	10	24.4
REP 2A		21	0	0
REP 2B		25	14	35.9
REP 2C		15	1	6.3

TREATMENT :1% RP2

		LIVING	DEAD	%MORT.
REP 1A		11	6	35.3
REP 1B	NONE LAID			
REP 1C		8	3	27.3
REP 2A		6	0	0
REP 2B		10	0	0
REP 2C		8	0	0

TREATMENT :3.2% RP2

		LIVING	DEAD	%MORT.
REP 1A		19	3	13.6
REP 1B		13	4	23.5
REP 1C		20	3	13
REP 2A		7	0	0
REP 2B	NOT SUIT.			
REP 2C		8	2	20

TREATMENT :10% RP2

		LIVING	DEAD	%MORT.
REP 1A	NONE LAID			
REP 1B		14	4	22.2
REP 1C		9	4	30.8
REP 2A	NOT SUIT.			
REP 2B		13	1	7.1
REP 2C	NOT SUIT.			

TREATMENT :32% RP2

		LIVING	DEAD	%MORT.
REP 1A	NONE LAID			
REP 1B	NONE LAID			
REP 1C	NONE LAID			
REP 2A	NOT SUIT.			
REP 2B	NONE LAID			
REP 2C	NONE LAID			

TREATMENT :100% RP2

		LIVING	DEAD	%MORT.
REP 1A	NONE LAID			
REP 1B	NONE LAID			
REP 1C	NONE LAID			
REP 2A	NONE LAID			
REP 2B	NONE LAID			
REP 2C	NOT SUIT.			

Appendix 7.e.2.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT:JUVENILE MORTALITY EXPECTED: FROM NUMBERS OF
SPECIES A.cumingii NEONATES HATCHED

TREATMENT:CONTROL

		LIVING	DEAD	%MORT.
REP 1A		13	4	23.5
REP 1B		30	5	14.3
REP 1C		17	0	0
REP 2A		35	1	2.8
REP 2B		25	0	0
REP 2C		27	1	3.6

TREATMENT:1% RP2

		LIVING	DEAD	%MORT.
REP 1A		42	4	8.7
REP 1B		52	0	0
REP 1C		42	6	12.5
REP 2A		32	6	15.8
REP 2B		36	8	18.2
REP 2C		33	1	2.9

TREATMENT:3.2% RP2

		LIVING	DEAD	%MORT.
REP 1A		10	2	16.7
REP 1B		41	2	4.7
REP 1C		33	2	5.7
REP 2A		16	2	11.1
REP 2B		16	3	15.8
REP 2C		13	2	13.3

TREATMENT:10% RP2

		LIVING	DEAD	%MORT.
REP 1A		11	0	0
REP 1B		36	3	7.7
REP 1C		21	0	0
REP 2A		13	0	0
REP 2B		12	1	7.7
REP 2C	NONE LAID			

TREATMENT:32% RP2

		LIVING	DEAD	%MORT.
REP 1A		11	0	0
REP 1B		14	3	17.6
REP 1C	NONE LAID			
REP 2A	NONE LAID			
REP 2B	NONE LAID			
REP 2C		8	1	11.1

TREATMENT:100% RP2

		LIVING	DEAD	%MORT.
REP 1A	NONE LAID			
REP 1B		12	3	20
REP 1C	NONE LAID			
REP 2A		9	6	40
REP 2B	NONE LAID			
REP 2C	NONE LAID			

Appendix 7.e.3.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT:JUVENILE MORTALITY EXPECTED: FROM NUMBERS OF
SPECIES GLYPTOPHYSA SP. NEONATES HATCHED

TREATMENT:CONTROL

		LIVING	DEAD	%MORT.
REP 1A		5	0	0
REP 1B		6	4	40
REP 1C		13	1	7.1
REP 2A		23	6	20.7
REP 2B		19	0	0
REP 2C		8	2	20

TREATMENT:1% RP2

		LIVING	DEAD	%MORT.
REP 1A		18	0	0
REP 1B		18	3	14.3
REP 1C		22	2	8.3
REP 2A		22	1	4.3
REP 2B	NONE LAID			
REP 2C		19	3	13.6

TREATMENT:3.2% RP2

		LIVING	DEAD	%MORT.
REP 1A		11	0	0
REP 1B		6	1	14.3
REP 1C	NOT SUIT.			
REP 2A		10	0	0
REP 2B		12	3	20
REP 2C		35	4	10.3

TREATMENT:10% RP2

		LIVING	DEAD	%MORT.
REP 1A		14	0	0
REP 1B	NOT SUIT.			
REP 1C		8	0	0
REP 2A	NOT SUIT.			
REP 2B		17	1	5.6
REP 2C		26	7	21.2

TREATMENT:32% RP2

		LIVING	DEAD	%MORT.
REP 1A	NONE LAID			
REP 1B	NONE LAID			
REP 1C		21	3	12.5
REP 2A	NONE LAID			
REP 2B	NONE LAID			
REP 2C	NONE LAID			

TREATMENT:100% RP2

		LIVING	DEAD	%MORT.
REP 1A		10	3	30
REP 1B	NONE LAID			
REP 1C	NONE LAID			
REP 2A	NONE LAID			
REP 2B		17	8	32
REP 2C	NONE LAID			

Appendix 7.f.1.

TRIAL #6 VALIDATION COMMENCED 12/4/91 PAGE 1
ENDPOINT:MORTALITY OF CONTROL REARED JUVENILES
SPECIES A. cummingii

TREATMENT:CONTROL

	LIVING	DEAD	%MORT.
REP 1A	6	4	40
REP 1B	9	1	10
REP 1C	10	0	0
REP 2A	5	5	50
REP 2B	10	0	0
REP 2C	8	2	2

TREATMENT:1% RP2

	LIVING	DEAD	%MORT.
REP 1A	9	1	10
REP 1B	9	1	10
REP 1C	9	1	10
REP 2A	6	4	40
REP 2B	9	1	10
REP 2C	3	7	70

TREATMENT:3.2% RP2

	LIVING	DEAD	%MORT.
REP 1A	8	2	20
REP 1B	8	2	20
REP 1C	10	0	0
REP 2A	4	6	60
REP 2B	9	1	10
REP 2C	9	1	10

TREATMENT:10% RP2

	LIVING	DEAD	%MORT.
REP 1A	10	0	0
REP 1B	7	3	30
REP 1C	8	2	20
REP 2A	9	1	10
REP 2B	7	3	30
REP 2C	8	2	20

TREATMENT:32% RP2

	LIVING	DEAD	%MORT.
REP 1A	10	0	0
REP 1B	9	1	10
REP 1C	8	2	20
REP 2A	5	5	50
REP 2B	6	4	40
REP 2C	8	2	20

TREATMENT:100% RP2

	LIVING	DEAD	%MORT.
REP 1A	9	1	10
REP 1B	10	0	0
REP 1C	10	0	0
REP 2A	10	0	0
REP 2B	10	0	0
REP 2C	8	2	2

Appendix 7.g.

TRIAL #6 VALIDATION COMMENCED 12/4/91
PHYSICO-CHEMICAL DATA

DISSOLVED OXYGEN mg/L

	TREATMENT											
	CON	CON	1%RP2	1%RP2	3.2%RP2	3.2%RP2	10%RP2	10%RP2	32%RP2	32%RP2	100%RP2	100%R
DAY1	7.6	7.6	7.8	7.6	7.8	7.8	7.7	7.7	7.7	7.9	8	[illegible]
DAY2	7.5	7.5	7.5	7.2	7.5	7.6	7.5	7.5	7.5	7.4	7.5	[illegible]
DAY3	7.6	7.5	7.5	7.5	7.4	7.5	7.4	7.3	7.2	7.4	7.5	[illegible]
DAY4	INSTRUMENT FAILURE											
DAY5												
DAY6												
DAY7												
DAY8	7.8	7.8	7.8	7.8	7.9	7.8	7.9	7.9	7.9	7.9	7.7	[illegible]
DAY9	7.8	7.9	7.8	7.8	7.8	7.7	7.8	7.7	7.8	7.7	7.7	[illegible]
DAY10	7.7	7.8	7.8	7.6	7.6	7.5	7.8	7.5	7.7	7.7	7.7	[illegible]
DAY11	7.8	7.7	7.7	7.8	7.8	7.7	7.7	7.7	7.7	7.7	7.4	[illegible]
DAY12	7.8	7.6	7.6	7.6	7.8	7.8	7.6	7.7	7.7	7.7	7.8	[illegible]
DAY13	7.7	7.7	7.8	7.8	7.8	7.8	7.5	7.8	7.9	7.9	7.9	[illegible]
DAY14	7.7	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	[illegible]
DAY15	7.7	7.8	7.8	7.7	7.7	7.8	7.8	7.8	7.9	7.8	7.8	[illegible]
DAY16	7.6	7.6	7.9	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.9	[illegible]
DAY17	7.7	7.7	7.8	7.8	7.8	7.7	7.7	7.7	7.7	7.9	7.9	[illegible]
DAY18	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.8	7.8	7.8	[illegible]

