CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Ella Almazan; Rea Anna Embrador

Project Number

S1901

Project Title

Horn Snails

Abstract

Objectives/Goals

The objective of this project is to observe and determine if there is a relationship between location of horn snails in regards to the size distribution, as well as parasitic prevalence.

Location of the horn snail is predicted to be a factor of parasitic activity. If the horn snails are attached onto the grass, then parasitic activity is occurring within that snail.

Another hypothesis tested in this project is the size frequencies in each of the mud/grass location. By initial observation, a lesser amount of snails seem to be encysted in the grass. A proposed prediction is that wider size distributions will be present in the mud than in the grass.

Methods/Materials

Field experiments were conducted in a mud flap located in Seal Beach. Collections (3 total collections, with 4 ounce plastic jars, consisting of one grass and one mud collection in each) within a quadrat of an established size of 1024 cubic centimeters were made and later taken back to Dr. Pernet's lab to be measured with Vernier calipers. Twelve snails were taken from those collections to be cracked open with forceps and placed in sea water-filled petri dishes and then observed under microscopes to observe parasitic activity. Size in millimeters and parasitic activity were recorded in this experiment. Parasitic activity was defined as the observation of larvae in the digestive tract, and/or the observation of swimming Cercaria.

Results

Analysis of the data shows that location does not exactly prove to be a significant factor of parasite activity. With the use of statistics, conclusions of the following were made. One can be 95% confident that one will find between an average of 2.384 and 6.282 parasites in every grass trial conducted. As with the location affecting size distribution, analysis also proves to have no significance. There was no major difference in distribution. On the other hand, both locations were high when compared to the average size taken from a resource, which is also the established control variable.

Conclusions/Discussion

In conclusion, overall results reject the proposed hypothesis and prove that location of the snail does not significantly affect its parasite prevalence or the size distribution of the quadrant population.

Summary Statement

This project observes the effect of location, grass or mud, on the size distribution and parasitic prevalence in Cerithidea California, also known as Horn Snails.

Help Received

Used lab equipment at California State University of Long Beach under the supervision of Dr. Bruno Pernet; Michael James Corpuz helped with statistical analyses; Mr. and Mrs. Embrador supplied transportation to mud flap; Mr. and Mrs. Almazan provided transportation to the lab and science fairs; Mr.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Chrystine E. Bourbina

Project Number
S1902

Project Title
Light Intensity Effect on Tilapia Behavior in the California High Desert

Abstract

Objectives/Goals
The behavior of the Oreochromis mossambicus #Mozambique Tilapia# will be compared against individual light intensity variables to determine if variations in light levels causes any increase in fish activity. Any additional fish activity caused by increased light levels may hinder growth rates or increase fish stress. Unaffected fish will exhibit a limited amount of movement allowing for more preservation of bodily mass, which is one of the main goals in maintaining a successful aquaculture project. If a tilapia exhibits a set amount of activity while exposed to sunlight (ambient), then an application of additional light should not cause any corresponding increase in fish activity.

Methods/Materials
Five set light intensities (normal ambient (control), 6.3K lumens, 6.2M lumens, 12.5M lumens and 25M lumens) are introduced individually into a 19-liter container (filled with 5.1 liters of water) containing a single Mozambique tilapia. The tilapia#s movement is videotaped for 15 minutes (calculating the amount of movement in 1-minute intervals from directly above). Recorded fish movement is based upon the entry of the tilapia#s head and torso across a grid matrix ((16) 6.35 x 6.35 cm sectors) displayed across the bottom of the 19-liter container.

Results
Of the variables tested, tilapia under normal ambient light exhibited a greater amount of movement (average of 11 sector movements/minute). Tilapia exposed to the four higher light intensities exhibited a smaller average of sector movements (4 sector movements/minute under 25M lumens) amongst the tilapia subjects.

Conclusions/Discussion
Mozambique tilapia, under additional high intensity light, exhibit less movement. Less movement conserves energy and preserves body mass whereas tilapia under normal ambient light show increased activity/movement. The capability of applying intense light could not only take advantage of reflective solar energy, but also may save money in feed costs.

Summary Statement
Determine if a higher light intensity causes a corresponding increase in Mozambique tilapia's movement/activity.

Help Received
Father helped with reviewing video tape and documentation

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Hippolyte Goux

Project Number

S1903

Project Title

Adaptive Dorsal Patterning and Morphological Variation in the Salamander Ensatina klauberi

Abstract

Objectives/Goals

The aim was to test the hypothesis that the color pattern of the salamander Ensatina klauberi is cryptic. It was also to compare the Ensatina salamander species klauberi and platensis to determine if their different dorsal pattern is due to dissimilarities in habitat background.

Methods/Materials

Specimens of the species klauberi and platensis were where found and photographed at four sites in California. Photographs were then analyzed using Scion Image Analysis Software. Three aspects of the salamander#s dorsum were quantified: 1) the Relative Average Spot Area, 2) the percentage of the dorsum covered by spots (Percent Cover), and 3) the number of spots on the dorsum. For the ground cover in Ensatina#s habitat, three areas at each site where randomly selected and photographed. The percent cover of light and dark areas in the background was then measured.

