CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Kevin L. Cheng

Project Number
S1901

Project Title
Antlions, The Farmer's Best Friend

Abstract

Objectives/Goals
Pest control is a very serious problem in agriculture today. Farmers need pesticides to keep their crops from being damaged by insects, but over time, insects build immunities against these pesticides so an even more powerful pesticide needs to be made to kill them and then an even more powerful one after that. My project was to find the ideal environment for the beneficial insect, the antlion, and use them as a natural insecticide. I hypothesized that antlions would create traps more effectively in the sediment they're most commonly found in.

Methods/Materials
Using a homemade sediment sift, I separated the soil I found my antlions in into five sediment sizes. I sifted 1kg of the soil to find the composition of the soil. I created six four-section containers out of pipette box lids and cardboard and filled all six containers with one sediment size. I put one antlion into each quadrant of each container and measured the dimensions of the trap each antlion made each day for a week. After a week, I changed the sediment of the containers to another sediment size, but made sure each antlion was still in their quadrants so they remained a constant. I would then measure once again for a week and recorded the dimensions of the traps.

Results
After sifting 1kg of the soil, I found that 70.9% of the soil was composed of the finest sediment size. My data showed that antlions created traps larger and more often in the finest sediment size.

Conclusions/Discussion
I conclude that my hypothesis was supported. From the data I have collected, it showed that in fact, the antlions did create traps in the finest sediment size; much better than the other sizes.

Summary Statement
Finding the ideal environment for the beneficial insect, the antlion, for the use of a natural insecticide.

Help Received
Dr. Jay Vavra helped advise my project.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Michelle Dizon; Tiffany Kuwatani

Project Number

S1903

Project Title

Fun in the Sun: A Comparison of Fertilization Rates in L. pictus and S. purpuratus When Exposed to Ultraviolet Light

Abstract

Objectives/Goals

This experiment observes the fertilization rates of Sea urchin eggs in the presence of UV light in different amounts of time.The purpose is to determine the percentage rate at which Sea urchin eggs are first able to fertilize in each of the different exposure times.

Methods/Materials

Our method included using a 40-watt UV lamp. We first irradiated eggs and sperm separately for different lengths of time-0, 1, 2, and 5 minutes, about 34 ½ inches away from the UV lamp. Then we fertilized them and counted the percentages of fertilized eggs by using a microscope. For our second experiment, we irradiated sperm for the same lengths of time. Then we fertilized the sperm with unirradiated eggs. We then calculated the percentage of fertilized eggs. For out third experiment, we irradiated eggs for different lengths of time- 0, 5, 10, and 20 minutes. Then we fertilized the eggs with unirradiated sperm. Then we calculated the percentage of fertilized eggs.

Results

For the S.purpuratus experiments:The longer sperm cells are exposed to ultra violet light, the less successful the number of fertilization; eggs are less affected by exposure to UV light; but there was a small decline in the rate of fertilizations. Similar results were found when both gametes were exposed to UV light prior to fertilization.For the L.pictus experiments: The longer sperm cells are exposed to UV light, the less successful the number of fertilization; eggs are less affected by exposure to UV light; but there was a small decline in the rate of fertilizations. Similar results were found when both gametes were exposed to ultra violet light prior to fertilization.The L.pictus species was more sensitive to UV irradiation than the S.purpuratus species. The L.pictus species also showed a decline in fertilization rates as the gametes were exposed to UV light but the percentage of actual eggs that were fertilized was less than the percentage shown by the S.purpuratus species.

Conclusions/Discussion

We can conclude that L.pictus is more sensitive to UV light than S.purpuratus. In general,Sea urchin eggs are scarcely affected by UV light.Also, the sperm are more affected by UV light than eggs.Another study that we would recommend is to observe if the color of a certain Sea urchin species plays a role in ultra violet light protection.The next question we would pose would be #Does the pigment of Sea urchins have impact on ultra violet light protection?#

Summary Statement

We compared the fertilization rates in L. pictus and S. pupuratus when exposed to ultra violet light in different amounts of time

Help Received

Katherine Hemela, and Pam Miller

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Jillian D. Gluck

Project Number
S1904

Project Title
Can of Worms

Abstract

Objectives/Goals
I wanted to see if it mattered where a nightcrawler (earthworm) was cut in order for it to regenerate.

Methods/Materials
I cut the nightcrawlers at: 1.27cm posterior (bin 1), 2.54cm posterior (bin 2), 1.27cm anterior (bin 3), 2.54cm anterior (bin 4), approx. in half (bin 5), and a control group (bin 6).

