CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Liza Angila; Lindsey Sanders

Project Number

S1901

Project Title

Amphibian Diversity in the San Lorenzo Valley

Abstract

Objectives/Goals

The objective of this project was to acquire an understanding of the amphibian species composition and diversity at each of our sites in the San Lorenzo Valley Watershed in Santa Cruz County, California. After our initial visits to the two sites, Quail Hollow Ranch and Waterman Gap, we formulated two investigative questions: 1. How does the species composition differ at these two sites? 2. Which site has greater biodiversity?

Methods/Materials

Methods: Our research took place primarily in the field using four search methods which included upturning logs and leaf matter, daytime visual surveys scanning the forest floor, evening listening surveys, and nighttime surveys using eye shine. We used the Shannon Weiner Biodiversity Index to analyze our data on species diversity at the two sites.

Materials included the Western Reptiles and Amphibians field guide (Robert C. Stebbins), Binoculars, Flashlights, All-Weather Notebook, Waders, Digital Camera, and Raingear

Results

During our research we observed 103 aquatic breeding amphibians (four species) and 1 terrestrial breeding amphibian (one species) at Quail Hollow Ranch. At Waterman Gap we observed 21 terrestrial breeding amphibians (two species) and 3 aquatic breeders (one species. Thus, 99% of the individuals found at Quail Hollow were aquatic breeding amphibians and 87% of the amphibians observed at Waterman Gap were terrestrial breeders.

Through use of the Shannon Weiner Biodiversity Index we found that the biodiversity at Waterman Gap scored an index of .958 and Quail Hollow scored an index of 1.212.

Conclusions/Discussion

Based on the data that we obtained, we have concluded that Quail Hollow is home to more aquatic-breeding amphibians while Waterman Gap supports more terrestrial-breeding amphibians. The calm waters at Quail Hollow provide an ideal habitat for aquatic-breeders to lay their eggs, while the leaf matter, duff, and logs found at Waterman Gap provide breeding ground for terrestrial-breeders.

After performing the Shannon Weiner Biodiversity Index equation to assess the level of biodiversity at each site, we found that Quail Hollow Ranch had higher biodiversity and Waterman Gap was lower. This is logical because although Quail Hollow supports mostly aquatic-breeding amphibians, we found a greater number of amphibian species and a greater number of individual amphibians there than at Waterman Gap.

Summary Statement

To determine the differences in species composition and biodiversity at two different sites in the San Lorenzo Valley.

Help Received

UCSC grad student Valentine Hemingway helped us get aquainted with amphibians, Marian Blair accompanied us on various excurrsions.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Jonathan M. Beard; Melanie A. Swan

Project Number

S1902

Project Title

Water Temperature: Does It Affect Salmonid Growth?

Abstract

Objectives/Goals

The goal of this project was to collect sufficient data to relate water temperature to salmonid development in the San Lorenzo River. Our hypothesis is that salmonids will have a greater median size at sites with relatively warmer water.

Methods/Materials

To monitor these temperatures, we launched HOBO devices at twenty sites along the river. (HOBOs are probes that allow for continuous monitoring of a certain factor.) We started collecting temperature data June of 2005 and continued through the end of October. We then compared these numbers with historical fish counts provided by our mentor.

Results

The data we collected shows that salmonids within the San Lorenzo River grow larger at sites with warmer water. The data in the scatter plot most closely follows the exponential equation y=(7.62095)(1.143630)x. This equation suggests that, at least in the San Lorenzo River, as the average of the minimum and the maximum of the rolling average of temperature increases, so does the median young of the year steelhead standard length.

Conclusions/Discussion

In conclusion we found that salmonid growth does seem to be enhanced by warmer water temperatures, proving our hypothesis correct. We combined the temperature data we collected in 2005 with Don Alley#s young of the year steelhead standard length data from the years 1998 and 2005. Because Don did not collect data in 2005 from all of the same sites we used, he suggested utilizing his 1998 fish length data. The rainfall amounts for 1998 were very similar to those of 2005, which allows us to assume that the stream-flows (and therefore temperatures) were about equal as well. After combining the 1998 and 2005 fish length data, we compared each site#s median to the average of the maximum and the minimum of the rolling average of the temperatures for that site. A scatter-plot of these data shows the correlation between them. The regression line that the data most closely follows is exponential: y=(7.62095)(1.14363)x. The r-value (correlation on a scale of 0 to 1) was .8027, which indicates a relatively strong correlation between fish length and temperature. This leads us to believe that the variables are not simply related by chance, but rather that there is a cause and effect relationship between them, meaning warm water temperature, at least in the San Lorenzo River, is a direct cause of larger salmonid length.

Summary Statement

This project explores the correlation between steelhead length and water temperature in the San Lorenzo River, and has shown that the warmer the water at a particular site is, the larger the young of the year are for that site.

Help Received

Fish biologist Don Alley provided the background data for our project, and teacher Jane Orbuch helped us to develop a hypothesis and write up our results.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Marisa Benfanti; Adriana DiBernardo

Project Number

S1903

Project Title

The Effect of Temperature on the Life Cycle of Chrysaora achlyos: From Ephyra to Medusa Stage

Abstract

Objectives/Goals

The purpose of this experiment is to determine if high or low temperatures affect Achlyos survival and growth. The hypothesis was that if Achlyos were contained in a colder atmosphere, then the Achlyos would mature into a medusa faster.

Methods/Materials

The experiment took approximately three weeks. To set up for this experiment Achylos had to live in a salt-water tank.Twenty Achylos were picked of similar size and placed in two separate tanks. One had a temperature of 68 degrees Fahrenheit and the other 58 degrees Fahrenheit. The jellyfish were observed twice a week. The constant in this experiment was the Achlyos were fed the same type and amount of food,rotifers and brine shrimp, which were fed three times a day by carefully matching the density of rotifers and shrimp in the jelly tanks.

Results

In this experiment it was observed that the Achlyos had adapted to the 58 Farenheit better and matured faster.One noticeable result in this experiment was that all of the Achylos in both tanks grew at least three millimeters over four weeks. Another relationship between growth size and time is that the Achylos in the 68 Farenheit tank grew at a slower pace.