Results

Between-group analysis revealed two different patterns: 1) in the platensis sample, spots were smaller but more numerous, and a large portion of the head and dorsum was black; 2) klauberi has larger but far less numerous spots that cover a greater portion of the dorsum and head. On average, substrate in klauberi habitats had an equal amount of dark and light ground cover. The ground cover in Sequoia was different from that in klauberi habitats, with an average 66.7% of the ground covered by dark soil. Within-group analysis of klauberi revealed morphological variations between the 3 sampled populations.

Conclusions/Discussion

The results support the hypothesis that the blotches of Ensatina are cryptic. In platensis habitat, the ground was covered at 66.7% by a dark tone. The predominately dark dorsum of platensis means it blends in with this sort of substrate. In klauberi habitat, large light-colored oak leaves covered 49.3% of the ground. Following this pattern, klauberi has large spots and up to 36 % of its dorsum covered by light coloration.

Summary Statement

The research investigates the cryptic value and geographic variation in the dorsal color pattern of the salamander species Ensatina klauberi.

Help Received

Andrew Stoehr, graduate student at the University of California at Riverside, taught me how to use the Image Analysis Program.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Julie A. Guerin

Project Number
S1904

Project Title
Effects of Salinity Concentration on Rates of Polyp Cloning, Growth, and Strobilation in the Aurelia labiata

Abstract

Objectives/Goals
The purpose of this study was to determine how decreased and increased salinity concentrations affect the developmental asexual stage in the life cycle of the Aurelia labiata. This species of moon jelly is known to be adaptable in the changing marine environments of coastal ecosystems, but environmental factors could influence their reproduction rates. Global warming also is causing large scale salinity changes in the oceans as is evidenced by shifts in the distribution of fresh and saline waters. I hypothesized that at decreased 2.5% salinity, polyps would successfully clone, colonize and strobilate at a slower rate, but that at increased 4.5% salinity polyps would not reproduce.

Methods/Materials
After culturing from fertilized eggs, 10 similarly developed polyps on settlement plates were suspended in closed system tanks having salinity concentrations of 2.5%, 3.5% (control), and 4.5%. Four overlapping trials of 9-12 weeks were conducted, two using a freshwater and artificial sea salt and two using seawater, artificial sea salt and RO water. Observations on health, cloning, colonizing, strobilation and ephyrae release were made weekly and recorded onto template data sheets.

Results
Results in the trials with a freshwater base were inconclusive due to unexpected distress and substantial detachment losses of control polyps, resulting in the decision to conduct the two trials with a seawater base and RO water. In these, all polyps in 2.5% and 3.5% salinities survived and formed colonies. The rate of cloning, colonizing, strobilation and release of ephyrae was faster in the 2.5% salinity than in the control group. No polyps in the 4.5% survived the length of the trials.

Conclusions/Discussion
My hypothesis was not supported in the 2.5% salinity group as these developed at a faster rate, but that polyps would not survive a high salinity concentration of 4.5% was confirmed. Results indicate that a lower salinity induces polyp cloning and strobilation. Examining adaptability can contribute to knowledge about the ecology of the life phases of this species, and contribute to future solutions in managing bloom problems in coastal habitats. I hope to further investigate salinity effects in combination with other relevant environmental variations, such as effects of increased ocean absorption of CO(2) which leads to higher water acidity levels.

Summary Statement
This project was conducted to determine effects of decreased and increased salinity concentrations on the asexual reproductive phase in the life cycle of Aurelia labiata

Help Received
Mike Schaadt, Dr. Kiersten Darrow, and Andres Carrilo at Cabrillo Marine Aquarium for guidance and teaching me procedures, my mother for driving me and encouragement; participant in Junior Southern California Academy of Sciences (JSCAS)

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Maxine E. Holland

Project Number
S1905

Project Title
Filter Feeders

Abstract

Objectives/Goals
My problem question was Can Mytilus edulis (mussels) in the class bivalvia and the phylum mollusca, absorb the particles put in the water they live in?

Methods/Materials
12 ten gallon, glass tanks with plastic or wooden: 6 tanks will be used as variables and 6 as controls; 50 mL beaker; 16.3 kg of Mytilus edulis (mussels) 2.7 kg for 6 tanks; 361.92 g of crushed black carbon pellets; 3,000 mL of fresh water (250 per tank); 12 airstones of the same brand; 12 airpumps of the same brand; 6 large rocks (for the mussels); 120 gallons of seawater; Latex gloves; Plastic sealant (prevents leaks in tanks); 12 undergravel filters of the same brand; Gravel; Photo spectrometer; 500 mL beaker; Food processor to crush up carbon pellets; 12 test tubes; Cento gram balance; Sift (to sift the crushed carbon).