Results
In bin 1, 78% regenerated and 22% did not. In bin 2, 33% regenerated, 44% partially regenerated, and 22% died. In bin 3, 40% healed and 60% died. In bin 4, 100% died. In bin 5, 38% of heads healed, 15% of tails healed, 62% of heads died, 85% of tails died. All worms in bin 6 were healthy.

Conclusions/Discussion
My hypothesis was incorrrect. I thought that it would matter that the shorter length would matter when what really mattered was the anterior/posterior cuts. The earthworms with their posterior cut regenerated or partially regenerated. The earthworms with their anterior cut did not regenerate. This might be because they cannot regenerate a "head" or I might have cut through their hearts.

Summary Statement
The placement of a cut on a nightcrawler affects it's ability to regenerate the cut off portion.

Help Received
Supervised by teacher Ms. Batteiger and mother, mother helped cut some worms.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Natacha Jade Hildebrand

Project Number
S1905

Project Title
Do Birds Respond to Different Colored Bird Seed?

Abstract

Objectives/Goals
The title of my project is #Do Birds Respond to Different Colored Bird Seed?# The purpose of my project was to see if birds were affected by color, more specifically if birds would respond to different colored birdseed in their typical environment. The outcome was something far from expected.

Methods/Materials
In my experiment I tested mainly wild birds, mainly sparrows and common small birds found in Calabasas# environment. . I bought a bag of Wild Bird Food. Then I bought red, green, blue, and yellow food coloring. I divided the bag up into five different sections and dyed each one of the sections a different color and left one section its natural color. Then, I measured 100 mL of each different colored bird seed with a graduated cylinder from. I then proceeded to go outside into my backyard and put the bowls on ledge which would be quite accessible for the birds. I left the bowls there for a four-day period, each day I measured how much bird seed was consumed and put the remaining amount back on the ledge. After three days I would measure the lasting amount of bird seed and then refill each bowl with 100 mL of bird seed. I did four, four-day trials, calculating my data each day. The colors of the bird seed were my changing variables and the colorless birdseed was my constant.

Results
My results displayed that the birds were highly affected by the color of the birdseed, furthermore they responded best to neutral color and yellow. They also responded well to the red birdseed.

Conclusions/Discussion
Since birds have such a high perception of color, they are most definitely affected by the color of the bird seed. According to the research I have done, birds have a greater response to colors found frequently in nature such as the natural color, yellow, and the green. However they are also highly receptive to the red dye because it is one of the foremost pigments in the clones of the eyes, of birds.

Summary Statement
My project was done to to find out if birds were affected by the color in bird seed i.e. if color would affect their choice.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Maxine E. Holland

Project Number
S1906

Project Title
Filter Feeders

Abstract

Objectives/Goals
My problem question was #Can Mytilus edulis (mussels), in the class of bivalvia and the phylum mollusca, absorb the particles put in the water they live in?# My hypothesis stated that the Mytilus edulis would absorb the particles because they are a type of filter feeder and filter feeders filter out water when feeding on plankton and could possibly absorb the particles within the water.

Methods/Materials
My variables are 6 tanks filled with Mytilus edulis and my controls are 2 tanks containing no livestock. In my procedure, I put in 250 ml of a carbon solution (30.16 g of black carbon pellets and 250 ml of fresh water) in all 8 tanks, found how well my variables (Mytilus edulis) absorbed the particles, and compared their results to the results of my control.

Results
In the results I found that the first day the variable tanks had 28 cells per milliliter of water and the controls had 118 cells per milliliter of water. The second day the variables had 24 cells per milliliter of water and the control had 99 cells per milliliter of water. The third day the variables had 17 cells for every milliliter and the controls had 77 cells per milliliter. The fourth day the variables had 15-cells/ milliliter and the control had 68- cells/ milliliters. The fifth day the variables had 12-cells/milliliter and the controls had 62- cells/milliliter. The sixth day the variables had 10-cells/milliliter and the controls had 58-cells /milliliter. And finally, the last day the variables had 6-cells/milliliter and the controls had 56-cells/milliliter.

Conclusions/Discussion
My conclusion was that the Mytilus edulis did absorb the particles because the variable tanks had decreased in cell numbers, which means that the carbon particles have been absorbed. My hypothesis was proven correct and it leads me to believe that Mytilus edulis may absorb bacteria as well.

Summary Statement
My project was to find out if Mytilus edulis (mussels) could filter out the carbon particles put in their water.

Help Received
used lab equipment from teacher, fish tanks donated by neighbors and teachers

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Michael M. Ishimoto

Project Number
S1907

Project Title
Mating Habits of the Liriomyza trifolii: Is There an Advantage of Double vs. Single Mating in the L. trifolii's Fitness?

