



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

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Project Title Phylogenetic Comparison of Pacific Coast Marine Algae: Cystoseria osmundacea and Halidrys dioica	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Phylogenetic taxonomies of different organisms derived from DNA sequence comparison of conserved genomic regions can be used to establish sensitive, quantitative relationships between different organisms. Taxonomic relationships between and among species have classically been established through morphologic and/or biologic studies.</p> <p>Methods/Materials Quantitative comparisons are difficult and the effects of environmental factors can create ambiguity. Techniques of molecular biology - DNA isolation, polymerase chain reaction, cloning, gene sequencing, and sequence analysis - were applied to the ribulose-1,5-bisphosphate carboxylase (rubisco) spacer region of the chloroplast DNA from Cystoseria osmundacea and Halidrys dicoica.</p> <p>Results The results from these analyses established the phylogenetic relationship between the two Pacific Coast marine algae, as well as among populations of C. osmundacea sampled from environmentally distinct locations (north and south of Pt. Conception, California). H. dicoica samples obtained from the same location showed no genetic variance, thereby serving as a control for the experimental techniques. The genetic variance between the H. dicoica samples and the various samples of C. osmundacea ranged from 0.8% to 1.3%. Genetic variances of 0.1% to 0.8% were observed between the various samples of C. osmundacea. However, no genetic variance was seen between samples of C. osmundacea obtained from locations north of Pt. Conception. These results were used to generate a phylogenetic map illustrating the evolutionary relationship of the rubisco gene of these Pacific marine algae.</p> <p>Conclusions/Discussion From these results, two conclusions can be reached: (1) H. dicoica and C. osmundacea, while being morphologically distinct, genetic analysis shows less than 1.3% variability these two species, and (2) environmental factors give rise to genetic variances in C. osmundacea.</p>	
Summary Statement Molecular genetic analysis was used to establish the phylogenetic taxonomy of (1) two morphologically distinct species of Pacific Coast algae	
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