In my procedure, I put 250 mL of a carbon solution (30.16 g of black carbon pellets and 250 mL of fresh water) in all 12 tanks, found how well my variables (mussels) absorbed the particles, and compared their results to the results of my control.I did this everyday for 21 days.

Results
In the results, I found that the first day the variable tanks had 36 cell per milliliter of water while the controls had 114 cells per milliliter of water. By the last day, the variable tanks ended up having 9 cells per milliliter of water while the controls had 83 cells per milliliter of water.

Conclusions/Discussion
In conclusion, I found that the mussels had absorbed the particles by 75% and that the controls diminished their particles by 30%. Although the analysis shows that the controls were able to diminish their particles, the reason for this was the help of the air filters. The controls were able to absorb particles through their air filters (they were turned on in the tanks every two days in order to keep the mussels alive), which explains why it had absorbed anything at all. Even though its filters absorbed the particles, the tanks with the variables absorbed 45% more, which proved that filter feeders do absorb.

Summary Statement
My project was to find out if sea mussels absorbed particles in their water other than nutrients for food.

Help Received
borrowed equipment from my teacher Mr. Callaway

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

John Michael L. Jones

Project Number

S1906

Project Title

The Mantis Project Stage 4: Is Observed Parthenogenesis Cryptic or Induced?

Abstract

Objectives/Goals

This is the 4th year of a study on the introduced mantid species Iris oratoria, the Mediterranean Mantid. Babies hatching from an isolated female indicate previously undocumented parthenogenesis. The goal of this study is the extraction of Iris oratoria DNA and the use of PCR technology to determine if the observed parthenogenesis is a cryptic event, or caused by an external factor such as a symbiotic bacteria. Also presented is data concerning a gender ratio distortion observed in the progeny of the non-isolated parthenogenic daughters; and egg laying data compares isolated progeny (wild caught or parthenogenic lineages) with wild caught control values.

Methods/Materials

MANTID REARING Materials: various Iris oratoria lineages, environments, food sources, heat lamp & full spectrum light, timers, thermometer.

Methods:Record-source, hatch dates, final molt, and egg laying dates. 47 captive-raised, isolated females were kept to evaluate parthenogenesis.

DNA PROCEDURES Materials: laboratory solutions & biochemicals, centrifuges, electrophoresis apparatus, micropipetters, etc.

Methods: modified cricket phenol/chloroform & Chelex DNA Extraction protocols, PCR with D2 primers, flat bed 1% Agarose gel electrophoresis with UV photo record.

Results

The modified cricket DNA extraction protocol worked for mantid DNA extraction. The Chelex method also worked as determined by PCR evaluation. Control (wild caught), and Norco lineage babies hatched at comparable rates, whereas progeny from parthenogenic daughters hatched at the same, very- low-rate as their mothers. All progeny from (non-isolated) parthenogenic females that reached adulthood are female. The progeny from the control group (wild caught) had a significant number of adult males. Captive-raised isolated females (all lineages) lay egg cases at the same rate as the wild-caught controls.

Conclusions/Discussion

If all adult progeny from the parthenogenic lineage are females, a gender ratio distortion exists. If captive-raised isolated females lay eggs at the same rate as wild-caught, the stage is set for parthenogenic progeny. The DNA extraction protocols have provided workable DNA. Now optimized PCR technology can be used to determine the gender of non-surviving progeny, identical genetic make-up between generations, or if external factors are present, such as symbiotic bacterial DNA.

Summary Statement

This study evaluates aspects of parthenogenesis observed in the mantid species, Iris oratoria.

Help Received

Dr. Brad Hyman, UCR for teaching me DNA extraction in his lab. Dr. Richard Stouthamer, UCR, information, for allowing me to continue my work in his lab.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Kristen D. Kelley

Project Number
S1907

Project Title
Do Crickets Communicate Information about Their Environment through Chirping?

Abstract

Objectives/Goals
The objective of this project is to test whether crickets communicate information about their environment through chirping.

Methods/Materials
To conduct these experiments two test environments must be constructed and a high quality recording made of crickets chirping at different temperatures. The first test environment is used to conduct control experiments and consists of two live cricket chambers at each end of an interconnecting tube. The temperature in each of the two chambers is regulated to one of four temperatures: hot, warm, room and cool. Ten trials were conducted with each pair of temperatures. The second test environment utilized four test chambers connected together via a long four way interconnecting tube. The environments of three chambers are set to three of the test temperatures. The recording of crickets chirping at the fourth temperature is used in the final chamber. Cricket response to the various recorded and live environments is established with twenty trials each of the four recordings for a total of eighty trials.

Results
The control trials show that the hot environment is overwhelmingly preferred, with the warm environment being the second choice. 56.3% of crickets preferred the hot environment and 31.3% preferred the warm environment. The four chamber tests using live and recorded environments show that the hot recording attracts crickets almost exactly the same as live chirping with 55% clustered around the recording area. The warm recording attracted 20%.

