CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Shayna Asher-Shapiro; Tess J. Morrison

Project Number
J1901

Project Title
Adios Ants

Abstract

Objectives/Goals
The purpose of our experiment was to determine which types of non-toxic natural substances repel ants most efficiently without killing them. Our hypothesis was that substances with a strong taste or smell would repel ants most effectively.

Methods/Materials
We set up two pieces of cardboard with five piles of sugar (one in each of the four corners and the center) we surrounded all eight piles of sugar that were in the corners with either, cinnamon, lemon juice, chalk, bay leafs, ground sage, cream of tartar, ground chili pepper, or salt. The two center piles we didn?t do anything to. This showed that if the ants disliked the repellents enough, they would take the trouble to go all the way to the center to get at the plain sugar.

Results
We found out that they disliked cinnamon and ground chili pepper ward off ants most effectively.

Conclusions/Discussion
We were correct in thinking that substances with either strong cents or smells or most efficient.

Summary Statement
Its about a natural way to repel ants.

Help Received
Mr. Steely for giving us advice, Kelsey Cervine for lending us her ant invested yard, and our parents for helping us get all of the materials we needed.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Michael J. Boland

Project Number
J1902

Project Title
Antlion Natural History

Abstract

Objectives/Goals
Antlions are insect larvae whose pit traps for ants are noticeable in sandy areas. I studied several aspects of antlion natural history. The question my main study addresses is, #If given the choice, do antlions prefer to build their pits in open sand or in sand under leaf litter?# My hypothesis is that antlions prefer to build their pits in open areas rather than areas covered with leaf litter because leaves would make it mechanically difficult for antlions to dig their pits, and leaves would make it possible for ants to climb out of the traps.

Methods/Materials
To answer my question, I did an experiment in which I gave antlions a choice of open, sandy areas or sandy areas covered with leaf litter. I filled three pans with sand and covered half of each pan with leaf litter. I then collected 33 antlions, and released 11 antlions into each pan at the border of the leaf-covered and sand-only sides. I recorded the number of pits visible on the sand-only sides every day for nine days.

Results
After just one day, most of the antlions had built their pits on the sand-only sides, and after nine days, 27 of the 33 antlions (82%) were on the sand-only sides of the pans.

Conclusions/Discussion
I conclude that antlions prefer building their pits in open sand, and will live in areas free of leaf litter when given a choice.

I also conducted some more experiments on antlion natural history, from which I concluded that:
1) Antlions do not move around a lot once established;
2) An antlion can dig a pit in as little as 15 minutes;
3) Antlions can remove small debris from their pits;
4) Antlion pits are frequently found in open sand at the base of trees; and
5) Antlions can 'doodle' as far as 3.5 meters.

Summary Statement
I studied many aspects of antlion natural history, and in my main study I found that when given a choice, antlions will build their pits in areas of sand not covered with leaves.

Help Received
My mother and younger sister helped me collect antlions; my mother provided pans for my experiment; and my father drove me to Tijuana River Valley and helped photograph and measure antlion doodles.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Lynn H. Chai

Project Number
J1903

Project Title
How Does Incubation Temperature Affect the Sex Ratio of Fruit Flies?

Abstract

Objectives/Goals
My objective for this project was to learn how temperature would affect the sex ratio of the fruit flies. I hypothesized that the female fruit flies would outsurvive the male fruit flies because they have to go through much more harsh labor than the males.They have to breed 500 eggs at a time and through this harsh labor, they have a greater chance of adapting to the sudden change of temperature more quickly than the males.

Methods/Materials
I ordered the fruit flies and I borrowed the rest of the materials from my seventh grade biology teacher. Materials used: Incubator, five vials of fruit flies, four extra empty vials, one fly anesthizer(flynap), one magnifying glass, one tweezer, one cone shaped cup with a small hole at the sharp end, five pieces of white paper, and one thermometer.
I took a new vial of fruit flies and put them all to sleep using the fly nap. I then seperated the fruit flies according to their gender into two piles and took ten of each sex. I took the food fly food and placed a spoonful of fruit fly food at the bottom of a empty vial. I then took those twenty flies and placed them in the vial and waited until they woke up. After waking up, I placed the vial into the incubator at the first temperature, which was 23.9 degrees celsius. I recorded the data and I reapeated the steps for the other temperatures.

Results
From the results that were collected from each of my five experiments,I found that the female fruit flies were more numerous than the male fruit flies in experiments one(23.9 degrees celsius),two(26.7 degrees celsius),three(29.4 degrees celsius), and five(18.3 degrees celsius). The male outsurvived the female in experiment four(21.1 degrees celsius). The females were able to outsurvive the male at the temperature most different from room temperature, while the male were able to only survive the temperature most closest to the room temperature.

Conclusions/Discussion
The results from the different experiments supported my hypothesis. Fruit flies are known as "pests" and never got the credit for helping out scientists with researching about the genes in a living body. They were one of the most studied insects on earth and my project gives a introduction to what fruit flies are and what they did to help scientists.

Summary Statement
My project is about how various temperatures from the incubator affects the sex ratio of the fruit flies at the end.

Help Received
My seventh grade biology teacher, Mr Kusumoto, has let me borrow his incubator and all the materials that were needed for the project. My sister, Jeanne Chai, has helped me to tell the difference between the two genders.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Alissa K. Clynne

Project Number
J1904

Project Title
Astrodapsis spatiosus

Abstract

Objectives/Goals
What type of sand do sand dollars like to live in? I am interested in fossils and I also always wondered what sand dollars really are. I always thought that they were just shells that washed up from the ocean, and I wanted to learn more about them and how they live.

Methods/Materials
I went to Bean Creek near Scotts Valley to collect fossil sand dollars and sand samples. I collected 6 sand samples and over 200 sand dollars. I cleaned the sand dollars and picked out all the small pieces that could not be measured and threw them away. Then I measured the sand dollars to the nearest mm and recorded and graphed the data. I used a lab at the USGS to sieve the sand samples into size fractions. The sieved samples were weighed and sample splits were taken. This data was also recorded and graphed. Then I analyzed all of my data to see what it told me.

Results
The population of sand dollars that I measured had a normal distribution. Most were adults and there were more juvenile than elderly sand dollars. Sand dollars lived in all the deposits that I collected except samples 5 and 6. Sample 6 was the finest and best-sorted sample. Sample 5 had similar sorting and coarseness to samples 1 and 4 but did not have sand dollars. Sample #3 was the coarsest and had the most sand dollars.