pH

	CON	CON	1%RP2	1%RP2	3.2%RP2	3.2%RP2	10%RP2	10%RP2	32%RP2	32%RP2	100%RP2	100%R
DAY1	6	6.18	6.24	5.29	6.3	5.4	5.43	5.63	6.79	5.59	5.7	[illegible]
DAY2	6.26	6.34	6.46	5.71	6.33	6.26	5.38	6.67	6.73	5.8	5.58	[illegible]
DAY3	6.32	6.54	6.52	6.81	6.72	5.76	5.69	6.88	7.9	7.03	7.2	[illegible]
DAY4	INSTRUMENT FAILURE											
DAY5												
DAY6												
DAY7												
DAY8	6	5.87	5.95	5.91	6.02	5.96	6.14	6.25	6.45	6.25	6.71	[illegible]
DAY9	6.41	6.14	6.44	6.62	6.85	6.93	6.93	7.17	7.2	7.26	7.57	[illegible]
DAY10	6.36	6.61	6.72	5.72	7.04	7.12	7.14	7.32	7.33	7.46	7.8	[illegible]
DAY11	5.26	6.63	6.85	5.91	6.94	7.02	7.1	7.34	7.42	7.5	7.55	[illegible]
DAY12	5.89	6.45	5.7	5.81	7.02	7.15	7.07	7.47	7.64	7.67	7.78	[illegible]
DAY13	6.22	6.2	6.16	6.3	6.84	7.2	7.01	7.15	7.45	7.5	7.67	[illegible]
DAY14	6.38	6.45	6.51	6.74	6.65	6.78	6.85	7.07	7.1	7.43	7.35	[illegible]
DAY15	6.32	6.45	6.62	6.78	6.7	6.8	6.77	6.9	6.97	7.12	7.43	[illegible]
DAY16	6.51	6.4	6.29	6.42	6.43	6.54	6.64	6.72	6.87	7.03	7.33	[illegible]
DAY17	6.71	6.54	6.62	6.68	6.64	6.78	6.96	7.01	6.95	7.1	7.28	[illegible]
DAY18	6.48	6.72	6.82	6.79	6.76	6.82	6.82	6.99	7.13	7.13	7.33	[illegible]

CONDUCTIVITY uSem/cm

	CON	CON	1%RP2	1%RP2	3.2%RP2	3.2%RP2	10%RP2	10%RP2	32%RP2	32%RP2	100%RP2	100%R
DAY1	25.7	26	38.6	39.3	71.9	72.2	167	166	420	423	1050	1050
DAY2	34.4	29.6	46.3	44.1	76.5	75.6	177	174	421	433	1100	1100
DAY3	33.8	24.2	43.6	41.2	70.8	74.7	171	168	421	420	1070	1070
DAY4	INSTRUMENT FAILURE											
DAY5												
DAY6												
DAY7												
DAY8	52.2	43.6	56.1	53.2	82.2	79.4	176	179	457	434	1110	1110
DAY9	21.9	20.1	34.9	36.2	73.7	71.2	171	172	461	438	1120	1120
DAY10	20.4	21.6	38.1	40.8	72.7	72.6	177	171	446	441	1140	1140
DAY11	21.7	24.7	37	37.8	70.2	75.7	179	175	448	442	1140	1150
DAY12	22.4	28.5	35.8	37.1	70.4	79.1	176	178	449	441	1140	1140
DAY13	25.8	31	39.9	41.5	70.7	83.7	170	176	430	423	1080	1080
DAY14	24.5	25.1	38.1	37.3	70.3	76.4	172	173	430	426	1050	1050
DAY15	22.7	22.5	35.6	25.7	70.7	69.9	172	173	441	434	1120	1120
DAY16	20.7	21.9	35.6	55.3	68.4	68	166	169	438	429	1110	1130
DAY17	21.1	26	34.7	34.1	71.7	68.2	177	175	449	447	1090	1090
DAY18	19.7	21.9	35.1	34.4	67.2	67.2	162	171	430	428	1090	1100

Appendix 8.a.1.

TRIAL #7 COMMENCED 2/5/91 RP2-URANIUM COMPARISON
ENDPOINT: DAILY EGG MASS PRODUCTION RAW DATA
SPECIES: A. carinata

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	2	2	1	1	1	2
DAY2	0	0	1	2	0	1
DAY3	0	1	0	0	1	0
DAY4	1	1	1	2	1	2
DAY5	0	0	1	1	0	1

TREATMENT :1% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	4	2	2	3	3	4
DAY2	1	1	1	0	0	0
DAY3	1	0	0	0	2	0
DAY4	0	2	1	2	2	1
DAY5	2	0	0	1	1	0

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	2
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0

TREATMENT :10% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	3	1	1	2	3	2
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	1	0
DAY4	0	1	1	0	0	0
DAY5	0	0	1	0	0	0

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	1	1	0	1	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	1	1	0	0	0	0
DAY5	0	1	0	0	0	0

TREATMENT :32% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	1	1	2
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0

TRIAL #7 COMMENCED 2/5/91 RP2-URANIUM COMPARISON
ENDPOINT: DAILY TOTAL EGG PRODUCTION RAW DATA
SPECIES: A. carinata

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	24	8	11	21	11	27
DAY2	0	0	9	22	0	8
DAY3	0	10	0	0	10	0
DAY4	18	5	12	27	11	22
DAY5	0	0	9	13	0	10

TREATMENT :1% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	28	10	0	22	13	34
DAY2	12	0	0	0	0	0
DAY3	26	0	0	0	39	0
DAY4	0	13	0	8	3	11
DAY5	14	0	0	7	0	0

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	28
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0

TREATMENT :10% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	12	12	16	0	12
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	12	10	0	0	0
DAY5	0	0	12	0	0	0

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	11	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	5	11	0	0	0	0
DAY5	0	0	0	0	0	0

TREATMENT :32% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	19	16	29
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0

Appendix 8.a.2.

TRIAL #7 COMMENCED 2/5/91 RP2-URANIUM COMPARISON
ENDPOINT: DAILY EGG MASS PRODUCTION RAW DATA
SPECIES: A. cummingii

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	2	3	3	1	1	2
DAY2	2	2	2	1	1	2
DAY3	0	2	3	1	2	2
DAY4	3	1	2	4	2	1
DAY5	3	2	1	2	2	2

TREATMENT :1% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	2	2	3	2	1	0
DAY2	0	0	1	2	2	2
DAY3	2	0	2	0	0	1
DAY4	1	2	1	2	4	2
DAY5	2	3	2	3	3	2

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	2	1	0	2	1	1
DAY2	1	0	0	2	0	0
DAY3	0	0	0	0	0	0
DAY4	0	1	1	0	1	1
DAY5	0	0	0	2	2	0

TREATMENT :10% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	1	2	4	2	2	2
DAY2	1	2	1	3	0	0
DAY3	0	0	1	0	1	0
DAY4	2	1	0	0	0	1
DAY5	1	1	0	1	0	1

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	2	0	1	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	1	0	0	0	0	0

TREATMENT :32% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	1	1	4	0	0	0
DAY4	1	0	0	0	0	0
DAY5	0	0	0	0	0	0

TRIAL #7 COMMENCED 2/5/91 RP2-URANIUM COMPARISON
ENDPOINT: DAILY TOTAL EGG PRODUCTION RAW DATA
SPECIES: A. cummingii

TREATMENT :1% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	31	53	36	20	16	31
DAY2	33	38	23	22	18	28
DAY3	0	44	38	23	31	26
DAY4	59	22	28	56	26	14
DAY5	25	30	11	31	29	31

TREATMENT :1% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	29	35	53	28	20	0
DAY2	0	0	15	28	19	35
DAY3	35	0	30	0	0	12
DAY4	30	33	20	34	77	26
DAY5	20	36	38	33	57	50

TREATMENT :10% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	22	17	0	32	15	10
DAY2	13	0	0	35	0	0
DAY3	0	0	0	0	0	0
DAY4	0	18	6	0	15	4
DAY5	0	0	0	23	35	0

TREATMENT :10% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	22	32	48	36	33	33
DAY2	24	26	0	33	0	0
DAY3	0	0	9	0	18	0
DAY4	37	13	0	0	0	18
DAY5	13	9	0	16	0	18

TREATMENT :32% RP2

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	19	0	14	0	0	0
DAY2	0	0	0	0	0	0
DAY3	0	0	0	0	0	0
DAY4	0	0	0	0	0	0
DAY5	6	0	0	0	0	0

TREATMENT :32% U

		REP 1			REP 2	
SAMPLE	A	B	C	A	B	C
DAY1	0	0	0	0	0	0
DAY2	0	0	0	0	0	0
DAY3	19	16	29	0	0	0
DAY4	0	0	0	0	0	0
DAY5	0	0	0	0	0	0

Appendix 8.b.1.