Abstract

Objectives/Goals
The objective of this project is to determine if there is an advantage for a female Liriomyza trifolii to mate more than once. The null hypothesis was there will be no advantage of double mating versus single mating.

Methods/Materials
Eighty virgin female L. trifoliis were mated once with a male. The females were then placed into individual cages with a chrysanthemum to ovipost its offspring. After five days half of the females were removed from the cages and were remated with another male. All the females were placed back into the chrysanthemum cages. The offspring were given time to mature and then they were counted.

Results
Double and single matings produced an equal number of offspring. Amount of offspring produced: t-test: t=0.713, DF=78, P=0.4779. The mean of both matings were equal.

Conclusions/Discussion
The null hypothesis was proven by the results of the experiment. However, my results suggest L. trfolii does not perform multiple matings for more offspring. Multiple mating may serve another purpose such as increasing longevity and gene variation or the sperm and sperm fluid could have been used as a nutrient.

Summary Statement
This experiment studied the mating habits of the Liriomyza trifolii to determine if double mating produces more offspring or has other functions.

Help Received
Used lab equpment at the University of California, Davis under the supervision of Dr. Roy Kaspi; Participant in UCD Young Scholars Program.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Marci O. Kirchberg

Project Number
S1908

Project Title
Predicting the Mating Sites of Grunion Based on Sand Grain Size

Abstract

Objectives/Goals
The objective of my experiment is to predict where grunion will lay their eggs based on the coarseness of the sand and to determine whether sand grain size has an affect on the grunion's choice of mating sites.

Methods/Materials
A study area was organized between Newport Pier and Balboa Pier (approximately 2 miles). Sand samples were taken, using a sand sampler, at 23 sites (approximately one tenth of a mile apart). Using a sand shaker with appropriate size sieves, the sand from each site was separated into verry coarse, coarse, medium, fine and very fine sand. The amount of each type of sand was recorded and percentages were calculated. From March 21, 2004 through March 24, 2004 at and after the highest tide, grunion were observed at the specified sites and their appearance was recorded.

Results
A t test was performed to compare the coarseness of the sand at the sites where grunion appeared two or more nights with the sites where grunion appeared one nght or fewer. The result was a t value of 2.3158 with 21 degrees of freedom, which suggests that the data is significant at the .025 level.

Conclusions/Discussion
The results of the t test suggest that there is less than a 2.5 percent chance that the results are insignificant. Therefore, grunion prefer sand which is primarily medium and fine opposed to coarse and very coarse sand.

Summary Statement
My experiment uses the determination of sand grain size and direct observation to predict the where grunion will choose to mate.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Michele Lanctot; Sarah Wood

Project Number

S1909

Project Title

Ecology of the Intertidal Zone: A Study of the Impact of Mussels on the Biodiversity of Conspicuous Biota

Abstract

Objectives/Goals

In this study a transect in the intertidal zone of Davenport Landing State Beach is monitored to determine if the population of mussels impacts the biodiversity of the community. In the1970?s, this same 15 x 3 m transect was chosen to monitor a mussel bed, in order to establish a baseline for comparing future changes. It is hypothesized, that a large mussel population restricts other organisms from inhabiting the substrate: thus lowering community biodiversity.

Methods/Materials

Over thirty species are counted(including anemones, coralline algae and chitons) in four random quadrats along the transect at low tide, twice a month. The biodiversity of each quadrat (H?) is calculated (using the Shannon Diversity Index) by comparing the relative proportion of each species compared to the total number of all individuals. Results were found by comparing the biodiversity (H?) to the number of mussels versus bare rock.

Results

The preliminary results indicate that the biodiversity is higher in quadrats with less mussel abundance and a greater proportion of bare rock. Our study demonstates that where mussels are less abundant species such as anemones, coralline algae and chitons increase in number, therefore supporting our hypothesis.

Conclusions/Discussion

It appears that space is the limiting factor in determining biodiversity in the intertidal zone and where there are less mussels(less competition for space) there is a greater diversity of intertidal organisms.

Summary Statement

In this study a transect in the intertidal zone of Davenport Landing State Beach is monitored to determine if the population of mussels impacts the biodiversity of the community.

Help Received

Lynda Rogers, Santa Cruz County Office of Education, Science Fair Workshops, Dr. John Pearse, University of California Santa Cruz, Field Mentor Jane Orbuch, San Lorenzo Valley High School, Classroom mentor Mary Lanctot, David Wood, Parents, Microsoft

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Lan H. Li

Project Number
S1910

Project Title
Ant Supercolony Aggression

Abstract

Objectives/Goals
Problem Statement: Ants of the #SuperColony# are spread all over California. Is one colony of ants mainly aggressors? Do aggressors always win, if so how do they win their battles?

