CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Emilio A. Arroyo

Project Number
J2301

Project Title
Ant Talk

Abstract

Objectives/Goals
By conducting an experiment using natural sugar and artificial sugar substitutes, determine whether ants have the ability to communicate the quality of a food source through the use of trial pheromones.

Methods/Materials
Conduct tests using natural sugar solutions and artificial sweetener solutions, whereby ants are provided with several foraging choices. The ants are counted in 15-minute intervals, in each plastic cup containing the solutions, to determne the ants' preference of sweeteners.

Results
The data from Tests 1A and 1B showed that ants preferred the natural sugars the most, and Test 2 showed that ants preferred the mid-level sugar concentration solution.

Conclusions/Discussion
The data supported the hypothesis where it was predicted that ants would prefer the natural sugars over the artificial sugar substitutes.

Summary Statement
Research and experimentation to determine whether trail pheromones can communicate the quality of a food source.

Help Received
My father taught me how to obtain scientific research papers, and reviewed my report and display board.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Georgia C. Butler

Project Number
J2303

Project Title
A Magnetic Surfboard: Will Sharks Be Lured or Perturbed?

Abstract

Objectives/Goals
The objective of this study is to create a 2ft high-density surfboard that repels leopard sharks using rare earth neodymium magnets.

Methods/Materials
14 Neodymium magnets of varying strength, 2ft high density foam surfboard, 7 leopard sharks, squid bait and holding clip.
Built surfboard with groove for magnet placement and adjustment, placed surfboard in tank with sharks and recorded number of approaches and repels within chosen distance ranges for 3x 10 min trials for different magnet strengths and postions in presence and absence of food.

Results
The number of approaches and scared reactions (repels) were counted for multiple trials at each magnet position, including the number of repels within different distance ranges and bait conditions. The average number of approaches and repels over the 10-minute trials was compared. The approaches decreased with magnet strength while the repels increased. The average repels at the median distance in each range was also compared and found to decrease rapidly with the distance from the surfboard. In general, the repel reactions were more abrupt in the 0-8 cm distance range and were also much more common when very close to a strong magnet. In some cases the bait was taken early so the number of approaches was lower for that trial.

Conclusions/Discussion
When no magnets were present it is clear that the sharks had limited scared reactions without food and none with food. Even at weaker magnetic fields the sharks were still repelled at shorter distances. As the magnet strength increased the repel events increased and the approaches decreased. The number of repel events even increased out at the further distances with the strongest magnets. It is also shown that the number of repels is lower farther away from the surfboard and higher close to the surfboard. The experiments indicate that the objective was accomplished and from these results it is possible that magnets may help reduce shark attacks on surfboards.

Summary Statement
I created a model foam surfboard that repelled leopard sharks using rare earth neodynium magnets.

Help Received
I designed and performed all the experiments in the shark tank, changed the bait and magnet positions myself. My school science teacher Nicole Shimshock and a mentor John Cafill reviewed my results and provided suggestions. My father helped with MS Excel, power saw and tools. Marine Science Institute

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Adelaide M. Cahill

Project Number
J2304

Project Title
How Diet Affects Vermicomposting

Abstract

Objectives/Goals
The objective of this study was to determine how diet would affect the reproduction rates of red wiggler worms and impact the nutrients of the castings they produce.

Methods/Materials
Constructed seven vermicomposting bins to determine the diet that would produce highest reproduction rates and most nutrient rich castings. Chose three food diets of: citrus and onions, fruits and vegetables and grass and leaves. Watered and fed over one month, taking observations daily.

Results
I analyzed my data by counting the number of worms, worm cocoons and conducted a soil casting test. Colonies fed grass and leaves produced the most nutrient rich castings and much higher reproduction rates. The fruit and vegetable diet was less beneficial followed by the citrus and onion diet which had the lowest reproduction rates and least nutrient rich castings.

Conclusions/Discussion
The citrus and onion bins followed my hypothesis of producing the least beneficial environment because of the high acidity in this diet. The grass and leaves bins were the most beneficial because they closely mimicked the worms natural environment as well as providing a balanced diet of carbon and nitrogen which the fruits and vegetable bins did not. My results showed me which diets would help maintain healthy, vermicomposting bins leading to the greatest reproduction rates of worms while also producing the most beneficial castings for farmers and gardeners.

Summary Statement
I determined that a balanced diet of both carbon and nitrogen rich foods dramatically effects reproduction rates of red wigglers and the nutrients in their castings.

Help Received
I constructed the bins with help from my father and performed the experiment independently.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Sydney J. Carlson

Project Number
J2305

Project Title
Where Does Kelp Go?

Abstract

Objectives/Goals
The objective of this project was to determine the role of the amphipod Megalorchestia corniculata (beach hoppers) in the removal of giant kelp blades once they have washed up on beaches.

Methods/Materials
80 Beach Hoppers, kelp blades, 7X 5 gallon buckets, sand, GoPro digital camera, digital weighing scale, red light, spray bottle, exact knife, collecting permit, ruler. Beach hoppers were collected and placed in 5 gallon buckets with 2 inches of wet sand on the bottom. Two nine inch cuts of kelp blades were placed in each of three replicate treatment buckets. Photographic images were taken daily of each blade for each treatment and control for 7 days. Time lapse photography was used to monitor beach hopper activity and kelp removal.

Results
Kelp blade removal was observed in the treatment buckets but not in the control buckets. There was no change in the percent of kelp blade removal in the control treatments. In contrast, the percent of kelp blade removal increased each day over 7 days at a constant rate. Over the course of 7 days approximately 20% of the kelp blade was removed in the treatment bucket. Time lapse photography showed that the beach hoppers were most active at night and consumption of kelp was observed then.