Conclusions/Discussion

The findings support the research hypothesis that they will grow quicker in a colder habitat. This prediction was made because it was thought that if jellyfish would adapt to colder climates their growth would increase because of the similarity to natural environments. In future experiments, the Achlyos can be measured more frequently, have a greater population of jellyfish, and have multiple trials, which may reveal a greater difference between jellies at each temperature. Several problems were encountered in the first trial, water flow was too strong, which caused the jellyfish to get stuck in the net and die. In the future #the surface area of the exit screen must be maximized so that the drain pressure at any one point is low enough to prevent the medusa from being trapped against the screen# (Cross). New jellyfish were selected but in Trial 2 it was discovered that the jellyfish were missing, because there was a hole in the tank and again, new jellyfish were selected. Trial 3 lasted for three weeks. Three of the jellyfish in the 68-degree tank were missing because the tank had hydrozoans, which ate the jellyfish. This only allowed for six collections of data instead of eight and only seven jellyfish were measured.

Summary Statement

The main focus of our project was to determine if temperature has an affect on the development of Chrysaora Achlyos.

Help Received

Used the lab at Cabrillo Marine Aquatic Nursery under the supervision of Kirsten Darrow.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Jennifer M. Buckner

Project Number

S1904

Project Title

Genetic Variation among Populations of Greenhouse Whitefly (Trialeurodes vaporariorum) throughout California

Abstract

Objectives/Goals

The Greenhouse Whitefly (Trialeurodes vaporariorum) is a huge pest to many types of plants throughout the state of California, especially in commercial agriculture. One of the biggest problems is that they can transmit a wide variety of viruses from plant to plant and are not easily controlled by pesticides. This project is to determine if significant genetic variability exists among Greenhouse Whitefly populations, in order to find out if there are biotypes, or sub-species of these populations. By knowing if there are different types of this whitefly, it will help in further studies of how to control these pests and their viruses.

Methods/Materials

1. Populations of Greenhouse Whitefly (Trialeurodes vaporariorum) were collected from different areas, including a strawberry field in Watsonville, a greenhouse in Salinas, a common backyard plant in Salinas and UC Davis.
2. The total nucleic acid (DNA and RNA) was extracted from these populations.
3. The Polymerase Chain Reaction (PCR) was used to amplify small sections of the mitochondrial DNA from individual whiteflies.
4. The PCR products were loaded onto an electrophoresis gel to separate the DNA macromolecules.
5. The electrophoresis results were then sent to a commercial laboratory to be sequenced.
6. Using a software program to align the genetic sequences, they were compared to the vector populations (controls) of Greenhouse Whitefly to determine if variability exists between them.

Results

The Salinas and UC Davis populations turned out to be very similar to the controlled (genbank) sequence. They were 99%-100% alike. However, the population from Watsonville was only 82%-86% alike with the genbank sequence. This was more of a considerable difference.

Conclusions/Discussion

The information for the Davis and Salinas populations was not quite expected; the hypothesis stated that there would be more of a difference between them and the control. However, the Watsonville population had more of a variation compared to the control, even when repeated several times. There is not an obvious explanation as to why this is, but it means there may be significance in this species if studied further. It is useful to study this because by finding out if there are biotypes of this species of whitefly, or any type of pest in agriculture, it will help to study their effects on virus transmission and their ability to resist or be affected by pesticides.

Summary Statement

This project is to determine if significant genetic variability exists among Greenhouse Whitefly (Trialeurodes vaporariorum) populations to find out if there are sub-species.

Help Received

Used lab equipment at the USDA in Salinas, under the supervision of Dr. McCreight and Dr. Wintermantle.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Jorielyn Calip; Nhan Dao; Daylin Pinal

Project Number

S1905

Project Title

Light Sensitivity in Regenerating Planaria, or The Dark Side of Planaria

Abstract

Objectives/Goals

Our project was done to determine whether the tail segments of planaria that had been cut in half were as sensitive to light as the head segments. Their light sensitivity was also compared to uncut planaria.

Methods/Materials

The planaria were first tested for their response to being exposed to light on half of their container, with the other half dark. The number in the light and dark was recorded at the end of a given time period. They were then bisected into "head" and "tail" halves, and the testing repeated during a 17 day observation period.

In the first experiment observations started on the 5th day of regeneration due to school schedules. A second experiment was done to observe the reaction to light of the regenerating "heads" and "tails" for the first four days after bisection. It was stopped after the 4th day, again due to school schedules.

Results

The data for the first experiment was not consistent enough to support the hypothesis. If all data from the first experiment is averaged, then overall the average for all the "head end" observations was 56% in the dark, and for the "tail ends" it was 60%, both lower percentages than the uncut planaria (73%). In the second experiment the data did support the hypothesis, Every time the percentage of "heads" that moved into the dark was higher then the percentage of "tails" that moved into the dark. If the data from all the days in experiment two are averaged, then the uncut planaria have the highest percentage that move into the dark (87%), with the heads having the second highest percentage (55%), and the tails have the lowest percentage moving into the dark (9.5%).

Conclusions/Discussion

Data from the first experiment did not support our hypothesis, which was if the eye spots of the planaria are their only light sensing organs, then the "tail ends" of regenerationg planaria will react less to light than the "head ends". The data from the second experiment does support the hypothesis. We concluced that the eyespot is an important organ for light sensitivity, since the "tail" ends without the eyespots displayed a much lower percentage of dark-seeking behavior.

Summary Statement

Planaria segments without eyespots are less able to sense light and avoid it than segments with eyespots.

Help Received

Our project sponsor helped us to format our project, to order planaria, and to collect equipment.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Steffani L. Campbell

Project Number
S1906

Project Title
The Downside of Desalination

Abstract

Objectives/Goals
The purpose of this project was to determine the range of salinity in the slough and the tolerance of Tigriopus Californicus copepods to increased salinity levels.

Methods/Materials
The first part of the experiment documented the salinity in different parts of the Elkhorn Slough and surrounding area at high and low tide. A canoe was use to collect samples and a refractometer was used to test the salinity of each.

The second part of the experiment investigated the ability of a local copepod, Tigriopus Californicus, to survive in high salinity solutions. A plankton net was used to collect these organisms which were then placed in six chambers, each with the same amount of sea water in them. Two of the groups became control groups and a hypersaline solution as added in varying amounts to each of the other four chambers. Salinity was measured in each chamber, and then all six were submerged in running ocean water. Every 24 hours for the next three days measurements were taken to determine what percentage of each population was still alive.