Conclusions/Discussion
I think sand dollars did not like the sand of sample #6 because it was too fine and they probably could not stand up in it. Maybe the sand was too fine for juvenile sand dollars to get started. Another possibility is that the water here was too calm to bring them food. I do not have a good explanation for why there were no sand dollars in sample 5. Perhaps next year I will further investigate this strange situation.

Summary Statement
I investigated the size distribution of a population of fossil sand dollars and the relationship to their environment.

Help Received
My father help to collect the samples, use the USGS lab, and to edit and organize my report.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Vicky N. Cuevas

Project Number
J1905

Project Title
Determining Which Spice Works Best as a Barrier Against Ants

Abstract

Objectives/Goals
The purpose of my project is to investigate the effects that spices will have on ants. The reason I am doing this investigation is to derermine if spices work as a better barrier than toxic sprays.

Methods/Materials
First I will collect seventy (70) ants and place them in jars. Then I will place honey in the center of container #1 and place ten (10) ants around the sides of the container and cover the top with plastic wrap. Then I will wait 30 minutes and see if the ants are attracted to the honey and record the results. Next I will place some honey in the center of container #2 and aprinkle cinnamon about 1 inch around the honey. Then I will place ten (10) new ants around the sides and cover the container. Next I will wait 30 minutes, and then recored the results. I will repeat the same process for each of the remaining five (5) spices which are, Nutmeg, Cayenne Pepper, Oregano, and Black Pepper.

Results
My hypothesis stated that the black pepper would work as a better barrier against the ants. Instead, the nutmeg prevented them from crosssing or even get near for that matter. The spice that worked the best against the ants was the nutmeg, it may have suffocated them. The cayenne pepper was the second best in keeping the ants from crossing over to the honey.

Conclusions/Discussion
In Conclusion to my project, spices such as nutmeg and cayenne pepper are better, and safer to use on your home than toxic sprays.

Summary Statement
My project is about the effects that spices have on ants when used as barriers rather than using toxic sprays.

Help Received
My Mom took me to the store to buy materials and supplies.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Damion J. Delton

Project Number
J1906

Project Title
How Do Severe Temperature Spikes Affect the Planorbis rubrum (Ramhorn Snail) Egg-laying and Survival?

Abstract

Objectives/Goals
In my study of snails this year, I wondered why there was a population decrease of the Planorbis rubrum. I also wondered what happened to the Marisa rotula, the striped tropical snail that took over the pond in my Year 2 study of snails.
My objective of this study (Year 3) was to observe how the specie Planorbis rubrum of ramhorn snails lay eggs and survive in different temperatures. My goal was to see if the cold temperatures could be the cause of a decrease in ramhorn population seen in a local pond.

Methods/Materials
Control aquariums were inside and outside while another aquarium shifted between the two environments biweekly. I used ramhorn snails (Planorbis rubrum) in ordinary aquariums and recorded eggs laid and behavior patterns throughout the trials. Additionally, eggs were monitored to ascertain survival rates.

Results
The ramhorn snails that switched from the indoor to outdoor environments laid more eggs overall. The warming up period following the cold proved to be the most productive for egg-laying. However, once laid, the majority of the eggs did not survive the subsequent exposure to the cold.

Conclusions/Discussion
In conclusion, cold snaps followed by warming will indeed encourage egg-laying. However, where survival and population maintenance is an issue, a protected, warmer area in the habitat would be necessary for the young snails to survive.
But the temperatures were only part of the reason why there was a decrease in snail population last year. Marisa rotula are tropical snails and are more aggressive breeder than the Planorbis rubrum. During the winter months, the tropical Marisa Rotula did not survive, and the Planorbis rubrum numbers were greatly decreased.
The eventual repopulation in this pond by the hardy Planorbis rubrum is nearly assured; however, it will be much slower than expected due to the cold temperatures. Additionally, any further inhabitation by tropical snails should be discouraged.

Summary Statement
Temperature spikes affect ramhorn snail (Planorbis rubrum) egg-laying patterns and young snail survival rate.

Help Received
Teacher as mentor

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Benjamin Formaker-Olivas

Project Number
J1907

Project Title
How Does the Intensity of a Magnetic Field Affect the Regeneration Rate of a Planarian?

Abstract

Objectives/Goals
My objective was to test my hypothesis that if the intensity of a magnetic field is increased, then the regenerative rate of a planarian that is exposed to that magnetic field will increase.

Methods/Materials
I tested the regeneration rates of planarians exposed to magnetic fields caused by neodymium magnets. Using a gauss meter, I measured the intensity of magnetic fields at the surface of 1 neodymium magnet (1,650 gauss) and at the surface of 3 neodymium magnets stuck together (3,550 gauss). I placed 1 planarian bisected at the auricle in each of 6 Petri dishes along with 50 ml. of spring water. Two of the dishes were not exposed to any abnormal magnetic fields (controls), with 2 dishes each exposed to the fields caused by 1 magnet and by 3 magnets placed under the Petri dishes, respectively. I compared the pre- and post-bisection total lengths, number of tail drops, and visible head and tail regeneration over 8 days.

Results
Although the total length measurements were unreliable, there appeared to be a possible accelerated effect on tail dropping and visible regeneration from exposure to strong magnetic fields.

Conclusions/Discussion
My experiment did not conclusively support my hypothesis and was complicated by the occurrence of tail dropping and by planarian contraction. However, because my results did indicate a possible link between exposure to strong magnetic fields and accelerated regeneration, and because there has only been limited research in this area with other species, my experiment suggests that further research is justified.

Summary Statement
My project aimed to determine whether the intensity of a magnetic field has an effect on the regeneration rate of a planarian.

Help Received
Dr. Duane Doty, Professor in Cal. State Northridge Department of Physics & Astronomy, provided gauss meter to help measure magnetic field strength of magnets; mother placed orders at my direction for materials and helped type this and my County Science Fair application; parents paid for materials.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Carlyn J. Girard

Project Number
J1908

Project Title
Migratory Magnetism

Abstract

Objectives/Goals
My objective was to prove that steelhead trout could detect magnetic fields. I wanted to train them to have a conditioned response between a 90-degree change in the magnetic field surrounding their aquarium and their feeding time. At the same time, I wanted to see if I could condition the fish to also connect feeding with a red light coming on. This way I could see if they could be trained in any way, if not to the magnetic field at least to the light. If I could prove that they can sense the magnetic field then that might mean that they use magnetic fields to migrate in the ocean.

Methods/Materials
I created a magnetic field around a 55 gallon aquarium that contained six one year old steelhead. I observed the steelhead through a web cam to see if they reacted to the magnetic field by moving to a feeding area in the tank as if they knew that food was coming. I also turned on a red light to see if they reacted to the light in the same way. Once I proved that they reacted to the red light, I used only the magnetic field.