TRIAL #7 COMMENCED 1/5/91 RP2-URANIUM COMPARISON
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES: A. carinata

TREATMENT: 1% RP2 REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6 15					
DAY5					6 14	
DAY6					5 14	
DAY7						5 14

TREATMENT: 1% RP2 REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10					
DAY4				10		
DAY5					10	
DAY6					10	
DAY7					10	
DAY8						10

TREATMENT: 1% RP2 REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
DAY5					11	
DAY6					11	
DAY7					11	
DAY8						11

TREATMENT: 1% RP2 REPLICATE 2A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	17					
DAY4				15		
DAY5					15	
DAY6					15	
DAY7					15	
DAY8					15	
DAY9						15

TREATMENT: 1% RP2 REPLICATE 2B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
DAY5					11	
DAY6					INFECTED	
DAY7					DEAD	

TREATMENT: 1% RP2 REPLICATE 2C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13 14					
DAY5					13 14	
DAY6					13 14	
DAY7					13 14	
DAY8						13 14

TREATMENT: 1% U REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12					
DAY5					11	
DAY6					11	
DAY7						11

TREATMENT: 1% U REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
DAY3			13			
DAY4					13	
DAY5					13	
DAY6					13	
DAY7					13	
DAY8					13	
DAY9					13	
DAY10						13

TREATMENT: 1% U REPLICATE 2A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8 8 6					
DAY5					8 8 6	
DAY6					INFECTED INFECTED INFECTED	
DAY7					DEAD DEAD DEAD	

TREATMENT: 1% U REPLICATE 2C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
DAY5					13	
DAY6					10	
DAY7						[illegible]

TREATMENT: 10% RP2 REPLICATE 1 NO EGGS LAID

TREATMENT: 10% RP2 REPLICATE 2C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10 18					
DAY5					10 18	
DAY6					10 18	
DAY7					10 18	
DAY8						10 18

TREATMENT: 10% U REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12					
DAY5						
DAY6					12	
DAY7					12	
DAY8						12

TREATMENT: 10% U REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12					
DAY6					12	
DAY7						12

TREATMENT: 10% U REPLICATE 2C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12					
DAY6					12	
DAY7					12	
DAY8						12

TREATMENT: 32% RP2 REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13 8					
DAY4				13 8		
DAY5					13 8	
DAY6					13 8	
DAY7						13 8

TREATMENT: 32% RP2 REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14					
DAY3				14		
DAY4					14	
DAY5					14	
DAY6					14	
DAY7						14

TREATMENT: 32% RP2 REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	19 26 10					
DAY4					19 24 10	
DAY5					18 24 9	
DAY6					18 24 9	
DAY7						18 24 9

TREATMENT: 32% RP2 REPLICATE 2A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13 9					
DAY4						
DAY5					13 9	
DAY6					13 9	
DAY7						13 9

TREATMENT: 32% RP2 REPLICATE 2B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7 20 7					
DAY5					7 20 7	
DAY6					7 20 7	
DAY7						7 20
						7

TREATMENT: 32% RP2 REPLICATE 2C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	15 18					
DAY3				15 18		
DAY4					14 18	
DAY5					14 18	
DAY6					12 18	
DAY7						12 18

TREATMENT: 32% U REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	9 10					
DAY4				9 10		
DAY5					9 10	
DAY6					9 10	
DAY7					9 10	
DAY8						9 10

TREATMENT: 32% U REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12					
DAY3				12		
DAY4					12	
DAY5					12	
DAY6					12	
DAY7					12	
DAY8						12

TREATMENT: 32% U REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11 12					
DAY3				11 12		
DAY4					11 12	
DAY5					11 12	
DAY6					11 12	
DAY7					11 12	
DAY8						11 12

TREATMENT: 32% U REPLICATE 2A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	7 11					
DAY4				7 11		
DAY5					7 11	
DAY6					7 11	
DAY7						7 11

TREATMENT: 32% U REPLICATE 2B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11 11					
DAY3		11 10				
DAY4				11 10		
DAY5				11 10		
DAY6					11 10	
DAY7					11 10	
DAY8					10 10	
DAY9						10 10

TREATMENT: 32% U REPLICATE 2C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12					
DAY3			12			
DAY4				12		
DAY5				12		
DAY6				(12) →		
DAY7				(12) →		
DAY8					(12) →	

Appendix 8.b.2.

TRIAL #7 COMMENCED 1/5/91 RP2-URANIUM COMPARISON
ENDPOINT: DEVELOPMENTAL CHARACTERISTICS PAGE 1
SPECIES: A. cummingii

TREATMENT: 1% RP2 REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13 20					
DAY5			12 20			
DAY6				11 19		
DAY7					11 19	
DAY8					11 19	
DAY9						11 19

TREATMENT: 1% RP2 REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16 22					
DAY5				12 18		
DAY6					11 18	
DAY7					11 18	
DAY8					11 18	
DAY9						11 18

TREATMENT: 1% RP2 REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	8 15					
DAY5			7	15		
DAY6				7	15	
DAY7					7 15	
DAY8					7 15	
DAY9						7 15

TREATMENT: 1% RP2 REPLICATE 2A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	12 22					
DAY4		12		22		
DAY5				12	22	
DAY6					12 22	
DAY7					12 22	
DAY8						12 22

TREATMENT: 1% RP2 REPLICATE 2B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	18					
DAY5				18		
DAY6					18	
DAY7					18	
DAY8					18	
DAY9						18

TREATMENT: 1% RP2 REPLICATE 2C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16					
DAY5					15	
DAY6					15	
DAY7					15	
DAY8						15

TREATMENT: 1% U REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14					
DAY5					10	
DAY6					10	
DAY7					10	
DAY8						10

TREATMENT: 1% RP2 REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	19					
DAY4					18	
DAY5					18	
DAY6					18	
DAY7					18	
DAY8						18

TREATMENT: 1% RP2 REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16 15					
DAY5					16 14	
DAY6					13 14	
DAY7					13 14	
DAY8						13 14

TREATMENT: 1% U REPLICATE 2A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13 15					
DAY4				11 14		
DAY5					11 14	
DAY6					11 14	
DAY7					11 14	
DAY8						11 14

TREATMENT: 1% U REPLICATE 2B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	20					
DAY4				14		
DAY5				INFECTED		
DAY6				DEAD		

TREATMENT: 1% U REPLICATE 2C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	19 16					
DAY4			19	16		
DAY5				INFECTED INFECTED		
DAY6				DEAD DEAD		

TREATMENT: 10% RP2 REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
DAY5				13		
DAY6					13	
DAY7					13	
DAY8					13	
DAY9						13

TREATMENT: 10% RP2 REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	17					
DAY6					16	
DAY7					16	
DAY8						15

TREATMENT: 10% RP2 REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	6					
DAY5		6				
DAY6			6			
DAY7				6		
DAY8					6	
DAY9					5	
DAY10					5	
DAY11					5	
DAY12						5

TREATMENT: 10% RP2 REPLICATE 1D CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	24					
DAY2	22					
DAY3		20				
DAY4			20			
DAY5				19		
DAY6					19	
DAY7					18	
DAY8						18

TREATMENT: 10% RP2 REPLICATE 1E CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	22					
DAY3		19				
DAY4		19				
DAY5				19		
DAY6				19		
DAY7					17	
DAY8						17

TREATMENT: 10% RP2 REPLICATE 1F CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	18					
DAY3		16				
DAY4				16		
DAY5				2	14	
DAY6					16	
DAY7					16	
DAY8						16

TREATMENT: 10% RP2 REPLICATE 2A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16					
DAY6					14	
DAY7					14	
DAY8						14

TREATMENT: 10% RP2 REPLICATE 2B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	15					
DAY6					12	
DAY7					12	
DAY8						12

