



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Emma Schaefer-Whittall	Project Number S0520
Project Title Something's Fishy: Using DNA Barcoding to Identify Mislabeled Fish	
<p style="text-align: center;">Abstract</p> <p>Objectives I investigated whether the fish that is being sold at Bay Area grocery stores is the same species as what it is being advertised as. I performed DNA extraction and sequenced the base pairs in order to compare it to the FDA's Seafood Labeling List.</p> <p>Methods I collected 37 fillets of fish (petrale sole, dover sole, red snapper, rockfish, rock cod, and halibut) from grocery stores around Santa Cruz County and Santa Clara County. I extracted the DNA and amplified the specific DNA sequence that codes for the enzyme Cytochrome Oxidase I (COI), one of the enzymes that is part of the electron transport chain in the mitochondria. The amplified DNA was then sent to Sequetech, a local sequencing company. I matched the sample sequence with the known sequences of the advertised fish. From this analysis, I was able to identify the true identity of the grocery store fish samples.</p> <p>Results I successfully sequenced the DNA of 24 out of 37 of the fish collected. Six fish samples out of a total of 24 samples were mislabeled (25%). 100% of red snapper (2/2) and rock cod (3/3) samples were mislabeled. Shopper's Corner, a locally owned grocery store, had 2/3 of their samples mislabeled.</p> <p>Conclusions The BLAST method and phylogenetic analysis both identified the same six mislabeled samples. Fish can be mislabeled accidentally or intentionally. Accidental mislabeling is most likely when common names are similar such as rock cod and rockfish. Although frequently confused, these two fish are in completely different fish families (Moridae and Sebastidae, respectively). Alternatively, the use of snapper as a synonym for red snapper indicates an instance of likely intentional mislabeling. Many stores that I purchased red snapper from insisted that the two names are interchangeable, but snapper describes 13 genera while red snapper only refers to one particular species (<i>Lutjanus campechanus</i>) and is much more expensive. The motivation for the adulteration of red snapper is likely driven by customer's familiarity with the name and association with a high quality (expensive) fish. My hypothesis that petrale and dover sole would be mislabeled was not supported (10/10 correctly labeled), indicating it is likely a regional problem. Most locally-owned grocery stores had higher proportions of mislabeled fish than fish markets and chain supermarkets.</p>	
Summary Statement 25% of fish I collected was labelled under a false market name, violating the Federal Food, Drug, and Cosmetic Act.	
Help Received I used DNA extraction materials from Santa Clara University and conducted my research in the biology lab. Sequetech collected my samples and produced nucleotide sequences.	