Results
During the first thirty feedings the fish showed no clear reactions to turning on the magnetic field or the red light. During this period the only reaction would come when the food actually dropped into the water.

Starting at feeding 30 the fish showed that they associated the red light to feeding because of a territorial response. After feeding 35 fish actually moved into the feeding area regularly after the red light came on showing that they knew that when the red light came on they would get fed.
The fish showed no signs that they associated the magnetic field with feeding. There was no pattern of entering the feeding chamber or an increase in activity. This was true during the testing of the magnetic field with and without the red light.

Conclusions/Discussion
I was able to train the fish to associate the red light coming on with feeding but not the change in the direction of the magnetic field. Compared to the reaction that I got from the red light, the fish didn#t detect the change in the magnetic field at all. My hypothesis was wrong at least for the way I tested the fish. My testing indicates that at least one year old steelhead trout don't use a magnetic sense to migrate. This sense could develop in older life stages or my approach to testing didn't draw it out.

Summary Statement
I created a magnetic field around an aquarium and using steelhead trout I tried to prove that they could detect changes in magnetic fields.

Help Received
Dr. John Phillips helped me design the experiment. My Dad helped me set-up the aquarium and the magnetic field.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Erika M. Gleim

Project Number
J1909

Project Title
Determining the Effects of Various Animal Hair and Temperature Variations on Cricket Behavior

Abstract

Objectives/Goals
My objective was to learn if the crickets were attracted to certine types of hairs in different temperatures. I wanted to see which hairs the crickets was attracted to in warm and room temperature.

Methods/Materials
I used Horse, Wool, Rabbit, Cat, Dog, and Human hair. I put one of the six hairs in one side of the container I used to keep the crickets in. For the room temp. I put the hair in on one side and let the crickets have ten minutes to choose wether they are attracted to that hair or not. Reapeat that process five times for each hair. For the warm temp. you heat the hair to 86 Farinhight and then put that hair in one side of the container. You would reapeat this step five times for each hair.

Results
The crickets was attracted to the control area the most in warm temperature and was repeled to the cat hair. In warm temperature the crickets was attracted to the cat hair and the crickets repeled from the dog hair. I think this happend because of the thickness of the different animal hair and the odor the hairs let out.

Conclusions/Discussion
My hypothesis for the warm temperature was that the crickets was going to be attracted to the horse hair. My hypothesis was wrong. The crickets was attracted to the control area. I think that the crickets was not attracte to the warmth the hairs let out or the odor the hairs let out. My hypotesis for room temp. was that the crickets was going to be attracted to the dog hair. My hypothesis was wrong again. The crickets was attracted to the cat hair. I think this happened because all the other hairs was too thick.

Summary Statement
I was trying to determine which hairs the crickets was attracted to the most in warm and room temperature.

Help Received
Father helped make the container; friend and neigbor helped with giving me the animal hair.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Christina Jade B. Gray

Project Number
J1910

Project Title
Que Moule

Abstract

Objectives/Goals
I started this project because I wanted to do a project on an animal that cannot sting, bite, or harm me in any way. So I chose the harmless mussels. I was very fascinated by their byssal threads and decided to see if two types of mussels from different places had a diversity in the strength of their byssal threads.

Methods/Materials
There were many materials used during the testing of my project. The materials I used were two groups of Mytilus californianus from different areas(mussels from the harbor and mussels from the jetty), twenty gallons of salt water, a fish tank, a newton scale, a filter, two feet of fishing line, paper, a pencil, and an unfolded paper clip. I put the water in the fish tank with the filter to clean for twenty-four hours. I then put the mussels into the tank for twenty-four hours to adapt to their new enviroment. The next day I started testing. I tested three times a day for seven days. Each time I ran a test, I would take the newton scale tied to the fishing line and the unfolded paper clip and I would hook one byssal. Then, I would hold the mussels down and pull the newton scale up until the byssal thead snapped. Then I would record my results.

Results
After testing, I found that the mussels from the jetty had stronger byssal threads because they came from a rougher enviroment. The mussels from the jetty have to withstand the crashing waves and the powerful tide while the mussels from the harbor only have to withstand a few predators every now and then.

Conclusions/Discussion
In conclusion, my hypothesis was right. The mussels from the jetty had stronger byssal threads due to the rougher enviroment. I liked doing this project because the procedures were easy and I liked working with the mussels. Working with the mussels was a complicated job. If I took the mussels out of the water, the anenome attached to the mussels would squirt poisen. If I kept the mussels in the tank to test, I would get rashes because of the poisen in the water. Overall, I loved working with the mussels and I hope to do another project on mussels.

Summary Statement
My project was about the strength of a mussels' byssal threads.

Help Received
Student helped with board.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Taryn R. Holliday

Project Number
J1911

Project Title
Do Viviparis malleatus (Trapdoor Snails) Exhibit Predictable Behavior?

Abstract

Objectives/Goals
My objective was to observe the trapdoor snails throughout the day and record their behavior in tallied charts. My goal was to see if the behavioral patterns could be analyzed to predict snail behavior.

Methods/Materials
I used trapdoor snails (viviparis malleatus) in ordinary fish bowls and observed their behavior throughout the day. The behaviors were tallied into charts/graphs and analyzed to find shared, individualized, or random behavioral patterns.

Results
Results indicated that trapdoor snails do exhibit predictable behavior. The larger the snail, the more predictable the behavior. Specific behavioral pattern data showed that snails were on the bottom of the bowls much of the time, (however, they were seldom there together). The snails spent little time on the side, in mating behavior, or together.

Conclusions/Discussion
The larger snails are older and had acquired a certain set of behaviors. The smaller snails are younger and have not yet learned the specie behavior.
The most predictable behavior can be explained by exploring trapdoor snails in their natural habitat. Trapdoor snails prevail on the bottoms of ponds. The tough operculum, or foot, enables it to navigate and survive the bottoms of ponds. When the operculum is closed, the snail sinks easily.
From what I observed, trapdoor snails do not like being with other pond animals--even their own type. They do not appear to be social.

Summary Statement
Trapdoor snails exhibit more predictable behavior as they grow older and have special features enabling survival on the bottoms of ponds.

Help Received
Teacher as mentor

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Katrina Hruska; Karina Subijana

Project Number
J1912

Project Title
Snail Science

Abstract

Objectives/Goals
The objective of our project was to determine the effect of calcium added to an aquatic snail's environment on a snail's weight gain and loss.

