CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Sara S. Aboobakar

Project Number
J2401

Project Title
Becoming the Biggest Brine

Abstract

Objectives/Goals
My goal was to see if placing a crushed L-Lysine tablet in my brine shrimps' habitat would help them grow larger, compared to the regularly grown shrimps.

Methods/Materials
I used 10 brine shrimp eggs (which would later hatch) in each of the four 500 mL bottles. the bottle were cut around the top making it easy to see the shrimps and for the shrimps to get air. Two 500 mg L-Lysine tablets were crushed and then one of the tablet's powder was put in one bottle, and the other's powder in the other bottle. Four grams of crushed rock salt was also put in each bottle. Lastly, 500 mL of water was added to each bottle.

Results
After the two week period the L-Lysine enhanced shrimps grew to be larger than the regularly grown shrimps.

Conclusions/Discussion
L-Lysine is a natural amino acid that builds protein in both animals and humans. However it can only be consumed and not produced. Since L-Lysine is all natural, it created a non-toxic and healthy enviornment. One side effect was that it made the shrimp hyper and energetic. Although the L-Lysine grown shrimps grew to be larger, they grew at a rapid pace at the start and slowed down after the 8 day mark. While the regularly grown brine shrimps kept at their gradual pace the whole two week period. So overall, the application my project can make to the real world is that if athletes want the results of steroids and don't want to harm their bodies, they can take L-Lysine pills as a substitute.

Summary Statement
My project is about the effects of L-Lysine on brine shrimps, and if it will advance their growth pace, compared to the shrimps that are regularly grown.

Help Received
Mother helped with the ordering of the materials.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Michael A. Alves

Project Number
J2402

Project Title
The Mating Game: Red Worm Reproduction

Abstract

Objectives/Goals
My objective was to determine if the diet of a red worm affect its reproduction.

Methods/Materials
Method: I labeled the metal trays A(produce)and B(newspaper). I placed sliced produce on the bottom of tray A and shredded newspaper on the bottom of tray B. I mixed 4 cups of potting soil with worm castings and the soil the worms were purchased in together and put it in each tray. I moistened the soil with 1 ounce of water. I added 60 worms to each tray, using the remaining 2 trays as covers. I set each tray under the kitchen window. I checked each tray every 5 days for new offspring. I counted each worm found. I documented any worms that were dead. I inspected the soil for any castings, cocoons or visible changes to the soil. I noted the worms behavior looking for signs of reproduction such as worms that were laying side by side possibly mating. I returned only the original worms to their trays and placed all new offspring into a new habitat. I did this to ensure that I documented the reproduction rate of the original worm populations. I checked the kitchen thermostat to be sure the room temperature was between 68-71 degrees.
Materials: Azalia potting soil with worm castings, red worms(120 count),4 metal disposable trays, measuring cup, metal spoon, newspaper, produce (apples, lettuce, potatoes), spray bottle filled with one ounce of water, kitchen thermostat and camera

Results
After reviewing my journal entries and data tables I found that my results supports my hypothesis, that diet does affect the reproduction of a red worm. I found that over the course of 6 weeks the worms being fed produce reproduced at a faster rate than the paper fed worms. The produce fed worms generated 33 new offspring and the paper fed only 12. The results showed that when the proper nutrients are given to red worms they thrive.

Conclusions/Discussion
It is my conclusion that after maintaining two habitats for 45 days that the diet of a red worm has an affect on its reproduction of offspring. The results of the data support my hypothesis that diet will affect the reproduction of an red worm. The worms being fed produce reproduced at a faster rate than the worms being fed paper. Tray A produced 33 offspring and tray B produced 12 offspring. I believe the lack of nutrients in the paper fed tray affected the reproduction of those worms causing them to reproduce at a much slower rate.

Summary Statement
My project is about how the diet of a red worm affects its reproduction.

Help Received
Mother and friend helped type report

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Norah M. Alwash

Project Number
J2403

Project Title
Clone Wars: The Effect of Food on Clonal Fighting among Anthopleura elegantissima

Abstract

Objectives/Goals
My purpose was to see if Anthopleura elegantissima clonal wars are affected by the amount of food available to them. My hypothesis was that A. elegantissima clonal wars will not be affected by the amount of food available to them because the wars are for territory, not food.

Methods/Materials
I used 10 A. elegantissima specimens, 2 of which were for backup. These were put in a plastic tank with 4 subdivisions each with two anemones separated with removable dividers. Each one of these subdivisions was a trial. First the specimens were collected and the tank set up. For the next week, the anemones were fed the minimum, once that week. After that, I tested them by removing the divider and recording the amount and time of the attacks that were made in 45 minutes. The next week they were fed the maximum, every day, and I did the same tests. The week after that they were fed the normal amount of food, 3 times a week, and I did the last of the tests.

Results
When fed the minimum amount of food, the attacks averaged 12 per test with a standard deviation of 11.5. When fed the maximum amount of food, the attacks averaged 16.75 per test with a standard deviation of 8.7. When fed the normal amount of food, the attacks averaged 19 per test with a standard deviation of 9.9. Also, the aggression between the anemone pairs differed from trial to trial. The anemones in trial 1 had an average of 4.6 attacks per test with a standard deviation of 2.5; in trial 2 there was an average of 11 attacks per test with a standard deviation of 7.1; in trial 3 there was an average of 21.6 attacks per test with a standard deviation of 5.4; in trial 4 there was an average of 26.3 attacks per test with a standard deviation of 7.8.

Conclusions/Discussion
A. elegantissima is a type of sea anemone that reproduces asexually through binary fission. After some time, this will create a large colony made up of genetically identical anemones. When two genetically different colonies meet, they will fight. The results of this experiment seem to show that A. elegantissima clonal fighting is not affected by the amount of food available to them. This irregular fighting pattern supports the hypothesis because the anemone fighting did not increase when there was less amount of food available to them or decrease when there was more food available to them. This would show that the fighting was not for food and therefore for territory.

Summary Statement
My project is about the effects of different amounts of food on the inter-clonal fighting among the sea anemone Anthopluera elegantissima.

Help Received
Participant in the Cabrillo Marine Aquarium Young Scientist program (specimens collected, housed, and fed at Cabrillo Marine Aquarium)

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Gabriel A. Araya

Project Number
J2404

Project Title
Pavlov's Fish: Do Goldfish Respond to Certain Conditioned Stimuli in Anticipation of Being Fed?

Abstract

Objectives/Goals
The purpose of this project is to determine whether fish can be conditioned to recognize when they are going to be fed.
Question: Do goldfish respond to certain conditioned stimuli?

