**ABSTRACT**

Sushi Way investigated whether sushi restaurants in New York City are selling the fish they claim to be selling and if these fish are being sold during the correct harvesting season. Mislabeling and out of season harvesting can be detrimental to the fish population and human health. The sushi vendors we picked were based on price range and health grade. The species of fish that we evaluated were Mackerel (Scomber scombrus) and White Tuna (Thunnus sp.). We sampled two of the most commonly consumed items. Following the DNA Barcoding Protocol, we collected Mackerel and White Tuna from the respective sushi vendors and used Ready-to-Go PCR Reagents in conjunction with COI Primers to sequence the fish barcodes. Our results revealed both seafoaled mislabeling and out of season harvesting. Falscutor was found to be mislabeled and sold as White Tuna, while Mackerel was caught being illegally sold out of season.

**RESULTS**

Before we sent off our samples for sequencing, we surveyed the menus of 50 sushi restaurants and found that 74% sold out-of-season Mackerel (Thunnus sp.) and 85% sold out-of-season tuna (Thunnus sp.) (Table 1). Most of the restaurants we surveyed were predominately grade “A”, yet, surprisingly, most of our sequences were obtained in the closed season. Specifically, 39% of the out-of-season fish was sold at an “A” grade, 62% were sold at “B” grade, and 7% were sold at “C” grade. We also investigated whether there was a correlation between restaurants’ prices and their susceptibility to sell out of season fish (Figure 1). This was based on the results obtained in the fifty restaurant survey. Our results indicate there is a stronger association between out-of-season fish being served at lower-priced establishments.

**DISCUSSION**

The objective of this project was to determine whether there was food fraud and out-of-season harvesting of our target species in Manhattan sushi restaurants. Since we know from our earlier investigation that white tuna and mackerel cannot be commercially farmed, the restaurants we surveyed which still offered our target species in March were either selling illegal harvested or fraudulently labelled fish (Table 2). Although only 6 out of our samples were successfully sequenced, the presence of even one mislabeled and out of season fish supported our hypothesis.

**ACKNOWLEDGMENTS**

We would like to thank Christine Marizzi, from the Harlem DNA Lab, for providing us with the reagents and general support of our project. We would also like to thank the Browning School and the Cold Spring Harbor Laboratory for funding the project. Lastly, we would like to thank Ms. Wolf and Ms. Bodis for providing assistance along every step of the project, when needed.

**REFERENCES**


**Table 1:** Analysis of Vendors Selling Out of Season Fish and Offering Seasonal Menus

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Tuna</th>
<th>Mackerel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade A</td>
<td>39 of 48</td>
<td>35 of 48</td>
</tr>
<tr>
<td>Grade B</td>
<td>1 of 1</td>
<td>1 of 1</td>
</tr>
<tr>
<td>Grade C</td>
<td>1 of 1</td>
<td>1 of 1</td>
</tr>
</tbody>
</table>

**Table 2:** Analysis of Vendors Selling Out of Season Fish Based on Restaurant Grades

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Tuna</th>
<th>Mackerel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendors offering out-of-season Tuna</td>
<td>8 (42 unknowns)</td>
<td>8 (42 unknowns)</td>
</tr>
<tr>
<td>Vendors offering out-of-season Mackerel</td>
<td>41 of 50</td>
<td>34 of 50</td>
</tr>
</tbody>
</table>

**Figure 1:** Legal Mackerel Sashimi

**Figure 2:** Mislabeled Mackerel Sashimi

**Figure 3:** The price range of vendors is based on the dollar sign system where $ is the lowest possible pricing and $$$$ is the highest possible pricing. Each dollar sign has received a numerical equivalent. $ = 1, $$ = 2, $$$ = 3, and $$$$ = 4. Each price range has received a numerical equivalent. $ = 1, $$ = 2, $$$ = 3, and $$$$ = 4. Each price range has received a numerical equivalent.