Hypothesis: Ants from the Supercolony will be more aggressive than ants of another colony.

Methods/Materials
Old Procedure: 1. Place 10 ants from one colony into one of the large Petri dishes and set on ice until ant activity slows down; 2. Mark the ants from that colony with small amount of acrylic white paint; 3. Remove the ants from ice and let sit at room temperature until ants are fully active; 4. Place one of the painted ants with an ants from the other colony in one of the small petri dishes; 5.Record which ant attacks first; 6. Observe for about 5 mins and record what the highest level of aggression; 7. Repeat steps 4#6 15 times; 8. Repeat steps 1-7 using the other colony of ants for a total of 30 experiments.
New Procedure: 1. Place about 10 ants from each colony into 2 of the large Petri dishes and place BOTH on ice until ant activity slows down (approximately 3 mins); 2. Mark both ant colonies with paint (Whtie=Lake Skinner; Yellow=Mason Park); 3. Remove both ants from ice and let sit at room temperature until ants are fully active again (approximately 6-10 mins); 4. Place 1 ant from both colonies into one of the small petri dishes; 5. Record which attacks first
6.observe for about 5 mins and record what the highest level of aggression was; 7. Repeat steps 1-6 a total of 15 times.
Materials: 2 different colonies of ants (Lake Skinner and Mason Park); Fluon-lined Petri dish; Paintbrushes(2); Paint (acrylic white and yellow); Ice.

Results
Results: After the ants were warmed, they did not seem to return to their normal activity as did before the ice. When the first procedure was used, where only one colony was iced and painted, the aggressor altered. The non-painted ant would attack first whether it was Mason Park or Lake Skinner. However when the procedure was changed where both ants were iced and painted only the Mason Park ants attacked first and had the highest level of aggression, a 4.

Conclusions/Discussion
Conclusion: Mason Park is the part of the Supercolony and was the aggressor in all 15 of the experiments where both of the ants were painted and iced. Therefore, ants of the Supercolony are more aggressive than ants of other colonies proving my hypothesis.

Summary Statement
To determine if ants of the "supercolony" will demonstrate more aggressions than ants of other colonies.

Help Received
Used lab equipment at university california irvine under supervision of Dr. Debra Mauzy-Melitz

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Katrina A. Lindsay

Project Number
S1911

Project Title
Can You Fool a Fruit Fly?

Abstract

Objectives/Goals
I tested to see if fruit flies would be more attracted to a real banana or a synthetic banana ester.

Methods/Materials
Material List: 2 vials of flightless fruit flies, 1 large beaker, 1 display case, 1 large test tube, 1 glass ball, water, 1 hot plate, 1 thermometer, 30 drops isoamyl alcohol, 20 drops acetic acid, 1 drop concentrated sulfuric acid, 1 pipette, 1 banana, 2 pieces of filter paper, lined paper.
Procedure: Order fruit flies from www.carolina.com, get display box for experiment testing and line the bottom with lined paper, obtain a large test tube and drop a glass ball in it, fill a large beaker approximately ½ way with water and place a thermometer in it, heat the beaker with water on a hot plate until it reaches 70-80 degrees, combine 30 drops isoamyl alcohol with 20 drops of acetic acid in the test tube, after slightly mixing the two liquids, add one drop of concentrated sulfuric acid (18 Molar), place the test tube in the heated water and leave in for about 10 minutes, using a pipette, place some of the liquid ester onto filter paper, put half of a banana, mushed, onto a separate piece of filter paper, place the two pieces of filter paper on separate sides of the display case, gently shake the flies into the middle of the case, directly in between the ester and the fruit, note results.

Results
My hypothesis was proved completely wrong when the flies went directly to the banana. If anything, they in fact avoided the ester, and stayed as far away from its side of the case as possible. I was rather surprised, because to me, it smelled exactly like a banana. I suppose that in hindsight, it probably happened because the flies could see the banana, or perhaps the smell of the ester was overpowering them.

Conclusions/Discussion
My experiment did not go as planned. While I initially believed that the flies would be attracted to the ester and not the banana, what happened was in fact the reverse. The flies avoided the ester, and climbed all over the banana. To further my experiment, I could have chemically made other scents to see if the flies were more attracted to them than the banana scent; or I could have seen if the concentration of the ester mattered in the results. Perhaps the flies would have been more attracted to it if the scent was more or less concentrated. In conclusion, I could not fool a fruit fly.

Summary Statement
Using fruit flies, I tested to see if they were more attracted to a banana or a synthetic banana ester.

