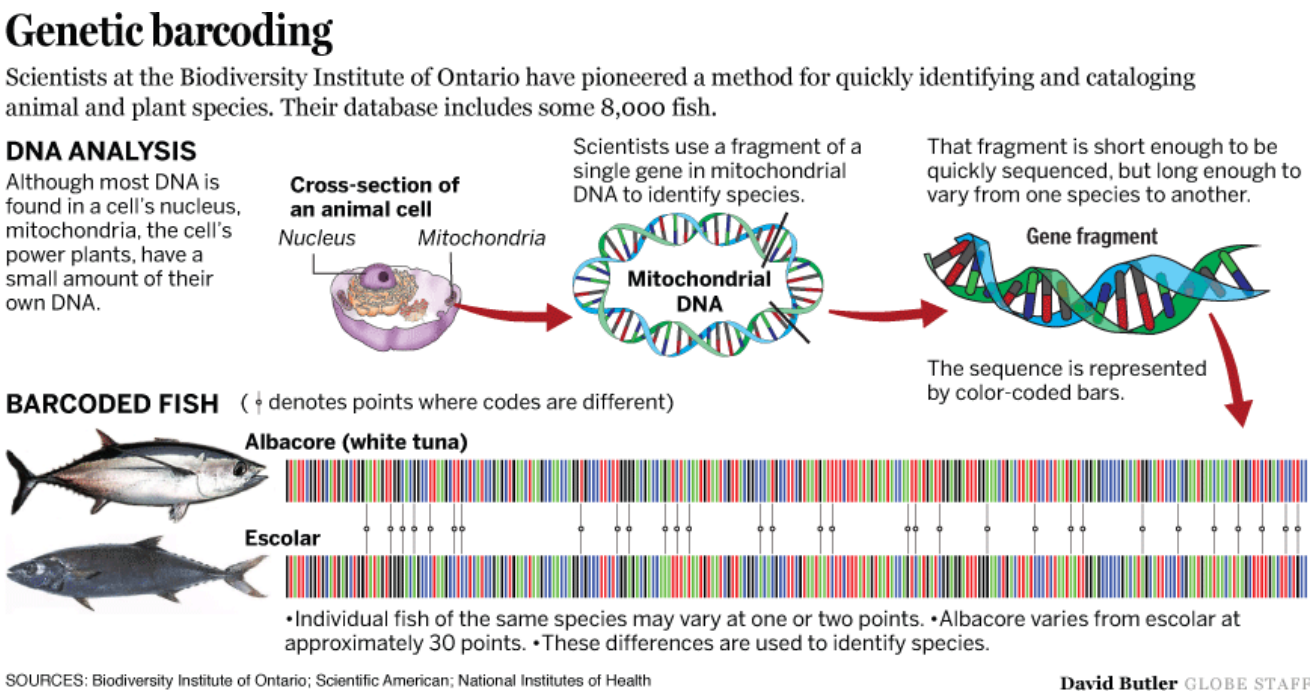
The Boston Globe **Business**

How the Globe tested fish DNA

By Beth Daley and Jenn Abelson | GLOBE STAFF OCTOBER 23, 2011



GUELPH, Ontario - To conduct DNA testing of fish, the Globe hired the Biodiversity Institute of Ontario at the University of Guelph. The institute, which is home to a 26-nation consortium called the International Barcode of Life, uses a novel method of genetic analysis to quickly and inexpensively identify species.

The method compares a snippet of a specimen's DNA against an existing DNA library to identify the species. Scientists use a fragment of a gene found in a cell's mitochondria that is short enough to be quickly sequenced, but long enough to vary significantly between species. The technique is called DNA barcoding because, just as a supermarket scanner reads a barcode to distinguish a can of beans from a carton of milk, the DNA snippet can separate one species from another.

Governments - including the United States - are beginning to use DNA barcoding for consumer protection, food safety, environmental monitoring, and documentation of biodiversity.