Results
The measurements from the first part of the project showed the great range of salinity levels in the slough, and led to the conclusion that the organisms who would be most affected by the salinity changes caused by the expansion of the desalination plant would be those located about 200 meters offshore near the ocean floor, where a hyper saline layer could form from the brine discharge.

The second part of the experiment showed that the increased salinity did have a significant effect on the survival of the population of Tigriopus Californicus. While the control group gruops suffered only an average 4% decline in the live population over the entire 72 hour testing period, the groups subjected to increased salinity levels suffered losses from 15% to 46% of their live populations over the same time period. It was also observed that females with egg sacks suvived in greater numbers than the general population.

Conclusions/Discussion
My results generally supported my hypothesis. Further research should be done to test the long term effects of increased salinity on this organism, as well as the effects of increased temperature on the plankton and other marine life near the Elkhorn Slough and Moss Landing Harbor.

Summary Statement
This project investigates the effect of desalination plants on the local environment by studying the reactions of the copepod Tigriopus Californicus to short term exposure to hypersaline solution.

Help Received
Advised by Dr. Preston; used refractometer at the Monterey Bay Aquarium Research institute under the supervision of Dr. Ken Johnson, Used equiptment at The Hopkins Marine Station with the help of Dr. Christian Reilly.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
An-Chieh Cheng

Project Number
S1907

Project Title
Aggregation of Hippodamia convergens (The Convergent Lady Beetles)

Abstract

Objectives/Goals
The purpose of this experiment is to investigate the aggregation behaviors of the convergent lady beetles by their specific temperature range of the seasonal hibernations.

Methods/Materials
Experiment 1: 1.Place some moist paper towels for the bug box's base. Attach the screen to the lid of the bug box to avoid lady beetles' escape. 2.Set the temperature between 17.0 degree C and 18.0 degree C. 3.Place forty convergent lady beetles into the bug box. 4.Record the observation of each group once an hour. The observation data will be the surface area that's covered by the aggregation of the lady beetles, the temperature, the condition of the lady beetles' behaviors, and the number of lady beetles that are aggregating (to measure density). Continually record the observation for 6 hours.
Experiment 2: 5.Repeat procedure number 1. 6.Set the temperature between 15.0 degree C and 16.0 degree C. 7.¡V8. Repeat number 3¡V4.
Experiment 3: 9.Repeat procedure number 1. 10.Set the temperature between 22.0 degree C and 23.0 degree C. 11.¡V12. Repeat number 3¡V4.
Materials: Hippodamia convergens adults; Honeydew; Bug Boxes; Screen; Paper Towel; Heater; Dorm refrigerator; Ice packs; CBL-Calculated base lab unit; TI graphing calculator.

Results
The percentage of the aggregated lady beetles is approximately 25% in the experiment one. The percentage of the aggregated lady beetles is about 45% in the experiment two. The average percentage is 19% of all lady beetles in the experiment three. The average density of the experiment 1 is 5.07 lady beetles per square centimeter. It has 4.60 lady beetles per square centimeter for experiment two. For experiment 3 it has 4.67 lady beetles per square centimeter.

Conclusions/Discussion
The influence of temperature on Hippodamia convergens is relevant to the aggregation behavior. However, the result does not match the hypothesis. The number of aggregating lady beetles during the six hours experiment is relatively unstable. It shows that temperature might not be the factor of H. convergens's aggregation behavior. The possible explanation is that lady beetles are cold-blooded. Therefore slowing down their activities as reactions to the surrounding low temperature is not a behavioral specialty. The possible factor might be the length of day light. For the density of the aggregation area and the number of H. convergens, the result didn¡#t show any direct or inverse proportion.

Summary Statement
This project is to find out the specific factor of Hippodamia convergens's (the convergent lady beetles) aggregation behavior.

Help Received
Mrs. Evans (research class teacher) helped to design the experiment; participant in Oak Grove high school research class (advanced science);

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Ben R. Chubak

Project Number
S1908

Project Title
Generational Adaptation of Coral to Variables in a Simulated Reef Environment

Abstract

Objectives/Goals
My objective was to determine if new generations of Xenia elongate coral would adapt better to changing conditions in a simulated reef environment compared to the mother colony coral which originated in the ocean.

Methods/Materials
A mother colony coral, and a first, second, third, fourth, and fifth generation offspring were tested. During this experiment, each coral was first monitored in a constant and balanced environment and then introduced to various changes. The changes were: exposure to excess lighting, placement under low lighting,exposure to low pH, and exposure to excessive pH. Growth and health were monitored and documented every day.

Results
Growth and health for all generations followed a similar pattern when exposed to each variable. The mother colony adapted to low lighting better than the other generations of coral. The fifth generation coral adapted to placement under high lighting better than the other colonies. During low pH, all of the corals' health declined and their polyps stopped pulsing. During high pH, all corals' health improved and their polyps pulsed faster than normal.

Conclusions/Discussion
Many scientists believe it is only a matter of time until all coral reefs will perish. One idea to save the coral reefs is to create massive man-made reef environments. This project shows how a wild coral and its new generations adapted to a new environment. Although all tested corals had similar reactions to the variables, it is encouraging that they were all able to survive the changes. Further testing is necessary to confirm whether subsequent future generations would adapt significantly better than the mother colony.

Summary Statement
My project tested the resilience of a mother colony coral (originally from the ocean) as well as a first, second, third, fourth, and fifth generation coral colony to variables that might arise in a simulated reef environment.

Help Received
Ryan Honda(Friend) helped with board layout.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Julie A. Guerin

Project Number
S1909

Project Title
Investigating Protocols for Haliotis rufescens Egg Cryopreservation

Abstract

Objectives/Goals
The number of aquatic species listed as endangered or threatened is growing. Cryopreservation may offer the opportunity to preserve genetic material in DNA banks, conduct genetic research, and optimize strategies to enhance survivability in the wild. The purpose of this study was to investigate cryopreservation protocols which would yield results for normal red abalone (Haliotis rufescens) egg phenotype after thawing, as a possible model for the at risk abalone species. The objectives were to determine whether eggs can be successfully cryopreserved using a stepwise cooling and thawing procedure, which cryoprotectant agent (CPA) is most effective, and whether a non-permeating cryoprotectant (sucrose) can aid in the thawing and rehydration process.