Methods/Materials
Materials: 6 Goldfish per trial, 2 (2.5 gallon) rectangular fish tanks, 4 glass divisions with opaque plastic squares to isolate fish, fish flakes, flashlight, a sheet of red construction paper, a bell, pencil and laboratory notebook.
Procedure:
1. Fill all six cells up with water.
2. Put a goldfish in each cell (do not kill it).
3. Label each cell accordingly to its stimuli (light, color, bell, vibrations). 4. Confront each fish with its conditional stimuli for ONE minute each, except for two of the fish (control fish), take observations. (conditioned stimuli actions: Flash a light back and forth across (light), surround the bowl with the construction paper (color), ring a bell in front of one (bell), tap bowl with pencil (tap), and do nothing for the last one (control).)
5. Feed each fish (not too much, but the same proportions each.)
6. Make observations after the stimuli (such as moving of certain fins, swimming patterns, or moving of certain body parts like the mouth that do no regularly occur), during them eating, and afterwards.
7. Repeat steps 4-6 for seven more days, once a day each.
8. Do multiple trials.

Results
There was a positive correlation between days passed and occurrence of conditioned responses. Light stimulus fish responded more as days went on. Color stimulus fish responded more as days went on. Tapping and bells worked, but caused stress and killed some fish. Observed responses were flickering of tail, bobbing of mouth, and swimming around in patterns.

Conclusions/Discussion
Light color, and bell stimuli all conditioned fish to recognize when they were going to be fed, especially in the later days. Conditioned responses were wagging of tail, bobbing of mouth, and swimming in circle patterns. Bell and tapping stimuli stressed fish and the stress killed them.

Summary Statement
The purpose of this project is to determine whether fish can be conditioned to recognize when they are going to be fed.

Help Received
My father helped me set up the aquarium. My mother helped me cut the typed report.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Aven J. Ault

Project Number
J2405

Project Title
The Effects of Sound Level and Type on Fish Behavior

Abstract

Objectives/Goals
The objective for my project was to determine if sound has an effect on fish behavior, and, if so, what type of sound (underwater or above water) affects the fish more.

Methods/Materials
My project materials consisted of an aquarium with 12 goldfish, a metal rod, a screwdriver, a recording of a lawn mower and hammer (to simulate construction noise), and a sound level meter recorder. I placed the metal rod into the aquarium and tapped on the end with the screwdriver for five minutes. I observed the fish and recorded any differences in behavior. I then played the recording of construction noise, observed the fish, and recorded any differences in behavior.

Results
My outcomes showed the fish had a primarily negative reaction to the sound tests. I observed that the fish swam primarily in a bunched group and away from the pole that I was banging on (to simulate driving piles in a river bed) and away from the speakers that were playing the recording (to simulate construction noise along a river).

Conclusions/Discussion
I found that overall my hypothesis that the fish would be disturbed by both sources of sound was correct. My hypothesis that the fish would be more affected by the recording than the tapping was incorrect; the results show that the fish swam bunched together more often when I tapped the pole than when I played the recording.

My conclusion for this experiment is that sound from both underwater vibration and above water noise sources disturbs fish behavior. Although I was not able to determine the exact physical effects of the sound on the fish, it was clear that the sound disturbed their normal behavior.

This study leads me to believe that noise sources in or near waterways can negatively affect fish behavior and ultimately their entire eco system. Knowing this helps us understand the dangers of noise from sources like bridge construction or even motor boats in relation to water life.

Summary Statement
This project investigated how sound level and types of sound affect fish behavior.

Help Received
Parents helped type the presentation materials; Mr. Russell (teacher) helped construct the flow chart; neighbor donated aquarium and fish.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Margot L. Barker

Project Number
J2406

Project Title
Tadpole Development and Temperature: Does It Matter?

Abstract

Objectives/Goals
The objective of my project was to determine if water temperature had an effect on the rate of leopard frog tadpole development and metamorphosis.

Methods/Materials
I raised twenty-four leopard frog tadpoles in three ten gallon tanks, each a different temperature. (18 degrees Celsius, 21 degrees Celsius, and 24 degrees Celsius). I meausured their change in length and their progression through metamorphosis.

Results
Tadpoles in the warmer water (21 degrees Celsius, and 24 degrees Celsius) were found to begin and complete metamorphosis faster than the the tadpoles in the colder water (18 degrees Celsius).

Conclusions/Discussion
The results of my experiment suggest that warmer water temperature increases the rate of metamorphosis in leopard frog tadpoles.

Summary Statement
The focus of my experiment was to determine if water temperature affects the rate of development and metamorphosis in leopard frog tadpoles.

Help Received
Mother helped oversee entire project.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Timmy A. Beckmann

Project Number
J2407

Project Title
The Effect of Bird Formation on Flight Efficiency

Abstract

Objectives/Goals
This project studied the amount of energy birds saved by flying in a V formation compared to solo flight. My hypothesis was that flying in formation reduces wind drag and leads to greater flight efficiency. I focued on Pink-Footed Geese because published information on this bird species was readily available. My work was unique because it used a wind tunnel rather than mathematical models.

Methods/Materials
For the experiments, a wind tunnel was constructed using a large fan and side walls. A pair of geese were built out of Legos at 1/5 scale. The birds were positioned at several different offsets relative to each other. The force on the rear bird was measured using a scale and simple lever mechanism. I compared the force on the rear bird for the various positions of the front bird and analyzed the results.

Results
I found that there is a significant advantage for flying in formation. When flying in very close formation, the rear bird requires 53.3% less energy than flying solo. For more realistic spacing, the rear bird saves about 30%.

Conclusions/Discussion
Although the experiments were a bit crude and could be refined, my results matched the efficiency gains found in the published literature. My work can be extended to other applications such as bicycle racing or race cars.

Summary Statement
This project studied the amount of energy birds saved by flying in a V formation compared to solo flight.

Help Received
My dad reviewed the experiments and helped plot the data

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Kurtis R.S. Bingemann

Project Number
J2408

Project Title
Can Bees "Bee" Fooled?

Abstract

Objectives/Goals
To see if bees can connect shapes with food sources.

Methods/Materials
Provide bees with two dishes: one with honey water and the other with water. Each dish has a different drawn shape on a paper towel placed on it before liquid is poured in the dish. The shapes are switched between water and food source (honey and water) on subsequent days to see if bees "remember" which shape contained food.

Results
The bees always went to the food dish.

Conclusions/Discussion
The bees detected the food by sight, or smell.

Summary Statement
To see if bees can remember shapes.

Help Received
Braver father helped move dishes closer to bee hive to prevent stings.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Joshua D. Bright

Project Number
J2409

Project Title
Free-Range vs. Caged Chickens: Influence on Yolk Color and Size

Abstract

Objectives/Goals
I have had chickens for pets for two years, and the eggs they lay seem to have brighter, larger yolks than commercial eggs. I wondered why this was, and this is what led me to my project. I hypothesized that the yolk color and size would be dependent upon whether the egg was organic and the chicken that laid it was free-ranged or caged. Egg color matters because it is the result of two carotenoids called lutein and zeaxanthin and other beneficial xanthophylls. Lutein and zeaxanthin have been shown to aid in prevention of age-related macular degeneration (AMD), the leading cause of blindness.

Methods/Materials
I took a total of 162 RGB readings from 54 photographs of 27 eggs representing nine different types of eggs. For each I recorded the weights of the egg and the yolk and took two pictures of each yolk sample and uploaded the images to my computer. For each image, I selected three representative spots on each photograph and took the RGB readings of each one. I then averaged the data.