Help Received
Mother helped me obtain display case and handle flies, friend helped me put the flies in the case.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Kevin N. McCully

Project Number
S1912

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

Abstract

Objectives/Goals
The purpose of this experiment is to determine if different external environmental factors, which simulate different natural habitats, affect the reproduction rates of Metridium sea anemones. With species becoming extinct, it is critical to know the habitats in which reproduction is maximized.

Methods/Materials
My hypothesis was that environment would affect the cloning rates. Metridium senile sea anemones were chosen since in an aquarium tank they reproduced very fast (probably by cloning) and were happily attached to any surface. I tested cloning rates with nine tanks having their own water supply; each tank was divided in two with a plastic mesh placed in the middle. One sea anemone was placed in each half tank. Four half tanks received extra feeding of immature brine shrimp, four had double the circulation, and four had reduced lighting. I also had six half tanks with the nominal conditions, meaning they got fed three times a week, had a set circulation, and constant light. Each week for 14 weeks I tabulated the number of sea anemones in each half tank. If any half tank had no anemones, I added one from the aquarium#s tank. I maintained my results on a spreadsheet and applied statistical methods to evaluate the data.

Results
The results of this experiment stated that the control half tanks had the highest average cloning rates of Metridium senile sea anemones (mean of 5.33 births per half tank over the 14 week experiment). The second highest average was the dark half tanks (4.75) followed by circulation (3.50) and extra food (3.50) tanks. I adjusted the water flow every week but fluctuations in the aquarium water system meant that water circulation during the week was often low or nonexistent which caused much waste and extra food to dirty the tanks; thus creating an unhealthy environment. This circulation problem may be the reason my results were not statistically significant.

Conclusions/Discussion
The results were statistically insignificant due to inconsistent variation in the data. If these results were significant, I would have concluded that extra food, faster circulation, or restricted light negatively affect cloning rates of Metridium senile. I hope to continue this experiment using new techniques to minimize the varying circulation conditions, increase the sample size, and prevent migration of the anemones from their tanks.

Summary Statement
This experiment researched the reproduction rates of Metridium senile sea anemones under different conditions(more food, faster circulation, restricted light).

Help Received
Mother for driving to and from experiment site (Cabrillo Marine Aquarium), Junior SCAS for helping in report writing, Linda Chilton and Andreas Carrilo for helping me begin the experiment.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Matthew S. Palmer

Project Number
S1913

Project Title
Does Global Warming Affect Bacterial Bleaching of Coral?

Abstract

Objectives/Goals
Recent research on coral bleaching suggests the bacterium Vibrio shiloi might cause coral bleaching as water temperature increases. Vibrio shiloi renders algae that feed the coral and give coral it#s coloration, unable to photosynthesize, which kills the algae. This stresses coral to expel the algae and turn white (bleach). If it is unable to replace the algae, the coral will eventually die. Most of the new research on Vibrio shiloi has been done on Red Sea and Mediterranean Sea corals. The water temperatures in these seas is naturally high (27°C) and the indigenous corals thrive, leading the researchers to discount that global warming alone can bleach corals. I believe that the coral in the tanks with V. shiloi and global warming will bleach faster than the coral in the tank with V. shiloi alone.

Methods/Materials
Four tanks were set up, one as a control, one with global warming, one with corals innoculated with bacteria, and one with both innoculated with bacteria and global warming. The temperatures in the tanks simulating global warming were raised by 2ºC a week.

Results
My hypothesis that global warming affects bacterial bleaching of coral, eluded me and I have again confirmed that Global Warming does not affect coral directly.

Conclusions/Discussion
Several possible factors may have affected my results. 1) The time I had for experimentation was short, 4 weeks, when it take 5-6 weeks to cause bleaching with the bacteria 2) Coral do have an immune system and defenses against infection. 3) Vibrio shiloi is species specific. And although researchers have been able to force infection in numerous species of coral in the laboratory, in the wild Vibrio shiloi only infects Oculina Patagonica. As, I proved in my last project, the issue of coral bleaching and any relationship to global warming is much more complex than global warming alarmists would have you believe.

Summary Statement
Determine if bacteria in conjunction with global warming alone, is responsible for bleaching of coral.

Help Received
Dr. Eugene Rosenburg, of the Department of Molecular Microbiology and Biotechnology at Tel Aviv University provided access to cultures & Dr. Hiam-Rozenblat provided procedures for their use. Alix Purdy of Scripps Institute provided cultures. Parents provided materials. Mr. Peter Starodub supervised

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Mark L. Perring

Project Number
S1914

Project Title
Demons in the Dirt

Abstract

Objectives/Goals
My project was to determine if humidity has an effect on antlion predation. My hypothesis was that a higher humidiy would increase the number of ants an antlion would eat.