Methods/Materials
After induced spawning (with prepared H(2)O(2)/Tris Solution), egg collection and centrifuging, four freezing trials were conducted using CPA 'Freezing Medium'(FM) or dimethyl sulfoxide (DMSO) at 8 and 16 mins stepwise gradual cooling at temps 14, 4, -40 degrees C, and non-stepwise 1 min cooling, before plunging into liquid nitrogen. A total of 45 stepwise (5 to 7mins at temps -40, 4, 14 degrees C) and non-stepwise thawing protocols were tested with and without sucrose at 5g, 2.5g or 1.25g/80ml water.

Results
Best results were found in protocols using DMSO at 8 and 16 mins stepwise cooling, and stepwise thawing with sucrose amounts of 1.25g or 2.5g, yielding 25% to 50% (8mins) and 50% to 75% (16mins) normal egg phenotypes. Non-stepwise protocols resulted in 75% to 100% eggs bursting with the remainder abnormal. Thawing protocols without sucrose resulted in 100% eggs bursting. Protocols using FM resulted in 50% to 100% eggs bursting, with the remainder abnormal.

Conclusions/Discussion
Stepwise cooling and thawing, DMSO as CPA, and the use of sucrose in acting as a non-permeating buffer in diminishing effects of rapid rehydration, contribute to maintain normal egg phenotype after cryopreservation, which supports my hypothesis. However, it is unknown whether eggs were still viable. The intention was to verify the survivabilty of eggs with live sperm, but male spawning was unsuccessful. Further research will include in vitro fertilization studies, and hopefully cryogenic studies on the endangered white and threatened black abalone.

Summary Statement
This project was conducted to test which protocols would give best results for normal red abalone egg phenotype after cryopreservation.

Help Received
Dr.Kiersten Darrow (mentor), Cora Webber and Stephanie Mattingly (aid in procedures), at Cabrillo Marine Aquarium; my mother for encouragement, and help in cutting display board sections; participant in Junior Southern California Academy of Sciences (JSCAS).

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Maxine E. Holland

Project Number
S1910

Project Title
Filter Feeders

Abstract

Objectives/Goals
To see whether or not Mytilus edulis (mussels) can absorb particles within their systems other than ones used for food.

Methods/Materials
In my procedure, I put 250 mL of a carbon solution (30.16 g of black carbon pellets, and 250 mL of fresh water) in all 12 tanks, found how well my variables (mussels) absorbed the particles, and compared their results to the results of my control.
1. 12 ten gallon, glass tanks with plastic or wooden: 6 tanks will be used as variables and 6 as controls
2. 50 mL beaker
3. 16.3 kg of Mytilus edulis (mussels) 2.7 kg for 6 tanks
4. 361.92 g of crushed black carbon pellets
5. 3,000 mL of fresh water (250 per tank)
6. 12 airstones of the same brand
7. 12 airpumps of the same brand
8. 6 large rocks (for the mussels)
9. 120 gallons of seawater
12. 12 undergravel filters of the same brand
13. Gravel
14. Photo spectrometer

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

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

Summary Statement
Attempts to find whether or not sea mussels can absorb particles other than food as a form of natural filtration.

Help Received
Used photo spectrometer from Hueneme High School under the supervision of Mr. Callaway.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

John Michael L. Jones

Project Number

S1911

Project Title

Mantid 5: Iris oratoria Displays Two Novel Survival Strategies: Cryptic Parthenogenesis & Post-Annum Resumed Hatching

Abstract

Objectives/Goals

This project is a long term generational study of the introduced mantid species, Iris oratoria, which gave opportunity to observe offspring derived by parthenogenesis. Following the observance of 5 parthenogenic progeny from an isolated F1 captive-raised female, an experiment was performed which involved 47 normally eclosed (becoming an adult), isolated females from three lineages.An unexpected discovery was finding nymphs hatching from the isolated 2003/04 oothecae which had hatched the prior season, in 2004. This study evaluates ootheca (egg case) production, parthenogenic progeny, and resumed-hatching offspring from wild caught or captive raised groups of three lineages.

Methods/Materials

MANTID REARING - MATERIALS:various Iris oratoria lineages, their environments, food sources, heat lamp & full spectrum light, timers, thermometer. METHODS: outside when warm, then add heat lamp inside when cooler, regular feeding.

OOTHECA HANDLING-Oothecae were placed in glass or plastic jars grouped by parent, nylon covered, secured with rubber bands. Stored outdoors in winter. 2003/04 oothecae were shelved in a non-insulated building.Hatchlings were counted and cleared periodically.

Results

Every 2004 female that produced more than four oothecae produced parthenogenic progeny. 35 isolated females produced 346 oothecae: and 30 of those females produced more than 853 parthenogenic offspring regardless of lineage or captive-raised generation. An unexpected phenomenon was the discovery of 2005 hatchlings in the stored ootheca containers from the 2004 hatching season. All 2003/04 females that produced oothecae prolifically had post-annum (2nd season) resumed hatching nymphs (2nd season values were from 5 to 25 % of the first season values); as represented by the wild caught control and two captive-raised lineages. Five females produced 410 post-annum, 2nd season offspring.

Conclusions/Discussion

Every prolific female reproduced parthenogenicly. The progeny of the wild caught control produced the highest numbers of parthenogenic offspring. The fact that those females had male siblings is evidence of a system waiting until needed, cryptic parthenogenesis. The fact that post-annum (2nd season) resumed hatching was seen in all three lineages indicates that the phenomenon is also a species-wide or pan-specific occurrence. These two novel survival strategies explain the successful spread of Iris oratoria in California.

Summary Statement

This study evaluates novel survival strategies observed in the mantid species, Iris oratoria, such as cryptic parthenogenesis and post-annum resumed hatching.

Help Received

Dr. David Yager - U of Maryland for advice and sending me Brunneria borealis.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
David P. Kari

Project Number
S1912

Project Title
How Skillful Are Drosophila virilis in Discerning Natural and Artificial Esters?

