



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Christine Chen	Project Number S2201
Project Title Assessing Polioptila californica Population In Differing Artemisia californica Habitats	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This purpose of this project was to study the bird population in varying habitats. Specifically, this project assesses the population of Polioptila californica (California gnatcatcher) in a sub-optimal newly restored Artemisia californica (California sagebrush) habitat versus that of a mature Artemisia californica habitat. I hypothesized that California gnatcatcher population would be greater in a mature California sagebrush habitat compared to a newly restored, California sagebrush habitat.</p> <p>Methods/Materials To test my hypothesis I conducted bird surveys, in which I counted the number of birds at a two different reserves in Palos Verdes, CA; the mature habitat, Vincente Bluffs reserve and the newly restored habitat, Three Sisters reserve. These surveys were conducted between October 2010 and February 2011. All the surveys at each site were conducted at two stations in the morning, and exactly 10 minutes long, where all visible, and audible birds were counted and recorded. During each survey at both locations, only birds within a 75 meter radius of the station were recorded down during each 10 minute interval. I also collected measurements of the California sagebrush at both sites to assess the optimization of each habitat. Since the bird and plant data collected had a non-normal distribution, I used a Mann-Whitney rank sum test to statistically compare the maturity of both reserves, and California gnatcatcher population at both reserves</p> <p>Results From the Mann-Whitney rank sum test conducted, for both the California gnatcatcher and the California sagebrush data sets, the median values between the two reserves for both sets of data was greater than would be expected by chance and therefore has a significant statistical difference ($P < 0.001$) This statistical result demonstrates that the Vincente Bluffs reserve is more mature than the Three Sisters reserve. The results also represent that the California gnatcatcher population is significantly higher at the Vincente Bluffs preserve (mature habitat).</p> <p>Conclusions/Discussion Both parts of the statistical analysis prove my hypothesis that the population of California gnatcatcher population is greater in a mature California sagebrush habitat in comparison to a newly restored, California sagebrush habitat. These results also demonstrate the importance of restoration efforts of the California sagebrush habitat as they are vital for the California gnatcatcher population.</p>	
Summary Statement The purpose of the project is to assess Polioptila californica (California Gnatcatcher) population in varying Artemisia californica (California Sagebrush) habitats	
Help Received Conducted research at land reserves created by the Palos Verdes Peninsula Land Conservancy and Ann Dalkey of the conservancy mentored me	



**CALIFORNIA STATE SCIENCE FAIR
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Name(s) Elizabeth A.R. Garfinkle	Project Number S2202
Project Title Is It a New Species?	
Objectives/Goals There are many species within the genus of clams Tucetona. Recently a clam emerged from Baja California that fit in the genus Tucetona, but did not fit into any of the species already described. The clam was studied by taking observations and measurements by counting, sketching, and observing under a microscope. Similar studies were done on Tucetona bicolor, Tucetona multicosata, and Tucetona strigilata, clams in the same genus, to act as a control. They were then compared to the new shell and found to be similar, yet different, confirming that the clam is new. A scientific article was written and the clam was recorded as a new species. The next step for this project is to research more about the fossil record of Tucetona isabellae and study, describe, and publish scientific articles on more possible new species of clams.	
Abstract Methods/Materials Clam Specimens: Axinactis inaequalis, Tucetona flabellate, T. bicolor, T. strigilata, T. multicosata; Clam of interest: Tucetona sp. 1; Scientific articles and journals (see Reference List); Calipers; Nikon D1 camera with lighting system; Lab counter; Dissecting microscope; Forceps; Lab notebook, pens, and pencils. I. Research background information on species description II. Research background information on Tucetona sp. 1, location and distribution, family, genus, and species III. Consult expert scientists in the field (see Reference List) IV. Take observations and measurements of Tucetona sp. 1; shape, sculpture, color, hinge plate and teeth, adductor muscle and pallial scars, inner ventral crenulations and ribs, and chevron grooves by counting, sketching, and observing under a microscope V. Repeat observations and measurements done in step 4 with the Clam Specimens (see Materials List) VI. Compare observations and measurements from steps 4 and 5 VII. Analyze data and compile observations, measurements, and analyses into a scientific article for publication to describe and record the clam of interest as a new species of bivalve mollusk VIII. Take pictures of Tucetona holotype, paratype, syntype, and vouchers. IX. Publish scientific article in Zootaxa	
Summary Statement I tested and described the characteristics of a clam to determine whether or not it was a new species.	