Conclusions/Discussion
The results of this experiment suggest that crickets do communicate and express which environment is more desirable through chirping. In the majority of the chirping trials, the crickets clustered at the preferred environments or recordings of preferred environments. The crickets did not show a significant different reaction between recorded and live hot environment showing that information about their environment is communicated through chirping.

Summary Statement
The purpose of this project is to determine if crickets communicate environmental information through chirping and more specifically to determine if information is conveyed by sound (chirping) or some other mechanism.

Help Received
Grandfather and father helped with the constuction of the test chambers; sound recording equipment provided by school; research advice provided by Mrs. Gushwa

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Katie Kinsella; Anna Messier

Project Number
S1908

Project Title
Do You Know What Lies Beneath? Parasitized Crabs in Our Own Santa Barbara Channel!

Abstract

Objectives/Goals
The main objective was to extract the external Rhizocephalan barnacle parasite from the host crab. After analyzing the measurement results of both the crab and the parasite, we determined physical differences between infected and uninfected crabs. Not only did we study the external component of the parasite, we also researched the behavioral effects caused by the internal parasite.

Methods/Materials
Following proper dissection procedure, we severed the crabs' thoracic ganglion (nerve chord) before extracting the externa (external parasite component) from the host crab through its mantle opening. We then took needed measurements for comparison to uninfected crabs. Our materials included a dissecting tray, triple beam balance, scalpel, forceps, microscope, calipers, scissors, and pins.

Results
After graphing all of our measurement results, we found that carapace width, abdominal flap height, and the masses of similarly sized crabs of infected are distinctly larger than that of uninfected crabs.

Conclusions/Discussion
After running many tests on both uninfected and infected sheep crabs (infected with rhizocephalan barnacles), we concluded overall that infected crabs are bigger than uninfected crabs. Once we recorded data on both the weight and height of 24 crabs, we found that, in general, the abdominal flap of an infected crab is greater than that of an uninfected crab. Likewise, on average infected crabs weigh more than uninfected crabs. Our tests also suggested that the externa (external part of the parasite located under the abdominal flap) adds significant weight to the crab. We used the carapace measurements as a constant to then compare crabs.

We also learned about the behavioral effects of the parasite on its host. The Rhizocephalan barnacle "takes over" the crab: no longer produces its own eggs, but rather the parasite's (parasitic castration), as well as controlling the crab's central nervous system. This could lead to visible decrease in this particular crab species and eventual extinction.

Summary Statement
In this project we explored the effect of the Rhizocephalan barnacle parasite on the host Spider/Sheep crab both physically and behaviorally.

Help Received
Used lap equipment at UCSB's Marine Biology REEF lab under the supervision of Scott Simon, borrowed Mentor Amber Kaplan dissecting equipment, REEF Marine Biologists aided in crab collection from Santa Barbara Channel

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Miriam Koppich; Kelly Metzler; Megan Schoettler

Project Number

S1909

Project Title

The Effect of Light and Diet on the Growth of the Sea Jelly Chrysaora colorata

Abstract

Objectives/Goals

The aim of this experiment was to determine the effect of light and diet on the growth of purple-striped jellies (Chrysaora colorata). Compared to other sea jelly species, the purple-striped jelly is one of the more difficult species to culture in captivity; captive jellies never reach their full potential of growth as they would in the wild. Therefore it was of interest to study and determine with which diet and light level a jelly would yield the highest average growth. It was hypothesized that the purple-striped jellies, Chrysaora colorata, exposed to the light and fed a diet of moon jelly ephyrae, baby brine shrimp, and rotifers would yield the greatest average growth when compared to the other experimental jellies.

Methods/Materials

Sixty purple-striped jellies were collected within 24 hours of strobilation to insure that jellies of the same size were used. Three tanks were each divided into a light and dark portion in which ten jellies were placed. Tank 1 was fed rotifers, Tank 2 was fed baby brine shrimp, and Tank 3 was fed a combination of rotifers, baby brine shrimp, and moon jelly ephyrae. The tanks were fed and cleaned daily, and once a week each jelly was measured using a depressed slide over a ruler. The jellies were measured to the nearest tenth of a millimeter and then the average for each compartment was calculated and recorded.

Results

It was found that the purple-striped jellies in Tank 1B, which were housed in the light and fed a diet of rotifers, had the highest average growth at the end of the seven-week span. The jellies in Tank 3B also grew; however, after the seven weeks, they still had a lower average growth than those in Tank 1B. All remaining jellies either shrank or died.

Conclusions/Discussion

The data did not fully support the hypothesis. The purple-striped jellies exposed to light in all tanks grew more, or in some cases shrank less, than the jellies in the corresponding dark compartments. The hypothesis, which stated that a varied diet would yield the best growth, was first derived from the implication that jellies are not limited to one food type in the wild. However, this part of the hypothesis was not supported because the varied diet of rotifers, baby brine shrimp, and moon jelly ephyrae did not yield the greatest growth. Determining under which conditions the jellies grow the most is important because this in turn could affect the survival of other coastal animals.