Methods/Materials
First, we bought two eight-cup tanks that were both the same size and shape. Next, we labeled the tanks 'Tank I' and 'Tank II' and filled each one with six cups of fish-treated water from our freshwater tank. We decided to make 'Tank I' the control tank and 'Tank II' the experimental tank. We placed two snails, about equal size in each tank along with a fresh water plant called Elodea Densa and placed half a crushed calcium tablet in 'Tank II.' Every five days, we changed the water and added another half of a crushed calcium tablet. The snails' weights were monitored and recorded every day. Every other day we checked Ammonia, Nitrate, and pH levels.

Results
'Tank I' (control) showed little or no increase or decrease in weight. The snails in 'Tank II' (experimental) gained, on average, 0.4 grams over a period of thirty days.

Conclusions/Discussion
In conclusion, calcium that is added to an aquatic snail's environment for a prolonged period of time (at least fifteen days) causes the snail's weight to increase

Summary Statement
Our project is about the effect of calcium on aquatic snail's growth.

Help Received
Our parents lent us money to buy supplies.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Rebecca A. Hubbard

Project Number
J1913

Project Title
The Effect of Color on the Behavior of Tidepool Sculpin

Abstract

Objectives/Goals
The objective of my project is to find out how Tidepool Sculpin react to colors in their natural habitat. I believed that the sculpin would stay away from all the colors except for green because it is a relatively natural color.

Methods/Materials
I bought four differently colored six-inch square tiles: one yellow, one red, one green and one blue. I placed each tile in a tide pool containing at least two active sculpin. I observed the pool for two ten-minute periods, recording how many times the sculpin swam over the tile. I then observed the pool for another two ten-minute periods, but without the tiles. This time I counted how many times the sculpin swam over the area where the tile had been before. I considered this a run. I completed two runs for each color tile.

Results
The Tidepool Sculpin did not react to any of the colors. They did not favor green over red, blue or yellow. While the colors blue and yellow had results that were relatively the same, the results for red and green were greatly varied. The tidepool sculpin avoided the tiles more than they were attracted to them throughout the experiment.

Conclusions/Discussion
My conclusion is that the color of the tiles does not matter to the sculpin. This shows that the sculpin can recognize foreign objects in their tide pools, but this does not show if they can see colors or if colors matter to them.

Summary Statement
I studied the effect of colored tiles on the behavior of Tidepool Sculpin.

Help Received
My mom, Amy Hubbard and my two sisters sat at the tidepools with me and helped me record data. Linda Chilton of the Cabrillo Marine Aquarium gave me the idea for the project and let me work in the tidepools at Cabrillo Marine Life Preserve. She also gave me lots of information about sculpin.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
John-Michael L. Jones

Project Number
J1914

Project Title
The Mantis Project 3: What Factor Is Critical for Success?

Abstract

Objectives/Goals
The third year of this project sought to determine cause of the dismal results that were obtained last year trying to duplicate Matilda's performance. This study included wild caught praying mantises, hatchlings from Matilda's daughter, and hatchlings from a Norco female. My hypothesis was that temperature is the critical factor. This year consistent, sustained heat was added; results were documented and compared with previous years.

Methods/Materials
Materials: Various mantises, their environments: mostly separate, food sources, environments to attract or maintain the food sources, heat lamp and thermometer, etc..
Methods: Hatching season mostly outside, daily food collection and daily feeding. With colder weather move inside, add heat lamp to keep temperature 68-95°F. Record: hatch dates, final molt, death and egg laying dates.

Results
More mantises achieved adulthood. All females final molted normally and all but one laid normal egg cases. The egg-laying by all groups paralleled Matilda's, with shorter intervals. 6 females have laid over 80 egg cases so far. Early stage molting deformities corrected and feet regenerated on the youngest mantis.

Conclusions/Discussion
This study documented the heat requirement of the praying mantis Iris oratoria. With temperatures consistently above 80°F, the results demonstrated by Matilda were duplicated in all groups. Captive raised mantises responded the same as wild caught. My hypothesis was correct beyond expectations; temperature is the factor that is critical for success.

Summary Statement
This study documents the temperature requirement for successful egg laying by the praying mantis, Iris oratoria.

Help Received
Dr. Mike Maxwell, Dr. David Yager (scientific review, advice), Uncle Paul , Uncle Gilbert (photography), Aunt Sharon, Grandma Ruth, and Mom.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Anisa R. Joseph

Project Number
J1915

Project Title
When Do I Change My Fish Tank?

Abstract

Objectives/Goals
My objective was to see how long it takes before the water in a fish tank needs to be changed. I think that it will take one week before the water in a 2.5 gallon tank needs to be changed, and 10-11 days before the water in a 10 gallon tank needs to be changed.

Methods/Materials
Two fish tanks, one 2.5 and one 10 gallon tank, with three fedeer goldfish in each. I tested them once a day for nitrate and nitrite, and when the nitrite level got from 3-5 ppm I changed it so there would be no ammonia in the tank because ammonia kills the fish. Every day I wrote down how much nitrite and nitrate was in each tank and changed them when the nitrite level got from 3-5 ppm.

Results
My results were that a 2.5 gallon tank with three fish in it should be changed from every 5-6 days, and that the water in a 10 gallon tank should be changed every 10-11 days.

Conclusions/Discussion
My results supported my hypothesis almost exactly. The only difference was that I thought a 2.5 gallon tank should be changed once a week instead of every 5-6 days. My information shows that nitrate and nitrite build up quickly, and that fish have a greater chance of dying in water with ammonia in it.

Summary Statement
My project is about when to change a fish tank and the difference in a 2.5 and 10 gallon tank.

Help Received
My mother helped correct my report and cut out paper for my board, my father bought the fish and tanks for me, and my science teacher corrected my papers and supervised my report.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Aubrey R. Lechuga

Project Number
J1916

Project Title
What Is the Difference in Quality between a Confined Chicken's Egg and a Backyard Chicken's Egg?

Abstract

Objectives/Goals
My project was to determine if the quality of a commercial chicken's egg was better or worse than a backyard chicken's egg. I think that a backyard chicken's egg will have a better quality.

Methods/Materials
I used 10 backyard chickens'eggs where the chickens were fed kitchen scraps, lay mash, scratch & weeds. I used 30 commercial chickens'eggs where the chickens were fed a commercial lay mash. All eggs were stored in the same refrigerator, the same type of container, & at the same temp. for a period of 1 week. After the week was over, I compared the eggs for shape, egg wt. & shell score. I cracked open the eggs & compared them for egg yolk color, thick albumen height, Haugh Unit & shell thickness. I used a Micrometer, a Roche Yolk Color Fan & an Ames Thickness Measurer.