Results
The most significant result I obtained from my project was that commercial eggs tend to have larger yolk/egg ratios than organic eggs. This may be because commercial feed may contain different dietary nutrients. The RGB color assessments showed that redder (more orange) yolks did not always correlate with free-range chickens, and this may be clue to dietary differences among the free-range animals. I am continuing to experiment and looking for a pattern regarding yolk color.

Conclusions/Discussion
Factors that I thought would have a great impact on coloration and yolk/egg proportion did not seem to have a consistent effect. One consistent result my tests yielded was that inorganic eggs tended to have larger yolk proportion than organic eggs. I believe this may be because these eggs are laid by chickens fed a diet supplemented by hormones and antibiotics. My free-range chickens did have yolks with deeper coloration than most of the other test eggs, but other free-range egg yolks were not as deeply colored as I predicted they would be. The diet a chicken is fed influences egg yolk color. In other words, chickens fed diets higher in xanthophylls will lay eggs that are higher in xanthophylls, and the eggs will be more deeply pigmented. I would suggest more testing be done, comparing the diets of free-range chickens, to see if more consistent patterns emerge.

Summary Statement
My project is about the factors that influence the color and size of the yolk of a chicken egg.

Help Received
My mother helped me acquire eggs for my testing; my science teacher helped me develop a way to analyze yolk color using RGB readings; Dr. Robert Pomeroy gave me general advice about my project.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

Sinead Casey; Edenne Flinn; Daniel Noel

Project Number

J2410

Project Title

Tracking the Pacific Bluefin Tuna

Abstract

Objectives/Goals

Using the Tagging of Pacific Predators Program (TOPP) tagging map satellite images, we plotted geolocations for eight Pacific bluefin tuna from January, 2004 through December, 2004. We compared the migratory patterns of the PBT to harvesting data released by the United Nations Food and Agriculture Organization in 2004 to draw conclusions regarding the effects of migratory movements and over-fishing on the bluefin tuna population related to the principles described by Biologist Garrett Hardin in 1968 as the Tragedy of the Commons or the depletion of commonly held resources.

Methods/Materials

We measured hundreds of geolocation images of eight bluefin tuna from January of 2004 through December of 2004 using the TOPP tracking program. We then created a tracking map illustrating the migratory patterns of the fish and then we compared the tracking map of the eight Pacific Bluefin Tuna over the course of one full year (1994) to data from the United Nations FAO report on international fish harvesting of that same year.

Results

We confirmed that Pacific bluefin tuna do demonstrate a migratory pattern from the Eastern Pacific Ocean to the Western Pacific Ocean and back to the the Eastern Pacific Ocean. We confirmed that the TOPP tracking system combined with geolocation position charting is a valid way of observing migratory patterns of the PBT. Data from the United Nations 1994 FAO report on tuna catches by nation in the Pacific Ocean confirmed that the greatest amount of harvesting of the PBT is occurring in the Western Pacific Ocean.

Conclusions/Discussion

The bluefin tuna is being heavily fished in the Western Pacific Ocean by several foreign nations and increasingly in the Eastern Pacific Ocean by foreign fishing fleets. We believe this is adversely affecting the survivability of the population as more fishing fleets resort to purse-seine fishing in attempts to gather as many of the remaining fish as possible before the collapse of the population. We believe this demonstrates the Tragedy of the Commons principle as suggested by Garrett Hardin. The value of the tuna is so great that fishing fleets in both the Western and Eastern Pacific Ocean are attempting to cash in by catching as many of the prized fish as possible before they are gone. We determined that there is a need for international treaties and protected marine sanctuaries to prevent the bluefin tuna from being over-fished to the point of collapse.

Summary Statement

Use of Satellite Archival Tags and Online Tracking to Examine Migratory Patterns of Pacific Bluefin Tuna Compared to Fish Harvesting Data and the Tragedy of the Commons Principle

Help Received

Dr. Kochevar and Dr. Block provided access to and permission to use data from the TOPP program and provided guidance on the study, Dr. Matsumoto provided guidance on the Tragedy of the Commons principle and report edits, my father and mother helped with typing the reports and the board

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Aaron F. Crasnick

Project Number
J2411

Project Title
Can Learned Behavior Be Transferred in Planaria by Regeneration or Consumption of Cells, and if so, Which Works Better?

Abstract

Objectives/Goals
I tested whether a planaria's learned behavior turning left in a T maze could be transferred through either regeneration or consumption of cells and, if so, which worked better. My hypothesis was that the learned behavior would be transferred between planaria by both methods, but that the transfer would be more effective with regeneration.

Methods/Materials
I placed 20 randomly selected planaria in 2 Petri dishes (10 per dish), for the controls. I screened 30 planaria for the tendency to turn right in a T maze. 20 of these planaria I trained to turn left in the maze using operant conditioning (mild shock). After each group was trained so that they turned left, I cut 10 of these planaria in half and allowed them to regenerate. I cut the control in the same manner, allowing them to regenerate. I ground up the remaining 10 planaria and fed them to the 10 right-turning planaria. I ground up 10 random planaria and fed them to the control group. After allowing for rest and regeneration, I reintroduced the planaria to the maze without a stimulus.

Results
Before the planaria were cut, the trained planaria turned left 92% of the time, compared to 61% in the control group. After regenerating, they turned left an average of 79% of the time, compared to an average of 43.5% in the control. Before they were ground up, the trained planaria turned left 75% of the time, compared to 48% in the control. The consuming planaria turned left 73% of the time, compared to 52.25% of the controls.

Conclusions/Discussion
In conclusion, my date revealed that the memory of a learned behavior could be transferred both through regeneration and consumption of cells. Overall, the consumption method worked much better than I had anticipated, and the regeneration method worked well also. I believe that the regenerated planaria developed an entirely new CNS with the synapse intact, but that the regeneration was not complete at the time of final testing.

Summary Statement
My project investigated whether a learned behavior could be transferred both by regeneration or consumption of cells, and which would work better.

Help Received
My parents helped me buy the materials for my project and they gave me encouragement when the project took longer than I expected.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Annmarie C. Delfino

Project Number
J2412

Project Title
Investigating Bird Populations in a Recently Restored Lagoon

Abstract

Objectives/Goals
The San Dieguito Lagoon is a newly restored wetland with recently created homes for waterfowl. Many millions of dollars have been spent to return this lagoon region back into a place where fish can thrive and birds can reside. I wanted to see if the restored wetlands would attract bird populations as environmentalists hoped. I hypothesized that the Western Snowy Plover and other birds would take advantage of new nest sites protected and built for birds that migrate during winter. I also hypothesized that there would be many ducks at the lagoon because it is a part of the resting places along a migratory route called the Pacific Flyway.

Methods/Materials
I visited the lagoon whenever possible and brought along the necessities of an avid birder. This included field guides, binoculars, a camera, and a journal to record data. I also used an anemometer to measure wind speed, a thermometer to record temperature, and a hygrometer to measure humidity.