Summary Statement

The purpose of this experiment was to determine if various diets and exposure to light would affect the growth of the sea jelly Chrysaora colorata.

Help Received

Used facilities and equipment at Cabrillo Marine Aquarium under the supervision of Dr. Kiersten Darrow, curator.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Juan Lopez; Andre Velasco

Project Number

S1910

Project Title

Estimating the Population of Crayfish using the Tag and Recapture Method

Abstract

Objectives/Goals

Tag/Recapture is a method used to estimate the population size of a certain species in a given area. Many scientists use the method of tag/recapture in order to estimate a population size. It would very difficult, if not impossible, to figure out the population of a species in a large body of water, since the species tend to migrate and wander around. A calculation is made from the data collected to estimate the population size.

The purpose of this study was to estimate the population size of crayfish in a city pond. The study was completed in order to evaluate the effect of human activity on this important species.

Methods/Materials

Crayfish were captured by one person pulling back a rock and another person grabbing the crayfish. They were tagged by using scissors and clipping their left telson. Fourteen crayfish were originally marked by this method and released. After crayfish were recaptured on a different day, the number of previously tagged crayfish was determined. The following calculation was used to estimate population size: T= Mt/m

T= total population
M= captured and tagged individuals
t= captured 2nd time
m= marked individual in the recapturing trials

Results

Crayfish were recaptured on several subsequent weeks following the original capture and tagging. The average of these calculations was fairly constant.

Conclusions/Discussion

This tells us this method of population estimation is reliable. We also learned that the crayfish population is thriving in Murray Park, despite the apparent pollution and human intervention. This is important for other species that depend on the crayfish population.

Summary Statement

Estimating the population of Crayfish using the Tag and Recapture Method

Help Received

My teacher edited our manuscript

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Stefanie J. Lynch

Project Number
S1911

Project Title
The Effect of Location on the Population Distribution and Size of the Olympia Oyster, Ostrea conchaphila

Abstract

Objectives/Goals
The Olympia Oyster (Ostrea conchaphila) is the only native oyster on the California coast. Once highly abundant, populations declined due to over-harvesting and habitat loss. Restoration projects are beginning, but data regarding current oyster numbers are scarce. This experiment is the first detailed population study ever done of Ostrea conchaphila around Richardson Bay, California, off of San Francisco Bay.

Methods/Materials
Ecological transects were performed at five sites on Richardson Bay. Two comparison sites were on main San Francisco Bay. Ten 10-minute transects were done at each site. Oysters were counted during low tide, size measured, and the settling surface noted (rock, concrete, shell, or wood). Water samples measured potential limiting factors of salinity, turbidity, pH, chlorophyll, calcium, silicates, nitrates, and phosphates.

Results
The number of oysters was greatest at two northern Richardson Bay sites (2.8 +/- 0.73 oysters/min, and 2.31 +/- 0.67) and the San Francisco Bay sites (3.64 +/- 0.78, and 2.92+/- 0.78). Size distribution graphs showed distinct single peaks at 20-25 mm shell length for these four sites, indicating a preferred timeframe of successful larval recruitment. 84.9 % of oysters were found on rock. A positive correlation was found between oyster counts and Phosphate levels ($r = 0.72$, $p < 0.05$) with the relationship: (Oyster count) = 7.60 [Phosphate (uM)] + 2.13.

Conclusions/Discussion
These data support the hypothesis that Olympia Oyster populations survive in preferred sites in Bay waters. This is the first detailed study of the distribution pattern of Olympia Oysters around Richardson Bay, and they were found to be as prevalent in northern Richardson Bay as in the main San Francisco Bay sites. The size/frequency graphs had large single peaks of oyster numbers clustered around 20-25 mm, which shows that a major limiting factor could be pulses or waves of successful larval recruitment leading to an abundance of oysters of a singular size. Rock was the preferred settling surface likely due to the clear abundance of this surface found at the transect sites. Phosphate levels were found to have a significant correlation with oyster counts. Phosphates are a micronutrient in the food chain, but its effect on oyster ecology is complex, and future surveys are planned to study this further.

Summary Statement
This experiment is the first detailed population study ever done of Ostrea conchaphila around Richardson Bay, California, and supports the hypothesis that Olympia Oysters survive in preferred sites in Bay waters.

Help Received
Parents drove me to transect sites. Dr. Michael McGowen, SFSU, and Holly Harris, M.S. candidate SFSU, gave advice on the process of transects. Adria Lassiter M.S., Romberg Tiburon Center, assistance with lab analysis of water samples.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Kevin N. McCully

Project Number
S1912

Project Title
Environmental Influence on the Cloning Rates of Metridium Sea Anemones, Year 2

Abstract

Objectives/Goals
The purpose of my experiment is to determine if different external environmental factors, which simulate different natural habitats, affect the reproduction rates of Metridium sea anemones. If more sea anemones can be grown using a particular environment, it may be possible to use them as food for other species or to repopulate damaged habitats, such as sub-tidal zones.
This is my third year of working with sea anemones and the second year of experimentation to measure cloning rates. Improved tank configuration, constant water flow, and more consistent feeding were implemented this year. My hypothesis is that environment would affect the cloning rates of these anemones. My tanks simulated the intertidal zone (warmer temperature), sub-tidal zone (control temperature with colder water temperature and circadian lighting) and deeper water (dark tanks).