Methods/Materials
Two humidity chambers were constructed, one with high humidity and one with low. Six antlions were used in the experiment, three in each chamber. The antlions were fed an aqual number of ants and the number of ants eaten by each antlion was recorded.

Results
The differing humidities had no effect on antlion predation.

Conclusions/Discussion
My conclusion is that humidity has little or no effect on the number of ants an antlion eats.

Summary Statement
My project is about humidity having an effect on antlion predation.

Help Received
Father helped with materials; Mother helped with board.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Nhung C. Phan

Project Number
S1915

Project Title
Evidence for a Chemical Sensory Mechanism in Strongylocentrotus purpuratus

Abstract

Objectives/Goals
The focus of this experiment is to explore the possible ability of purple sea urchins by manipulating a non-tactile chemical sensory mechanism to detect distant objects, such as rocks.

Methods/Materials
In each set of trials, urchins were selected through the process of random selection and were placed at one end of the tank opposite to the rocks. Successful trials would involve the urchin's movement in locating the rocks on the other side of the tank. Controlled trials were conducted with urchins who were never given prior exposure time with the rock. The experimental trials consisted of urchins who were given prior introduction to the rock for a time of three hours but then either had the rock scrubbed or underwent further exposure with simulated wave movements. All trials that took place in the tank ran for three hours. A grid underneath the tank measured the distance traveled by the urchins, which was recorded every fifteen minutes.

Results
Results show that urchins who were exposed to the rock were able to find their way to the rock more often and in a lesser time than urchins that were not given prior exposure. Furthermore, there was a reduction in the level of locomotive activity when the rocks were scrubbed and the simulated wave movements were added.

Conclusions/Discussion
Results indicate that sea urchins have a chemical sensory mechanism. This indication was supported by urchins' inability to locate a rock after it was scrubbed. The scrubbing process is to rid the rock of any chemicals it may have in aiding the urchin's movement. This is further supported with the set of trials in which the urchins were introduced to simulated wave movements. The simulation reduced urchins' movements toward the rock in diffusing their senses throughout the tank.

Summary Statement
This project employed the use of rocks to test sea urchins' sensory mechanism base on chemical.

Help Received
Sister helped with calculations; project was conducted under the guidance of teachers: Todd Linke and Larry Nordell

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Annette M. Rice

Project Number
S1916

Project Title
The Physical Effects of Low Temperature on Two Diverse Species of Insects

Abstract

Objectives/Goals
My goal was to observe and determine the physical effects on two diverse species of the insect class as a result of different times of exposure to low temperature.

Methods/Materials
Two hundred sixteen plastic wrap covered containers were created for 108 ants and 108 crickets to six different times of low temperature exposure; 30 seconds, 1 minute, 1 ½ minutes, 2 minutes, 2 ½ minutes, and 3 minutes. There were containers holding one, two, or three ants or crickets and three sets of ants or crickets exposed for each time of exposure (i.e., the experiments were performed in triplicate). Since survival is difficult to measure, due to not having access to the proper equipment, I have used cessation of motion as a surrogate for determining survival.

Results
The results of the study, based on the established criteria, were a survival rate for all periods of exposure was 100% for the crickets and 44% for the ants. The survival rate of ants in freezing temperatures is significantly less than that of crickets, with none of the ants surviving exposure to freezing temperatures for three minutes. The crickets, experienced in this study, had a higher rate of survival which is directly attributed to their greater body mass.

Conclusions/Discussion
The results clearly validate my first hypothesis that with identical exposures to low temperatures, crickets will survive longer than ants due to their larger body mass; which enables them to store heat longer. The test results were inadequate to validate or disprove my second hypothesis which was that the rate of survival will improve for both ants and crickets when the number of specimen in each test is increased. While the survival rate did not increase when multiple ants were added to the population, the test results were inconclusive because 100% of the crickets survived at all exposure levels. Expanding the testing model and extending the exposure time for crickets would have been necessary to provide additional data for this study.

Summary Statement
Determining and observing the physical effects of two diverse living organisms if the temperature drastically dropped.

Help Received
My mom and dad helped me get from place to place and buy all the materials I needed and the insects I would experiment with. My older sister helped me chose a topic for my experiment. My younger sister helped me when I was containing the crickets.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Erin V. Satterthwaite

Project Number
S1917

Project Title
How Does Water Temperature Affect What Settles on Subtidal Surfaces?

Abstract

Objectives/Goals
The objective is to determine how ocean water temperature affects the species composition and quantity of larvae that settle on different substratum.