Results
I observed and documented bird species at the lagoon. I found that the lagoon seems to be serving its purpose since the restoration project began. Many birds are returning although no Western Snowy Plovers or California Least Terns were sighted.

Conclusions/Discussion
I hope that by recording the species making use of the wetland, we can better provide for these animals in the future. As the breeding season approaches, I may be given special permission to observe endangered birds, nests and fledglings, and collect more data.

Summary Statement
This project documented bird populations in a recently restored wetlands lagoon.

Help Received
Thanks to biologist Leslie Woollenweber who helped me with questions on my project. Thanks to my science teacher for help with species identification. Thanks to my parents for driving me to my test site and for their endless support for me to carry out this project.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Katie N. Fernandes

Project Number
J2413

Project Title
This Is No Joke, I Want a Darker Yolk!

Abstract

Objectives/Goals
The purpose of my project was to try to achieve darker yolks by adding alfalfa to my hens diet. By the research I had done, xanthophylls are responsible for making the yolks a darker yellow-orange. Alfalfa is a good source of xanthophylls.

Methods/Materials
Materials:42 Rhode Island Red Hens in full-egg production,Free Range pen divided in half with shelter, nest boxes, fresh water, and feed container for each pen, Alfalfa Hay, Paint chips from a hardward store to compare color of yolks against, and Lay Mash feed. I took a random sample of 6 eggs from the experimental group and control group on day 1. Using a color chart that I made from 10 different paint chips from the hardware store I numbered the chips 1 to 10, lightest to darkest. I recorded the egg yolk colors and graphed the results. 21 hens were in the experimental group that received alfalfa hay and 21 hens were in the contorl group. Samples were taken on day 8, 12, 12, 14, and day 16.

Results
There was a difference in the color of the yolk due to adding alfalfa to the lay mash. This darker yolk color can be attributed to the higher amount of xanthophylls in alfalfa versus the regular lay mash. I accepted my hypothesis, Adding Alfalfa to Hens Diet Will Wause Their Yolks to Become a Darker Yellow-Orange Than Those Hens Without Alfalfa. The yolks from the hens fed alfalfa were 19% darker in average.

Conclusions/Discussion
The color of the yolk is important because the people that buy our eggs like to see darker yolks. Our customers state the free-range hens lay a tastier, better egg, and they are a darker yolk than store bought eggs. I would recommend that farms that have thousands of hens add alfalfa to the hens' diet when the yolks are pale yellow. At present this is not common practice. Farmers already add calcium to feed and high protein supplements to the feed when needed. An interesting note is when I fed the alfalfa to the hens, the shell seemed to be thicker and the shell gota darker brown, another thing that customers liked. We now use the results of this experiment for all 100 of our hens. I noticed that the hens that were fed alfalfa picked on each other less, and seemed happier because they had something to do. I also noticed that the alfalfa fed hens seemed to have a thicker, darker shell which is what I would like to continue in another study.

Summary Statement
Feeding Xanthophyll-rich alfalfa to laying hens achieves a desired, darker yellow-orange yolk.

Help Received
Dad helped with setting up the pens, Mom with graphs, and my sister and mom with moving the hens to their new location.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Jaclyn M. Hirbawi

Project Number
J2414

Project Title
Experimental Opuntia oricola Regrowth in Burned Cactus Wren Habitat

Abstract

Objectives/Goals
During the summer, I read an article in a magazine regarding our plant community, the most compromised plant community in the nation, coastal sage scrub. The article stated that, due to effects of the 2007 wildfires on prickly pear cactus, a bird, the Cactus Wren is now of particular concern. The only suitable nesting site for these birds is a cacti clump at least one meter in height. The purpose of this project was to monitor the vertical growth of approximately 500 experimental cacti and to search for evidence of cactus wren activity. I hypothesized that experimental prickly pear pads planted vertically would grow more rapidly and attain greater height than experimental pads that were laid flat or buried.

Methods/Materials
I wore a SD River Conservancy vest as I measured and recorded the vertical heights of 345 experimental cacti. I also monitored humidity, wind speed, air and soil temperatures, soil moisture level, and soil pH. I performed soil nutrient tests on soil samples I gathered. I visited four different test sites; Lake Hodges, San Pasqual Valley, Battle Field Monument, and the Wild Animal Park Corridor. Almost on a weekly basis, I either took measurements of the vertical height of each cactus specimen or recorded the number of Cactus Wrens, and nest locations in cacti clumps at my control site at the battlefield monument.

Results
According to my data, the horizontal method of planting prickly pear cactus plants was not successful. Many of these pads withered and rotted. Experimental pads that were buried showed more growth, but were not as tall as the pads planted vertically. After four months, the average height for the initially buried pads was 13 cm while the vertically planted cacti averaged 32 cm in height. The tallest vertically planted cactus attained a height of 63 cm. Several of the cacti grew 10 cm in height during the four month period.

Conclusions/Discussion
At this rate, some of the experimental cacti may grow to heights that might attract cactus wrens by next winter. At my control site, I was able to spot many Cactus Wren nests. I also documented approximately 40 species of other birds. I very much enjoyed this project, and I am continuing to monitor the Cactus Wrens and prickly pear growth.

Summary Statement
The purpose of this project was to monitor Cactus Wren activity and the vertical growth of approximately 500 experimental cacti as potential nesting habitat for the locally at risk Cactus Wren species.

Help Received
I would like to express my gratitude to my parents who drove me several times to my testing sites and provided supervision. I would like to thank field biologist, Leslie Woollenweber, from the San Dieguito River Valley Conservancy, who answered many of my questions.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Nanor Kassabian

Project Number
J2415

Project Title
The Effect of UV Light Range Radiation on the Magnetosensitivity of Drosophila melanogaster

Abstract

Objectives/Goals
The purpose of this project was to see if UV radiation affects the ability of Drosophila melanogaster, a type of fruit fly, sense a magnetic field. I hypothesized that, if the UV light was filtered out, the flies# magneto sensitivity would be reduced. My independent variables are the entire light range (about 300-700nm), and the light in the UV light range (about300-400nm) filtered out. My dependent variable is the number of flies affected by the entire light range, as opposed to the number of flies affected by the removal of the UV light range.

Methods/Materials
Starve 120-150 flightless D. melanogaster for 20-22 hours. Transfer 30 flies into each of the three labeled bottles. Construct a T-shaped maze in a clear case. Place a piece of banana at the end of one of the horizontal arms. Generate a magnetic field at the same end. Transfer flies through the vertical arm of the maze. Record results after 3 minutes. Stop magnetic field, and remove the flies and the banana. Repeat the procedure, excluding the banana. Replace the T-shaped maze with one that is covered with a UV filter sheet. Repeat the procedure, again without the banana. Repeat all the steps for batches B, C, and D.

Results
When the UV filter was applied to the apparatus, the ability to sense the magnetic field was reduced in the flies, and there was no preference in direction. 34% of the flies went towards the magnetic field, 43% went away, and 23% were undecided. When there was food, along with the magnetic field, the majority of flies (78%) went towards it, and 9% away, with 13% left undecided. When the food was removed, the majority of flies (68%) still went towards the magnetic field, but less than when there was food. 22% went away and 10% were undecided.