Methods/Materials
I tested the reproduction rates using 6 small tanks split in two by fine mesh which allowed passage of nothing except for water. Four half tanks received warmer (room temperature 68˚) water and four half tanks had reduced lighting due to black acrylic covering. I also had four half tanks with control conditions consisting of colder ocean temperature water and circadian lighting. All tanks were fed a mixture of immature brine shrimp or rotifers twice daily. The number of anemones was counted weekly. After a noticeable difference in size of anemones among the different variables, I added measurement of the size of the sea anemones to my project. I also surveyed the tide pools to measure the water temperature (57˚F) and search for sea anemones.

Results
The dark tanks reproduced the fastest out of all of the tanks; but had the lowest survival rate. The warmer tanks reproduced faster and had the larger sea anemones than but did not survive as well as the control anemones. The control tanks reproduced the slowest, but had the highest survival rate, so they ended with the highest total of anemones.

Conclusions/Discussion
The data did not support my hypothesis because the restricted light tanks actually reproduced faster than the control. However the hypothesis was correct in saying that a warmer temperature would cause an increased reproduction rate. The control tanks best symbolized the environment of Metridium senile where it is found in Southern California, the sub-tidal zone, about two to five feet below low tide.

Summary Statement
This project simulated different tidal zones to determine the ideal condtions for reproduction of Metridium senile.

Help Received
Used student intern labratory at Cabrillo Marine Aquarium; under the supervision of Dr. Kiersten Darrow.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Evan T. Morikawa

Project Number
S1913

Project Title
Parthenogenesis: Optimizing Virgin Birth in Sea Urchins

Abstract

Objectives/Goals
This experiment was designed to test the most effective measures to parthenogenically activate sea urchin eggs of the purple sea urchin (Strongylocentrotus Purpuratus). The study of parthenogenesis is the ability to artificially induce asexual reproduction in living creatures. This unique field of study is finding new applications in modern stem cell research. Parthenogenic eggs are being investigated as an alternative means to create embryos that stem cells may be harvested from

Methods/Materials
For my experiment, I activated the eggs of Strongylocentrotus Purpuratus by exposing them to a hypertonic shock of a pure Sodium Chloride (NaCl) solution. The two experimental variables were the concentration of the hypertonic solutions (ranging from a 3.4% to a 5.3% NaCl solution) and the length of suspension in those solutions (ranging from 30 to 105 minutes). I suspended the eggs in six different solutions for six different suspension times to yield thirty-six different tests, plus an additional thirty-seventh test in which I normally fertilized eggs as an alternate control. I then counted the percentage of eggs in each test that showed signs of activation and calculated basic statistical data such as standard error of the mean.

Results
I discovered that eggs placed in a 4.8% concentration of a NaCl solution had the highest egg activation percentage by a statistically significant margin and hence was the most successful concentration. The amount of time the eggs were suspended did not produce statistically significant results and yielded inconclusive data; however, eggs immersed from 30-45 minutes seemed to show slightly higher activation percentages.

Conclusions/Discussion
What I found indicated that an extremely precise set of conditions in salinity needed to exist in order to successfully activate the eggs through parthenogenesis. Out of my thirty-six different tests, only two showed signs of significant activation percentages. Knowing the set of conditions that function most efficiently, I would want to continue this experiment in the future by experimenting with other variables to further optimize the process of parthenogenesis.

Summary Statement
This project artificially induces asexual reproduction in sea urchins through parthenogenesis.

Help Received
Used lab equipment at High Tech High School

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Genevieve G. Mount

Project Number
S1914

Project Title
Maggots, Meat, and Mayhem

Abstract

Objectives/Goals
The object of my experiment is to find out if, and how, the number of maggots on a piece of beef affects the length of their life cycle. I tested to see if the number of maggots on a controlled amount of beef liver would affect how long the maggots would take to grow from egg to pupa. My hypothesis was that the increase in the number of maggots on a controlled piece of meat would decrease the length of the maggots# life cycle.

Methods/Materials
I conducted my test with wild fly eggs collected by leaving a piece of beef liver out for a day. I raised the maggots in shallow round containers. There were 4 sets of containers with 10 eggs in them and 4 sets with 20 eggs. Each container had 5 grams of beef live in it. I repeated this setup 5 times. The testing environment was controlled, the temperature, humidity, amount of meat and all other factors were held constant. The number of maggots was the only variable.

Conclusions/Discussion
My results show that the number of maggots does have an effect on the length of their life cycle. The trend was that the greater the number of maggots on a piece of beef liver, the shorter the time they took to grow from egg to pupa.