Conclusions/Discussion
The Beach Hopper (Megalorchestia corniculata) feed at night and are a contributing factor to the removal of kelp blades on sandy beaches. This experiment is likely a lower estimate of the beach hopper influence on kelp removal because in natural conditions a greater number of beach hoppers would be present.

Summary Statement
I demonstrated that the amphipod Megalorchestia corniculata plays an important role in kelp removal after it is washed up on the beach.

Help Received
I designed and carried out the experiment by myself. Dr. Jenny Dugan of the Marine Science Institute at UCSB helped me collect the beach hoppers, kelp and sand. Both Dr. Dugan and Dr. Carlson (UCSB) advised me on data collection.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Kaitlin A. Dean

Project Number
J2306

Project Title
Step into the Light: How Choosy Are Cockroaches about Light?

Abstract

Objectives/Goals
The objective of this project is to determine which colored light is most effective in deterring cockroaches.

Methods/Materials
In this experiment, six different light bulb colors (red, yellow, green, blue, black, and white) and no light were tested to see how well they deter Dubia cockroaches. The lights illuminated one side of a clear bin, which had egg crate nesting material on the non-illuminated side. One hundred cockroaches placed into groups of twenty were stored in small plastic containers. Five trials were conducted each with twenty roaches for every colored light and the control (no light) in the following way. A timer for one minute was set as the roaches were placed in the illuminated half of the bin. After one minute, the roaches that remained in the light were counted and any interesting behaviors were noted.

Results
The results of the investigation on what color will repel the greatest number of cockroaches, indicate that red light repels a greater number of roaches than the other five colored lights and the control group of no light. Green light deterred the second most roaches followed by white, yellow, and blue. Two interesting results: first, yellow light deterred fewer roaches than the control. This continues to validate previous years# investigations, where it was discovered that insects were attracted to the color yellow. Second, the cockroaches seemed to freeze when exposed to black light. They did not move much at all. It took several minutes for them to become active again.

Conclusions/Discussion
Dubia Cockroaches do react differently to different colored lights. Red light deterred the most roaches in this investigation. All colors tested, including the control, deterred at least one roach. Because of the unusual behavior of the roaches under the black light, it is difficult to conclude the effect of this color on the roaches. More experimentation is needed to determine if the black light disorients the roaches or if it simply does not deter them. To help keep roaches out of undesired areas, illuminate it with red light.

Summary Statement
Using prior knowledge of insect color preference, this project investigates colors that deter Dubia cockroaches.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Caleb Laures S. Empig

Project Number

J2307

Project Title

How Does the Distance from a Body of Water Affect Mosquito Population?

Abstract

Objectives/Goals

The objective of this study is to determine whether the distance from a body of water affects the number of mosquitoes that could be counted at a site or location.

Methods/Materials

Experiment was done outdoors. Chose 4 sites located at different distances from a body of water (a marsh). Set up 3 mosquito traps at each site. Collected mosquito traps 24 hours later. Counted mosquitoes under a microscope. Used Microsoft Excel to calculate average counts per site. Also determined sex and species of mosquitoes.

Results

Site 1 (closest to the body of water) had more mosquitoes than Sites 3 and 4, which were further away. Interestingly, Site 2 had more mosquitoes than Site 1. One possible reason is that Site 2 was still close to water. The marsh was covered with tall foliage and might have obstructed my view of the water. Site 1 had an obvious pool of water. However, looking at Sites 1, 3 and 4, my data suggest that the closer you are to a body of water, the more mosquitoes would be present. Thus the distance is inversely related to the number of mosquitoes present.

Conclusions/Discussion

I measured the number of mosquitoes at different distances from a body of water. My results suggest that the further away one is from a body of water, the less mosquitoes will be present. This supports the fact that mosquitoes prefer being close to water, particularly since water is important for their life cycle. If there is any danger from being exposed to disease-carrying mosquitoes, my results suggest that people should avoid being close to bodies of water at times when mosquitoes are present in high numbers (for example, at dusk or dawn).

Summary Statement

I showed that the further away you are from a body of water, the less mosquitoes will be present.

Help Received

Mr. Robert Cummings from OCVCD chose site for study; assisted in setting up traps, counting mosquitoes under a microscope at his lab, also determining sex and species. My father helped in data analysis, graphing. Had helpful discussions with Mr. Cummings and my father regarding my data.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Elena K. Houle

Project Number
J2308

Project Title
Do Fish Get Jet-Lagged?

Abstract

Objectives/Goals

To begin, the purpose of my project was to investigate if changing the circadian rhythm of gold fish affects their memory. My first observation was when I removed the cardboard box of the fish on the disrupted circadian rhythm and found they were less active than the fish on the normal circadian rhythm.

My hypothesis was that the fish on the normal circadian rhythm would learn the trick faster, and better than the fish on the disrupted circadian rhythm. When I first got my fish, I had to let them adjust to their surroundings before I began the experimented. For five days I trained my fish to swim through a hoop, next I changed the circadian rhythm. During those five days I put a box on top of one tank of fish during the day and switched the box onto the other tank of fish during the night. I changed the box every12 hours, at 7a.m and at 7p.m. and training each tank of fish for 10 minutes a day.

On the first day of training I got one fish to go through the hoop, it was the fish on the normal circadian rhythm. On the third day of the experiment I got another fish to go through the hoop, once again it was the fish on the normal circadian rhythm. On the fourth day I got one fish to go through the hoop that was on the disrupted circadian rhythm. The second fish on the disrupted circadian rhythm did not get through the hoop at all. The answer that I obtained was that the fish on the normal circadian rhythm learned the trick faster and better than the fish on the disrupted circadian rhythm.

My hypothesis was correct about the fish on the normal circadian rhythm and how they were able to learn the trick faster and better.