Help Received Materials and guidance supplied by the Invertebrate Zoology Department at the Santa Barbara Museum of Natural History.	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Imli K. Khair	Project Number S2203
Project Title Hippodamia convergens Undergo the Lasic Treatment	
Abstract Objectives/Goals The purpose of this experiment is to determine whether a ladybugs vision will become impaired from a certain amount of Lasik exposure after 10 days. From my research, lasers (which employ a vast beam of light) will cause the ladybugs contained in groups B and C to eventually become blind. Methods/Materials A brief overview of what was conducted on the ladybugs is simple. First, lazar the ladybugs contained in Group B for 2 minutes and Group C for 4 minutes, keeping a distance of about 4 inches from their eyes. Continue this step each day, for a total of 10 days. After each exposure, place the ladybugs in a setting (transparent container) in which rocks are scattered wholly. Mark on the container a start and finish line. Record the reaction of the ladybugs to the rocks. In addition to that, record the time and length the lady bug takes to transition from point A to point B. This test will demonstrate blindness. Results After this test was applied, Group A (control) climbed on top of the rocks. Groups B and C collided with the rocks numerous times. Too add, Group A (control) was seen to be much more active. Groups B and C responded with characteristics of exhaustion. Conclusions/Discussion Furthermore, not only was vision affected but also the nervous system of the ladybugs. Overall, Group A responded much more vivacious then Groups B and C.	
Summary Statement This project was conducted to test whether a ladybug#s vision would become impaired from a laser#s light exposure and to then correlate it to the effects of light exposure for humans.	
Help Received My teacher Mrs. Delacruz contributed advice; My classmate Juan Llamas supplied the lasers.	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Julian O. Kimura	Project Number S2204
Project Title Copepod Culturing: Conditions for Maximum Yield per Generation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Today, certain marine animals cannot be kept for research due to their specialized diet on micro-organisms known as copepods. This is caused by the copepod's unusually long period of sexual maturation. The reproduction of copepods cannot keep up with the demand for food, forcing laboratories to keep multiple cultures. This project aims to eliminate the need for excess cultures and maximize the productivity of copepod reproduction through manipulations of culture conditions.</p> <p>Methods/Materials This study tested three variables: food, light, and water temperature. Each trial measured one variable at a time, lasting four weeks. Cultures were five gallon buckets hooked up to an airstone for circulation. Each culture started with 100 gravid females of the species Tigriopus Californicus. Every two weeks, water was agitated, forcing copepods into suspension, and three 20ml samples were taken. Next, the averages of the three samples were used to estimate the population.</p> <p>Results Results showed that of the three types of algae used, Isochrysis yielded up to 360% more individuals. Temperature trials showed that copepods will not survive in temperatures above 75 degrees, and a temperature of about 69 degrees was ideal. Finally, a light intensity of 75 watts produced slight increases in population.</p> <p>Conclusions/Discussion The data shows Tigriopus Californicus cultures produce the most individuals when fed with Isochrysis algae paste, kept at 69 degrees Fahrenheit, and kept under 75 watt bulbs. With this data, a wider variety of marine animals such as corals and pipefish would be able to be kept for both research and conservational reasons.</p>	
Summary Statement By finding conditions that will produce the most copepods in a culture, endangered and delicate species will be able to be kept with more ease for conservation and research efforts.	
Help Received Dr. Kiersten Darrow was my mentor/advisor, Mother drove me to Cabrillo Marine Aquarium, Mr. Peter Starodub was my research teacher from school.	