Abstract

Objectives/Goals
I plan to test two cultures of Drosophila virilis to determine how effective they are in distinguishing between artificial and natural esters. The goal of the project is to discover which fruity esters are the most attractive and why the fruit flies choose them.

Methods/Materials
A closed testing apparatus was constructed using five jars and a cardboard box. Four of the jars were attached to the box, each jar to a separate side. The fifth jar was used in tranferring the flies from the culture tube into the contained area. Nine chemicals were used, including the following: butyric acid, concentrated acedic acid, ethyl alcohol, methyl alcohol, n-octyl alcohol, n-pentyl alcohol, phenylacetic acid, and 6M sulfuric acid.

Results
Nearly all of the visits by the Drosophila virilis were to natural esters as opposed to the artificial esters. There was little difference in the results between the unfasted Culture 1 and the fasted Culture 2 in terms of results. The majority of the visits were to the control water. The most attractive esters were natural orange and banana. The least attractive were pineapple and honey.

Conclusions/Discussion
Clearly, the fruit flies preferred the natural esters above the artificial esters because it is possible that the synthesis between the alcohols and the acids in the artificial esters was incomplete, deterring any potential visits. Drosophila virilis also felt the need for water more than intangible foods, overwhelmingly choosing water over the esters. This research confirms that fruit flies have a keen sense of smell that can help in the development of artificial esters designed to be used in products such as scented candles, perfumes, and soft drinks.

Summary Statement
My project is about revealing the refined and highly adaptive fruit fly olfactory system as well as the complexity of ester composition.

Help Received
Dr. Don Lorance of Vanguard University helped select the esters to be tested and supplied raw chemicals; Dr. Nelson Samuel of California Baptist University suggested the use of fruit flies.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Stefanie J. Lynch

Project Number
S1913

Project Title
Shellfish Pursuits: Population Dynamics of the Olympia oyster, Ostrea conchaphila, in Richardson Bay, CA - Year 2

Abstract

Objectives/Goals
The Olympia oyster (Ostrea conchaphila) is the only native oyster on the Pacific Coast. Though once highly abundant, populations have been severely depleted. The purpose of this project is to continue a study of the natural population distribution and factors affecting growth and survival of Olympia oysters in the intertidal zones of Richardson Bay.

Methods/Materials
Seventy 10-minute ecological transects were performed during low tide at five sites around Richardson Bay, and at two other sites on main San Francisco (SF) Bay. Oyster size was measured, and water samples were collected measuring potential limiting factors including salinity, turbidity, pH, temperature, calcium, phosphate, silicate, and nitrate. Predators of the oysters were recorded, including oyster drills, shore crabs, and flatworms. Individual oysters were tracked for growth rate.

Results
Oyster counts were found to be as prevalent in Year 2 (1353) as in Year 1 (1438, $P = 0.54$). Abundance by location ranked in the same order as Year 1, with one exception, and predators were associated with decreased counts at two sites. Size-frequency distribution curves show variation and multi-modal peaks consistent with constant population renewal and turnover. Oyster counts correlated with phosphate ($r = 0.73$, $P < 0.05$) and with calcium levels ($r = -0.80$, $P < 0.005$). Individual oyster growth rate was highest (1.26 mm/wk) at the site adjacent to an ongoing oyster restoration project.

Conclusions/Discussion
The Olympia oyster once thrived in the healthy ecosystem of San Francisco Bay. The first step in successful restoration is acquiring detailed knowledge of the population distribution and factors limiting survival. In this study, population abundance and size composition were determined for seven sites in Richardson Bay and northern San Francisco Bay for two consecutive years. Total counts in the entire study remained statistically unchanged while size-distribution varied widely, probably reflecting constant renewal and change within the oyster populations due to waves of larval release and settlement at preferred sites. Providing even small amounts of preferred habitat could supply a viable niche for oyster survival.

Summary Statement
In this first detailed study of the natural population of Olympia oysters in Richardson Bay, CA, population abundance, size composition, and limiting factors have been determined at seven sites during two consecutive years.

Help Received
Parents drove me to transect sites. Dr. Michael McGowan, SFSU, offered advice on the transect process. Adria Lassiter and Al Marchi, Romberg Tiburon Center, gave assistance with lab analysis of water samples.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Amanda M. McDowell

Project Number
S1914

Project Title
Rolly-Pollies Finding Their Way Home

Abstract

Objectives/Goals
I wanted to learn the survivablity and adaptive behavior of the isopod Armadillidium vulgare. Ultimately, I wanted to know what would happen to these bugs if they were displaced from their main living area under rocks or brush.

Methods/Materials
To test the survivability and adaptive strength, I displaced 120 pill bugs away from their initial location, under a pile of rocks. I had 10 groups of twenty, and each group was put and "x" amount of feet away. My Group A was left in the initial location. Group B was put 1 ft. away around the pile of rocks. Group C was put 2 ft. away; Group D was put 3 ft.; Group E was put 4 ft.; lastly, Group F was put 5 ft. After ta three days I started my tests. I counted the isopods found in the initial location everyday for ten days

Results
I found the average number of isopods in each group. Group A consistently had about 18 bugs every time I counted. Group B had about 17; Group C had a about 14; Group D had about 12; Group E had about 9; lastly, Group F had about 6 evertime I counted. After doing a statistical analyisis of my data, it showed that there is a significant difference between the groups.

Conclusions/Discussion
In conclusion, isopods can survive the journey back home if they were placed up to a maximum of two feet. After two feet, they are lost and their chances of making it back home are slim.

Summary Statement
I testested the survivability and behavior of the isopods Armadillidium vulgare.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Samantha Munger; Jessica Serrato

Project Number
S1915

Project Title
Catostomus santaane: The Santa Ana Sucker

Abstract

Objectives/Goals
Our Project was to determine if the Santa Ana River is suitable for the Santa Ana Sucker fish based on the dissolved oxygen content, pH, and temperature compared to the controlled artificial stream. We believe that the Santa Ana River does not correspond with that tested in the artificial stream.

Methods/Materials
We tested three different locations; two different spots of the Santa Ana River and one in the artificial stream at the Riverside Water District. At each location we used three different probes connected to a graphing calculator that measured dissolved oxygen content, pH, and temperature. We tested six different locations at each site and used test tubes to take samples of the water from each area of the various sites.