Summary Statement
The object of my experiment is to find out if, and how, the number of maggots on a piece of beef affects the length of their life cycle.

Help Received
Father helped with field work, and editing the report, Mrs Clark helped with statistical analysis, Mother helped with board, and editing the report.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Ryan T. Shimizu

Project Number
S1915

Project Title
Colonization of Three Species of Aphid on Two Types of Locally Grown Lettuce

Abstract

Objectives/Goals
To observe the colonization of three aphid species on a lettuce head. Thus determining,if possible, an effective eradication treatment.

Methods/Materials
Materials:Eighteen, two-month old lettuce plants(9-iceberg, 9-romaine)
Eighteen seclusion cages(Glass-panel/canvas)
180 Aphids(60-species A, 60-species B, 60 species C)
Method: Three plant groups(3-iceberg, 3-romaine)were infected by a separate aphid species and each individual plant placed in a seclusion cage. Colonization pattern was observed once per week over a three week period.

Results
Two species of aphids(Nasonovia-ribis-nigri, Acyrothosiphon-lactucae) preferred to colonize in or very near the center or core of the lettuce leaves. Only Myzus-persicae preferred the outer leaves.

Conclusions/Discussion
My conclusion is that because both Nasonovia ribis-nigri and Acyrthosiphon lactucae prefer the inner leaves of lettuce plants, eradication with insecticides won't be effective, however Myzus persicae is still vulerable to and can be killed with insecticide.

Summary Statement
My project's purpose was to find where three separate types of aphids colonize on locally grown lettuce.

Help Received
Used lab equipment at the USDA ag. center under supervision of Dr. Jim McCreight and Patty Fashing; Recieved help in organizing my project ideas from Dr. Jim McCreight and Patty Fashing.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Sonia Singhal

Project Number
S1916

Project Title
A Study of Anthopleura sola as an Indicator of Global Warming in the Northern California Rocky Intertidal

Abstract

Objectives/Goals
The goal of this research is to understand ecological change in the Northern California intertidal due to global warming by observing populations of Anthopleura sola, a newly-identified species of sea anemone. This project describes results from a baseline survey conducted at Fitzgerald Marine Reserve and Davenport Landing.

Methods/Materials
Abundance, distribution, and size of A. sola were measured using 1-m^2 quadrats along randomized transects within 30 m x 30 m plots at each site. Temperature data was recorded at 20-minute intervals with Thermochron data loggers to gain a detailed temperature profile of the intertidal.

Results
The survey shows that the average densities of A. sola at the Fitzgerald Marine Reserve and at Davenport Landing are 0.37±0.1 per m^2 and 4.97±0.03 per m^2, respectively (p=0.05). Population densities increase towards the ocean and can be modeled by exponential distribution. Sizes are normally distributed, with larger individuals occurring at the more northern site. Temperature data shows that A. sola is subjected to a wider variation in temperature than indicated by the mean ocean or atmospheric temperatures. Surprisingly, the temperature at the northern site is slightly higher than at the southern site, the difference being both statistically and environmentally significant.

Conclusions/Discussion
It may be possible to understand changes to both macro and micro-habitats in the intertidal by observing Anthopleura sola. This project establishes a baseline of A. sola populations and intertidal temperature that will be used for comparison in future research.

Summary Statement
This study creates a baseline survey of a newly-identified species of sea anemone, Anthopleura sola, in order to test if global warming is causing its migration northward.

Help Received
Dr. John Pearse gave me information on A. sola, suggested study sites, and answered questions. Mr. Robert Breen helped me get started with field work.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Katrina Maria C. Steinhauer

Project Number
S1917

Project Title
Does Mutation in Drosophila melanogaster Affect Their Attraction to Different Odors?

Abstract

Objectives/Goals
The objective of this project was to determine if genetic mutation affects attraction to different odors in Drosophila melanogaster, the fruit fly. I believe that the behavior of the mutant fruit fly is different due to its genetic mutation.

Methods/Materials
Three different mutated fruit fly populations were tested: the "sepia", having a mutation on chromosome 3 for eye color; the "white eye", having a mutation on chromosome 1 for eye color; and the "ebony", having a mutation on chromosome 2 affecting body color. A "wild type" population was compared as a "control". To avoid confusion, 16 different odors were tested as three categories: Fermented liquids; fruits; and condiments. The odors were obtained by rubbing the surfaces of each item with Q-tips and placed in slits in the covers of containers having fifty flies each. It was necessary to anesthetize the flies before placing them into each container, and then wait until they each awoke before counting the number of times that flies landed on each of the Q-tips. The landings were counted for fifteen minutes and then recorded.

Results
The number of "landings" recorded in the mutants were lower that the number of "landings" recorded in the "control wild-type" group. I compared the mutant populations to the "wild type control" using statistical methods.