Results
The backyard chickens' eggs were better in quality by having a darker yolk color & they appeared fresher because of the thickness of their albumen. The commercial chickens' eggs had lighter colored yolks & did not appear as fresh but they had a better shell thickness & the eggs were heavier.

Conclusions/Discussion
My conclusion is that a backyard chicken's egg is better than a confined chicken's egg & that the food that they eat had a lot to do with the quality of the egg.

Summary Statement
My project is to determine the differences between a backyard chicken's egg & a confined chicken's egg.

Help Received
Mr. Doug Kuney, Poultry Advisor @ UC Davis, graded the shape of the egg and taught me how to use a Micrometer and a Roche Yolk Color Fan. Mr. Don Bell, Well known Poulty Specialist, graded the egg shell. My mom drove me to UC Riverside each day for a week and proofread my reports.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Gary J. Lent

Project Number
J1917

Project Title
The Sowbug's Dilemma: Shelter, Shade, or Swamp?

Abstract

Objectives/Goals
Sowbugs (Oniscus asellus) are known to seek (1) hiding places, (2) darkness, and (3) dampness. I wondered what a sowbug would do if forced to choose between two things it likes. Sowbugs breathe through gills, so I hypothesized that their favorite would be dampness. Hiding places (providing protection from predators) seemed a likely second choice, leaving darkness in last place.

Methods/Materials
I built a 3-room structure (Entry Room, Room 1, and Room 2), using three 90 mm Petri dishes interconnected by doorways. Rooms 1 and 2 each contained a different benefit: a hiding place, darkness, or dampness. (In control runs, the rooms could contain matching benefits or no benefit.) Twenty sowbugs started in the Entry Room. At twenty 1-minute intervals, I counted sowbugs in each room. I compared percentages of sowbugs that migrated to Rooms 1 and 2, to determine which of the benefits the sowbugs preferred.

Results
Dampness was the sowbugs' least-favored choice, with only 35.0% choosing dampness over darkness or hiding places. Darkness (58.4%) and hiding places (56.6%) were almost equally preferred. (The percents add up to more than 100% because I only compared two benefits at any time.)

Conclusions/Discussion
My results contradicted my hypothesis, since I had predicted that dampness would be the most popular. That was surprising, because sowbugs need moist gills to breathe. After my main experiments, I developed improved versions of a hiding place and dampness, and tested to verify that the sowbugs do prefer the new versions. Then I did a few test runs with these improved benefits, getting similar overall results to those with the original benefits. More testing with the new benefits might give different results in the long run. Understanding sowbugs' relative preferences could help us modify their environment to control their population in ways useful to agriculture and recycling.

Summary Statement
When sowbugs are forced to choose among hiding places, darkness, and dampness, more of them choose hiding places and darkness than choose dampness, a preference that might be useful in controlling sowbug populations.

Help Received
This project was my idea, based on my interest in sowbugs and Internet research showing what attracts them. My father helped me design my experiment, find supplies, and watch the timer while I counted sowbugs. My mother helped me paste up the poster.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Cody J. Long

Project Number
J1918

Project Title
Which Bait Do Crabs Bite?

Abstract

Objectives/Goals
My project was to determine what kind of bait is the most effective in catching Dungeness crab. This species is the most common sport crab in Humboldt Bay. There were two things I was looking for, which kind of bait catches the most crab, and which kind of bait catches the biggest crab.

Methods/Materials
I chose these three types of bait: fish heads, clams, and squid. These baits were chosen over something like dog food because it seems most logical that a crab would eat something from its own habitat. I used three identical crab pots, placed in close proximity to each other and did six tests.

Results
The fish heads got the best results in catching the largest quantity of crabs. Fish heads caught more than the squid and clam bait combined. The squid was the most effective bait in catching the largest crabs; the average size was 5.08 inches.

Conclusions/Discussion
In conclusion, the largest quantity of crab was caught using fish heads. If you want to catch larger crab, which most often is the case; you would want to use squid. Clams were ineffective in catching crab in both size and quantity.

Summary Statement
My project was to determine which crab baits most effectively caught the biggest and most crab.

Help Received
My dad took me crabbing so I could conduct my study. My mom edited my written presentations. Gary Hendrickson, Professor of Fisheries at HSU, helped me with data presentation. A local fish house called Fish Brothers provided me with free fish heads.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Lucas C. Miller

Project Number
J1919

Project Title
Chamaelo calyptratus Color Manipulation

Abstract

Objectives/Goals
My project was to determine if you could make a veild chameleon change colors.

Methods/Materials
I had two different lights, red, and yellow. I also had a mirror to see if having another veild chameleon nearby agitated him enough to make him change colors.

Results
I could not make him change colors. During the testing week he had changed, but it was not during or because of my testing.

Conclusions/Discussion
I conclude that veild chameleons change alot more because of emotional reasoons than physical reasons.

Summary Statement
My project is about seeing if you can force a chameleon to change colors by changing his enviroment and playing tricks on him.

Help Received
Dad helped type. CSF helped edgucate me on chameleons.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Shannon C. Mueller

Project Number
J1920

Project Title
Effectiveness of Copper Banding in Preventing Brown Garden Snails (Helix aspersa) from Reaching Food Sources

Abstract

Objectives/Goals
My objective was to determine if new copper banding, copper with patina, or irrigated copper banding would prevent brown garden snails from reaching their food sources. We grow citrus trees, and snails are always eating the fruits and leaves. Gardeners and commercial growers share the same problem. Decollate snails, predators of brown garden snails, may not be the best solution especially for agriculture, since decollate snails often cannot be shipped outside San Diego county. My goal was to find a solution for reducing the number of snails on citrus trees with limited environmental impacts.

Methods/Materials
First, I performed preliminary trials to determine which food bait attracted the most snails. Although all baits were popular, snails were most attracted to tangerines. Next, I placed copper banding in widths of 2.5 cm, 6.5 cm with flanged tabs at the top, 6.5 cm with flanged tabs at the bottom, and 7.5 cm around 4 pots. Another pot had no copper banding to act as a control. A tangerine was placed on top of each pot as bait. I placed seven snails around each pot, multiple times, and observed and recorded their behavior. For further experimentation, I also wrapped 7.5 cm new copper banding and 7.5 cm copper banding with patina around two citrus tree trunks. Seven snails were placed around the base of each trunk and observed. After 24 hours, both 7.5 cm copper bands were irrigated. I also tested the DC voltage interaction of the copper with the snails' mucus.

Results
The widest band of copper (7.5 cm) prevented snails from reaching the tangerine. No snails crossed the new copper bands or copper bands with patina wrapped around the tree trunks, even when irrigated. The average volt reading of the electrical reaction between the copper and the snails' mucus was 350 mV.