Results
The average pH from the first sampling site was almost identical to the average at the second sampling site (control). The temperature was ideal throughout all sampling (under 30 degrees C). The dissolved oxygen was significantly less at the first sampling site compared to the other two.

Conclusions/Discussion
The average pH from the first sampling site was almost identical to the average at the second sampling site (control). The temperature was ideal throughout all sampling (under 30 degrees C). The dissolved oxygen was significantly less at the first sampling site compared to the other two.

Summary Statement
Our project was to determine whether or not the Santa Ana River is a suitable habitat for the Santa Ana Sucker fish based on dissolved oxygen content, pH, and temperature.

Help Received
Bonnie Nash at the Orange County Water District helped us get into the sites and supervised testing.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Caroline K. Salmond

Project Number
S1916

Project Title
A Goldfish Never Forgets

Abstract

Objectives/Goals
Do goldfish contain long-term memory capabilities or the ability to remember an event or an occurrence in time?

Methods/Materials
These were the steps taken to complete my experiment:
1. Construct two partitions(one colored red and one colored blue) with a hole evenly placed in the middle of both. Both holes must be the same size.
2. Put one partition at a time in the middle of the tank with the fish corralled to one side of the tank (food goes on side opposite of side with fish when red partition is put in the tank).
3. Record the times the fish swim through the hole.
4. After several trials, put fish in between both partitions in tank and let the fish choose the hole to swim through.
These were the materials used in order to conduct my experience:
10 common goldfish; # 1 20-gallon aquarium; # 25 pounds of black gravel; # 1 filter; # 1 aquarium heater; # 1 aquatic thermometer; # 1 light and tank covering (lid); # 5 artificial plants; # 4 clear transparencies; # 2 permanent markers (one red and one blue); # 1 jar of fish food (flakes); # 1 stopwatch.

Results
The fish swam through the red partition with times lowering every trial. They chose the red partition favorably over the blue partition when given a choice of which colored-partition to swim through.

Conclusions/Discussion
The common goldfish has long-term memory. Also, the common goldfish has the ability to smell an object from a distance and follow its scent. The goldfish also have the ability to see and establish the differences between different colors (red and blue).

Summary Statement
If I operantly condition ten common goldfish to associate a certain colored partition with a food reward, then it will prove that goldfish do have long-term memory and are able to remember an event for more than three seconds alone.

Help Received
Mother, Mrs. Kathryn Salmond, helped maintain the goldfish and their tank.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Sonia Singhal

Project Number
S1917

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

Abstract

Objectives/Goals
The goal of this research is to understand ecological change due to global warming in the Northern California intertidal by establishing baselines for intertidal temperature and poplulations of Anthopleura sola, a southern species of sea anemone that is being used as an indicator of species.

Methods/Materials
Abundance, distribution, and sizes of A. sola were measured along randomized transects within 30m x 30m plots at three sites in Northern California. Temperature data were recorded at 1-hour intervals to obtain detailed temperature profiles of the sites.

Results
Measurements show that the sizes of A. sola are correlated with site topography and abundance. Large individuals are found in low-lying areas where there are few other A. sola, but tend not to exceed 7.5 cm in size as density increases. As expected, A. sola is less abundant at the more northern sites. Intertidal temperatures show variations that exceed ranges of both ocean and atmospheric termperatures, and, surprisingly, do not follow trends observed in either the ocean or the atmosphere.

Conclusions/Discussion
This baseline provides the first record of simultaneous measurements of intertidal temperature and abundance of A. sola, and will be used as a comparative foundation for future research on ecological change in the intertidal.

Summary Statement
This project surveys populations of a newly-identified species of sea anemone, along with temperatures in their environment, to see if they are being affected by climate change.

Help Received
I would like to acknowledge the on-going help and guidance of my mentor, Dr. John Pearse, in this project.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Cole T. Symanski

Project Number

S1918

Project Title

Egg-into-Egg: Effect of Dietary Protein on Clutch Traits in Zebra Finches

Abstract

Objectives/Goals

Objective: My objective was to determine the effects of supplemental dietary protein on the traits of eggs laid by zebra finches, a species whose basic diet of grass seed is low in protein. I developed and tested five hypotheses regarding the effects of low- protein (seed) vs high-protein (seed plus supplemental protein) diets.

Methods/Materials

Materials and Methods: Two captive populations were used, each having 30 pairs of zebra finches. The populations were maintained under identical food conditions prior to the start of the experiment. One week before data collection began, the aviaries were randomly assigned to treatments. Birds in the low-protein treatment received grass seed, water, cuttlebone and oyster shell. Birds in the high-protein treatment were supplied hens egg and Cede in addition to the aforementioned basics. During the 24-day experimental interval, fresh eggs were collected daily from nests (and replaced by dummy eggs); then experimental eggs were weighed and marked for identification. Eggs were then frozen to facilitate separation of the yolk from the albumen upon subsequent dissection to obtain yolk weights. Clutch size and clutch start date were also recorded. After all data had been recorded, statistical analyses were performed using Systat.

Results

Results: For the most part, results were statistically significant and fit expectations. Eggs and yolks from the high-protein treatment weighed, respectively, about 6 and 8 percent more than those from the low-protein treatment. Clutch size was 50% greater in the high-protein treatment. There was no difference in the percent yolk of eggs in the two treatments. In the high-protein treatment, there was a positive correlation between total egg mass of a clutch and its start date, but for the low-protein treatment these variables were not significantly correlated.

Conclusions/Discussion

Discussion: Protein supplementation substantially increases egg traits and clutch size in zebra finches, which are typical seed-eating songbirds. This finding raises questions about how seed-eating birds evolved to provide sufficient protein for their embryos to develop; and how the protein level available to an embryo affects its ultimate survival and reproductive success.

Summary Statement

I experimentally investigated the effects of supplementary protein on pre-embryonic reproductive traits in zebra finches.

Help Received

I used birds and lab equipment at University of California Irvine under the supervision of Dr. Nancy Burley.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Bryce W. Trevett

Project Number
S1919

Project Title
How Habitat Fragmentation Affects Arthropod Diversity

Abstract

Objectives/Goals
This research project was designed to find out if arthropod diversity decreases with increasing habitat fragmentation and development.

