

## **2024-2025 School of Exercise and Nutritional Sciences Student Research Grant Report**

**Authors: James Wadman, Jing Zhao**

### **Title: Retail Product Catalog, Consumer Acceptance, and Volatile Organic Compound Analysis of Vegan Seafood Analogs**

**Purpose:** Segments of the world's food supply are under threat. Oceanic fisheries are endangered by pollution, climate change, water acidification, and overfishing. A fishery collapse would devastate the industry and disrupt food availability. Vegan seafood substitutes have been a traditional alternative product for hundreds of years. Advancements in food science and manufacturing techniques of these products can alleviate these pressures. However, that's only possible with expanded consumer acceptance and use of these products. The goal of the study was to understand the impacts of product volatile profiles on their consumer acceptance by examining the current state of the marketplace, consumer acceptance, and the volatile profiles of vegan seafood substitutes. Dissemination of this information may provide a valuable set of resources for vegan food manufacturers.

**Methods:** The data acquisition was carried out in three phases. Phase I cataloged all available products and determined popularity by having a minimum of four different representatives. Phase II ran select popular products through consumer testing to pick the most acceptable species simulations, and used statistics to analyze contributing acceptance factors. Phase III used Gas Chromatograph-Olfactory-Mass Spectrometry (GC-O-MS) and analyzed odor components of both vegan products and their actual animal-based product counterpart.

**Results:** The market search revealed that 10 different seafood species had 37 vegan representative products available in the San Diego County region. Four of these species groups were sufficiently popular to advance to consumer testing. These were cod, shrimp, crab, and tuna. Consumer test subjects selected vegan tuna as having the most acceptable set of simulations with some strong correlation of overall acceptance to factors of odor, taste, and texture, and a less strong relationship to appearance. GC-O-MS analysis revealed 32 relevant volatile organic compounds (VOCs) across the four vegan and one actual tuna products. Of these, four VOCs, 2-pentylfuran, (E)-1-phenyl-1-butene, 2-acetyloxypropyl acetate, and p-xylene, correlated strongly with overall product acceptance. While D-limonene was less strongly associated with consumer acceptance, it along with 2-pentylfuran had the most overlap of being detected in the five products.

**Conclusion:** There is a substantial existing marketplace for vegan seafood products. However, the overall liking of these products by consumers is not high. By comparing the key volatile compounds of those seafood analogues to their animal counterparts, key flavor components can be identified. Understanding the impacts of the overall flavor profile and specific VOCs on consumer acceptance would help with future formulation development and improvements.