Conclusions/Discussion
Wide copper banding (7.5 cm) repelled the snails from reaching the food bait and, when wrapped around a tree trunk, prevented snails from crossing. Copper banding with patina also effectively prevented the snails from crossing. The snails receive a small electric shock of 350 mV when crawling on copper. Irrigation did not interfere with the reaction between the snails' mucus and the copper. Unlike many pesticides used to kill snails, copper does not leave large quantities of scattered, toxic residues and is therefore a more environmentally friendly solution for controlling snails.

Summary Statement
My project determined that new copper banding, copper with patina, and irrigated copper banding can be used to prevent brown garden snails from reaching their food sources.

Help Received
Thanks to Roberto Sanchez, entomologist at the Department of Agriculture, for discussions on snails and agriculture; Mary Chidester Borevitz for supplying copper banding and sharing her knowledge about snails; and my father for helping me construct the tubs and wood structures.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Shannon E. Murphy

Project Number
J1921

Project Title
Finding Nemo's Respiration Rate

Abstract

Objectives/Goals
The purpose of this experiment was to determine how changes in water temperature affect the respiration rate of fish. The hypothesis of this experiment is that, if the water temperature decreases, then the respiration rate of the fish in the water will decrease also. This result was expected for two possible reasons: (1) the decrease in the metabolism rate of the fish as the water temperature got colder, and (2) the increase in the percent of oxygen per unit of water volume as the water temperature got colder.

Methods/Materials
Materials: two goldfish, a fish bowl, a thermometer, a watch with a second hand, plastic bag, and ice cubes.

Methods: Three trials were performed to determine the change in the respiration rates of two fish when the temperature of the water was decreased by 5 degrees Fahrenheit. For each trial, the results from five thirty-second intervals were determined, and these results were averaged.

Results
The data collected during the three trials, when averaged together for each fish, showed that the repiration rate, measured in "gulps" per thirty-second interval, decreased by about 15%-20% when the temperature of the water was decreased by 5 degrees Fahrenheit. The patern in the data collected in each observation was fairly consistent.

Conclusions/Discussion
The experiment supported the hypothesis that the respiration rate of fish will decrease when the temperature of the surrounding water is decreased. As noted above, this decrease in the respiration rate was expected based on two factors: (1) the decrease in the matabolism rate of the fish as temperature decreases, and (2) the increase in the percent of oxygen per unit of water volume as water temperature decreases.

Problems which could affect the results includeed variations in the activity level of the fish, and difficulty in observing the number of gulps taken by each fish. The effect of these problems was reduced by taken a number of readings during each experiment, and repeating the experiment three times.

Summary Statement
This experiment is about the effect of changing water temperatures on the repiration rate of fish.

Help Received
Dad helped me by timing the thirty second intervals; Both parents helped glue various things to the board.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Thomas H. Palmer, II

Project Number
J1922

Project Title
Do Peanuts Make Chickens Lay Bigger Eggs?

Abstract

Objectives/Goals
The objective of this experiment was to determine whether or not the introduction of peanuts into the diet of chickens would result in larger and heavier chicken eggs. Assuming that peanuts would increase egg size, the additional goal was to determine the ideal amount of the peanut supplement.

Methods/Materials
In order to obtain a proper control sample, the size and weight of the chickens' eggs were measured without changing their diet. Next, non-salted, unshelled Spanish peanuts were placed in a home blender and ground into a small chunky consistency. The method was to replace a small amount of their food with peanuts. The eight chickens were first fed two ounces of peanuts and their eggs were measured and weighed. Next, four ounces of peanuts and finally, six ounces were analyzed. The procedure for feeding the peanuts to the chickens was to equally spread the peanuts on the ground so that each chicken would get a close to equal amount. Each egg was weighed by an electronic ounce scale and measured using a medical Knee Brace measuring device. As further control, peanuts were withdrawn from the diet and eggs measured. Finally, the six ounces portion of the experiment was re-tested.

Results
Egg size and weight averages were computed in order to make comparisons. Without peanuts, the weight of the eggs was 2.03 ounces. With two ounces of peanuts substituted into the chickens' diet, the weight of their eggs increased from 2.03 ounces to 2.22 ounces. The height and width also increased. Next, with four ounces of peanuts, the weight increased to 2.35 ounces and the size again increased. Then with six ounces of peanuts the chickens failed to produce eggs. Next, peanuts were withdrawn from the chickens. The eggs weighed 2.09 ounces and were smaller. Last, the experiment substituting six ounces of peanuts was again attempted and once again the chickens stopped laying eggs.

Conclusions/Discussion
The test results support my hypothesis. This project expands our knowledge about the value of feeding a controlled amount of peanuts to chickens and perhaps other foul. It has value to the chicken farmer who may want to increase the size of their chickens' eggs. It may also produce healthier baby chicks, but testing is required. Finally, adding peanuts may assist those attempting to increase the nutrition of other birds.

Summary Statement
This project attempts to make hens produce larger eggs by the introduction of peanuts into their diet.

Help Received
Father, who allowed the use of his chickens and Sherri of Dave's Feed Store for providing me information about available chicken feeds.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Andryus K. Planutis

Project Number
J1923

Project Title
Snails on Their Trails: Do Snails Have Color Vision?

Abstract

Objectives/Goals
My objective was to study the ability of animals to recognize colors and try to understand how early in evolution it first appeared. I believe that so ancient animals such as snails may have color vision because their eyes are well developed, and some of their far relatives (cephalopod species) have an ability to see at least some colors. My expectation is that if snails can distinguish colors, they would choose green color, which is the color of their food and shelter.

Methods/Materials
Two sheets of paper, orange and light green were taped to the table side by side. Adult brown garden snails were placed one at a time in the middle of the line between these two color papers, their tracks were followed with pencil or visually until the snails left the paper border or stopped moving. The color of paper where the snail finished its track was marked in the notebook. The second and the third experiments were similar to the first one, except that a big piece of transparent glass was placed to cover the color papers. The green paper used in the third experiment was much darker than the orange one. Each experiment consisted of three trials of 20 snails each for a total of 60 snails.

Results
In the first experiment about 83% of the snails chose green. When color paper was covered with glass, about 73% of the snails chose green. Finally, when the light-green paper was replaced for the dark-green one, about 78% of the snails chose green.

Conclusions/Discussion
The results of my experiments showed that garden snails preferred green color to the orange one. This preference did not depend on the differences in smell or taste of the orange and green pigments (the glass prevented the snails from smelling or tasting them) or on the difference in brightness of these two color papers (the snails chose green when it was either lighter or darker then orange). My conclusion is that garden snails really do have the ability to see at least some colors, including green.