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Adrienne B. McColl	Project Number S2205
Project Title Effects of Food Types on Survival and Development of California Spiny Lobster Phyllosomas, Panulirus interruptus	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Larval California spiny lobsters, <i>Panulirus interruptus</i>, were reared on 5 different diets to study survivorship and metamorphic development. This species has never been successfully raised in captivity before due to the lack of information available on how to sustain life (i.e. food, temperature, tank design). The goal of this study is to provide information on what food types phyllosomas need to live through their larval period so that they can be raised in an aquaculture setting. In addition, morphological development for this species has not been thoroughly studied. Obtaining information on when certain stages occur and on how they are characterized is another objective of this study.</p> <p>Methods/Materials 1. 5 cultures of 10 phyllosomas were reared, each culture fed its assigned diet. All cultures were fed Tetraselmis enriched <i>Artemia nauplii</i> and were supplemented as follows: 1. <i>Artemia nauplii</i> only; 2. gonadal material; 3. larval fish; 4. rotifers & copepods; 5. gonadal material, larval fish, rotifers, and copepods. 2. Each tank was cleaned daily. During this time, deaths were recorded. Deceased phyllosoma were measured and photographed. 3. Survivorship was analyzed with PAST-generated survivorship probability curves.</p> <p>Results The survivorship probability curves show that the larval fish and <i>Artemia nauplii</i> only diets promote the longest survivorship and the greatest amount of growth. In addition, diets including gonadal material were detrimental to survivorship.</p> <p>Conclusions/Discussion The larval fish and <i>Artemia nauplii</i> diets were the most beneficial, while the gonadal material was extremely detrimental. The largest and most morphologically advanced phyllosoma, which was part of the larval fish supplemented culture, reached stage VIII after 179 days. This is the longest survivorship and the furthest stage reached for this species in captivity. This research could be used for aquaculture applications in the future. Using the larval fish supplemented diet, development could be more thoroughly tracked. Also, using this diet, other conditions (i.e. tank design or water quality) could be improved to promote increased survivorship. Similar designs could additionally be applied to closely related species. Aquaculture for this species would encourage conservation of wild stocks and increase economic benefits as the California spiny lobster is currently valued at \$46 per pound.</p>	
Summary Statement Effects of food types on larval California spiny lobsters was studied for aquaculture applications, resulting in the longest-living phyllosoma and most advanced morphological stage reached in captivity.	
Help Received Used lab equipment at Cabrillo Marine Aquarium.	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Leigh M. Moffett	Project Number S2206
Project Title Drosophila Eye Color in Response to Different Light Levels	
Abstract Objectives/Goals Eye color in drosophila melanogaster is a classic example of sex-linked inheritance. My experiment is designed to show if there is any difference in expected inheritance patterns based on exposure to different levels of light. I hypothesized that the eye color of the drosophila would not change in different exposures to light. Methods/Materials A culture of wild type red eyed flies was crossed with white eyed flies to produce the F1 generation. These flies were separated into three different cultures and then exposed to three different light conditions. These light exposures consisted of complete darkness, twelve hours of light and twelve hours of darkness, or complete light. We followed two generations to see if there was any statistical differences in eye color inheritance compared with expected sex linked patterns. Results The chi-square statistical test was employed to see if there was a significant difference in the three cultures of different light exposure from the expected eye color inheritance. The flies in the F2 generation followed the expected genetic pattern regardless of the differing light levels. However, in the F3 generation, rather than the expected 3:2 ratio of red to white eyes, the 100% dark culture was a 9:1 ratio. This was significant to the 0.00001% level. The 50/50 light culture demonstrated a ratio of 7:3, which was also statistically significant. Conclusions/Discussion Exposure to increasing levels of darkness led to a predominance of wild type red eyed flies. These results are highly statistically significant. This is contrary to my hypothesis and suggests that environmental factors can rapidly influence the phenotypes of drosophila eye color. This raises the question of why there is an adaptive advantage to having red eyes in darker conditions. Future research could focus on several issues. First, further generations of flies (F4 and F5) could be bred and counted. The experiment could also be replicated with different eye colors or with different drosophila traits such as wing and body types to see if these phenotypes have any selective advantage in differing light conditions.	
Summary Statement My project determined that different light exposures influenced the eye color of subsequent generations of drosophila melanogaster.	