Methods/Materials

Two fish tanks, four fish, cardboard box, and a metal hoop. I put two fish in each tank and put a box over one tank of fish tanks for twelve hours, then I put the box over the other tank for the same time.
I found this project online but I changed some the variables.
http://www.juliantrubin.com

Results

The results obtained were not so surprising. The fish on the normal circadian rhythm were able to go through the hoop faster and better than the fish on the disrupted circadian rhythm.

Conclusions/Discussion

After testing my fish numerous times, I have concluded that if you change the circadian rhythm of the fish they become jet-lagged.

Summary Statement

During a five day period I tested if fish could get jet-lagged by changing the circadian rhythm on tank (1) of the two fish tanks and then training the fish in tank (2) the second fish tank to do a simple trick,to go through a hoop.

Help Received

The internet was helpful because i found projects related to my topic and they helped me understand the relative behavior of fish,and after i purchased the fish i took note on how they behaved so the fished helped in a sense.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Emily M. Huitt

Project Number
J2309

Project Title
Where Are All My Queens? The Effects of Royal Jelly on Grafting

Abstract

Objectives/Goals
My objective is to determine if by adding royal jelly, using warm distilled water with royal jelly, or dry grafting to queen cell cups at the time of grafting honeybee larvae, will the survival rate of queens be greater or less.

Methods/Materials
Grafting honeybee larvae into cell cups to see which takes best. Using royal jelly as my control group, dry grafting, and warm distilled water with royal jelly on my baby larvae. I will use both Italian and Carnolian honeybees to perform my project. Each group I graft will receive 3 grafting bars into queen less hives.

Results
Success rate of grafting with warm distilled water and royal jelly kept the cells warm and moist which gave me a 100% survival rate, royal jelly which was the control group had a 65% success rate and dry grafting was only 45% as the cells dried out before I could get them to the hive for the worker bees to feed the cells royal jelly.

Conclusions/Discussion
I found that dry grafting didn't work well and most of the larvae died before it had time to adjust into the hive to be fed by the worker bees. Dry grafting had a take of only 45% survival of queens hatching out. I observed after 24 hours the cells that had warm distilled water and royal jelly had a better bed for the queen larvae to grow in and 100% survival rate. The worker bees had more time to adjust to the feeding of the larvae to become queens. My control group of royal jelly had a 65% success rate. I learned Italian queens were very gentle and better honey producers. Carnolian queens and worker bees were good honey producers but very aggressive when taking away the honey for extraction. By grafting with select breeding of queens you can choose the best breeding stock to keep your hives thriving, healthy and protect from colony collapse disorder. Queens are very important to the bee industry with all the diseases, mites, colony collapse disorder and costs as each queen can cost $35.00 per hive.

Summary Statement
My project showed how using warm distilled water mixed with royal jelly and placed into the queen cells at the time of grafting had a 100% success rate.

Help Received
My mom worked with me, as she is a beekeeper, I learned how to be efficient in grafting and raising new queens from larvae to lay.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Daniel Kim; Micah Mekhitarian

Project Number

J2310

Project Title

Testing the Sweet Tooth of an Ant

Abstract

Objectives/Goals

The objective is to find the ants' preference on sugar by testing two different species of ants with various types of sweeteners.

Methods/Materials

Two tanks for Harvester and Garden ants, 20 Harvester ants, 20 Garden ants, timer set to 10 minutes, and 5 types of sweeteners that can easily be obtained from coffee shops (Equal, Sweet N' Low, Splenda, Sugar in the Raw, and honey). Observed and recorded the number of ants that took interest in the packets in a space of 10 minutes. Repeated for 12 trials.

Results

Both species of ants took more interest in the sugars that generated more smell. These addicting sugars were Equal and Sweet N# Low. Many of the ants unintentionally died due to the high amount of chemicals in the artificial sugar packets.

Conclusions/Discussion

The results of our experiment concluded that both species of ants share mutual interest for the sweeteners. Equal and Sweet N' Low were the favorite, both gave aromatic scent unlike the other choices. These two were toxic as well, killing many of the ants after they consumed these chemicals. Natural sweeteners such as Sugar in the Raw and honey gave out little smell, and received few visitors.

Summary Statement

Our experiment was on testing ants' preference on various types of sugar, including artificial and natural.

Help Received

We would like to thank Ms. Hoffman, both of our parents, and Daniel's brother for assisting and advising us on our project. We couldn't have done it without them.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Kayden E. Lincoln

Project Number

J2311

Project Title

Is Planarian Regeneration Affected by Magnetic Fields?

Abstract

Objectives/Goals

The objective of my experiment was to show that if planarian were exposed to magnetic fields while regenerating they would regenerate faster.

Methods/Materials

24lb pull magnet, 10 plastic cups, 10 brown planarian (Dugesia tigrina), microscope, 10 clean razor blades, distilled water, petri dishes, and paper towels. I used a razor blade to cut planarian horizontally across the middle. I made observations under a microscope over the next 14 days and took detailed qualitative observations of the regeneration. I cut 5 planarian to produce 10 halves. Each planaria was placed in its own plastic cup. I place 5 cups on top of a 24 lb pull ceramic magnet and left them tow regenerate for 14 days. Each day I made observations under the microscope. The other five cups were kept in the same room but on a counter about 5 ft away.

Results

The results of my experiment were it did speed up planarian regeneration by 2 days from the average time it takes in all planarian. On average the planarian exposed to magnetic field regrew their heads within 5 days, whereas the planarian not exposed to magnetic field regrew in 8 days on average. Full regrowth was determined by a lack of clear blastoma cells, regrowth of organs near cut site, fully formed eyespots (on head portions), and pointed tail (on tail portions). PLanarian exposed to the magnetic field showed regrowth of organs at 4 days on average, fully formed eyespots at 4.5 days on average, pointed tail at 5 days, and lack of clear blastoma cells at 5 days. Planarian not exposed to the magnetic field showed regrowth of organs at 6 days on average, fully formed eyespots at 6 days, pointed tail at 7 days, and lack of clear blastoma cells as 7 days.