Conclusions/Discussion
It was found that UV radiation affects the magnetosensitivity of Drosophila melanogaster. This is due to the fact that UV radiation activates cryptochrome, a molecule in the fruit flies, which in turn activates the magnetosensitivity of the flies.

Summary Statement
Drosophila melanogaster lose their magnetosensitivity when UV light range radiation is blocked.

Help Received
Mother helped transfer flies; Father helped get supplies and generate magnetic field.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

Olivia A. Lafferty

Project Number

J2416

Project Title

Mapping Blue Shark Populations to Evaluate NMFS Preservation Efforts

Abstract

Objectives/Goals

A week-long snorkeling field-trip to Catalina began my keen interest in Marine Biology. A family friend is working on a study regarding tagged Blue Sharks (Prionace glauca). According to research, for five decades, Blue Sharks have suffered bycatch fishing mortality in North Atlantic waters. Their stock status remains under debate, and their migratory behaviors are complicated and unclear. In addition, they are finned and discarded in large quantities because of the low value of their flesh. The purpose of this project is to investigate the extent of movement patterns of juvenile Blue Sharks around the waters of the Azores Archipelago by developing a migratory map based on unused Blue Shark tag evidence. This study asks: What is the Blue Shark migratory behavior around the Azores? and, Given Blue Shark migratory behavior, would the species benefit by a Marine Protected Area?

Methods/Materials

A sample of juvenile Blue Sharks (n=400) was tagged and released in the Azores waters in 2003 by the Cooperative Shark Tagging Program of the U.S. National Marine Fisheries Service (NMFS) and the University of the Azores in Portugal. Between 2003 and 2006, Blue Sharks were caught by fishermen; their tags, date of capture, location, sex, and size reported. I wanted to contribute to research, and asked to use this raw data so I could analyze Blue Shark migratory patterns. I used Microsoft Excel to analyze the data, and a Geographical Information System Tool to map the migration patterns.

Results

The results showed highly migratory Blue Shark behavior. My data on the migratory behavior suggests that Blue Sharks may benefit from a restrictive Marine Protected Area around Azores Archipelago waters, but other measures (e.g. size-based throw-back policies) need to take place in order for juvenile Blue Sharks to reproduce and thrive.

Conclusions/Discussion

According to my results, it seems the Blue Shark's unpredictable and highly migratory behavior may have previously helped the species thrive worldwide, but perhaps it is not enough now in the face of unrestricted hunting from diverse locations. It is estimated 10-20 million Blue Sharks each year are killed by fishermen. My maps revealed unpredictable and complicated geographic migration habits for both male and female sharks. Further studies are needed to evaluate migration and help protect this species.

Summary Statement

The purpose of this project was to investigate movement patterns of juvenile Blue Sharks by developing maps based on raw data Blue Shark tag evidence.

Help Received

Thanks to my parents who support my interest in Marine Biology. Thanks to Dr. Alexandre Aires-da-Silva who allowed my use of the Blue Shark raw data. Thanks to my science teacher who helped edit my report.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Samuel Lang

Project Number
J2417

Project Title
The Effects of a Worm's Diet on Its Rate of Growth

Abstract

Objectives/Goals
In this project, I am trying to see what foods affect a worm#s rate of growth in a positive way the most. The food groups are Balanced Mix, High Nitrogen, High Carbon, and Weak Natural Acids

Methods/Materials
40 Eisena Fetida worms,4 glass cups, soil, plastic wrap, digital gem scale.
High Nitrogen: vegetable scraps, grass clippings, soybeans, fresh leaves

High Carbon: shredded paper, wood shavings, cardboard, dried leaves

Weak Natural Acids: Citrus Peels

I take 40 Eisena Fetida worms, divide them into groups of 10, and assign each group to a food type. I then label the food types, put the worms in cups with approximately 1.5 inches of soil, then add 5 grams of slightly rotten food from the designated food group. I extract the worms from their cups every day, then wash, dry, and weigh them as a unit. Then, I note the weight and put the worms back in their cups. Once every four days, I add another 5 grams of food from that specific food group. After 8 days of recording, I put all the weight changes on a chart, and make my conclusion from there. The worms are not euthanized, but are reverted to the life of vermicomposting, helping make fertilizer for the garden.

Results
All the worms were healthy, and gained plenty of weight, but the balanced-diet-fed worms gained the most weight overall.

Conclusions/Discussion
The results of this experiment support my hypothesis, that the balanced mix-fed worms would gain the most weight. Therefore if raising worms for vermicomposting, a balanced diet would be the best food for their health, size, and productivity.

Summary Statement
This project is about finding the effects of a worm's diet on its rate of growth.

Help Received
Mother helped put together display board.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Evan C. Lewis

Project Number
J2418

Project Title
Sight, Smell, or Taste: How Do Ants Find Their Food?

Abstract

Objectives/Goals
The objective of the project was to discover what senses ants use to find their food. The possibilities that were tested were sight, smell, and taste.

Methods/Materials
Food (honey or cocktail shrimp) was placed in a 35-mm Petri dish and set by an ant trail. Once a minute for 30 minutes, the dish was photographed with a digital camera to count the number of ants. In that test, the ants could use, sight, smell, or taste to find the food. This test was repeated after covering the Petri dish with a scrap of nylon attached with a rubber band. In this case, the ants could use sight and smell only. Finally, the test with the covered dish was repeated in the dark by turning off the lights and covering the Petri dish with a small box. In this test, the ants could only use smell to find food. As a control, tests were done with empty Petri dishes with or without nylon covering.

Results
At 30 min., the greatest number of ants (32-113) was found on the uncovered dishes, an intermediate number (6-12) was found on the nylon-covered dishes, and the least number (4) was found on the nylon-covered dish in the dark. All of these numbers were greater than the number of ants on the control dishes (0-1).

Conclusions/Discussion
It was concluded that odorous house ants could find food using multiple senses: smell, sight, and taste. When the ants could use smell and sight, they found the food only slightly better than when they could only use smell. This indicates that smell was more useful than sight. But when they could use taste as well, many more ants discovered the food. This suggests that taste is the most important sense for finding food.

Summary Statement
The focus of this project was to discover what sense(s) ants use to find their food.

Help Received
Father taught me how to use Igor to plot out data, helped with revising the writing; Mother brought home Petri dishes, helped lay out poster

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Maria A. Linton

Project Number
J2419

Project Title
What Concentration of Sugar Is Most Preferred by Hummingbirds?

Abstract

Objectives/Goals
The objective is to learn what concentration of sugar is most preferred by hummingbirds.

Methods/Materials
Concentrations of 0%, 25%, 35%, 45%, 55%, and 65% were made with white granulated sugar and warm water. A graduated cylinder and postal scale were used to make precise measurements. Modified and graduated feeders were used to contain the artificial nectar, and were tied to the fence with wire for 7 days. The feeders were checked every 12 hours and the cumulative milliliters consumed were recorded. For the last experiment, concentrations of 0%, 50%, 55%, 60%, and 65% were made to more precisely find which concentrations hummingbirds are most attracted to.