Help Received My mother helped with the final editing and revisions of my reports and board. My father purchased the flies and supplies needed for the experiment.	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Mark T. Nakata	Project Number S2207
Project Title Use of Surfactants in Mosquito Control: A Continued Study of Surface Tension	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to investigate how non-toxic surfactants affect the surface tension of water and to determine if any of these surfactants can be used as an effective weapon against mosquitoes by reducing the surface tension enough to sink mosquito eggs.</p> <p>Methods/Materials I constructed a single beam balance. I used the balance to record the number of drops of water needed to pull a needle out of the container containing a solution of water and surfactant at 20° C. I added sodium bicarbonate, glycerin, and vinegar in 10 tsp/ml increments from 0 to 10 tsp/ml and ran 5 trials at each increment. I then dropped a small amount of chicken egg whites into the solution at every increment and recorded if it sank. I then re-ran the experiment at 38° C. Finally, I collected real mosquito eggs, larvae, and pupa and re-ran a simplified version of my experiment to test if they sank at 36° C.</p> <p>Results I converted the number of drops into surface tension and found that surface tension decreased and then leveled off due to the critical micelle concentration. The egg whites did not sink at room temperature; however, there was some downward movement at 38° C. The mosquito eggs and pupa did not sink with added surfactant, but the larva did show some difficulty in swimming up to the surface when enough surfactant was added.</p> <p>Conclusions/Discussion The experimental partially supported my hypothesis. The surfactants reduced the surface tension of water linearly and then leveled off when the critical micelle concentration was reached. Although some downward movement was seen in the egg whites and larva at higher temperatures, the results show that sodium bicarbonate, glycerin, and vinegar are not effective in mosquito control. Thus, I was unable to find a cheap, safe, nontoxic mosquito insecticide. Mosquitoes cause over 3 million deaths per year; thus, it is imperative to find cheap readily available materials that can be used to control mosquitoes without harming plants and animals.</p>	
Summary Statement My project explores how non-toxic household surfactants affect the surface tension of water and examines whether any of these surfactants can be used in mosquito eradication by lowering the surface tension enough to sink mosquito eggs.	
Help Received Mother helped assemble backboard; Mr. Hunt, my biology teacher lent me laboratory supplies and gave me advice; Father helped pay for everything.	



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Jennifer A. Ocín	Project Number S2208
Project Title The Effects of Magnetism on the Semi-Immortal Planaria	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my project was to determine whether magnets and their various magnetic field intensities exert an effect on the rates of regeneration in the flatworm, <i>Dugesia tigrina</i>, or more commonly known as planaria. My hypothesis tests that magnets can increase the rate of regeneration in planaria with increasingly strong magnetic field intensities.</p> <p>Methods/Materials Rare earth magnets called neodymium magnets, all the same size and shape, are mounted onto 12 circular steel sheets. On top of the magnets and steel sheets are 12 plastic, see-through containers, which hold the planaria and their spring water. Half of the 40 planaria are cut into half and the other 20 are left whole. The measurements of the head, (anterior), segments and the tail, (posterior), segments of each of the bisected worms are recorded and measured over a period of 5 days. The total number of groups, including bisected head and tail groups, is 12, with the first 4 groups having the head and tail segment subgroups. The first four (bisected) groups and the next 4 (whole) groups are all mounted onto circular steel sheet metal pieces according to the magnetic field intensities. The first one has no magnets, thus being the control, (groups 1 and 5). Then, magnetic field intensity 1 includes 2 magnets, intensity 2 includes 4 magnets, and lastly, intensity 3 has 8 magnets.</p> <p>Results The results expected were that the planaria would be higher in growth with the effects of magnetism, rather than without the magnets. However, there were a lot of unprecedented complications that could have possibly disrupted the experiment. The results indicated that the magnets did indeed have an effect on the growth of the cut planaria, especially as the magnetic field was increasingly stronger.</p> <p>Conclusions/Discussion Every group had a wide variety of results due to unavoidable and measuring errors. Spontaneous tail dropping, binary fission, and other random events of asexual reproduction occurred. This increased the number of head and tail parts, especially in the tail groups. The planaria were also very active, contracting and expanding, deceiving of their real sizes. Further research can test whether magnets can have an effect in the stem cell biology of humans, as they do in the planaria, whether the short-term and long-term effects are positive or negative.</p>	
Summary Statement The focus of this project was to test whether magnets can increase the rate of regeneration in planaria since the regeneration process is distinctive of their stem cell biology and can be applied to research in human stem cells.	