Conclusions/Discussion

By testing this I showed that planarian regeneration could be sped up by magnetic field. Although my sample size was small, if further testing showed consistent results, this could possibly lead to applications in human regeneration of tissue in the future.

Summary Statement

I showed that planarian exposed to a magnetic field regenerated faster than those without the magnetic field.

Help Received

I cared for and made observations under the microscope myself. My father, Douglas Lincoln, helped me to use the razor blade and cut the planarian. My science teacher Mrs. Conklin helped me to understand the research and the process of regeneration in planaria.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Elizabeth M.B. Lindholm

Project Number

J2312

Project Title

Can I Have Some of That? Group Foraging in Coral Reef Fishes across Multiple Islands in the Western Caribbean

Abstract

Objectives/Goals

Group foraging in coral reef fishes has been studied for many years, but the focus has mostly been on the benefits of participation to individual fish. Less is known about the effects of group foraging on species diversity in the communities where it occurs. This study focused on the relationship between the frequency of group foraging and species diversity at three Caribbean Islands (Grand Cayman, Roatan # Honduras, and Cozumel # Mexico). Because the species at each island were assumedly the same (all western Caribbean fishes), I hypothesized that species diversity and group foraging behavior would also be the same at each island, and that multi-species foraging behavior would be the most common.

Methods/Materials

I used SCUBA to observe fishes for 10 minute periods in their natural habitats and recorded data on a waterproof slate and using a GoPro camera. Each of the survey sites at each island was within the same depth range (40-70 feet deep) and water temperature was the same (82-83°F). The data I recorded included fish species diversity, the number of foraging bouts for both single- and multi-species groups, and the identification of each fish that participated.

Results

Total fish species diversity was higher at Cozumel (45 species) than at Roatan (28 species), but when I divided the totals by the number of surveys I conducted, to find the unit rate, the diversity was basically the same (Cozumel 13 species per survey & Roatan 12.6 species per survey). The fish species participating in single- and multi-species groups were also mostly the same at each island. However, the rate at which the bouts occurred varied by reef site and by island. Unfortunately, no data were collected at Grand Cayman due to weather conditions (high surf and strong winds).

Conclusions/Discussion

In conclusion, all of my hypotheses were confirmed. The fish species diversity did not differ much at each island, and multi-species foraging behavior was the most common. I am planning to go back to the Caribbean next year to four different islands in the eastern Caribbean to continue this project.

Summary Statement

This project is about fish species diversity in relation to the amount of group foraging occurring at three western Caribbean Islands.

Help Received

I built my project within a bigger project my dad has been working on around the world. This project occurred as part of a week-long meeting aboard a cruise ship called Cruising For Conservation. I received help collecting data from my dad on one day when I was too sick to dive.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Chloe E. Millar

Project Number
J2313

Project Title
Composting with Black Soldier Fly Larva: Feeding Black Soldier Fly Larvae Various Foods in Self Harvesting Bins

Abstract

Objectives/Goals
In this experiment I was testing whether different foods fed to Black soldier fly larvae in my custom designed self-harvesting bins affect the health and production rate of the larva. The goal of this experiment was to see which food would be a good starter food for someone just starting their bins, also figuring out if my bins work for the self harvesting that is their purpose. Also, due to the growing consumption of seafood in the United States, fish farms have needed to raise in number, and the bigger fish are fed with food made of anchovies, but we could be feeding them with BSFL (black soldier fly larvae) instead.

Methods/Materials
4 long, short bins, plastic netting, cardboard, sandpaper, black soldier fly larvae, eco earth dirt bedding, 4 foods. Cut out the interior leaving two inches around the perimeter on the bin#s lid. Cut the piece of plastic from the lid in half to use as ramps. Use the plastic netting to cover the hole in the lid using duck tape. Glue sandpaper to the plastic ramps to make grippable. Make a triangle out of cardboard to place inside of the bin as a ramp support, then glue the piece of sandpapered plastic to the triangle to finish the ramp, which should be placed to leave # of the bin clear. In the # of clear bin, put your eco earth bedding, grubs, and foods in each bin and record daily how many grubs crawl up the ramp into the ¼ of the bin used for self-harvesting.

Results
Bin A, carrots had 1, Bin B, Potatoes, had 2, Bin C, green beans, had 18, and Bin D, pear, had 6. This pertains to my objective by showing most efficient food to feed your new grubs is green beans, or for the fastest fish food marketing, you would want to feed the grubs green beans to boost growth.

Conclusions/Discussion
Due to growing consumption of seafood in the U.S. we are eating more fish, fish farms are growing in number,the fish food is made of smaller fish, like anchovies. BSFL are much cheaper, reproduce 10 times as fast. My project showed what to feed BSFL to boost production rates the most, enlarging fish production. Now we have a new design for a BSF self-harvesting bin, the only commercial bin is 100+ dollars. My bin can be used indoors, it can be used in climates unfit for the insects.. In conclusion my experiment proves which foods are most beneficial to BSFL, overall benefiting our knowledge about food sources for BSFL, my bins are a new way to farm BSFL.

Summary Statement
In my project I tested feeding black soldier fly larva various food scraps in my custom designed self-harvesting bins, I found that the fastest larvae producing food was green beans.

Help Received
I used blacksoldierflyblog to research my topic. Devin Avey (a teacher at my school) gave me final advice on my abstract, and my grandpa helped me to cut out the center because I do not have the physical strength to do so.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Elise M. Ochs

Project Number
J2314

Project Title
Investigating How Temperature in Clovis California Affects the Mortality Rate of Aedes aegypti Eggs in Winter and Summer

Abstract

Objectives/Goals
The objective of this study was to determine what temperatures/environments it would take to make Aedes aegypti eggs no longer viable.