CONTINUE READING BELOW ▼

For this study, Globe reporters purchased 183 pieces of fish at 134 restaurants and grocery stores across Massachusetts between May and July. The fish were stored, with the original purchase receipts, in industrial freezers in a locked room at the Globe's offices. Using a sanitized scalpel, reporters placed small pieces of fish - roughly the size of a Q-tip head - in separate alcohol-filled test tubes before mailing them overnight to the Biodiversity Institute.

Related

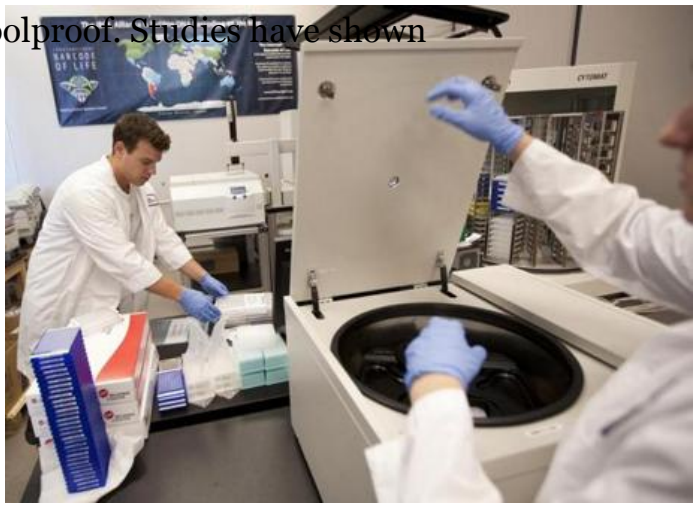
- **The Back Story: Fish mislabeling**
- **Graphic: Commonly substituted fish**
- **Searchable database: Results of the Globe's fish testing**
- **How the Globe tested fish DNA**
- **Bertucci's tries to right a wrong**
- **Coverage: Fishy business**

In the institute's two-story brick building about 60 miles outside Toronto, technicians ran the specimens through thermal cyclers, centrifuges, and other machinery to extract, amplify, and identify each specimen's DNA barcode. Researchers then compared the fish barcodes with existing ones in the database.

Over the past six years, scientists working at academic institutions, museums, or independently have created an online database of barcodes - a sort of Wikipedia of DNA. The database, called Barcode of Life Data Systems, or BOLD, contains records for almost 115,000 species of plants, insects, and animals. Typically, at least five to 10 specimens make up each library entry to ensure the barcode captures any small variations within species.

Fish are just a part of the database, but one of its most robust collections. With 8,000 species cataloged - the vast majority with multiple specimens - it includes most commercially eaten fish, allowing accurate identification of seafood.

The species identification process isn't foolproof. Studies have shown misidentifications can occur through DNA barcoding - in part because public reference libraries, such as BOLD or the US government's GenBank, can contain incorrect specimen sequences.



DARREN CALABRESE/THE CANADIAN PRESS

Technicians at the Biodiversity Institute of Ontario put specimens in a centrifuge. The Globe hired the institute to analyze fish samples, using a novel method of scientific analysis.

There are other limitations. Barcoding cannot identify species that are not in a reference library, although it can place them in a genus or family - a group of related species. This kind of analysis also relies on a snippet of DNA passed on by mothers, so it will identify hybrids as their maternal species.

DNA barcoding also has difficulty distinguishing among species that diverged from one another only recently, such as some species in the snapper families.

Still, the DNA barcoding methodology is accepted by many as a tool in detecting seafood fraud: A 2008 study by the US Food and Drug Administration found the Barcode of Life correctly identified 60 fish samples out of 60 submitted. Other independent analyses have found varying success rates.

Of the 190 samples submitted by the Globe - including seven specimens that were retested to verify results - barcode researchers successfully conducted analysis of a snippet of DNA from 179. Eleven samples were thrown out because their DNA was unable to be read. To validate the results, the Globe sent a group of specimens to a different lab for DNA testing, and also provided some of the data to a researcher for analysis.