Help Received Parents bought materials; my aunt and mom cut out the steel sheet circles; my 3 sisters for support; my Science, Technology, and Research teacher Ms. De La Cruz for giving advice	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Nikhita H. Poole	Project Number S2209
Project Title The Effects of Neurotransmitter-like Substances on Cell Differentiation in Hydra	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Nerve cells in hydra influence stem cells to form additional nerves. I hypothesized that higher concentrations of neurotransmitters in the environment would simulate a higher nerve cell density because neurotransmitters are produced by nerves. Thus, with the increase in nerve signals, I expected a higher percentage of nerve cells to be produced, as the stem cells differentiate into more neurons in correlation with the apparently higher nerve density.</p> <p>Methods/Materials 5×10^{-3} M solutions were made of three substances: GABA, 5-HTP (a precursor of serotonin), and L-Tyrosine (a precursor of dopamine and norepinephrine). Six hydra were placed in each of these solutions, as well as in a control with normal water. After four days, the hydra were macerated and the macerate spread on microscope slides to count the cells. In a second experiment, the hydra were left in the solutions for only two days in an attempt to simulate the approximate cell cycle time of an interstitial (stem) cell.</p> <p>Results Those hydra treated with GABA experienced a significant increase in nerve cell percentage after four days when compared to the control. Those treated with 5-HTP experienced a significant decrease in nerve cell percentage, while those treated with L-Tyrosine did not experience any significant change. The changes in nerve cell concentration for hydra treated for just two days were not statistically significant.</p> <p>Conclusions/Discussion My results appear to support my hypothesis to some extent, as the influence of GABA did indeed seem to produce a significant increase in nerve cell concentration. Although 5-HTP caused a significant decrease instead, this may be due to the fact that 5-HTP is a precursor of serotonin, an inhibitory neurotransmitter, which would decrease the electrochemical activity of neurons and may instead simulate a lower nerve cell density instead of a higher one, perhaps resulting in less nerve cell differentiation. Because L-Tyrosine is merely a precursor to a neurotransmitter, the enzymes necessary to convert it may not be present in hydra, so it would not be expected to have an effect on cell differentiation. As none of the substances produced a significant difference after just two days, this time period may not have been long enough to allow the substances to have a measurable effect.</p>	
Summary Statement I attempted to induce stem cell differentiation into nerve cells by using neurotransmitters to simulate the cellular environment known to cause differentiation.	
Help Received My biology teacher let me borrow some equipment from school, and my chemistry teacher let me use the chemicals I needed for the maceration of the hydra.	



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Connor Chesus; Alexander Rinkert	Project Number S2210
Project Title Birds of the Santa Cruz Sandhills	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The Santa Cruz Sandhills is a rare and unique habitat found only in central Santa Cruz County, California. There are two distinct communities that make up the habitat which comprise of less than 1,000 acres of Sandhills habitat. These two communities are home to many endemic organisms that are adapted to the climate the habitat makes. Because of this uniqueness and rarity, the Sandhills have been a topic of study in many different areas of science. However, one area lacks considerably: birds and avian ecology. Very little information is known about what exactly the 'birds of the Santa Cruz Sandhills' are, and no documented study has been performed to answer this question.</p> <p>Methods/Materials Our three survey sites were each surveyed once a week (day determined by a RNG), totaling to three surveys per week. We tossed a fair coin at the start of each survey to determine if we start in Sandhills or adjacent habitat. We established two Sandhills points and two adjacent habitat points at each site. If heads, we would begin at Point 1 in Sandhills , then Point 2. We would then go to Point 2 in adjacent, then Point 1. At each point we would begin with a 5-minute "settling" period to allow birds that we unintentionally disturbed while entering the point area to resume natural activity and then we would record all the birds detected, auditorily and visually, within a 50 meter radius. Surveys began one hour after sunrise.</p> <p>Results By using the Shannon-Weaver Index, relative abundance charts, and ANOVA tests, we can see community and species differences between the Sandhills and Adjacent habitat. We have determined that the Sandhills does hold a resident population of bird species and that the Sandhills' avian life structurally varies between the two communities as well.</p> <p>Conclusions/Discussion It is clear that there is a resident population of birds within the Sandhills that is not heavily influenced by adjacent habitats, and that avian life structurally varies between the two main habitat types, so there are two distinct populations of birds within the Sandhills. This is important because it sets a baseline as to what the "birds of the Sandhills" are, and is also important because birds are just one part of this rare ecosystem and are connected to the endemic and endangered organisms within the Sandhills. Hopefully this study will promote future research and conservation of the birds and Sandhills as a whole.</p>	
Summary Statement This project was designed to describe what the 'birds of the Santa Cruz Sandhills' are.	