TREATMENT: 10% RP2 REPLICATE 2D CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	30					
DAY3		30				
DAY4		29				
DAY5			25			
DAY6			11			
DAY7			INFECTED			
DAY8			DEAD			

TREATMENT: 10% RP2 REPLICATE 2E CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16					
DAY3		14				
DAY4		12				
DAY5			12			
DAY6			INFECTED			
DAY7			DEAD			

TREATMENT: 10% RP2 REPLICATE 2F CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16					
DAY3		13				
DAY4		12				
DAY5			10			
DAY6			INFECTED			
DAY7			DEAD			

TREATMENT: 10% U REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	22					
DAY6					22	
DAY7					22	
DAY8						22

TREATMENT: 10% U REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13 16					
DAY6					13 16	
DAY7					13 16	
DAY8						13 16

TREATMENT: 10% U REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	15 16					
DAY6					15 16	
DAY7					15 16	
DAY8						15 16

TREATMENT: 10% U REPLICATE 1D CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
DAY3		11				
DAY4		10				
DAY5			10			
DAY6				9		
DAY7				3		
DAY8					3	
DAY9						3

TREATMENT: 10% U REPLICATE 1E CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	23					
DAY3		23				
DAY4			23			
DAY5				23		
DAY6				23		
DAY7					21	
DAY8					21	
DAY9						21

TREATMENT: 10% U REPLICATE 1F CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	20					
DAY3		19				
DAY4			19			
DAY5				18		
DAY6					18	
DAY7					18	
DAY8						18

TREATMENT: 10% U REPLICATE 2A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	21 15					
DAY6					15 13	
DAY7					15 13	
DAY8						15 13

TREATMENT: 10% U REPLICATE 2B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	18 17					
DAY6					15 14	
DAY7					15 14	
DAY8						15 [illegible]

TREATMENT:10% U REPLICATE 2C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	18 15					
DAY6					18 15	
DAY7					18 15	
DAY8						18 15

TREATMENT:10% U REPLICATE 2D CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16					
DAY3		15				
DAY4			13			
DAY5				4		
DAY6				DEAD		

TREATMENT:10% U REPLICATE 2E CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	33					
DAY3		16				
DAY4		13				
DAY5				13		
DAY6				5	7	
DAY7					12	
DAY8					11	
DAY9						11

TREATMENT:10% U REPLICATE 2F CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	26					
DAY3		24				
DAY4		23				
DAY5				23		
DAY6					23	
DAY7					23	
DAY8					23	
DAY9						23

TREATMENT:32% RP2 REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	13					
DAY6				13		
DAY7					13	
DAY8					13	
DAY9					13	
DAY10					13	
DAY11						13

TREATMENT:32% RP2 REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	14					
DAY6					14	
DAY7					14	
DAY8						14

TREATMENT:32% RP2 REPLICATE 1D CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	19					
DAY2	19					
DAY3		19				
DAY4				19		
DAY5					19	
DAY6					19	
DAY7					19	
DAY8						19

TREATMENT:32% RP2 REPLICATE 1E CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	17					
DAY2	17					
DAY3		17				
DAY4			17			
DAY5					16	
DAY6					16	
DAY7					16	
DAY8					16	
DAY9					16	
DAY10						16

TREATMENT:32% RP2 REPLICATE 1F CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	27					
DAY2	24					
DAY3		24				
DAY4				23		
DAY5					23	
DAY6					23	
DAY7					23	

TREATMENT:32% RP2 REPLICATE 2D CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	21					
DAY2	20					
DAY3	20					
DAY4		20				
DAY5				20		
DAY6				5	14	
DAY7					19	
DAY8					19	
DAY9						19

TREATMENT:32% RP2 REPLICATE 2E CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	29					
DAY2	29					
DAY3		29				
DAY4			28			
DAY5					29	
DAY6					19	
DAY7					29	
DAY8						29

TREATMENT:32% RP2 REPLICATE 2F CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
DAY2	10					
DAY3		10				
DAY4		10				
DAY5		5		5		
DAY6					3	
DAY7					3	
DAY8					3	
DAY9						3

TREATMENT:32% U REPLICATE 1A

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	19					
DAY4					18	
DAY5					18	
DAY6						18

TREATMENT:32% U REPLICATE 1B

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16					
DAY4					16	
DAY5					16	
DAY6						16

TREATMENT:32% U REPLICATE 1C

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	18 11					
DAY4					4 18	
DAY5					4 10	
DAY6					4 6	
DAY7					4 6	
DAY8					4 6	
DAY9					4 6	
DAY10					4 5	
DAY11						4 6

TREATMENT: 32% U REPLICATE 1D CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	10					
DAY2	10					
DAY3		10				
DAY4			10			
DAY5					7	
DAY6					BREAKDOWN	
DAY7					DEAD	

TREATMENT: 32% U REPLICATE 1E CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	18					
DAY2	17					
DAY3		17				
DAY4			13			
DAY5					9	
DAY6					BREAKDOWN	
DAY7					DEAD	

TREATMENT: 32% U REPLICATE 1F CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	17					
DAY2	17					
DAY3		17				
DAY4			17			
DAY5					BREAKDOWN	
DAY6					BREAKDOWN	
DAY7					9	
DAY8					7	
DAY9						7

TREATMENT: 32% U REPLICATE 2D CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	16					
DAY2	16					
DAY3		16				
DAY4				16		
DAY5					15	
DAY6					13	
DAY7					11	
DAY8						11

TREATMENT: 32% U REPLICATE 2E CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	11					
DAY2						
DAY3		11				
DAY4			11			
DAY5				7		
DAY6					2	
DAY7					1	
DAY8					0	

TREATMENT: 32% U REPLICATE 2F CONTROL LAID

	GASTRULA	TROCH	VEL	HIPPO	H'LING	N'NATE
DAY1	17					
DAY2						
DAY3		17				
DAY4			11			
DAY5					7	
DAY6					7	
DAY7					6	
DAY8						6

Appendix 8.c.1.

TRIAL #7 COMMENCED 1/5/91 RP2-URANIUM COMPARISON
ENDPOINT: CONTROL REARED JUVENILE MORTALITY PAGE 1
SPECIES: A. carinata 10 INDIVIDUALS PER SAMPLE

TREATMENT: 1% RP2	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	100	70
REP1B	100	70
REP2A	80	80
REP2B	100	70

TREATMENT: 1% U	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	100	100
REP1B	90	100
REP2A	100	100
REP2B	100	100

TREATMENT: 10% RP2	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	100	40
REP1B	100	100
REP2A	70	80
REP2B	40	80

TREATMENT: 10% U	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	100	100
REP1B	100	100
REP2A	100	100
REP2B	90	100

TREATMENT: 32% RP2	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	40	100
REP1B	80	90
REP2A	20	60
REP2B	40	60

TREATMENT: 32% U	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	100	100
REP1B	100	100
REP2A	100	100
REP2B	100	100

Appendix 8.c.2.

TRIAL #7 COMMENCED 1/5/91 RP2-URANIUM COMPARISON
ENDPOINT: CONTROL REARED JUVENILE MORTALITY PAGE 1
SPECIES: A. cumingii 10 INDIVIDUALS PER SAMPLE

TREATMENT: 1% RP2	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	0	40
REP1B	0	30
REP2A	30	30
REP2B	10	20

TREATMENT: 1% U	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	10	30
REP1B	10	30
REP2A	0	10
REP2B	30	10

TREATMENT: 10% RP2	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	30	20
REP1B	20	20
REP2A	10	10
REP2B	0	0

TREATMENT: 10% U	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	20	60
REP1B	20	10
REP2A	30	60
REP2B	20	60

TREATMENT: 32% RP2	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	10	20
REP1B	0	50
REP2A	60	50
REP2B	50	80

TREATMENT: 32% U	2 DAY EXPOSURE %MORT	4 DAY EXPOSURE %MORT
REP1A	70	100
REP1B	90	100
REP2A	80	100
REP2B	90	100

Appendix 8.d.1.