Methods/Materials
Get approximately 1,000 Aedes aegypti eggs already on germination paper.
Use a microscope to check the eggs for their viability. Look to see if the eggs are collapsed.
Place those 10 eggs in a controlled environment (Fridge, freezer, control(any room steadily set at 21°C) and vacuum oven) at one of the following temperatures:-13°C, 9.4°C, 21°C, 40°C.
Perform this procedure for tests that are 1 hour, 8 hours, and 24 hours long. Record the results of the hatch.
*Experimentation must be done in a supervised level 1 general laboratory.

Results
After several trials, data showed that the eggs most successfully stayed viable in the 9.4°C and 21°C environments. This proves that that is why the mosquito is thriving in such temperatures; the eggs don't lose viability there.

Conclusions/Discussion
I learned that Aedes aegypti eggs do not preserve their viability in extreme cold, and extreme hot temperatures. However, they do in temperatures such as 9.4°C and 21° C, which are more common in Clovis, California. After viewing the outcomes of my project, it is apparent that although the eggs should not be surviving in these temperatures, more often than not, they are.

Summary Statement
I showed that the irregular mortality rate of Aedes aegypti mosquitos in Clovis, California is almost completely dependent on temperature.

Help Received
Consolidated Mosquito Abatement District supplied me with eggs already on germination paper. An entomologist from that district advised me throughout experimentation.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Alexandra P. Orczyk

Project Number
J2315

Project Title
Comparing Changes in Local Sea Star Populations

Abstract

Objectives/Goals
Sea star populations, recently hit by sea star wasting syndrome, have been declining at my local tidepools, and throughout the West Coast. Water temperature is rising, and rising temperatures have been shown to intensify sea star wasting syndrome. Rising temperatures can also diminish sea stars' abilities to protect themselves from overheating and desiccation during low tides. I hypothesized that these effects would over time decrease the general population. Additionally, I wondered if human disturbance had any impact. These questions led me to investigate at the Cabrillo Point Loma tidepools.

Methods/Materials
During multiple timed searches, I documented four species of observed sea stars. I then obtained 26 years of raw data on annual sea star numbers from Cabrillo biologists, and local water temperature data from NOAA. To analyze temperature correlation with sea star numbers, I compared the number of counted sea stars in the six warmest vs. six coolest seasons, by using two-sample unequal variance t-tests. Because temperature changes may have delayed effects, I also compared the number of sea stars with various time lags after the six warmest and six coolest seasons. Cabrillo is composed of Zone 1 and Zone 2, with visitors, and Zone 3, with no visitors allowed. I compared these three groups to assess possible human impacts.

Results
I found no statistically significant differences based on temperature. Comparing the six warmest and six coolest seasons, with any delay period, returned a p-value >0.05. Concerningly, sea stars populations plummeted in the once-haven of Zone 3 ($p=0.006$), especially bat stars ($p=0.008$). Comparing the peak population of 1990-1994 to that of 1995-2017 revealed a decline of 94.5% for sea stars in Zone 3. Knobby sea star numbers slightly increased in Zone 1 only ($p=0.02$). The three zones had no statistically significant differences overall ($p=0.10$).

Conclusions/Discussion
Neither temperature nor human intrusion seems to be factors in sea star population size. However, the extreme population decline in Zone 3 suggests the possibility of other factors; prey and predator abundance, or, since Zone 3 is closer to the San Diego Bay's marinas than Zones 1 and 2 are, perhaps a higher concentration of potential pollutants.

Summary Statement
I I analyzed and compared numbers of four sea star species at the Cabrillo National Monument tide pools.

Help Received
My science teacher lent me some materials, and my mother drove me to the tide pools. Marine biologists at the Cabrillo National Monument gave me helpful advice as well as long term data.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Julianna M. Ramirez

Project Number
J2316

Project Title
Black Gold: Study of Worm Castings as Fertilizer

Abstract

Objectives/Goals
The purpose of my experiment was to see if worm castings could be an effective non-chemical fertilizer that is safe to use around children and pets. I wanted to compare different mixtures of worm castings to a purchased fertilizer. I learned from my research that nitrogen and potassium are important nutrients for plants so to determine the best soil, I measured the nitrogen and potassium levels in each sample.

Methods/Materials
There will be 160 worms from Uncle Jim#s Worm Farm in each of the boxes, I will feed them every other day. My experiment will test levels of nitrogen and potassium in the soil from the worms and the other two soils. Materials: Uncle Jim's worms, HoldAll Soil Test Kit, with Nitrogen and Potassium tests, (6) Plastic rectangular boxes (23cm x 15cm x 7cm), Care Fresh Complete Natural Paper Bedding, coconut husk (Coir), table scraps, coffee grounds, and barley.

Results
The nitrogen levels were mostly very low and low, the potassium levels were medium to high. The coffee castings had the highest levels of nitrogen and potassium. The next sample was the table scraps and coffee grounds which had the same level of nitrogen as coffee ground castings but a little lower level of potassium. Miracle-Gro had medium levels of nitrogen and lowest level of potassium. Table scrap sample had very low levels of nitrogen and low levels of potassium. Final the dirt from my backyard had very low level of nitrogen and medium level of potassium.

Conclusions/Discussion
My results rejected my hypothesis since I thought that the table scrap and coffee grounds mixed together would be the best. I did not predict that coffee grounds alone would be the best since in the beginning the coffee grounds were very dry and the worms were having a hard time and not thriving. I think the reason my hypothesis was not correct was due to the fact that originally those worms were in barley, which was very hard for them and killed many of the worms so they basically had to start over with less worm than coffee grounds and table scraps. I have learned that if I want to grow plants using worm castings coffee grounds would be the best type of castings to use. If I were to do this experiment again I would have use the dirt from my backyard to add in with all of my castings, then tested the soil for nitrogen and potassium levels.