Results
It was observed that progressively with each experiment the hummingbirds became more accustomed to the feeders and consumed more nectar at a faster rate. Even in the second experiment, when the feeders were randomized, the hummingbirds still seemed to find their favorite once more, so they are not dependent on the location, rather the concentration. Hummingbirds also seemed to be more attracted in the day, and not so much at night. By using the slope of the line to measure the preference of the concentrations of nectar, (more nectar consumed over shorter period of time), data from all of the experiments demonstrates that 55% had the highest slope.

Conclusions/Discussion
In conclusion, the 55% sugar solution was most preferred by hummingbirds. This went against the original hypothesis, which stated that 65% would be preferred most, as it has the most sugar, leading to more calorie consumption needed by the hummingbird to fuel its high metabolism. Hummingbirds prefer not too much sugar in their nectar, but enough to satisfy their caloric needs. Overall, 55% seemed to attract the hummingbirds from the start.

Summary Statement
This project was done to determine the concentration of sugar that is most preferred by hummingbirds.

Help Received
My mom helped me get supplies, and my dad helped me edit and understand data.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Rachael E. Oliver

Project Number
J2420

Project Title
Mealworms to Pupa: Which Type of Light Bulb Will Change Mealworms into Pupa Fastest?

Abstract

Objectives/Goals
The objective of this science project was to determine which type of light bulb (black, incandescent, flourescent or infrared) changes mealworms to pupa the fastest. Based on research on the care and lifecycle of mealworms, it was thought that black light would change mealworms to pupa fastest because it was the warmest light.

Methods/Materials
Five identical environments were created and each container of 20 mealworms was placed 27.94 cm from the light. The control was a container of worms in natural light. The variable manipulated in this experiment was the type of light bulb each container of worms was exposed to. The dependent variable was measured by checking the worm population every two days looking for sheds, dead worms and pupa.

Results
The results of this experiment were that only four pupa grew from 100 mealworms. The survivability under black light was 1 pupa and 9 mealworms, incandescent was 1 pupa, 18 mealworms, and flourescent was 2 pupa and 15 mealworms.

Conclusions/Discussion
The results after 14 days were inconclusive because one more pupa is not a significant difference. Based on the survivability of worms incandescent and flourscsnt would be rated together in first place, black light in second place and natural light and infrared in third place. If improvements were made to this experiment, more time should have been allowed for mealworm growth since the average time it takes for beetles to develop is 90-114 days.

Summary Statement
How fast mealworms turn to pupa under different heat sources.

Help Received
Mother helped type reports, local feed store helped with research and supplies.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Amanda Penicks

Project Number
J2421

Project Title
Does a Chicken Prefer One Color of Feed over Another?

Abstract

Objectives/Goals
My project was to determine if Bantam Light Brahma chickens would prefer one color of crackeconrn over another. I believe that chickens will eat more orange and red corn than blue and green.

Methods/Materials
The materials I used were 4 Bantam Light Brahma chickens, cracked corn, bakery food dyes(sky blue, orange, leaf green, super red), a gram scale, 4 feed cups, 4 feed trays, 1 cup measure, large mixing bowl, 4 cookie sheets, 4 sheets wax paper, rubber gloves, and 4 poultry pans. I dyed 4 cups of each corn in each color and allowed it to dry. I measured 15 grams of each color of cracked corn and put them in individual feed cups and put them in the pens with the chickens every other morning. After each feeding the colored corn was reweighed to determine the amount of each color corn eaten. I ran this experiment every other day for a total of 6 test days.

Results
Overall the chickens preferred orange over red and blue over the green cracked coren. The difference in the preference between the orange and the red is small when considering the results for all four birds. None of the chickens like the blue corn and they liked the green even less than the blue.

Conclusions/Discussion
If I were to expand on this experiment I might consider running the experiment for a longer time period. Another possibility would be to run this experiment on baby chicks to see if they have the same response to the color feed.

Summary Statement
Does primary color vision effect Bantam Light Brahma Birds preference in feed?

Help Received
Mother was the 4H poultry project leader, Cynthia Ross helped with graph program

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Rachel N. Redd

Project Number
J2422

Project Title
Are Geckos Food Critics Too?

Abstract

Objectives/Goals
The objective is to determine whether Eublepharis macularis (Leopard Geckos) have a taste preference for crickets that have been gut-loaded and flavored with either sweet or bitter substances.

Methods/Materials
Three phases of the experiment were performed-Phase 1 was completed in December 2008 and Phases 2 and 3 were completed in late January/Early February 2009. During each phase, two geckos were alternately fed "bitter" crickets gut-loaded and misted with asparagus or "sweet" crickets flavored with apples and sugar water. The third gecko in each phase was fed unflavored crickets that had only received water. The geckos were fed once a day and allowed to feed for one hour; the number of crickets eaten were counted and then removed until the next day's feeding.

Results
During Phase 1 of the experiment, Gecko 1 showed only a slight preference (2%) for sweet over bitter crickets. Gecko 2 had a much higher preference at 9% more sweet crickets eaten over bitter. During Phase 2 when I rotated the control gecko, Gecko 1 showed a greater preference for sweet with 9% more sweet eaten over bitter and Gecko 3 showed exactly the same 9% difference. Finally during Phase 3, Gecko 2 (who had showed a higher preference for sweet in Phase 1) showed only a 1% preference and it was for bitter crickets. Gecko 3 continued to show a significant preference for sweet crickets with a 12% difference. In summary, over all crickets eaten during the experiment, the geckos showed varying degrees of preference for sweet over bitter crickets.

Conclusions/Discussion
Although my hypothesis was proven correct,(all showed a preference for sweet)one of the geckos showed only a slight preference for sweet and during one phase actually showed a slight inclination for bitter. Overall, it appears that all the geckos like the flavored crickets (sweet or bitter) more than the unflavored crickets. I also found that each gecko has individual preferences so it would be difficult to apply this to improving nutrition unless one tested the gecko#s preference first. In future studies, I would like to find a way to give the gecko a choice in the same feeding cycle between sweet and bitter to see if they choose to eat one over the other.

Summary Statement
Can leopard geckos distinguish different tastes?

Help Received
Mother helped glue items on board and type state application on-line

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Jesse J. Rothbard

Project Number
J2423

Project Title
Chemical Basis for Ant Behavior: Nestmate Discrimination

Abstract

Objectives/Goals
1. Determine whether the chemicals that define ant nest mates can be extracted, and used to stimulate different behavior in ants from the same and foreign colonies.
2. To better understand the molecular basis of the scent, modify the scent of nestmates in an attempt to make the colony attack its own extract.

Methods/Materials
Ants, from two different colonies of Linepithema humile, were collected, frozen, extracted with pentane, and evaporated onto cotton. Pieces of cotton from each of the samples was placed 2 inches from a path of L. humile between an indoor colony and a pile of sugar. The number of ants diverted from the path and contacting the samples of cotton in 5 minutes were counted.