TRIAL #7 COMMENCED 1/5/91 RP2-URANIUM COMPARISON
ENDPOINT: JUVENILE MORTALITY EXPOSED EGG MASS PAGE 1
SPECIES: A. carinata

TREATMENT: 1% RP2	LIVING	DEAD	%MORT
REP1A	19	0	0
REP1B	10	0	0
REP1C	6	5	45.5
REP2A	15	0	0
REP2B	INFECTED		
REP2C	17	10	37

TREATMENT: 1% U	LIVING	DEAD	%MORT
REP1A	9	2	18.2
REP1B	11	1	91.7
REP1C	NOT SUIT.		
REP2A	INFECTED		
REP2B	NOT SUIT.		
REP2C	0	7	100

TREATMENT: 10% RP2	LIVING	DEAD	%MORT
REP1A	NONE LAID		
REP1B	NONE LAID		
REP1C	NONE LAID		
REP2A	NONE LAID		
REP2B	NONE LAID		
REP2C	14	14	50

TREATMENT: 10% U	LIVING	DEAD	%MORT
REP1A	NOT SUIT		
REP1B	10	2	16.7
REP1C	3	9	75
REP2A	NOT SUIT.		
REP2B	NOT SUIT.		
REP2C	5	7	58.3

TREATMENT: 32% RP2	LIVING	DEAD	%MORT
REP1A	NONE LAID		
REP1B	14	1	6.7
REP1C	NOT SUIT.		
REP2A	NONE LAID		
REP2B	NOT SUIT.		
REP2C	NONE LAID		

TREATMENT: 32% U	LIVING	DEAD	%MORT
REP1A	NONE LAID		
REP1B	NONE LAID		
REP1C	NONE LAID		
REP2A	NOT SUIT.		
REP2B	NOT SUIT.		
REP2C	NOT SUIT.		

TREATMENT: 32% RP2	LIVING	DEAD	%MORT
REP1D	20	1	4.8
REP1E	12	2	14.3
REP1F	35	16	31.4
REP2D	18	4	18.2
REP2E	34	0	0
REP2F	26	4	13.3

TREATMENT: 32% U	LIVING	DEAD	%MORT
REP1D	0	19	100
REP1E	0	12	100
REP1F	0	23	100
REP2D	0	19	100
REP2E	0	20	100
REP2F	0	12	100

Appendix 8.d.2.

TRIAL #7 COMMENCED 1/5/91 RP2-URANIUM COMPARISON
ENDPOINT: JUVENILE MORTALITY EXPOSED EGG MASS PAGE 1
SPECIES: A cumingii

TREATMENT: 1% RP2

	LIVING	DEAD	%MORT
REP1A	26	4	13.3
REP1B	26	3	10.3
REP1C	21	1	4.5
REP2A	29	5	13.9
REP2B	16	2	11.1
REP2C	13	2	13.3

TREATMENT: 1% U

	LIVING	DEAD	%MORT
REP1A	10	0	0
REP1B	17	0	0
REP1C	27	0	0
REP2A	8	17	68
REP2B	INFECTED		
REP2C	INFECTED		

TREATMENT: 10% RP2

	LIVING	DEAD	%MORT
REP1A	13	0	0
REP1B	14	2	12.5
REP1C	3	2	40
REP2A	20	9	31
REP2B	7	5	41.7
REP2C	NOT SUIT.		

TREATMENT: 10% U

	LIVING	DEAD	%MORT
REP1A	0	22	100
REP1B	13	16	55.2
REP1C	18	10	35.7
REP2A	14	14	50
REP2B	13	16	55.2
REP2C	18	15	45.5

TREATMENT: 32% RP2

	LIVING	DEAD	%MORT
REP1A	13	0	0
REP1B	NONE LAID		
REP1C	12	2	14.3
REP2A	NONE LAID		
REP2B	NONE LAID		
REP2C	NONE LAID		

TREATMENT: 32% U

	LIVING	DEAD	%MORT
REP1A	3	10	76.9
REP1B	0	9	100
REP1C	1	8	12.5
REP2A	NONE LAID		
REP2B	NONE LAID		
REP2C	NONE LAID		

Appendix 8.e.1.

TRIAL #7 COMMENCED 1/5/91 RP2-URANIUM COMPARISON
ENDPOINT: JUVENILE MORTALITY CONTROL EGG MASS PAGE 2
SPECIES: A. cumingii

TREATMENT: 10% RP2

	LIVING	DEAD	%MORT
REP1D	13	5	27.8
REP1E	9	8	47.1
REP1F	13	3	18.8
REP2D	BREAKDOWN		
REP2E	BREAKDOWN		
REP2F	BREAKDOWN		

TREATMENT: 10% U

	LIVING	DEAD	%MORT
REP1D	3	0	0
REP1E	16	5	23.8
REP1F	2	26	92.9
REP2D	INFECTED		
REP2E	10	1	9.1
REP2F	19	4	17.4

TREATMENT: 32% RP2

	LIVING	DEAD	%MORT
REP1D	16	3	15.8
REP1E	13	4	23.5
REP1F	20	3	13
REP2D	NOT SUIT.		
REP2E	20	9	31
REP2F	3	3	0

TREATMENT: 32% U

	LIVING	DEAD	%MORT
REP1D	BREAKDOWN		
REP1E	BREAKDOWN		
REP1F	0	7	100
REP2D	0	7	100
REP2E	BREAKDOWN		
REP2F	0	9	100

Appendix 8.f.

TRIAL #7 COMMENCED 2/5/91 RP2-URANIUM COMPARISON
PHYSICO-CHEMICAL DATA

DISSOLVED OXYGEN mg/L INSTRUMENT OVERHAUL

pH

	TREATMENT											
	1%RP2	1%RP2	10%RP2	10%RP2	32%RP2	32%RP2	1%U	1%U	10%U	10%U	32%U	32
DAY1	6.63	6.63	6.25	6.4	7.05	7.17	5.48	5.72	7.09	6.91	6.74	6.
DAY2	6.12	6.62	6.41	6.62	6.73	6.87	6.81	6.85	7.17	7.07	7.59	7.
DAY3	6.05	6.09	6.02	6.27	6.3	6.55	6.21	6.38	6.8	6.66	7.09	6.
DAY4	5.92	5.94	6.16	6.54	6.5	6.64	6.38	6.4	7.05	6.37	6.73	6.
DAY5	6.22	6.41	6.25	6.38	6.62	6.77	6.23	6.28	6.25	6.28	7.33	7.
DAY6	6.15	6.28	6.18	6.28	6.55	6.68	6.27	6.3	6.48	6.37	6.83	6.7
DAY7	6.12	6.38	6.3	6.37	6.43	6.78	6.37	6.45	6.62	6.47	7.11	7.
DAY8	6.11	6.24	6.07	6.16	6.51	6.75	6.07	6.38	6.14	6.26	6.96	6.
DAY9	6.09	6.28	6.2	6.26	6.94	6.91	6.5	6.8	6.53	6.54	7.2	7.
DAY10	5.9	6.29	6.42	6.51	6.59	6.8	6.35	6.6	6.66	6.45	7.08	7.0
DAY11	6.21	6.5	6.4	6.48	7.07	7.03	6.62	6.39	6.48	6.55	7.07	6.7
DAY12	6.28	6.28	6.29	6.22	6.57	6.69	6.51	6.45	6.39	6.31	7	7.0
DAY13	6.17	6.19	6.37	6.4	6.81	6.75	6.19	6.16	6.41	6.35	6.86	6.7
DAY14	6.25	6.38	6.5	6.54	6.75	6.89	6.34	6.52	6.54	6.63	7.01	6.7
DAY15	6.04	6	6.36	6.37	6.61	6.71	7.01	6.72	6.95	6.65	6.94	6.

TRIAL #7 COMMENCED 2/5/91 RP2-URANIUM COMPARISON
PHYSICO-CHEMICAL DATA

CONDUCTIVITY uSem/cm

	TREATMENT											
	1%RP2	1%RP2	10%RP2	10%RP2	32%RP2	32%RP2	1%U	1%U	10%U	10%U	32%U	32%
DAY1	39.2	44.9	170	176	450	453	26.7	23.9	25.8	23.8	32.2	34.7
DAY2	49.2	47.8	174	178	455	458	34.1	27.5	31	29.5	30.4	22.
DAY3	39.7	47.8	171	185	458	460	34	20.7	23.7	22.6	24.7	23.
DAY4	39.6	44.4	169	177	457	461	21.6	26.1	23.9	23.2	24.4	23.
DAY5	42.1	40	172	176	457	461	23.7	23.9	22.1	26.3	28.9	24.7
DAY6	41	41.7	171	177	457	460	24.3	22.7	22.7	23.1	26.2	24.9
DAY7	40.9	43.1	175	177	467	454	23.1	27.2	20.6	23.5	20.7	20.1
DAY8	41.9	41.7	181	176	465	461	24.4	20.6	19.7	22.6	19.6	19.4
DAY9	44.3	41.1	174	181	466	466	23.3	20.6	19.6	24.8	19.7	19.9
DAY10	41.2	39.4	175	177	472	474	23.7	19.5	18.8	24.6	19.5	19.1
DAY11	40.3	39.9	173	186	468	464	24.4	18.7	18.9	29.6	19.2	18.9
DAY12	72.3	70.7	174	179	460	461	22.9	18.8	19.3	23.7	20.7	20
DAY13	42.4	42	171	172	474	475	21	19.3	19.9	19.7	21.5	19.8
DAY14	40.2	40.7	177	172	469	469	21.2	20.5	23.2	22.6	20.1	18.8
DAY15	36.2	35.5	166	168	463	456	23.4	17.7	19.8	20.6	18.1	19.3