Methods/Materials
Research was conducted in chosen sites of habitat fragments in Palos Verdes. Three sites were chosen for the project that were between 0.5 and 1.5 miles from development. The arthropods were captured by constructing two pit-fall traps each site. To measure the arthropod diversity, we used a few simple elements. The number of species of arthropods were recorded, the number of individuals were recorded, and the Simpson#s Diversity Index was used to calculate the data.

Results
Species A: Pill bug (Armadillidum vulgare). Species B: Grass spider (Agelenopsis spp). Species C: Black widow (Latrodectus mactans). Species D: Broad-necked darkling Beatle (Coelanemis californicus). Species E: European Earwig (Forficula auricularia). Species F: Common Black Ground Beatle (Pterostichus spp). Species G: Silvestri#s Scorpion (Paruroctonus silvestii). Species H: Jerusalem cricket (Stenopelmatus fuscus). Species I: California spanworm (Procherodes truxaliata).

Site Name Can number
bnumNumber Type and # of different species found in can Number of arthropods in can
Del Cerro- between ½ and 1 mile #1 C-1, G-1, H-6 8
Del Cerro- between ½ and 1 mile #2 I-1, F-4, D-1 6
Bogdonavich- ½ mile #1 B-1, A-1, E-2 4
Bogdonavich- ½ mile #2 B-1, A-2 3
La Dera Linda- between 1 and 1 ½ mile. #1 C-1, D-1,G-1 3
La Dera Linda- between 1 and 1 ½ mile #2 E-15, A-3, F-2 20

Site Name Can number
bnumNumber Type and # of different species found in can Total number of different species
Del Cerro- between ½ and 1 mile #1 C-1, G-1, H-6 3
Del Cerro- between ½ and 1 mile #2 I-1, F-4, D-1 3
Bogdonavich- ½ mile #1 B-1, A-1, E-2 3
Bogdonavich- ½ mile #2 B-1, A-2 2
La Dera Linda- between 1 and 1 ½ mile. #1 C-1, D-1,G-1 3
La Dera Linda- between 1 and 1 ½ mile #2 E-15, A-3, F-2 3

Summary Statement
This research project was conducted to find out how arthropod diversity is effected by the constant development happening all over Palos Verdes and if it is increasing or decreasing due to habitat fragmentation.

Help Received
Mother helped decorate poster board. Uncle helped peer revise report.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Cathy N. Truong

Project Number
S1920

Project Title
Comparing the Attraction of Linepithema humile to Various Sweeteners

Abstract

Objectives/Goals
My goal was to determine which common household sweetener (saccharin, sucrose, aspartame, sucralose) the ant species, Linepithema humile, was most attracted to.

Methods/Materials
For the first part of the experiment, which included 7 trials, Argentine ants were caught in groups of 20 specimens each and starved for a period of 24-hours. Then, each group of 20 ants was placed into a paper cup in the center of a dirt-filled circular Tupperware container along with 5 2x2x2 cm cubes saturated with 5 ml of either a 10% saccharin, sucralose, aspartame, sucrose, or 100% water solution placed equidistant from each other along the edge of the container. Every 10 minutes for 1 hour, photographs and records were taken of the number of ants found on each solution-soaked square. For Procedure II, 3 trials were performed where Argentine ants were once again caught in groups of 20 specimens and starved for a 24-hour period. Afterward, they were placed into a paper cup in the center of a dirt filled circular Tupperware container. For a period of 24-hours, they were exposed to 5 dishes of 5 g of a10% saccharin, sucralose, sucrose, and 100% water solution placed equidistant around the edge of the Tupperware. The amount of solution consumed by the ants was calculated using an electric scale.

Results
The results of Procedure I showed a strong attraction of the Argentine ants to the sucrose sample, while they displayed little interest in the aspartame, saccharin, or sucralose samples. Likewise, the specimens in Procedure II showed a strong preference to the sucrose solution, consuming an average of about 0.69 grams of the sucrose solution in contrast to the 0.12 grams of aspartame, 0.04 grams of saccharin, 0.03 grams of sucralose, and 0.00 grams of the water (control) solution.

Conclusions/Discussion
During the overall experiment, the ants showed an extreme attraction to the sucrose samples in Procedure I and consumed the most of the sucrose solution in Procedure II. As a result, the results of the study supported the hypothesis that the Argentine ants would be mostly attracted to the sucrose sample, and over time, consume the most of it.

Summary Statement
My project deals with the ant species Linepithema humile and its attraction to sucrose versus various artificial sweeteners.

Help Received
My mother and brother transported me to various places to obtain my supplies; My sister gave me feedback on my project; Mr. Hunt and Mrs. Cox allowed me use of their equipment

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Erin H. Welter

Project Number
S1921

Project Title
Termites Doing Geometry?

Abstract

Objectives/Goals

This science fair project tested the hypothesis that termites determine the direction of their nest from the degrees of the angles found in their pheromone trails. The ink from the Papermate# was used to mimic the actual pheromone the termites laid down in their trails. The main experiments tested if the termites were capable of using the different angles in the trails to help find their way to and from their destination like ants do.

Main Hypothesis: Do termites use the angles (geometry) of their pheromone trail to tell the direction of their food source or nest?

Sub-Hypotheses: Can this species of termites follow the parapheromone found in a blue Papermate ball point pen? Do the termites follow the color blue? Do they use information from the geometry of their trail to find their nest (obtuse and acute angles)?

Methods/Materials

A series of experiments were conducted to develop the procedures for testing the effects of trail angle on termite orientation. Two types of inks were compared for their ability to generate artificial trails that the termites would follow. Using artificial trails, termites were presented with a choice of two different paths, which intersected the original path at different angles. The different angles were presented in two different categories: acute (43° and 60°) and obtuse angles (120°, 150°, and 158.5°).

Results

The termites were able to distinguish between trails made with the parapheromone from the Papermate pen, which allowed for construction of artificial trails of different angles. Termites selected all trails equally regardless of the angle from which they intersected the original trail. These results failed to support my hypothesis.