The chemical composition of the colony scent was modified by the addition of a mixture of alkanes. The modified scent was transferred to cotton and tested in the bioassay.

Results
The chemical scent extracted from the Woodside colony and transferred to cotton did not stimulate the Woodside ants, but cotton treated with an extract of a foreign colony (Portola Valley) generated a robust response.

The addition of a mixture of straight chain alkanes to the pentane extract of a colony resulted in a scent that was treated as foreign, based on the aggression of the ants. The addition of the alkane mixture to the scent of a foreign colony did not have a significant effect. The ants did not respond to the alkane mixture alone.

Conclusions/Discussion
The scent of a colony can be extracted and manipulated to affect ant behavior. A colony of ants was able to distinguish its scent from the perfume of a distant colony, which stimulated aggressive behavior. The addition of a mixture of alkanes to the pentane extract of a colony resulted in a scent that was treated as foreign, based on the aggression of the ants. The ants did not respond to the alkane mixture alone, consistent with the chemical signal being the ratio between the alkanes and the compounds in the hydrocarbon mixture.

Summary Statement
The chemical scent of an ant colony can be extracted and manipulated to affect ant behavior.

Help Received
My father provided the chemical reagents and the camera.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Fiateleimoana K. Tapasa

Project Number
J2424

Project Title
Tides and Gulls

Abstract

Objectives/Goals
My project, "Tides and Gulls", was designed to ascertain a possible correlation between high and low tides and the number of gull sightings at a given beach. I hypothesized that there would be a higher number of gulls at low tide than high tide, due to food availability, and having more land space.

Methods/Materials
Multiple observations were taken during both high and low tide at the predetermined beaches. Paper, a writing instrument, and weather appropriate clothing were needed materials to document data. The local tide schedules were needed to ascertain proper observation times.

Results
During low tide, the number of gulls sighted was consistently greater than the number of gulls during high tide.

Conclusions/Discussion
I came to the conclusion that gulls are sighted in greater numbers during low tide than high tide, although other untested factors not related to tides could have contributed to the outcome. Other factors may include: feeding habits, possible migration patterns, weather, etc.

Summary Statement
Finding a correlation between tide times and gull sightings can aid others who wish to further study gulls in large numbers.

Help Received
Parents drove and accompanied to and from beaches for observations.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Laura Tovar; Perla Virgen-Silva

Project Number
J2425

Project Title
Can Snails Be Used as an Indicator for Toxins in Your Garden?

Abstract

Objectives/Goals
Our purpose for this project is to see if snails can detect changes in the environment around them. Based on research done, we believe that snails will turn away from the given alkaloids, due to the sensitiveness of their skin.

Methods/Materials
After we did research, we found several alkaloids that are foods, and are believed to have a high number of amino acids. The foods we used as the alkaloids are: coffee beans (grounded), cocoa powder, corn starch, salt, eucalyptus oil, tea, coke, and mountain dew. For our testing we simply placed the snails inside a tray with the foods and observed if the snails went near the food or stayed away.

Results
After testing 100 snails, we averaged out what food most snails stayed away from, and which on they preferred. The food they least liked was the salt, and the food they most liked was cocoa powder.

Conclusions/Discussion
Our hypothesis was not supported by the data that we received. The cocoa powder was the most liked, although we had thought that it was going to be the least liked. We had some controlled variables such as the lettuce fed to the snails. The dependent variable was the snails' reaction to the different foods, and the independent variable was the different foods being tested on the snails. The results could have varied because of the different areas the snails were collected from, and the condition of the trays. In the future, we will try collecting the snails from the same area, or getting more detailed alkaloids.

Summary Statement
Our project is about testing snails and seeing if they can detect the different toxins in our garden.

Help Received
Schmahl Science Workshop provided the supplies for the project.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Meaghan H. Truman

Project Number
J2426

Project Title
Caged vs. Free-Range: Chicken Eggshell Strength

Abstract

Objectives/Goals
The purpose of this project is to determine whether caged or free-range chicken eggs have stronger shells. This project will prove whether caged or free-range chicken eggshells are stronger.

Methods/Materials
To do this project, you need to purchase three dowels and two wood triangles. Then, you make a machine with two equilateral triangles with holes in each corner to fit the dowels. You glue the dowels in the corners of the bottom triangle, while you allow the top triangle to slide up and down on the dowels. You place a block of styrofoam with an egg shaped indentation on the bottom triangle to hold the egg vertically, and balance the top triangle on the egg. Then, you place a plastic bucket on top of the triangle and slowly fill the bucket with water until the weight of the water crushes the egg. Measure and record how much water you put in the bucket. Do this with all of the eggs.

Results
In my experiment, I noticed the eggs could tolerate a lot of force. I repeated the steps with all the eggs and recorded the measurements in my logbook. Then, I calculated the force that crushed each egg, using the combined mass of the water, the bucket, and the top triangle and Newtons second law of F=ma. The results showed the average force required to crush a caged chicken egg was 34.8 Newtons and the average force required to crush a free-range chicken egg was 46.5 Newtons.

Conclusions/Discussion
This project proved that free-range chicken eggshells are stronger than caged chicken eggshells.

Summary Statement
I devised a method to prove that eggs from free-range chickens are stronger than eggs from caged chickens.

Help Received
My dad helped me cut the triangles of wood with a power saw.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Jack E. Turman, III

Project Number
J2427

Project Title
Environmental Determinants of Ghost Shrimp Migratory Behavior

Abstract

Objectives/Goals
Objective: To determine if changing environmental conditions influences the migratory behavior of ghost shrimp.

Methods/Materials
Methods: I studied the migratory behavior of 4 ghost shrimp, either in a group (experiment 1) or individual (experiment 2) setting. Migratory behavior was defined as the number of times that a shrimp crossed the middle portion of tank (line crosses) that was marked externally with a piece of tape. The migratory behavior of the shrimp was tested in a tank environment with the following characteristics: gravel bottom (control), altered bottom gradient, plant gradient, and temperature gradient. In addition, the latency to food was also studied. Two trials (10 minutes each) were conducted for each environment, for both group and individual settings, and the mean number of line crosses was calculated.

Results
Results: Group Experiment: Line crosses with the bottom temperature gradient were significantly more than in the other environmental conditions, and when compared to the control condition.
Individual Experiment: The mean number of line crosses across all four shrimp was lower than in the group setting. The latency to reach the food increased between the group mean and the individual mean. In the bottom temperature experiment, line crosses drastically dropped between the group mean and the individual mean.

Conclusions/Discussion
Discussion: My experiments showed that ghost shrimp had the most line crosses with changes in the bottom temperature gradient, thus proving my hypothesis, that a bottom temperature gradient promotes the most migration of ghost shrimp. There were differences in migratory behavior when shrimp were tested individually in all conditions. Differences between individual and group behavior experiments suggest that group behavior exerts some influence of ghost shrimp migratory behavior. My experiments show that ghost shrimp can respond to differences in environmental conditions and other ghost shrimp.