Appendix 9.a.1

GENETIC VARIATION
ENDPOINT: EMBRYONIC AND JUVENILE MORT   PAGE 1
SPECIES A. carinata   SAMPLES FROM KNOWN PAIRS

	DEV. TIME (DAYS)	EGG Nos.	Nos. HATCH	Nos. SURV.	%HATCH /LAID	%SURV. /HATCH	%SURV. /LAID
REP 1							
SAMPLE 1	8	20	7	4	35	57.1	16
2	8	10	10	8	100	80	80
3	8	9	9	9	100	100	100
REP 2							
SAMPLE 1	8	14	14	5	100	35.7	35.7
2	8	8	8	8	100	100	100
3	8	9	8	6	88.9	75	66.7
4	6	15	15	9	100	60	60
REP 3							
SAMPLE 1	7	22	22	17	100	77.3	77.3
2	7	9	9	4	100	44.4	44.4
3	7	25	25	22	100	88	88
REP 4							
SAMPLE 1	8	15	6	5	40	83.3	33.3
2	7	9	9	5	100	77.8	77.8
3	7	8	8	6	100	75	75
4	7	4	4	4	100	100	100

Appendix 9.a.2

SPECIES A. cummingii

	DEV. TIME (DAYS)	EGG Nos.	Nos. HATCH	Nos. SURV.	%HATCH /LAID	%SURV. /HATCH	%SURV. /LAID
REP 1							
SAMPLE 1	8	22	17	11	77.3	64.7	50
2	8	22	15	11	68.2	73.3	50
3	8	37	12	7	30.1	58.3	18.9
4	8	17	5	5	29.4	100	29.4
REP 2							
SAMPLE 1	7	48	22	20	45.8	90.9	41.7
2	7	28	28	21	100	75	75
3	7	32	22	19	68.8	86.4	59.4
REP 3							
SAMPLE 1	8	21	11	8	52.4	72.7	38.1
2	10	19	12	12	63.2	100	63.2
REP 4							
SAMPLE 1	8	25	11	9	44	81.8	36
2	7	16	16	13	100	43.3	43.3
3	9	22	18	17	81.8	94.4	77.3
REP 5							
SAMPLE 1	9	9	8	6	100	66.7	66.7
2	8	15	14	6	93.3	50	46.7
3	9	33	23	20	69.7	87	60.6
4	8	65	65	36	100	55.4	55.4

Appendix 9.b.1

TRIAL CONTAINER/ALGAE TRIAL   COMMENCED 2/5/91
ENDPOINT: JUVENILE MORTALITY   PAGE 1
SPECIES A. carinata

TREATMENT: CONTROL WATER   20 NEONATES PER TREATMENT
: LARGE/SMALL (STANDARD) VIALS
: WITH/WITHOUT ALGAE

LARGE VIALS

	+ALGAE LIVING	DEAD	%MORT	LIVING	-ALGAE DEAD	%MORT
REP1	5	15	75	8	12	60
REP2	7	13	65	7	13	65
REP3	11	9	45	12	8	40
REP4	2	18	90	3	17	85

SMALL VIALS

	+ALGAE LIVING	DEAD	%MORT	LIVING	-ALGAE DEAD	%MORT
REP1	12	8	40	15	5	25
REP2	13	7	35	15	5	25
REP3	15	5	25	11	9	45
REP4	19	1	5	16	4	20

Appendix 9.b.2

SPECIES A. cummingii

TREATMENT: CONTROL WATER   20 NEONATES PER TREATMENT
: LARGE/SMALL (STANDARD) VIALS
: WITH/WITHOUT ALGAE

LARGE VIALS

	+ALGAE LIVING	DEAD	%MORT	LIVING	-ALGAE DEAD	%MORT
REP1	2	18	90	4	16	80
REP2	9	11	55	7	13	65
REP3	4	16	80	0	20	100
REP4	LOST			11	9	45

SMALL VIALS

	+ALGAE LIVING	DEAD	%MORT	LIVING	-ALGAE DEAD	%MORT
REP1	1	19	95	7	13	65
REP2	11	9	45	20	0	0
REP3	17	3	15	15	5	25

Appendix 10.a.

TRIAL #1 RESULTS OF URANIUM AND MANGANESE ANALYSIS
DATE SUBMITTED 19/2/91

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	1	6.5
0.3% RP2	6.1	12
1% RP2	16	18
3.2% RP2	53	37
3.2% RP2	48	38
10% RP2	170	90
32% RP2	520	180
BLANK	< 0.1	< 0.1

All samples were analysed using Scintrex Time Decay Flourimetric technique for the determination of uranium, and Graphite Furnace Atomic Absorbtion Spectrometric technique for the determination of manganese.

The 3.2% RP2 samples were randomly chosen replicates.

Appendix 10.b.

TRIAL #2 RESULTS OF URANIUM AND MANGANESE ANALYSIS
DATE SUBMITTED 28/2/91 COMMENCEMENT TRIAL#2

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	5.7	13
1% RP2	21	22
3.2% RP2	62	41
10% RP2	180	90
32% RP2	510	170
32% RP2	550	170
100% RP2	1700	380
BLANK	< 0.1	< 0.1

All samples were analysed using Scintrex Time Decay Flourimetric technique for the determination of uranium, and Graphite Furnace Atomic Absorbtion Spectrometric technique for the determination of manganese.

The 32% RP2 samples were randomly chosen replicates.

DATE SUBMITTED 28/2/91 TERMINATION TRIAL#2

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	5	1.2
1% RP2	15	2.7
3.2% RP2	55	24
10% RP2	160	50
10% RP2	160	60
32% RP2	380	100
100% RP2	1400	440
BLANK	< 0.1	< 0.1

All samples were analysed using Scintrex Time Decay Flourimetric technique for the determination of uranium, and Graphite Furnace Atomic Absorbtion Spectrometric technique for the determination of manganese.

The 10% RP2 samples were randomly chosen replicates.

Appendix 10.c.

TRIAL #3 RESULTS OF URANIUM AND MANGANESE ANALYSIS
DATE SUBMITTED 19/3/91 COMMENCEMENT TRIAL #3

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	1.3	6.6
1% RP2	17	15
3.2% RP2	60	36
3.2% RP2	60	36
10% RP2	110	60
32% RP2	560	200
100% RP2	1600	460
BLANK	< 0.1	< 0.1

All samples were analysed using Scintrex Time Decay Flourimetric technique for the determination of uranium, and Graphite Furnace Atomic Absorbtion Spectrometric technique for the determination of manganese.

The 3.2% RP2 samples were randomly selected replicates.

Appendix 10.d.

TRIAL #5 RESULTS OF URANIUM AND MANGANESE ANALYSIS
DATE SUBMITTED 28/3/91 COMMENCEMENT TRIAL #5

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	0.2	1.4
1% RP2	11	2.3
3.2% RP2	37	3
10% RP2	160	56
10% RP2	180	46
32% RP2	420	310
100% RP2	1600	750
BLANK	< 0.1	< 0.1

All samples were analysed using Scintrex Time Decay Flourimetric technique for the determination of uranium, and Graphite Furnace Atomic Absorbtion Spectrometric technique for the determination of manganese.

The 10% RP2 samples were randomly selected replicates.

Appendix 10.d.

TRIAL #6 RESULTS OF URANIUM AND MANGANESE ANALYSIS
DATE SUBMITTED 1/4/91 TRIAL #6
COMMENCEMENT FIRST WATER LOAD

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	0.3	10
1% RP2	17	17
1% RP2	16	19
3.2% RP2	53	36
10% RP2	150	96
32% RP2	540	280
100% RP2	1700	860
BLANK	0.6	0.5

The 1% RP2 samples were randomly selected replicates.