Help Received Dr. Jeff Smith, mentor, assisted with the development of the procedure and methods of statistical analysis.	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Michael A. Salmond	Project Number S2211
Project Title An Order of Fry with Salt: A Process for Breeding Freshwater Mollies to Produce Saltwater Fry	
Objectives/Goals Is it possible for freshwater mollies to give birth to fry that are capable of surviving in a saltwater environment?	
Abstract Methods/Materials Establish freshwater 10 gallon tank with pregnant mollies at 78 degrees with daily food. Establish two 2.5 gallon tanks (salt and fresh) for the silver mollies to #birth# in. Over 3 days, add salt to the brackish water tank until it reached the level of 1.007 (magic salinity number-it matches salinity of the mollies amniotic fluid). On Jan 20, I placed one silver molly in brackish tank and one in freshwater birthing tank because they appeared ready to birth fry. Within 24 hours, both had birthed fry over a six hour period. The molly in brackish tank had about 35 fry and the other had about 30 fry in freshwater tank. On Jan 22, I removed adult mollies from birthing tanks and returned them to freshwater tank to avoid any loss of fry through consumption by adults or overcrowding. Every day I fed fry a small amount of First Bites Fish Food and recorded time it took for all fry to eat food. I also recorded daily salinity of brackish tank. After fry had survived for a few days, I began to gradually add salt to brackish tank to increase salinity. I measured salinity using a Hydrometer to record daily levels. I raised salinity level very slowly to avoid stressing fry; some days I would not add any salt. Once each week I cleaned fish tanks by replacing 50% of water, matching salinity reading in saltwater tank. Track fry daily eating until salinity in brackish tank reached 1.023 ppt. At least 3 pregnant mollies, 10 gallon fish tank, 2 2.5 gallon fish tanks, Fish food, Aquarium Salt, Hydrometer, Skewer, Timer, Fresh water, Bucket, Syphon, Measuring spoons, Spare Filters, Water Conditioners, Fish Net	
Results Saltwater fry have survived with no changes in eating habits compared to freshwater fry. In fact, the saltwater fry were more active, robust, and better eaters than the freshwater fry.	
Conclusions/Discussion Freshwater molly birthed fry in brackish environment (1.007 PPT) without harmful effects. Fry survived birthing despite mother being freshwater fish because 1.007 PPT salinity matches mother's amniotic fluid. Saltwater fry thrived in brackish environment while salinity gradually increased to saltwater aquarium level (1.023#1.025PPT) because fry's sodium or potassium ATPase enzymes were never deactivated because fry were never in a freshwater environment.	
Summary Statement To see if it is possible for freshwater mollies to produce fry that can survive in a saltwater environment.	
Help Received Mom helped with maintaining aquariums.	