Summary Statement
My study explores how different environmental conditions influence ghost shrimp movement.

Help Received
My father helped in the design of the project and helped with data analysis using Excel.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Madison R. Uetrecht

Project Number
J2428

Project Title
Geckos, the Amazing Wall Climbers: How Do They Do It?

Abstract

Objectives/Goals
My objective was to find out how geckos are able to walk on walls and ceilings, and if there are any materials that they can't stick to.

Methods/Materials
Several different materials were prepared by securing them to rigid pieces of cardboard. A material sample was selected and placed on the bottom of a clear box. A juvenile gecko was placed on the material. The gecko was observed on the material as the box was rotated about one edge, creating a steep incline. If there was any sliding of the gecko's feet, then the height of the lifted edge of the box was recorded. The angle and the coefficient of friction were then calculated. Two geckos were observed for each material sample.

Results
Four out of nine of the materials tested made the geckos slip. These materials were vinyl, wax, soap, and Teflon. Sliding was observed on the wax and Teflon at the shallowest angles. The geckos did not slip on aluminum foil, Teflon tape, acetate, Mylar, or glass.

Conclusions/Discussion
My conclusion is that there are materials that geckos have trouble sticking to. Gecko adhesion is made possible by a molecular force called the Van der Waals force. I think that the geckos slid on the Teflon because the molecules in Teflon are firmly bonded and therefore resistant to the Van der Waals force. The geckos may have slid on the wax because the wax that the geckos attached themselves to rubbed off of the main wax block.

Summary Statement
I tested geckos' ability to walk on different materials to find out whether there were any materials that they were unable to stick to.

Help Received
My mother helped with typing, preparing materials, and handling the geckos.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Brendan L. Walsh

Project Number
J2429

Project Title
Birds of a Feather Bathe Together

Abstract

Objectives/Goals
The purpose of my project was to determine whether birds prefer the upper or lower level of birdbaths. The materials I used were a two-level birdbath, water, and a video camera to record the data. I built a birdbath and filled it with water. I monitored the birds for eight hours a day for eleven days. I then reviewed the video footage to determine how many birds drank or bathed in the birdbath.

Results
A total of 78 birds visited the birdbath in a nine-day period. Fifty-one birds visited the top level and 27 birds visited the lower level. Of the total number of birds that visited the birdbath, sixty five percent (65%)of birds preferred the top level and thirty-five percent (35%) of birds preferred the bottom level.

Conclusions/Discussion
As you can see in my findings, most of the birds went to the top of the birdbath rather than the lower part. From my research, I discovered that this is because smaller birds feel safer on the bottom because they are more protected from predators. Larger birds feel more comfortable being on the top level because they can see predators more easily and since they are bigger, can escape from the top level.

Summary Statement
The purpose of my project is to determine whether birds prefer the upper or lower level of birdbaths.

Help Received
Father helped locate 2-story bird bath, Mother helped proof-read and board

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Conor J. Walsh

Project Number
J2430

Project Title
How Does Temperature Affect the Transformation of Caterpillar to Butterfly?

Abstract

Objectives/Goals
This project attempted to determine how temperature affects the metamorphosis of cold-blooded Painted Lady (Vanessa cardui) larva (caterpillar) and pupae (chrysalis) to butterfly.

Methods/Materials
My experiment exposed identical groups of cold-blooded Painted Lady caterpillars and chrysalis to different temperatures to determine whether this difference in temperature causes them to develop at different rates. One sample of caterpillars was exposed to cooler temperatures (about 66 F) and a second identical sample was exposed to warmer temperatures (about 75 F). The transformation from caterpillar to chrysalis to butterfly was observed and recorded. The experiment was conducted twice to verify results.

Results
My hypothesis that cold-blooded caterpillar larva and pupae exposed to warmer temperatures would grow and develop into butterflies at a faster rate than those exposed to cooler temperatures was supported by the data collected in the experiments conducted. In both trials of the experiment the larva and pupae exposed to warmer temperatures developed into butterflies about twice as fast as those exposed to cooler temperatures.

Conclusions/Discussion
All insects, including caterpillars and butterflies, are cold-blooded and take on the temperature of their surroundings. Cold-blooded creatures are much more active in warm environments and are very sluggish in cold environments because their muscle activity depends on chemical reactions which run quickly when it is hot and more slowly when it is cold. The climate of the earth is changing with average temperatures increasing. My experiment shows that increasing temperatures will have an affect on how cold-blooded butterflies will develop. The experiment also raises questions: Will a change in temperature change caterpillar population? Migration? Impact their food source? How will these changes affect the rest of the ecosystem? The results and conclusions from this experiment raise a number of other questions and opportunities for other scientists to look deeper at these issues.

Summary Statement
My project exposed two identical groups of cold-blooded Painted Lady caterpillars to different temperatures to determine if this difference in temperature causes them to develop into butterflies at different rates.

Help Received
My dad ordered the caterpillars online and helped me with typing the report and building the display boards.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Benjamin W. White

Project Number
J2431

Project Title
Crustacean Location: Which Factors (Soil Type, Moisture, Light) Influence Where a Pill Bug Makes Its Home?

Abstract

Objectives/Goals
To test my hypothesis that pill bugs will seek moisture in their environment over light (color or darkness) and soil type. My hypothesis is based on the fact that a pill bug's respiratory system uses gills and gills require water.

Methods/Materials
My project used a characteristic of how animals respond to their environments called kinesis. I built a test chamber divided into four quadrants to test different environment factors. I conducted three studies to test three factors; moisture, light, and soil type. In each study, I placed five pill bugs in each quadrant and at ten minute intervals observed and recorded the number of pill bugs in each quadrant. Study 1 tested for light and moisture (white light and wet soil, white light and dry soil, dark and wet soil, and dark and dry soil). Study 2 tested different types of light (no light, yellow, UV, and white light) and Study 3 tested soil types (mulch, sand, topsoil, and plastic).

Results
In Study 1 (light/moisture), the highest number of pill bugs was in the dark and dry quadrant and not the wet environments. In Study 2 (type of light), the highest number of pill bugs was in the dark (no light) quadrant. In Study 3 (soil type), I found the highest number of pill bugs in the mulch quadrant.

Conclusions/Discussion
My results did not support my hypothesis. Although the pill bug respiratory system uses gills which need water, the pill bugs in the experiment preferred a dry and dark environment. My results showed that pill bugs prefer darkness over other types of light, even light it can't sense, and soil with lots of organic matter. The pill bug's priority for these factors may be derived from their survival instincts for food (organic matter) and protection from predators (no light). This is likely due to a pill bug's finding a plentiful food source in organic matter and their need for protection from predators that could hunt them in the light. The information learned from this project expands our knowledge about the pill bug's unique anatomy, and more importantly, how its survival instincts influence its choice of environment.

Summary Statement
To determine which environmental factors are most influential in a pill bug's selection of environment: moisure, light, soil type.

Help Received
Parents helped with purchasing of supplies, construction of test chamber and final editing of report.