Summary Statement
My project is about snails' ability to see colors.

Help Received
My Brother took pictures; my Mother printed graphs and helped to find books; Gary Platner provided snails.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Lisa M. Reed

Project Number
J1924

Project Title
Do Urchins Have Any Sense?

Abstract

Objectives/Goals
My objective was to use the scientific method to determine if red sea urchins use touch or smell to find their food.

Methods/Materials
First, I starved the urchins for at least a week. Then I placed a sea urchin in the middle of a tank, about 400cm x 70cm, filled with seawater. There was no current in the tank. The bottom of the tank was covered with two inches of sand. I placed a small boulder at either the north or south end of the tank. On half of the trials, I placed kelp under the boulder. I had five trials for each combination of kelp treatment (present or absent), and direction (north or south). I used a different sea urchin for each trial. I timed each trial using a stopwatch, and I recorded the time of each trial in my field notebook. If the sea urchin did not reach the boulder in 120 minutes, I stopped the trial and recorded >120 min. At the end of each trial, I measured the length(cm) of the tracks that the sea urchin left in the sand. I measured how far the sea urchin traveled in both directions (north and south), and recorded the measurement in my field notebook.

Results
When kelp was present, 60% of the sea urchins reached the boulder. The average distance a sea urchin traveled was 262.2cm, and the average time it took the urchin to reach the kelp was 72.5 minutes. When kelp was not present, 60% of the sea urchins reached the boulder. The average distance traveled by a sea urchin was 289.5cm, and the average time to reach the boulder was 65 minutes. Many sea urchins stopped within a few centemeters of the kelp for as long as 30 minutes. They did not appear to know that the kelp was next to them, but as soon as they touched it with one of their tube feet, they began to eat it immediately.

Conclusions/Discussion
In conclusion, I found that sea urchins use touch rather than smell to find their food. In my experiments, they wandered around randomly until they contacted their food. I found that there was a wide range in the time it took a sea urchin to reach the boulder, and in the distance that it traveled. The average distance traveled to the boulder, and the average time that it took for a sea urchin to reach it was similar for trials with and without kelp, regardless of direction.

Summary Statement
My project is to determine if red sea urchins use touch or smell to find their food.

Help Received
Used seawater tanks at UCSB, and sea urchins collected by UCSB collector Shane Anderson. Father helped with computer graphing program to display the data. Father and teacher gave advice on experimental design and display of data.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Megan E. Reese

Project Number
J1925

Project Title
What Is the Prevalence of Roundworms and Hookworms in Young Companion Dogs versus Young Dogs in Shelters?

Abstract

Objectives/Goals
The objective of my experiment was to determine if puppies in shelters or companion puppies have a greater prevalence of roundworms and hookworms. This is significant because these intestinal parasites are zoonotic, or transmittable to humans. I wanted to make people aware of these dangers and I also wanted to see whether people should be more cautious when acquiring dogs from one of the two sources.

Methods/Materials
I collected over 100 fecal samples from shelter and companion dogs less than six months of age. Each sample was put through an extensive laboratory procedure. I used a sodium nitrate solution, which was denser the parasite ova. The ova rose to the surface, where a cover slip was placed. I transferred the cover slip to the microscope slide and viewed the specimen under the microscope, looking for hookworm and roundworm eggs. I recorded my results. I used gloves while performing my procedures.

Results
My data showed that shelter puppies have a significantly higher prevalence of roundworms and hookworms. I did not have an equal number of shelter and companion dog samples so I compared percentages. Eleven percent of companion puppies and 42% of shelter puppies tested positive for these parasites.

Conclusions/Discussion
My hypothesis was supported by my data. There is a greater prevalence of roundworms and hookworms in shelter puppies than in companion puppies. I think that shelter dogs may have a higher prevalence of parasites because of the densely populated kennels and the shelter deworming programs may not have been implemented properly. A follow up project would be to study and compare the deworming practices of shelters to determine which program is most effective and suggest improvements.

Summary Statement
My project successfully demonstrated that shelter puppies had a higher prevalence of roundworms and hookworms than companion puppies.

Help Received
My parents provided transportation. My mother initially helped me identify the parasite ova. My dad helped me assemble my board. My science fair coach answered my questions about presenting my project. Dr. Claude and Becky Phene helped me with statistical analysis.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Allison B. Richina

Project Number
J1926

Project Title
Investigating the Effects of Different Food Additives Combined with Meats on Drosophila Behavior

Abstract

Objectives/Goals
The objective of my project was to see which natural substance combined with meats such as Beef and Chicken would attract or repel drosophila. My goal was to see which substance combined with meats would repel drosphila.

Methods/Materials
I had a total of two vials per test and there were a total of 56 vials altogether. There were ten drosophila in each vial A and vial B. I then made a solution of the substances, by pureeing the different meats and natural substances. Then I added 1/2 cup of water. Using the pipette, I aspirated 1.5 mls. of the solution and allowed this to drip onto the sponge. I tested all the natural substances alone at first,then the Beef and Chicken alone, and last the natural substance and meats combined. I then recorded my information.

Results
There was great attraction in all the substances even the plain tap water, but the most attraction was, Jalapeno/Beef, Jalapeno/Chicken, Lime/Chicken, Lime/Beef, and especially to the non comination natural substances of paprika, oregano, jalapeno, and citrus lemon. The Lemon/Chicken and Lemon/Beef did not attract as much as the others.

Conclusions/Discussion
My hypothesis stated that the Paprika/Beef would have a greater attraction to the Drosophila. I later found out that I was wrong, it did have attraction but not the most. So now I know that drosophila attract to odor, taste, vitamins, and minerals.

Summary Statement
Which natural substance combined with meats will attract or repel drosophila, fruit flies.

Help Received
High School teacher gave me the Drosophila and my Mother proof read my papers.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Ariel E.T. Single

Project Number
J1927

Project Title
Effects of Habitat Diversity and Pond Size on Bird Abundance and Species Diversity: A Two Year Study

Abstract

Objectives/Goals
My objective was to see how habitat diversity and pond size in flood basins affected the numbers of birds and the species of birds using the ponds, over a period of two years.

Methods/Materials
I estimated the size and counted the number of habitats for 8 ponds in NE Fresno. I identified and counted birds at each pond 10 times in December-January (2002-03,2003-04). Materials: pencil, binoculars, camera, paper, bird identification book, statistical software (SPSS), MSWord and Excel, car, driver, ladder.