Methods/Materials
Three different substrates (approx. the same size): shale, concrete, PVC, were put into three aquaria with thermometers and a raw sea water flow at the Marine Science Institute, UCSB. To test each substrate, the substrate was put into a plastic bucket, rinsed off with filtered sea water, and brushed with a toothbrush. A pipette was used to draw up the detritus with organisms in it, the sample was put into a fingerbowl, and a dissecting microscope was used to observe the sample. The type and number of larvae were recorded, and the procedure was repeated each week for the concrete, shale, and PVC.

Results
Overall, the organisms seemed to settle in great concentrations when the water temperature was at the median point. The two most abundant organisms were copepods and polychaetes. The copepod trend showed that as the number of copepods increased, the water temperature was at a middle range. The polychaetes trend was very similar to the copepods, in that when the water temperature was at a middle temperature, the polychaete number was at its peak.

Conclusions/Discussion
After analying my results I concluded that temperature did play an important role in the settlement of organisms on different substrates. The concrete and shale had similar relationships between organism settlement to temperature, but the PVC was much different. This shows that PVC is not a very effective artificial reef, due to the fact that it is not able to mimic natural substrates. This data could be used in artificial reef projects, to see what organisms could be expected to settle on varied substrates at different times during the year.

Summary Statement
My project tests how the water temperature of the ocean affects the organisms that settle on different subtidal surfaces

Help Received
Used lab equipment at Marine Science Institute, UCSB; Patricia Sadeghian and Paul Valentich- Scott helped with intial set up

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Michael T. Seversky

Project Number
S1918

Project Title
Determining the Habitat Selection (Moist vs. Dry) of Armadillidium vulgare through Taxis or Kinesis

Abstract

Objectives/Goals
The purpose of this experiment is to determine if the Armadillidium vulgare (pill bug) shows taxis (movement due to stimulus) or kinesis (random movement) when given the option between a wet or dry environment as well as which environment is preferred. If a positive taxi is shown towards either environment, we can learn about their favorable conditions, which provide insight into habitat selection.

Methods/Materials
To conduct the experiment 100 pill bugs were collected. An environment was created by connecting two petry dishes and one side was made moist. Five pill bugs were introduced into each side. Every 30 seconds for 10 minutes the number in each side was recorded. After each trial 10 new bugs were used for a total of 10 trials and 100 minutes. At each measurement interval of 30 seconds, observations were made.

Materials: 100 Armadillidium vulgare (pill bugs); 2 petry dishes; 1 exacto knife; lined paper; paper towels; 1 scissors; water/H20 (just enough to wet paper towel); 1 pencil; 1 timer (with seconds display); 1 small plastic container (with lid).

Results
On average, over time the amount of pill bugs in the dry decreased while the amount in the moist side increased. At the first minute, there was an almost even split with an average of 5.2 pill bugs in the moist side and 4.8 in the dry. At 5 seconds, half way through the experiment one can observe the sharp increase in the number of bugs in the moist with an average of 6.7 bugs in the moist and 3.3 bugs in the dry. At the end of the 10-minute period, an average of 7.7 pill bugs existed in the moist side and only 2.3 in the dry. By the end of the 10 minutes the majority (77%) chose moist over dry.

Conclusions/Discussion
The results obtained through this experiment proved the original hypothesis, that the pill bugs would demonstrate positive taxis towards the moist environment, correct. The Armadillidium vulgare is a Crustacea and therefore has gill like lungs that require water for breathing. Pill bugs lack a waxy cuticle layer and are therefore susceptible to desiccation (drying out). As the pill bugs become more situated with their environment, the tended to choose the moist side as a long-term habitat. This is because they have an exoskeleton that is permeable to water vapor. They usually stay in places with higher humidity and cooler temperatures so their body remains hydrated

Summary Statement
The habitat selection (moist vs. dry) of Armadillidium vulgare was determined through examining movement in response to a stimulus or random movement.

Help Received
Teacher helped answer questions

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Nivedita Sharma

Project Number
S1919

Project Title
Biodiversity of Bugs: How Is Relative Abundance of Species Affected by Local Environment?

Abstract

Objectives/Goals
My objective is to determine the affect of temprature,humidity and flora on Biodiversity of Bugs found in our local eniornment. To compare biodiversity sesonally using Shanon-Weiner Index.

Methods/Materials
Tanglefoot Tree Pest Brand barrier, Insect Identification Books, Plastic cups, Plastic knife, Petri dish, Distilled water, 3x5 Note cards, magnifying glass, sugar, Tweezers.
Three locations were chosen in an appropriate location without water sprinklers. Distilled water and sugar was mixed in a plastic cup and placed at each of the location. The note cards were covered with Tanglefoot Tree pest barrier and placed with the plastic cups at each location. The apparatus was left out for a day. Then the collected bugs were observed and analysed to determine their species. The bugs were characterized according to their species and counted for mathematical analysis of the data. The experiment was conducted during summer and winter.