Conclusions/Discussion
The mutant populations were less attracted to all of the odors tested as compared to the "wild type control" population. This suggests that each of the mutations tested affected behavior, or possibly that because of "mutation linkage", feeding behavior was affected.

Summary Statement
I compared three mutations in the fruit fly to the wild type fruit fly to determine if mutation in fruit flies affects their attraction to different odors.

Help Received
Mr. Nathan Whittington, High School science teacher provided fruit flies. Mrs. Charlebois, AP statistics teacher, provided advise on statistical analysis. Mr. Carl Gong advised me on my idea for my project.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Vinay Tripuraneni

Project Number
S1918

Project Title
Inhibition of Cell Recognition and Reaggregation by Chitin and Chitinase in the Sponge Microciona prolifera

Abstract

Objectives/Goals
Previous research has shown that chitin may have antigenic properties leading to bronchial constriction in mice exposed to chitin (Elias, et al. 2004). The study outlined below supports the hypothesis that chitin may act as an allergen that inhibits cell-cell recognition, leading to an immune response characteristic of Reactive Airway Disease (RAD).

Methods/Materials
Microciona prolifera, a marine sponge, was selected to demonstrate the inhibition of cell-cell recognition by chitin and chitinase as a function of reduced cell reaggregation. Cells were teased apart and diluted to a concentration of 1.8 x 107 cells per µL, and specified amounts of chitin and chitinase were added to each group. The inhibition of cell reaggregation was measured through the use of a hemocytometer.

Results
The most significant results yielded an 80.1 % reaggregation inhibition at a saturated chitin concentration of 1mg/15mLs. Interestingly chitinase (alone) also inhibited cell reaggregation by 79.2% at a saturated concentration of 1 unit per 15mLs. Curvilinear graphs were derived from the data for chitin and chitinase, and the graphs had reliability coefficients of 0.82 and 0.99 respectively.

Conclusions/Discussion
Ongoing experimentation using gel electrophoresis of surface proteins suggests that chitinase may be altering the structure of the surface proteins and their attached oligosaccharides and an alteration of surface proteins affects cell-cell recognition and cell reaggregation in M. prolifera. Although not present in normal individuals, exposure to chitin in genetically predisposed individuals may stimulate an upregulation in chitinase production and lead to an immune response such as asthma. Thus my results support the model that chitin-induced inhibition of cell-cell recognition may be related to an immune response and possibly Reactive Airway Disease.

Summary Statement
Reactive Airway Disease (asthma) is caused by environmental irritants; one of these irritants, Chitin, may be a key factor that induces bronchial constriction.

Help Received
Lab space and equipment provided by Dr. Brian Tsukimura. Advisor, Mr. Wayne Garabedian, graciously purchased other experimental materials.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Karissa J. Willits

Project Number
S1919

Project Title
The Influence Gravel Seep Temperature and Dissolved Oxygen Has on Juvenile Salmonid Numbers and Behavior

Abstract

Objectives/Goals
Elevated stream temperatures and low dissolved oxygen are two components which are detrimental to salmonids. Ground water is generally cool enough to be considered thermal refugia to salmonids; however, they contain low levels of dissolved oxygen. The objective of this project was to observe the temperature and dissolved oxygen of gravel seeps and the influence they have on juvenile steelhead in Redwood Creek, Humboldt County, CA. My hypotheses were that due to low dissolved oxygen content of the groundwater issuing from the seeps, fish would stay in the main channel until the stream reached an elevated temperature (>21°C), and to cope with the low dissolved oxygen levels, fish would weave between the cool seeps and the warmer stream channel.

Methods/Materials
Four times a day, five days a week I made fish observations and measured the temperatures of the stream, seep, and seep influence zones. Once per week I measured the dissolved oxygen of those seeps, plus the temperature and dissolved oxygen of six other seeps and nearby riffles. I identified seep influence zones by temperature and dissolved oxygen levels, as well as with a FLIR infrared thermal imaging camera.

Results
The seep water had extremely low dissolved oxygen content, ranging from 1.91 mg/L to 4.58 mg/L (desired levels are 7 mg/L or greater). Seep 1 and Seep 2 had water temperatures under 19°C. Fish converged in seep influence zones, which had an average dissolved oxygen level of 6.73 mg/L with average temperature of 21.0°C.

Conclusions/Discussion
Fish did not start to utilize the seeps until the stream reached 24°C. Fish converged in the influence zones of the seeps. By utilizing the influence zones, fish were able to find compromise between thermal refugia and adequate dissolved oxygen which minimized the need to weave between the main channel and the seep water. Larger fish used Seep 1, which had slightly cooler water than Seep 2 and slightly high dissolved oxygen content. They were generally found closer to the mouth of the seep.

Summary Statement
I studied gravel seep temperature and dissolved oxygen in Redwood Creek for five weeks to determine the influence gravel seeps have on juvenile salmonid numbers and behavior.

Help Received
Michael Sparkman suggested this project and answered questions, Department of Fish and Game provided supplies, Scott Willits took infrared pictures and proofread.