Results
Ponds were 3-11ha, with 3-7 habitats. 23 species of birds were observed. The number of species per observation at each pond was 1-12, and the number of birds was 0-51. In Year 1, habitat diversity was not a significant predictor of species diversity, but pond size, and the interaction of pond size and habitat diversity were. In Year 2, habitat diversity, pond size and the interaction were all significant predictors of species diversity. Using data from both years, habitat diversity, pond size, and the interaction are all significant predictors of species diversity. Only pond size was a significant predictor of bird abundance in Year 1. In Year 2, neither of the variables was a significant predictor of bird abundance. When the data from both years are combined, only habitat diversity is a significant predictor of bird abundance.

Conclusions/Discussion
Both habitat diversity and pond size affected species diversity. But larger ponds did not always have greater habitat diversity. Maybe the larger ponds provide more space, so that more kinds of birds can tolerate being in the same area. There were different predictors of the number of birds in Year 1(pond size), Year 2(none) and both years combined (habitat diversity). There were only small differences in bird abundance between years. There was a big difference in species diversity. The relationship of habitat diversity and pond size to species diversity and bird abundance changed between years. Other things could affect species diversity and bird abundance, such as yearly differences in bird populations, movement of birds into or out of the study area, small changes in pond characteristics, or other things I did not measure. The results could be used to help design ponding basins to make them better for birds, or influence the kinds of birds that use them.

Summary Statement
I looked at how the number of birds using flood basins, and their species diversity are affected by size and habitat diversity of the ponds.

Help Received
My parents drove me around, and helped with typing, data input, putting the board together, and using SPSS. The satellite photo is from the California Department of Fish and Game.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Robert E.S. Weller

Project Number
J1928

Project Title
Are Annual and Perennial Plants Differentially Eaten by Snails?

Abstract

Objectives/Goals
My objective was to test whether snails prefer to eat annual plants more than perennial plants. I predicted that annual plants would be eaten more because annual plants may have fewer chemical and physical defenses than perennial plants.

Methods/Materials
I used Helix aspera, the common brown garden snail, and 6 species each of annual plants and perennial plants. I cut 2 x 2 cm squares of leaves and put one square of each species and one snail in each of 10 plastic containers. After 12 hours, I measured the remaining leaf area.

Results
The annual plants were eaten much more than the perennials (47.8% of leaf area eaten for annuals, 15.6% for perennials). The lettuce (annual) and Petunia (annual) were eaten the most by the snails and the Viola (annual), Primula (perennial), and the Gerbera (perennial) were eaten the least.

Conclusions/Discussion
I predicted that the snails would eat the annual plants more than the perennial plants because the annual plants may have fewer physical and chemical defenses. Annual plants may have fewer defenses because they have shorter lifespans and live in different places each year and it is therefore difficult for herbivores to locate them. Perennial plants live for years in the same place before they die, and the herbivores get used to the plants being there. Perennial plants may have more chemical and physical defenses to keep from being eaten. Examples of physical defenses include thorns and tough leaves. Chemical defenses include tannins that make leaves taste bad, and cyanogenic glycosides that release cyanide when leaves are chewed. My results are consistent with the idea that perennials have more defenses than annuals to discourage herbivores from eating them.

Summary Statement
My project tested whether annual and perennial plants are differentially eaten by snails.

Help Received
Dad helped collect snails and buy plants. Mom helped with statistics and graphs, and measuring leaf area. Dick Hudson helped with statistics. Ms. Beth Zemke helped with paper organization.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Chris D. Woodward

Project Number
J1929

Project Title
The Freezing Tolerance of Mytilus edulis (Black mussel) and Perna canaliculus (Green mussel)

Abstract

Objectives/Goals
Cryobiologists are trying to develop procedures for freezing and thawing organs for transplant. Mussels produce a cryoprotectant to help them withstand cold temperatures. This study was conducted to determine if a mussel's cryoprotectant would raise its survival rate after freezing. I believe 100% of the mussels would survive freezing.

Methods/Materials
Phase I included 9 black mussels and 6 green mussels frozen in three batches in sea water at - 5. Phase II included 7 black mussels and 2 green mussels frozen in two batches without sea water. In both Phases the mussels were frozen for at least 5 hours. The mussels were then thawed, probed, and dissected to determine if they survived. 5 criteria were used to determine the mussels' vitality.

Results
In Phase I, the survival rate for the black mussels was 56% and for the green mussels was 83%. In Phase II, the survival rate for the black mussels was 86% and the green mussels was 0%. Overall 69% of the black mussels survived and 63% of the green mussels survived.

Conclusions/Discussion
The survival rate of the mussels was over 50% but less than the 100% I hypthesized. More experimentation would be helpful to determine the longest period a mussel could be frozen and survive. Utilizing a high-powered microscope, the actual change in the cell's structure during and after freezing could be observed.

Summary Statement
Black and green mussels were frozen, thawed and then checked for vitality to determine presence and effectiveness of cryoprotectants.

Help Received
Mother helped type report. Father cut open the mussels remaining after I cut my hand.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
James A. Cook

Project Number
J1999

Project Title
Eisenia fetida, "Redworms," and California's Soil Ecology

Abstract

Objectives/Goals
The purpose of this project is to determine if earthworms, represented by Eisenia fetida, can live and reproduce in distressed California ecosystems, such as soil from tilled farmland or heat damaged soil from our Southern California forests recently ravaged by wildfires. If so, this might be a method of rehabilitating distressed soil ecosystems.

Methods/Materials
Five wooden plantars divided into five sections each were filled with one of five soil types: Pristine Oak Forest,Tilled Farmland, Pristine Pine Forest, Burnt Pine Forest, and Commercial Worm Bedding (as control). 25 healthy, mature Eisenia fetida were randomly assigned to each section. Saturation, absorption and pH of the soils were measured. The soils were moistened to 75% saturation, and observed for one reproduction cycle (31 days).Each section was then examined for mature, immature and cocoons.

Results
The numbers of worms and cocoons were tallied for each section of each soil. Mature worms were found in approximately the same numbers as were originally introduced. Very few immature worms were found. Cocoons were found in all soils, but in markedly greater numbers in the Pristine soils and the Control than in the Disturbed soils.

Conclusions/Discussion
Earthworms can survive in distressed soils but reproduce very poorly. If earthworms were to be used to rehabilitate distressed soils, other ingredients, such as organic matter, would be needed.

Summary Statement
The purpose of this project is to determine if earthworms can reproduce in distressed California soil ecosystems.

Help Received
Parents helped obtain soils and gave typing and grammar suggestions. Ms. Benoy gave worm care recommendations. Mr. Hobbs, my science teacher, gave helpful suggestions.