Conclusions/Discussion

Overall, the experiments showed that the termites do not use the angles of the trail to determine their orientation to their nest or food source. In other words, termites cannot do geometry. While the termites were able to differentiate between the parapheromone (Papermate blue pen) from the other trail odor (Bic blue pen ink), the choice as to the particular angle selected appears to be random or at least not significantly different at $P < 0.05$. Termites do not appear to be using the same cues as more advanced species such as the ants.

Summary Statement

These experiments tested if termites were able to use the angles of their pheromone trails to determine the direction of their food source and nest.

Help Received

Dr. Vernard Lewis donated the termites; Father helped with data analysis and talking through the experiments; High school teacher helped with paper structure

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Genevieve Y. Williams

Project Number

S1922

Project Title

Foraging Behavior and Food Preferences of Argentine Ants

Abstract

Objectives/Goals

Linepithema humile is a widespread invasive species. To understand the relationship between this species# success exploiting food sources and devastating indigenous species, this study documents the Argentine ant#s food preferences and foraging behavior.

Methods/Materials

Baits from 7 food groups tested food preferences, different size baits tested the ant#s ability to communicate size, and observations of their recruitment process were recorded.

Results

During the spring, Argentine ants prefer baits from the meat group. The ants also recruited in higher numbers faster to larger baits, suggesting that recruitment begins with size recognition. Perhaps the ant#s circling explorations around baits are linked to size estimation. Additionally, recruitment seems to follow percent of the bait covered, so recruitment slows when the bait is covered 80-100%.

Conclusions/Discussion

L. humile#s preference for protein which is available in the form of dead insects and animals in most ecosystems might explain its dominance over competitors tied to one food source.

L. humile#s ability to recruit relatively faster and more numbers to baits of larger weight and volume, in other words its ability to recognize more attractive baits, demonstrates how it successfully exploits food sources by preventing access to baits by competing species.

Observations of three stages of L. humile#s foraging behavior suggests that the Argentine uses a simple stimulus-response mechanism, possibly in conjunction with communication by pheromones, to recruit to and withdraw from a food source. Such a system of communication demonstrates L. humile#s efficient use of the colony#s #manpower,# furthermore contributing to its dominance in a given ecosystem.

Summary Statement

My study details the foraging behavior and food preferences of the invasive and environmentally destructive Argentine ant.

Help Received

Dr. Andrew V. Suarez was available for consultation on methods/materials as well as conclusions via email. Mom helped edit my report and was available for advice.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Karissa J. Willits

Project Number
S1923

Project Title
Super Salmon: Year 2

Abstract

Objectives/Goals
Elevated stream temperatures (T) and low dissolved oxygen (DO) are two components which are detrimental to salmonids. Ground water is generally cool enough to be considered thermal refugia to salmonids; but has low DO. The objective of this project was to see if the T tolerance of fish changes from year to year by comparing the influences T and DO have on steelhead salmon over two summers in Redwood Creek, Humboldt County, CA. My hypotheses were that due to high water flows this year fish would use the seeps less; fish would exhibit the same behavior trends as they did last year; fish would stay in the main channel until the stream reached an elevated temperature of 24°C; to cope with DO levels of the seeps, fish would weave back and forth between the seeps and the stream channel.

Methods/Materials
Four times a day, five days a week I made fish observations and measured the T and DO of the stream, seeps, seep transition zones and stream margin. Seep transition zones were identified by T and DO levels.

Results
The seep water had extremely low DO content, ranging from 2.65 mg/L to 3.65 mg/L. The seeps had water T under 20°C. Fish converged in transition zones, which had an average DO level of 6.53 mg/L and average T of 19.7°C. By utilizing the transition zones fish were able to get thermal refugia and adequate DO. In 2004 the creek would reach 26°C almost daily by mid summer. This year the creek would reached 24°C towards the end of summer. Significantly more fish used the seeps last summer than this summer.

Conclusions/Discussion
This summer at temperatures around 22°C fish were noted using the seeps, but were not stressed. Once the main channel reached 24°C fish exhibited stress behavior. Fish exhibited the same characteristics this year as they did last year, even though the creek did not reach the stream T it did last year. This year showed that fish do only use the seeps for thermal refugia because the creek did not reach as extreme T as last year, and a significantly lesser amount of fish used the seeps.

Summary Statement
I studied fish behavior to determine if the temperature tolerance of salmon changes from year to year by comparing the influences temperature and dissolved oxygen have on steelhead salmon over two summers in Redwood Creek, Humboldt County.

Help Received
Michael Sparkman from Department of Fish and Game suggested this project and provided the dissolved oxygen meter

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Heather Walker; Kristin Walker

Project Number

S1999

Project Title

Shake Ya Tail Feathers 2: Anas platyrynchos vs. Gallus domesticus

Abstract

Objectives/Goals

The objectives of our project are to determine if sebum samples from the uropygial glands of ducks or chickens will promote or prevent bacterial growth on the uropygial papilla, and, by using that information, to understand the functions and significance of the uropygial gland.

Methods/Materials

To conduct our experiment, we collected bacteria and sebum samples from ten ducks and ten chickens, separately caged, and transferred the samples to sterile nutrient-agar-filled petri dishes. While swabbing the fowl, sterile swabs, gloves, and techniques were utilized to ensure the quality of the samples. The petri dishes containing the samples were placed in a 37ºC incubator for five days. Observations were conducted daily at 6:00 AM and PM, and a total of twenty trials were conducted.

Results

In all twenty trials conducted, the sebum samples from the uropygial glands of the ducks produced less bacterial growth than those of the chickens.

Conclusions/Discussion

The conclusion that we have drawn from our experiment is that although both the uropygial oil and wax were successful in the prevention of bacterial growth, the oil samples from the ducks were four times more effective in discouraging growth. The bacterial growth was used as a tool in understanding the proper function of the uropygial gland in ducks and chickens, and illustrated the importance of the uropygial gland in the survival of ducks and chickens.

Summary Statement

This project is about determining the difference in bacterial growth of sebum samples from the uropygial glands of ducks and chickens and further understanding the uropygial gland's significance, its components and diet's impact upon it.

Help Received

Our parents helped us make the agar, catch some of the fowl, straighten out our board, and buy the materials; Dr. Kinde and Dr. Read suggested techniques for collecting sebum samples without harming the birds and provided diagrams and information about the uropygial gland.