Summary Statement
My project studied if I feed different groups of worms table scraps, coffee grounds, and table scraps and coffee grounds combined which group would produce castings with the highest levels of nitrogen and potassium.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Austin D. Roberts

Project Number
J2317

Project Title
Can Juvenile Crayfish Combat Schistosomiasis?

Abstract

Objectives/Goals

QUESTION: Can juvenile crayfish, Procambarus clarkii, control population levels of the snail Biomphalaria glabrata?

PURPOSE: This experiment tested the ability of juvenile crayfish to control populations of intermediate host snails that can transmit schistosomiasis to humans.

HYPOTHESIS: My hypothesis was that juvenile crayfish could control population levels of Biomphalaria glabrata snails,reduce egg masses and 0-2mm hatchlings in aquaria over 30 days.

Methods/Materials

Experiments had three control 1 gallon aquaria with 5 snails (2-8mm, 2-12mm and 1-15-20mm diameter snail), red leaf lettuce, 0.2 grams of calcium carbonate powder, and airstones.

Size-specific Predation Ability: The maximum size of Biomphalaria glabrata snails consumed by different sizes of Procambarus clarkii crayfish was determined. One crayfish was introduced into each treatment aquarium with snails. Aquaria were checked daily for consumption of B. glabrata snails.

Effect of Crayfish Predation on a snail population: Three 12mm carapace length (CL) crayfish were used in the population experiment. The experiment ran 30 days and snail, egg mass and hatchling (0-2mm diameter) consumption was determined.

Results

In the size-specific experiment, crayfish 14mm CL and larger killed the largest snails offered (15-20mm diameter). The maximum size class of snail consumed by 13mm CL crayfish varied from 12mm to 15-20mm in size. No snails died in control aquaria over the same time period.

In 30 day population experiments, 12mm CL crayfish significantly reduced snail populations (8-20mm diameter) to 2 compared to 4.3 in control aquaria with no crayfish. Egg masses were reduced to 7.3 compared to 41.3 in control aquaria and hatchlings were reduced to 0 compared to 10 in control aquaria.

Conclusions/Discussion

Very small juvenile crayfish effectively reduced population levels of B. glabrata snails, consumed egg masses and totally blocked recruitment of 0-2mm hatchling snails into the snail population. The ability of very small crayfish to control population levels of B. glabrata snails is a very promising step in our knowledge of the size of crayfish that can be effective in controlling B. glabrata population sizes. In other field studies, fewer intermediate host B. glabrata snails has translated into reduced schistosomiasis transmission to humans.

Summary Statement

My science project showed that juvenile crayfish could control a laboratory population of snails that transmit human schistosomiasis, a parasitic worm disease that infects 200 million people worldwide and kills 300,000 people annually.

Help Received

I discussed the experimental design with Dr. Kuris and developed how to conduct the experiment. I asked what statistical tests to run and then I went online to study statistical tests and run them in Excel.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Ashley C. Schletewitz

Project Number

J2318

Project Title

Comparing the Effectiveness of Various Aloe Vera Solution Levels on the Regeneration Rate of Planaria

Abstract

Objectives/Goals

The purpose of this experiment is to determine if aloe vera can increase the regeneration rates in planaria. This is beneficial to determine how much aloe vera is needed to heal wounds and cuts. Planaria is a type of flatworm, that when cut into two or more pieces will regrow and become two or more planaria. Because of planarias regeneration capacity it was chosen to simulate wounds and cuts. Aloe vera was tested to determine if it helps speed up regeneration rates of planaria.

Methods/Materials

This test included 40 Planaria. The specimen were divided into 3 sections per petri dish and filled with 7mls of water. Variables were a control w/ no aloe added, 3mls, 6mls and 9mls of aloe solution. Cleaned petri dishes daily and add Aloe to all test groups except control group which only contained water. Observe each test planaria for regeneration rate under a dissection microscope and measured growth with a ruler for 10 days.

Results

After 10 days planaria head control =average growth .66cm in length. Planaria body control =average growth .83cm in length. Planaria tail control =average growth .62cm in length. Planaria heads/ 3 ml of aloe vera =average growth .72cm in length. Planaria bodies /3 ml of aloe vera solution= average growth .95cm in length. Planaria tails/ 3 ml of aloe vera =average growth .82cm in length. Planaria heads /6 ml of aloe vera =average growth .58cm in length. Planaria bodies/ 6 ml of aloe vera =average growth .45cm in length. Planaria tails/ 6 ml of aloe vera=average growth .46cm in length. Planaria heads/ 9 ml of aloe vera=average growth .35cm in length. Planaria bodies/ 9 ml of aloe vera=average growth .32cm in length. Planaria tails/ 9 ml of aloe vera=average growth .26cm in length.

Conclusions/Discussion

The hypothesis showed to be correct, it was stated that 3ml of aloe vera added to planaria and water would increase the regeneration rate. Higher concentration levels of aloe vera ended the life of the planaria. Growth was shown in the 6ml and 9ml aloe solution, but over the ten day test ultimately died. This study did show in low doses aloe vera proves to be effective at increasing the regeneration rate of planaria. This project is important, because it proves that dosage plays a very important role. The homeopathic industry is a multibillion dollar industry and growing every year with very little scientific research to back up what is being sold to the public as a healthy remedy.

Summary Statement

Natural remedies are becoming more popular, to determine if they are really effective aloe vera was chosen as a wound and cut remedy and tested on the regeneration rate of planaria

Help Received

Parents took photos

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Kurrun Sethi

Project Number
J2319

Project Title
Do Different Levels of Salt Affect Brine Shrimp?