DATE SUBMITTED 1/4/91 TRIAL #6
TERMINATION FIRST WATER LOAD

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	2.7	110
1% RP2	32	110
1% RP2	140	640
10% RP2	670	890
32% RP2	1300	660
100% RP2	1800	600
BLANK	0.3	0.3

TRIAL #6 RESULTS OF URANIUM AND MANGANESE ANALYSIS
DATE SUBMITTED 20/4/91 TRIAL #6
COMMENCEMENT SECOND WATER LOAD

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	1.6	15
1% RP2	19	24
3.2% RP2	52	34
3.2% RP2	52	30
10% RP2	180	79
32% RP2	510	210
100% RP2	1600	920
BLANK	0.2	0.2

The 3.2% RP2 samples were randomly selected replicates.

DATE SUBMITTED 1/4/91 TRIAL #6
TERMINATION SECOND WATER LOAD

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	0.9	1.6
1% RP2	16	8.4
3.2% RP2	50	19
10% RP2	170	57
10% RP2	180	58
32% RP2	540	180
100% RP2	1700	610
BLANK	0.1	0.1

TRIAL #6 RESULTS OF URANIUM AND MANGANESE ANALYSIS
DATE SUBMITTED 25/4/91 TRIAL #6
Commencement THIRD WATER LOAD

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	< 0.1	2.9
1% RP2	19	9.6
3.2% RP2	55	22
10% RP2	200	54
32% RP2	670	190
32% RP2	640	190
100% RP2	1900	690
BLANK	< .1	< .1

The 32% RP2 samples were randomly selected replicates.

DATE SUBMITTED 10/5/91 TRIAL #6
TERMINATION THIRD WATER LOAD

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
MAGELA CK WATER	1.4	3.5
1% RP2	37	56
3.2% RP2	72	42
3.2% RP2	70	33
10% RP2	220	84
32% RP2	730	230
100% RP2	2000	480
BLANK	0.2	< .1

All samples were analysed using Scintrex Time Decay Flourimetric technique for the determination of uranium, and Graphite Furnace Atomic Absorbtion Spectrometric technique for the determination of manganese.

The 10% RP2 samples were randomly selected replicates.

NOTE:SEDIMENTATION OBSERVED IN REPLICATE TANKS

Appendix 10.e.

TRIAL #7 RESULTS OF URANIUM AND MANGANESE ANALYSIS
DATE SUBMITTED 3/5/91 TRIAL #7
COMMENCEMENT

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
1% RP2	29	12
1% RP2	19	8.2
1% U	17	8.6
10% RP2	130	59
10% U	170	7.5
32% RP2	500	170
32% U	550	8
100% RP2	1300	540
100% U	1800	7.5
BLANK	< 0.1	< 0.1

The 1% RP2 samples were randomly selected replicates.

DATE SUBMITTED 31/5/91 TRIAL #7
TERMINATION

SAMPLE	URANIUM ug/L U	MANGANESE ug/L Mn
1% RP2	20	6.4
1% U	39	1.5
10% RP2	220	47
10% U	170	1.8
32% RP2	740	150
32% U	470	2
32% U	500	2.2
BLANK	12	< 0.1

All samples were analysed using Scintrex Time Decay Flourimetric technique for the determination of uranium, and Graphite Furnace Atomic Absorbtion Spectrometric technique for the determination of manganese.

The 32% U samples were randomly selected replicates.

Appendix 11.a.1.

STATISTICAL TESTING

TEST: ANALYSIS OF VARIANCE
TRIAL: #1
ENDPOINT: JUVENILE MORTALITY

SPECIES: A. carinata

Source	dF	SS	MSS	F	P>F
Treatment	5	153.233	30.6466	0.29	0.9122
Error	18	1900.78	105.598		
Total	23	2054.01			

RESULT: NO SIGNIFICANT DIFFERENCE

SPECIES: A. cummingii

Source	dF	SS	MSS	F	P>F
Treatment	5	1299.85	259.970	1.12	0.3855
Error	18	4182.62	232.368		
Total	23	5482.47			

RESULT: NO SIGNIFICANT DIFFERENCE

SPECIES: GLYPTOPHYSA SP.

Source	dF	SS	MSS	F	P>F
Treatment	5	521.602	106.230	0.78	0.5757
Error	18	2447.16	135.953		
Total	23	2978.76			

RESULT: NO SIGNIFICANT DIFFERENCE

Appendix 11.a.2.

STATISTICAL TESTING

TEST: ANALYSIS OF VARIANCE
TRIAL: #1
ENDPOINT: DAYS TO HATCHING

SPECIES: A. carinata

Source	dF	SS	MSS	F	P>F
Treatment	5	1.7143	0.34286	1.87	0.1491
Error	18	2.2923	0.182091	0.32	
Total	23	5.0066	6.2852		

RESULT: NO SIGNIFICANT DIFFERENCE

SPECIES: A. cummingii

Source	dF	SS	MSS	F	P>F
Treatment	5	0.95613	0.191228	0.73	0.6071
Error	18	4.68603	0.260335		
Total	23	5.64216			

RESULT: NO SIGNIFICANT DIFFERENCE

SPECIES: GLYPTOPHYSA SP.

Source	dF	SS	MSS	F	P>F
Treatment	5	1.0804	0.21608	0.45	0.8058
Error	18	8.5886	0.47714		
Total	23	9.6690			

RESULT: NO SIGNIFICANT DIFFERENCE

Appendix 11.b.1

STATISTICAL TESTING

TEST: ANALYSIS OF VARIANCE
TRIAL: #2
ENDPOINT: DAYS TO HATCHING - DEVELOPMENTAL RETARDATION

SPECIES: A. cummingii

Source	dF	SS	MSS	F	P>F
Treatment	5	6.8750	1.3750	3.19	0.308
Error	18	7.750	0.430556		
Total	23	14.6250			

RESULT: NO SIGNIFICANT DIFFERENCE

SPECIES: GYRAULUS SP.

Source	dF	SS	MSS	F	P>F
Treatment	5	42.8565	8.57197	31.67	0.0001
Error	18	4.87256	0.270203		
Total	23	47.7291			

RESULT: SIGNIFICANTLY DIFFERENT
MEANS: 5.4 / 5.81 / 5.2 / 5.5 / 5.54 / 9.05

SPECIES: LYMNAEA SP.

Source	dF	SS	MSS	F	P>F
Treatment	5	118.708	23.7147	100.55	0.0001
Error	18	4.250	0.236111		
Total	23	122.958			

RESULT: SIGNIFICANTLY DIFFERENT
MEANS: 7.5 / 7.5 / 7 / 7.25 / 7.25 / 13.25

Appendix 11.b.2

STATISTICAL TESTING

TEST: ANALYSIS OF VARIANCE
TRIAL: #2
ENDPOINT: EMBRYONIC MORTALITY

SPECIES: A. cummingii

Source	dF	SS	MSS	F	P>F
Treatment	5	627.383	125.476	0.67	0.6490
Error	18	3354.75	186.375		
Total	23	3982.13			

RESULT: NO SIGNIFICANT DIFFERENCE

SPECIES: GYRAULUS SP.

Source	dF	SS	MSS	F	P>F
Treatment	5	4060.98	812.197	2.38	0.082
Error	18	6150.32	341.685		
Total	23	10211.31			

RESULT: SIGNIFICANTLY DIFFERENT AT 10%

SPECIES: LYMNAEA SP.

Source	dF	SS	MSS	F	P>F
Treatment	5	469.194	93.8388	0.72	0.6196
Error	18	2358.75	131.042		
Total	23	2827.95			

RESULT: NO SIGNIFICANT DIFFERENCE

Appendix 11.b.3

STATISTICAL TESTING

TEST: DUNNETT'S COMPARISON TO CONTROL MEAN.
TRIAL: #2
ENDPOINT: DEVELOPMENTAL RETARDATION.

SPECIES: *Gyraulus* sp.

MEANS	CONT.L	1% RP2	3.2% RP2	10% RP2	32% RP2	100% RP2
	5.4	5.81	5.2	5.5	5.54	9.05

RANK 3.2% CONT. 10% 32% 1% 100%
n=7 ANOVA EMSS=0.2703

CONTRAST	DIFF.	S.E.	|q|	p	q'	CONCLUSION
10%	0.1	0.280	0.36	2	2.02	Do not reject.
32%	0.14	0.280	0.50	3	2.44	Do not reject.
1%	0.41	0.280	1.48	4	2.68	Do not reject.
100%	3.65	0.280	13.1	5	2.85	Reject.

NOEC 32% RP2
LOEC 100% RP2.

SPECIES: *Lymnaea* sp.

MEANS	CONT.	1% RP2	3.2% RP2	10% RP2	32% RP2	100% RP2
	7.5	7.5	7	7.25	7.25	13.25

RANK 3.2% 10%/32% CONT./1% 100%
Smallest n=4 ANOVA EMSS=0.2361

CONTRAST	DIFF.	S.E.	|q|	p	q'	CONCLUSION
/100%	5.75	.0.344	16.7	2	2.02	Reject.