**CALIFORNIA STATE SCIENCE FAIR
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Name(s) Jenna K. Schurr	Project Number S2212
Project Title What Is the Effect of Ocean pH on the Fertilization Rate of Purple Sea Urchins (<i>Strongylocentrotus purpuratus</i>) Eggs?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to see if falling ocean pH levels would have an adverse effect on the fertilization rate of the purple sea urchin species <i>Strongylocentrotus purpuratus</i>.</p> <p>Methods/Materials Sea urchin gametes were collected after inducing spawning by injecting a 0.5 M solution of potassium chloride. Eggs were soaked in filtered seawater of pHs 7.6, 7.8, 8.0, and 8.2 (control). Eggs and sperm were then mixed on a slide with grid lines and observed under a compound light microscope. Two squares per slide were randomly selected, and the number of fertilized eggs divided by the number of total eggs in the square was recorded as the percent fertilization. Six different pairs of sea urchins were used. Per pair, each pH was tested three times.</p> <p>Results The lowest average percent fertilization was 50.52% for pH 7.6. The average percent fertilization was 65.83% and 64.84% for pH 7.8 and 8.0 respectively. The highest average percent fertilization was 76.20% for pH 8.2. Although the lowest fertilization rate was for the lowest pH and the highest fertilization rate was for the highest pH of 8.2, which corresponds to the average pH of seawater, the ANOVA p-value for this data was 0.310. This p-value indicates that the differences between the fertilization averages are not statistically significant. For each pH level, the standard deviation was greater than 16.71 and as high as 27.33 (7.6 pH).</p> <p>Conclusions/Discussion Because the results did not show that the change in pH has a statistically significant impact on the fertilization rate, the <i>S. purpuratus</i> gametes may just be more pH resistant than the <i>H. erythrogramma</i> gametes. As seen from the large standard deviation values, the percent fertilization varied greatly among the parent pairs tested. In particular, at the pH level of 7.6, the average fertilization rate was 50.52% with a standard deviation of +/- 27.33%, suggesting that the purple sea urchin parents may be influencing the gametes' resistance to pH differences. Also, while significant differences were not observed in the fertilization rates, effects of the pH was seen on the fertilization membranes. The lower the pH, often the more deformed the membrane appeared to be. The next steps in this research project would be to investigate the effects of even lower pH on the fertilization rates, the eggs and membranes themselves, and the development of the larvae.</p>	
Summary Statement This investigation of pH on the fertilization rates of purple sea urchins produced statistically inconclusive results; however, there may be an effect on the development of the fertilization membrane.	
Help Received Used materials and lab equipment provided by Cabrillo Marine Aquatic Nursery under the supervision of Dr. Kiersten Darrow and Mr. Andres Carrillo. Assistance with the statistical analysis provided by Mr. Andres Carrillo. Photographic assistance provided by Cabrillo Staff.	



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Manu Vaish	Project Number S2213
Project Title The Effect of the Rhopalia on the Regeneration and Overall Health of Aurelia aurita: Year 2	
Abstract Objectives/Goals The objective of my project was to determine whether the removal of the rhopalia, the sensory organ of the Aurelia Aurita, affects or even controls the organism's regeneration and overall health. The hypothesis of the project was that when a certain rhopalia was removed the jelly would cease to function properly. Methods/Materials In order to do this project, two adult medusas and six ephyra (baby jellyfish) were obtained. Then using a pair of fine knives and a microscope an incision was made to remove two adjacent rhopalia. Once the jelly or ephyra regenerated one or two of its original rhopalia, the next two were cut out. This process was repeated until the jelly exhibited awkward movement, no regeneration, and/or death. Results The results garnered from this experiment were that in all of the medusa jellies removal of the rhopalia resulted in either death or horrible regeneration. In all cases at least one of the rhopalia did not come back and the bell reformed all the way past the original point of cut. Also the medusa all exhibited a hoola hoop type of movement instead of a normal bell type of movement. The ephyra all died within the first cuts mostly; however, one ephyra managed to survive and regenerate all of its rhopalia. Also, two times out of six the ephyra lost the arms that the rhopalia were removed from. Conclusions/Discussion The conclusions drawn from this project are that removing a rhopalia definitely affects the organism. From the medusas it shows that the rhopalia may control the movement and regeneration of the jelly and in the ephyra the results show that the rhopalia may even control its growth and development. Whether there is one rhopalia or multiple rhopalia controlling the rhopalia is still up for question; however, in the end the rhopalia truly has a massive impact on the organism from ephyra to medusa stages.	
Summary Statement The project was done to determine whether the rhopalia, the sensory organ of the Aurelia Aurita, controls the jellyfish's regeneration and overall health.	
Help Received Dr. Kiersten Darrow, supplied the jellyfish and equipment.	