Abstract

Objectives/Goals
The purpose of this project was to discover if different levels of salt affect Brine Shrimp. I built 4 different brine shrimp habitats my controls are Oxygen given, amount of water, same size habitat, food given, temperature, and duration of testing. I am testing to see which salinity level works best using a hydrometer. Brine Shrimp can tolerate a vast range of salinity from 25 to 250 grams per liter, with an optimal range of 60 to 100 grams per liter. They prefer a range from 30 to 35 grams per liter, the problem is Brine Shrimp encounter more predators at that level of salinity. Many different levels of salinity can have an effect on Brine Shrimp different such as, difference in color, sizes, and shapes. Currently the only possibility on how Brine Shrimp environments are going to get a higher salinity level, is through a drought. Because during a drought the water wouldn't stay in the environment, the salt will, which increases the salinity level.

Methods/Materials
Materials :
> 4 Teaspoons of Brine Shrimp eggs; > 4 Two liter bottles; > 4 Air pumps; > 16.8 grams of spirulina powder; > 6.8 liters of water (1.7 per habitat); > 9 Petri dishes; > 2 Pipets; > 1 lamp; > 1 Microscope; > 4 mason jars; > 4 pieces of tubing.

Procedure:
Step 1: Organise materials
Step 2: Drill holes on top of the mason jars
Step 3: Fit tubing through drilled hole
Step 4: Attach other side of tubing to air pump
Step 5: Use Hydrometer and salt to get salinity levels of 0, 20, 30, and 44
Step 6: Get a teaspoon of Brine Shrimp eggs and put one into each mason jar
Step 7: Turn air pump on
Step 8: Make sure they have a light source

Results
The data was that the salinity of 44 had the best result in terms of most amount of Brine shrimp, least amount of dead Brne shrimp, and least amount of eggs unhached.

Conclusions/Discussion
In conclusion, my hypothesis, #Brine Shrimp in salinity levels of 30 and 44 parts per thousand will have

Summary Statement
This project investigates how different levels of salt affect Brine Shrimp.

Help Received
Alex Hofsteen, Jim Barry

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Calvin Z. Sway

Project Number
J2320

Project Title
How Do Turkey Vultures Find Food?

Abstract

Objectives/Goals
The objective of this study is to determine which senses Turkey Vultures use to locate carrion. Turkey Vultures have exceptional eyesight and they also have an exceptional sense of smell. Do they rely on just eyesight or smell? Do they use both these senses in combination or is one sense dominant?

Methods/Materials
As a scent generator I used a hidden metal trash can with 20 pounds of meat in it and covered with a metal screen. I used motion and infrared activated trail cameras and visual observation to record data. Visual attractant was life size goose decoys mimicking dead geese.

Results
For 6 weeks I placed my visual and scent attractants individually in two different locations where Turkey Vultures were present. I recorded Vulture interest by both observation and remotely activated cameras. My study showed that Turkey Vultures could locate carrion by scent alone and did not show any interest in a visual attractant without accompanying scent.

Conclusions/Discussion
Because of California wildlife regulations I had to make sure Vultures could not feed on the meat I used to attract them. I believe that it would be possible to use these methods or variation of this method to determine if Turkey Vultures or California Condors were using an area which could be important in management of those species.

Summary Statement
How Turkey Vultures locate the Carrion that they eat.

Help Received
Richard Thiel ,Wildlife Biologist

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Kate Terbush

Project Number
J2321

Project Title
The Feathered Tyrannosaurus rex: Determining that T. rex Feathers Were Not Preserved Due to Soil Properties

Abstract

Objectives/Goals
The objective of this project is to determine how different soil types affect preservation of possible feather imprints of Tyrannosaurus rex. Research has proven that it is probable the T. rex had feathers, though T. rex feather imprints have never been found.

Methods/Materials
Six different soil types placed in separate containers. Made impression in each soil sample with chicken bone, sea shell and a downy feather (these three items emulate therapod bones and feathers) and pour plaster to make an imprint of each. Observed imprints to determine the relative visibility of feathers compared to the bones in each soil type.

Results
Two trials of experimentation confirmed that the bone and shell imprints were visible in all soil types. Feather imprints were visible only in fine grain soil types. Feather imprints were not visible in coarse soil types, the soil type in which the Tyrannosaurus rex died.

Conclusions/Discussion
My experiment suggests why the Tyrannosaurus rex has not been found with feather imprints though other theropods have, including the closest relative of the T. rex. My experiment data shows that feather imprints were visible only in fine grain soil types and not in coarse soil types. The type of soil determines whether or not any feather imprints were left behind. The coarse soil type that T. rex died in does not imprint feathers, therefore it is possible the T. rex had feathers that were not imprinted.

Summary Statement
My experiment supports that the feather imprints of Tyrannosaurus rex were never found because the coarse soil types the T. rex died in were not conducive to preserving feather imprints.

Help Received
I developed the project idea as well as created the board and conducted the experiment myself. My teacher Mr. Raul Cantalejo reviewed my work.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Kathleen G. Virsik

Project Number

J2322

Project Title

Enhanced Heptyl Butyrate Attractants for Western Yellowjackets (Vespula pensylvanica)

Abstract

Objectives/Goals

Vespula pensylvanica (V. pensylvanica), or western yellowjackets, are the most common species of yellowjackets in California and the western United States. Outdoor summertime activities often result in human-yellowjacket contact, which can lead to painful stings and even allergic reactions. The purpose of my experiment was to find an improved heptyl butyrate (HB) attractant which attracted more yellowjackets than HB alone (HB is the leading yellowjacket attractant).

Methods/Materials

I did 2 different experiments within my project. In the first, I tested single agents. In the second, I tested combinations of test agents with heptyl butyrate (HB) against HB alone. In each experiment, I tested each test agent twice. For my project, I made three boxes out of cardboard and put the attractants inside. I counted the number of yellowjackets that entered the box.