NOEC 32% RP2
LOEC 100% RP2.

Appendix 11.c.1

STATISTICAL TESTING

TEST: ANALYSIS OF VARIANCE
TRIAL: #3
ENDPOINT: DAYS TO HATCHING - DEVELOPMENTAL RETARDATION

SPECIES: A. carinata

Source	dF	SS	MSS	F	P>F
Treatment	5	16.8333	3.36667	6.73	0.0011
Error	18	9.0	0.50		
Total	23	25.8333			

RESULT: SIGNIFICANTLY DIFFERENT
MEANS: 7.25 / 7.50 / 7.75 / 7.75 / 7.50 / 9.75

SPECIES: A. cummingii

Source	dF	SS	MSS	F	P>F
Treatment	5	6.20833	1.24167	3.31	.027
Error	18	6.75	0.3750		
Total	23	12.9583			

RESULT: SIGNIFICANTLY DIFFERENT
MEANS: 8.0 / 8.0 / 7.0 / 7.0 / 8.0 / 8.25

SPECIES:

Source	dF	SS	MSS	F	P>F
Treatment	5	26.0893	5.21786	5.2	0.0105
Error	18	22.3539	1.24188		
Total	23	48.4432			

RESULT: SIGNIFICANTLY DIFFERENT
MEANS: 7.5 / 7.5 / 6.75 / 7.25 / 7.46 / 10.0

Appendix 11.c.2

STATISTICAL TESTING

TEST: TWO WAY ANALYSIS OF VARIANCE
TRIAL: #3
ENDPOINT: EMBRYONIC MORTALITY - mortality to hatchling stage, as hatchling and as neonate.

SPECIES: A. cummingii zero values excluded

Source	dF	SS	MSS	F	P>F
Treatment	5	480.047	96.0094	1.41	0.2682
Error	18	1226.82	68.1563		
Total	16	355.119			
STAGE	1	3.62416	3.62416	0.21	0.7719
STAGE * TREATMENT	8	72.0697	9.00871	0.23	0.9734

RESULT: NO SIGNIFICANT DIFFERENCE BETWEEN TREATMENTS OR INTERACTION BETWEEN TREATMENTS AND STAGES

SPECIES: A. cummingii zero values excluded

Source	dF	SS	MSS	F	P>F
DEV.STAGE	2	331.339	165.670	5.6	0.0153
Error	15	444.136	29.6090		
Total	17	775.475			

RESULT: SIGNIFICANT DIFFERENCE IN MORTALITY BETWEEN STAGES
MEANS: 3.1% / 1.7% / 0.0%

SPECIES: A. carinata

Source	dF	SS	MSS	F	P>F
Treatment	5	364.453	72.8909	1.79	0.131
STAGE	2	208.276	104.138	2.55	0.0872
INTERRACTION	10	460.357	46.0357	1.13	0.3582

RESULT: NO SIGNIFICANT DIFFERENCE BETWEEN TREATMENTS OR STAGES, AND NO SIGNIFICANT INTERACTION BETWEEN TREATMENTS AND STAGES

STATISTICAL TESTING

TEST: TWO WAY ANALYSIS OF VARIANCE
TRIAL: #3
ENDPOINT: EMBRYONIC MORTALITY - mortality to hatchling stage, as hatchling and as neonate.

SPECIES: GLYPTOPHYSA SP.

Source	dF	SS	MSS	F	P>F
Treatment	5	998.492	199.690	0.46	0.8022
Error	18	7850.25	436.125		
Total	23	8848.70			
STAGE	2	954.650	477.325	2.28	0.1252
INTERACTION	5	1017.37	203.474	0.84	0.5397

RESULT: NO SIGNIFICANT DIFFERENCE BETWEEN TREATMENTS OR LIFE STAGES AND NO SIGNIFICANT INTERACTION BETWEEN TREATMENT AND STAGES.

Appendix 11.c.3

STATISTICAL TESTING

TEST: ANALYSIS OF VARIANCE
TRIAL: #3
ENDPOINT: JUVENILE MORTALITY

SPECIES: A. carinata

Source	dF	SS	MSS	F	P>F
Treatment	5	9140.92	1828.18	7.89	0.0004
Error	18	4170.17	231.676		
Total	23	13311.1			

RESULT: SIGNIFICANTLY DIFFERENT
MEANS: 16.5% / 24.5% / 45.1% / 10.9% / 33.6% / 96.1%

SPECIES: A. cummingii

Source	dF	SS	MSS	F	P>F
Treatment	5	10185.7	2037.15	11.89	0.0001
Error	18	5786.72	171.280		
Total	23	12205.4			

RESULT: SIGNIFICANTLY DIFFERENCE
MEANS: 22.5% / 16.4% / 11.4% / 5.3% / 9.1% / 92.7%

SPECIES: GLYPTOPHYSA SP.

Source	dF	SS	MSS	F	P>F
Treatment	5	6218.70	1243.74	3.4	0.017
Error	18	5786.72	332.595		
Total	23				

RESULT: SIGNIFICANTLY DIFFERENT
MEANS: 31.9% / 9.7% / 32.7% / 13.2% / 81.5% / 59.4%

Appendix 11.c.4

STATISTICAL TESTING

TEST: DUNNETT'S COMPARISON TO CONTROL MEAN.
TRIAL: #3
ENDPOINT: DEVELOPMENTAL RETARDATION - DAYS TO HATCH

SPECIES: A. carinata

MEANS	CON	1% RP2	3.2% RP2	10% RP2	32% RP2	100% RP2
	7.25	7.50	7.75	7.75	7.5	9.75

RANK CON 1% RP2 / 32% RP2 3.2% RP2 / 10% RP2 100% RP2
Smallest n = 4 ANOVA EMSS = 0.50
Ho:Xcon > = Xa. H1:Xcon < Xa.

CONTRAST	DIFF.	STD.ERR.	|q|	p	q'	CONCLUSION
CONTROL /						
1% RP2 /						
32% RP2	0.25	0.50	0.50	3	2.44	DO NOT REJECT Ho
3.2% RP2 /						
10% RP2	0.50	0.50	1.0	5	2.85	DO NOT REJECT Ho
100% RP2	2.0	0.50	4.0		2.98	REJECT Ho

NOEC: 32% RP2
LOEC 100% RP2

SPECIES: A. cummingii

MEANS	CON	1% RP2	3.2% RP2	10% RP2	32% RP2	100% RP2
	8	8	7	7	8	8.25

RANK 3.2% RP2 / 10% RP2CON / 1% RP2 / 32% RP2 100% RP2
Smallest n = 4 ANOVA EMSS = 0.375
One-sided Ho:Ucon > = Ua. H1:Ucon < Ua. (Denoted by " ' ").
Two-sided Ho:Ucon-Ua = 0. H1:Ucon-Ua < > 0. (Denoted by " " ").

CONTRAST	DIFF.	STD.ERR.	|q|	p	q'	CONCLUSION
CONTROL /						
3.2% RP2 /						
10% RP2	1.0	0.433	0.43	3	2.57"	DO NOT REJECT Ho
100% RP2	0.25	0.433	0.57	2	2.44'	DO NOT REJECT Ho

NOEC: 100% RP2
LOEC UNDEFINED

STATISTICAL TESTING

TEST: DUNNETT'S COMPARISON TO CONTROL MEAN.
TRIAL: #3
ENDPOINT: DEVELOPMENTAL RETARDATION - DAYS TO HATCH

SPECIES: GLYPTOPHYSA SP.

MEANS	CON	1% RP2	3.2% RP2	10% RP2	32% RP2	100% RP2
	7.5	7.5	6.75	7.25	7.46	10.0

RANK 3.2% RP2 10% RP2 32% RP2 CON / 1% RP2 100% RP2
Smallest n = 4 ANOVA EMSS = 1.24188
Ho:Xcon > = Xa. H1:Xcon < Xa.

CONTRAST	DIFF.	STD.ERR.	|q|	p	q'	CONCLUSION
CONTROL /						
32% RP2	0.04	0.788	.05	2	2.57''	DO NOT REJECT Ho
10% RP2	0.25	0.788	.32	3	3.03''	DO NOT REJECT Ho
3.2% RP2	0.75	0.788	.95	4	3.29''	DO NOT REJECT Ho
100% RP2	2.50	0.788	2.45	5	2.85'	DO NOT REJECT Ho

NOEC: 100% RP2
LOEC UNDEFINED

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