Results
My Hypothesis was supported by my analysis, that the relative abundance of species is affected by temprature and humidity of the local enviornment. The species and number of individuals found in the summer are higher than the number found during winter.

Conclusions/Discussion
My hypothesis was supported by my analysis, that the biodiversity of bugs is affeted by local enviornment.The temprature and humidity affect population of bugs sesonally such as summer and winter. The data led to additional information, that some bugs found in the local enviornment are sesonal and some are found throughout the year. The biodiversity of bugs determines the health of the ecosystem.Research on the experiment highlighted the importance of bugs in the biome.

Summary Statement
The project determines the sesonal population of bugs in the local enviornment using mathematical analysis.

Help Received
Mr. Levy helped organize the board, Dr. Suraj Pal Sharma helped format the conclusion, Mr. Taylor helped with the mathematical analysis of the data and Terminex and Stanley Pest control call advisors explained the relationship between household pest and their local enviornment .

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Rebecca D.E. Wehrle

Project Number
S1920

Project Title
Snake Locomotion: Analysis of Forces

Abstract

Objectives/Goals
The purpose of this project is to look into the pattern of force exerted during lateral undulation, the most common form of snake locomotion.

Methods/Materials
I analyzed the forces involved in this movement by running my snake through a trough of sand (repeated five times) and recording through photography. I hypothesized that the force exerted at each vertex of the sinusoidal curve will be the greatest exerted. I analyzed the data to find three common types of #sand mounds# created and I reproduced them by using a prosthetic snake of the same approximate density and diameter as my subject.

Results
I found that A (the track leading towards the outside vertex) was on average the product of 1.3 times the force needed to create B(the track leading towards the inside vertex) and that the force exerted to make C (track approximately perpendicular to the direction in which the snake was traveling) was significantly reduced compared to A and B.

Conclusions/Discussion
All the tracks were produced with the vertices of one side of the sinusoidal curve against the wall of the trough and so I conclude that come force was exerted on the wall, creating an uneven pattern of force in the sand.

Summary Statement
This project is about how forces are distrbuted within a snake track.

Help Received
Mr. Fabini lent me a spring scale and suggested that I should try to recreate the tracks as opposed to look at the properties of the sand. My father helped clean up the edges of the display. My parents put up with a sand trough on their counter for a year.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Justin W. Woo

Project Number
S1921

Project Title
The Effect of Temperature on Filtration Rates of Mytilus californianus, the California Mussel

Abstract

Objectives/Goals
Can mussels be used as a biological mechanism to decrease high levels of phytoplankton in California bay waters? If so, at what temperature do they function best?

Methods/Materials
Spec-20D spectrophotometer, 20 Mytilus californianus mussels, thermometers, electric heating wands, algae discs, refrigerator/freezer, filtered seawater, mortar & pestle.
Dissolve 300 mL of finely crushed algae in 4000 mL of filtered seawater. In 5 different 500-mL beakers, place 390mL of the algae water. Measure the starting transmittance of each of the 5 beakers, then put 4 mussels in 4 beakers. Leave one beaker empty to measure rate of settling. Take 2 transmittance readings per beaker every 10 minutes for 90 minutes with the spectrophotometer. Repeat process for the 19°C trial, done at room temperature. The 14°C & 9°C trials are done in an open refrigerator and freezer. For 24°C or 29°C, use a heating wand to heat water surrounding the trial beakers.

Results
Mussels at 19°C consistently had an increased rate of filtration. The rates were second fastest at 14°C, their average seawater temperature. At 9°C, there was a 50% decrease in filtration, while at warmer temperatures of 24°C & 29°C, the mussels barely fed at all. In a 90-minute period of time, mussels working at 19°C improved the water clarity by an average of about 22%. At 14°C they cleared up the water by about 11%, and 5% at 9°C. Warmer temperatures showed less than 1.5% improvement in water clarity.

Conclusions/Discussion
Due to the fact that they are cold-blooded, mussels# respiration rates and feeding rates vary in proportion to their environment#s temperature. They cannot survive or feed in high temperatures. This information can be used to apply mussels for a practical use of clearing up bay waters of algae. Utilizing the knowledge that mussels function quickest at 19°C, they can be placed in waters during the summer, when water temperatures are increased. Calculations show that a population of 2000 mussels can improve water transparency/clarity of a 1-million gallon body of water by 50% in less than two years.

Summary Statement
If mussels can be used as a biological mechanism to decrease high levels of phytoplankton in California bay waters, my project tested at what temperature they fed and filtered fastest.

Help Received
Father helped to drive and pick up supplies; Mr. P. Hunt (AP Biology teacher) helped with supplying equipment, working space, and suggestions