Results

I positively identified the yellowjacket species as V. pensylvanica workers. In the first experiment, I found that heptyl butyrate (HB) attracted an average of 171.5 yellowjackets, while the highest number of yellowjackets attracted by the other test agents was turkey broth, with 35.5. In short, I found that HB was by far the strongest yellowjacket attractant as a single agent. In the second experiment, I found that the citric acid/HB combination and the turkey broth/HB combination attracted 59% and 34% more yellowjackets, respectively, than HB alone. On the other hand, the butyric acid/HB combination and the isobutanol/HB combination attracted 80% and 54% fewer yellowjackets, respectively, than HB alone. The other HB combinations attracted similar numbers of yellowjackets as HB alone. No bees were attracted to any of the attractants.

Conclusions/Discussion

I can conclude that butyric acid and isobutanol may be repellents of V. pensylvanica, while citric acid/heptyl butyrate (HB) and turkey broth/HB combinations may be more effective attractants of V. pensylvanica than HB alone. The addition of citric acid to commercial traps should be considered.

Summary Statement

I discovered that a citric acid & heptyl butyrate combination attracted significantly more western yellowjackets (vespula pensylvanica) than heptyl butyrate alone.

Help Received

On my own, I planned the experiment and made the test boxes. My dad assisted me while I carried out the experiment. Both my parents helped me edit my poster.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Caroline G. Zdanowski

Project Number

J2323

Project Title

Examining the Botanical Composition of Coastal California Gnatcatcher Habitats in Local Lagoons

Abstract

Objectives/Goals

The California Gnatcatchers# fluctuating endangerment status is a reflection of gains and losses in the struggle to save this iconic California bird from the edge of extinction. In my project, I sought to understand more deeply the specific botanical composition of this songbird#s habitat, so that I might be able to know why the California Gnatcatcher makes this at-risk plant community its home. I hypothesized that the Gnatcatcher has a preference for areas of dense, low growing shrub where it can search for berries and insects while being protected from predators. I hypothesized this habitat would consist of Coastal Sage, California Sagebrush, Laurel Sumac, Lemonade Berry, Black Sage, and Cleveland Sage due to being aromatic, dense and low-growing.

Methods/Materials

I visited eight trails at the San Elijo and San Dieguito Lagoons. I observed and documented sightings of California Gnatcatchers. I recorded weather conditions including air temperature, wind speed, and humidity. I also recorded the other birds I observed while in the field. Each time I observed the California Gnatcatcher, I documented the plants that grew within a five-meter radius.

Results

I documented Coastal Sagebrush (Artemisia californica) within the 5-meter radius at 77% of the observations, Deerweed (Acmispon glaber) 72% of the time and Cleveland Sage (Salvia clevelandii) 61% of the time. I observed California Brickellbush within a 5-meter radius at 55% of the sites, Black Sage at 50%, Lemonade Berry at 44%, and Goldenbush at 44% of the sites. I also gathered data about where the California Gnatcatchers perched. I found that 33% of the time, the California Gnatcatcher perched in Laurel Sumac (Malosma laurina). I encountered the Gnatcatcher in Coastal Sagebrush 22% of the time and Black Sage (Salvia mellifera) 11% of the time.

Conclusions/Discussion

I have learned that the birds naturally favor a microhabitat consisting of dense shrubs such as Coastal Sagebrush and Deerweed and taller plants such as Laurel Sumac. These particular plants seem to be key components of the California Gnatcatcher habitat because they offer food opportunities, shelter and protection from predators. It appears the endangered California Gnatcatcher favors habitats within the Coastal Sage Scrub Plant Community that foster dense, native scrub, where they are able to forage and perch undisturbed.

Summary Statement

In my project, I documented perching sites and habitat composition of the Coastal California Gnatcatcher in its native Coastal Sage Scrub habitat.

Help Received

My science teacher provided me with some materials such an anemometer and a hygro-thermometer. I emailed Robert Patton, a biologist who has studied the Coastal California Gnatcatcher, and discussed the birds' habits while researching for my project.

CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Thomas D. Zumkeller

Project Number

J2324

Project Title

Investigating the Effects of Salinity on the Survival of Tigriopus californicus Copepods

Abstract

Objectives/Goals

Copepods are very important to the ocean's ecosystem. Copepods, a type of zooplankton, are at the bottom of the food chain but they are major food organisms needed for all types of marine life to survive. Climate change has affected the salinity level in our oceans. These changes have a direct effect on the survival of copepods which in turn threatens the survival of marine life. This project aims to determine which salinity level of water allows copepod populations to survive in the most.

Methods/Materials

This study measured one variable, salinity in reverse osmosis water. Five various levels of salinity were measured and mixed with reverse osmosis water in five separate one gallon buckets. Seven petri dishes were filled from each of the five buckets. Each petri dish held 20 Tigriopus Californicus copepods. Every two days, two drops of phyto feast were added to each petri dish to feed the copepods. A magnifying glass was used daily to count and record the number of copepods surviving in each petri dish over 15 days.

Results

Results showed that salinity does have an effect on the survival of copepods. The highest survival rate of copepods was 45% in the salt water solution of 34 ppt. The lowest rate of survival at 15% was the 27 ppt salinity treatment. These results demonstrate that marine life in our oceans are at risk of dying due to the changes in our climate that alters its salinity levels.

Conclusions/Discussion

This data demonstrates that water salinity directly affects the survival of Tigriopus californicus copepods. Climate change has a great impact on the salinity in our oceans. The salinity levels are rising in some parts of the world and decreasing in others. While these changes threaten the survival of copepods, it is in turn threatening the existence of various species of marine life. These changes are causing harm to our ocean's fragile and complex ecosystem.

Summary Statement

I showed that the changing levels of salt in our oceans are destroying copepods which are a major food source for various species of marine life.

Help Received

Mrs. Diane Loflin and Mr. Carl Gong