



## NOAA FISHERIES SERVICE

**What is Forensics?** Forensic science, or forensics, is the application of scientific methods to answer questions within a legal setting. When any science is presented in a court of law, the level of scientific rigor must be higher and better documented than in regular research laboratory settings. The analysis of forensic evidence requires absolute security and an unbroken chain-of-custody to be admissible in court.

### *The NWFSC's Forensics Group uses molecular genetic tools to identify fish and other marine species recovered during civil and criminal investigations.*

The NWFSC's Genetic and Evolution Program has had an active Forensics Group since 2000. In support of the NOAA Fisheries Office of Law Enforcement, this group has genetically analyzed evidence for approximately 100 civil and criminal investigations involving violations of the Lacey Act, the Endangered Species Act, the Marine Mammal Protection Act, and the Magnuson-Stevens Act, as well as international CITES violations.

### **NWFSC Helps Protect Biological Resources and Seafood Consumers**

NOAA Fisheries is responsible for the management of marine fish and mammal species in the United States, and the agency's regulations are often species- or stock-specific. The NWFSC's Forensics Group provides the necessary identification of a marine species (or stock) associated with the agency's regulated activities, which in turn helps law enforcement officials evaluate potential violations.

In addition to protecting our biological resources, the NWFSC helps the NOAA Fisheries Office of Law Enforcement protect consumer interests. The agency aims to ensure that the high demand for seafood doesn't result in illegal activities. For example, "food fraud", can occur when a restaurant or seafood business substitutes a fish species of low economic value for a species of higher market value. Forensics improves the traceability of fish from the net to the plate and keeps illegal, unreported and unregulated (IUU) catch from entering the market.

Species identification can be complicated when only a portion of the animal is available for inspection (e.g., a fish fillet in a market, or a piece of fur or shell made into clothing or jewelry), or when protected and non-protected populations co-occur during portions of their life cycles (e.g., endangered salmon stocks in the open ocean). However, where we have reference samples or databases, the NWFSC's Forensic Group uses advanced molecular genetic tools to accurately determine the identity of a species or population.

### **Forensic Genetic Analysis is a Powerful Tool to Identify Species and Populations**

Since an organism's DNA (genetic information) is contained in most of its cells, the identity of a species can be determined from a wide range of samples including fish fillets, canned fish, dried tissue, and fish scales.

The NWFSC's forensic scientist can extract DNA from very small samples, such as tissue cells from a fish hook, and from heavily processed material, such as tanned hides. NWFSC scientists use DNA sequencing technology, often referred to as genetic barcoding, for species identification. For population level analysis, scientists develop databases of multi-locus genotypes, or DNA fingerprints, for each species of interest.



### Forensics Science at Work

In 2007, the NWFSC's Forensics Group processed evidence in a case involving over 160,000 pounds of falsely labeled salmon with an estimated market value of \$1.3 million. Office of Law Enforcement agents seized thousands of pounds of processed fillets, and the NWFSC's DNA analysis showed that a substantial portion of the product was misrepresented as a higher value species. The processor responsible for defrauding customers was fined over \$300,000 and sentenced to a year in prison.



### Contact Us

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Visit our Conservation Biology Forensic Group webpage at: <http://www.nwfsc.noaa.gov/research/divisions/cbd/forensics-main.cfm>

Given the expertise in the NWFSC, the Forensics Group is particularly well supported for Pacific salmon Endangered Species Act cases. However, the NWFSC's Forensics Group also provides genetic analyses in cases involving marine fish species, seals, dolphins, and shellfish. The forensics laboratory is set up to maintain appropriate chain-of-custody procedures for evidence, and our lead forensic analyst has experience with providing courtroom testimony.

### Strategic Collaboration with NWFSC's Research Staff and Partners

The Forensics Group's strength lies in the fact that it is embedded within a fisheries science laboratory at the NWFSC. The Forensics Group is part of the NWFSC's larger genetics research program, which has a long history of genetic monitoring of a wide variety of marine species. The NWFSC's genetics research program has 10 geneticists on staff with a wide range of research and expertise, and the Forensics Group is often able to request further research from this staff in response to Office of Law Enforcement needs. For example, the Forensics Group works closely with scientists developing Genetic Stock Identification methods to determine if an individual fish is from an endangered population.

On the species level, forensic scientists have been collaborating with the University of Washington's School of Fisheries and Aquatic Sciences for the past eight years to develop a Forensic Voucher Collection for species identification. The effort generates DNA sequence data that are linked to archived, expertly identified specimens. These data are submitted to Genbank, the largest public DNA sequence database, and the Barcode of Life Database, and the archived specimens are part of the permanent museum collection at the University. NWFSC's Forensics Group also provides general biological consultation to Office of Law Enforcement agents, and when genetic analysis is not sufficient or appropriate for a case, the group can locate the appropriate expertise or information.

The breadth of scientific expertise at the NWFSC is considerable, and the Forensics Group has access to colleagues who perform lipid analysis, pathology, disease diagnostics, nutritional analysis, toxicology, and microchemistry. Since Center scientists are intimately involved in the major issues in the Pacific Northwest region—many times the policies are based on NWFSC research—the Forensics Group has access to both the biological and technical expertise needed to address enforcement issues and can assist Office of Law Enforcement agents with performing the necessary analyses.



### Learn More

Sharing our work with other scientists, policymakers, resource managers, and the public is important to us. To learn more about what we do, please visit our website at: [www.nwfsc.noaa.gov](http://www.nwfsc.noaa.gov) and follow @NOAA\_NWFSC on Twitter. To obtain additional information, please call 206-860-3200.