

High school students track down fish fraud

Buck Meloy, an Alaska fisherman and longtime contributor to Pacific Fishing, heard of an exemplary high school student project, in which two Trinity School seniors went looking for an honest fishmonger in New York City. We wanted to know how they did it, in case you wanted to do your own investigation into fish fraud. Here is their report:

A new DNA-based identification system shows that fish in New York City restaurants and grocery stores are commonly mislabeled.

The identification system “scans” the same part of the same gene from every species and matches it with similar information in a database containing verified gene sequences of tens of thousands of species.

Scanning the gene region to identify a species is like scanning the barcode to identify a supermarket item. By analogy, the system is called “DNA barcoding.”

A commercial laboratory would charge about \$25 per sample to sequence DNA from a piece of fish. But the charge would be about \$5 if you isolate the DNA yourself, which is easy to do.

With some help from Kate’s dad, who is a biologist at The Rockefeller University, we collected 60 samples from 14 Manhattan restaurants, fish markets, and grocery stores. We snipped off a tiny bit of each and stored the pieces in plastic vials with alcohol in our kitchen freezer.

We recorded the market name of each fish and where and when it was purchased, and in most cases took pictures of each sample. We created a project on the Barcode of Life Database (BOLD) Web

site and uploaded this information. After a month, we had a full set of samples and sent them to University of Guelph, Ontario, Canada, where graduate student Eugene Wong performed DNA sequencing from the barcode gene region.

We compared the DNA barcodes of samples to the BOLD reference library, which so far contains about 24,000 barcodes from 4,500 fish species. Nearly all (93 percent) of our samples could be identified by their DNA barcodes.

Of the 56 samples that could be identified by DNA, 13 – or 23 percent – were

Why is this important? In most cases, less expensive fish were marketed as more expensive fish. You might think you are eating \$20-a-pound “flying fish roe,” but you are actually eating \$6-a-pound smelt roe.

We are not certain where the mislabeling occurs, but it seems it is not the fishermen doing it, because the mislabeled fish are from completely different parts of the world. For example, if a fishing boat arrives at a dock in Florida, it is unlikely that it carries fish from Southeast Asia.

Perhaps the mislabeling occurs somewhere in the middle, when the fish are filleted and no longer easily identifiable.

We think that there should be routine DNA barcode testing of fish to make sure we are getting what we pay for – and to make sure that protected fish are not

being sold illegally.

Scientists around the world are cooperating in a Census of Marine Life program to develop a reference library of barcodes not only for fish but also for scallops, crabs, and other kinds of seafood. We hope to get our school interested in doing a larger investigation of fish markets and restaurants in other parts of New York City. ⚓



Some fish sold in New York City are mislabeled as more expensive varieties	
Sold as: White (Albacore) Tuna \$8.50/lb wholesale	DNA ID: Mozambique Tilapia \$1.70/lb wholesale
	
<small>Photo FishBase M Bariche</small>	<small>Photo FishBase B Gratwicke</small>

mislabeled. For example, a piece of sushi labeled as “white tuna” (albacore) matched with the DNA sequence of Mozambique tilapia, a freshwater fish that is commonly farmed.

A restaurant item listed on the menu as “Mediterranean red mullet” matched the DNA sequence of spotted goatfish, which is restricted to the Caribbean. Seven of nine samples listed as “red snapper” were mislabeled. Fish substituted for “red snapper” included Acadian redfish from the North Atlantic, slender pinjalo from Southeast Asia, lavender jobfish from the South Pacific, Nile perch, a freshwater fish from Africa, and Atlantic cod.

Before starting, make an arrangement with a laboratory that does DNA sequencing, preferably one that is familiar with DNA barcoding methods.

We worked with the University of Guelph, Ontario, Canada. They sent a specially designed collection kit, which is a small tray with 96 plastic tubes for samples

and instructions on how to use it.

The Smithsonian Institution in Washington, D.C., also has sample collection kits and is experienced with DNA barcoding.

The testing method can detect DNA in microscopic bits of tissue, so it is very important to avoid carry-over between specimens.

Here’s where you can find more information:

Census of Marine Life:
www.marinebarcoding.org

Barcode of Life Database:
www.barcodinglife.org

Once you have your DNA sequences, it is easy to copy and “paste” these into the “Identification Engine” on the Barcode of Life Database. However, because some closely related species have similar DNA barcodes, you may need an expert to help with analyzing the data. ⚓