



California Science Center
CALIFORNIA STATE SCIENCE FAIR
 2001 PROJECT SUMMARY

Your Name (List all student names if multiple authors.)

Allison M. Woo

Science Fair Use Only

S1826

Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9)

Effect of Temperature on the Fertilization and Development of *S. purpuratus*

Division

_ Junior (6-8) X Senior (9-12)

Preferred Category (See page 5 for descriptions.)

18 - Zoology

Abstract (Include Objective, Methods, Results, Conclusion. See samples on page 14.)

Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.

OBJECTIVE: The objective was to determine how the increasing marine temperatures affect the fertilization and early embryonic developmental stages, represented through the purple sea urchin, *S. purpuratus*.

MATERIALS: 30 urchins (*S. purpuratus*), computer, temperature probe & software, plastic vials, plastic droppers, filtered sea water, 6.5-ml test tubes, light microscopes, glass slides, ice, large cooler, electric hot pad, refrigerator, timer, parafilm, 2 syringes, 0.5 M KCl

METHOD: Urchin sperm (dry) and eggs were obtained separately through an injection of KCl solution. Seawater-exposed gametes were stored separately at temperature variable for 0.5 hrs, then mixed with each other and sustained at that temperature. Number of embryos in each stage of development (by no. of divisions) surveyed every half hour for four hours, testing each temperature in four identical tubes and surveying about 300 eggs in each tube at each time. Repeat at: 6, 13 (control), 20, 27, 34 degrees C.

RESULTS: It was shown that urchins cannot develop at 27°C, consistently proven in all four test tubes of the over 4200 eggs, which never underwent a single division, observed at that temperature. Success of fertilization and development is directly related to temperature: Cold temperatures slow development rate and warm temperatures increase rate and success. This relationship stops at the limit of at least 27°C.

DISCUSSION: At the annual rate of global warming being approximately 0.033°C, depending upon which source is attributed, extinction will occur within 365 years. It could be drastically sooner because this considers average temperatures, not excluding particularly extreme seasons which temperatures have been known to increase by 2.2°C. Hopkins Marine Station's Somero observed that the rate of warming is as fast as 0.7°C, the temperature limited only 17 years away, depending on whether trends continue. Death, flourishing, or migration due to these changes have serious ecological impacts.

Summary Statement (In one sentence, state what your project is about.)

This project tests, discusses, and projects how increasing global temperatures affect the survival of the sea urchin as observed during its fertilization and successive early embryonic stages.

Help Received in Doing Project (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4.

Teachers P. Hunt and J. Fusco provided equipment. Father drove to Long Beach Marinus. Hopkins Marine Station (via R. Kuo, C. Patton, and S. Woo) sent supplies unavailable from school and provided advice. Long Beach Marinus donated 30 sea urchins to my cause.