

# GENETIC IDENTIFICATION OF FISH PRODUCTS



**FEM2 - Ambiente srl**  
Spin-out company  
acknowledged  
by University of Milano - Bicocca



**FRIEND OF THE SEA**  
certification scheme  
for sustainable fishing  
and aquaculture



# **THE FISH TRADE**

Framework and issues



## COUNTERFEITES AND FRAUDS

In a long and complex supply chain like that of fish products it is often difficult to follow all the steps. Raw materials can come from different parts of the world and can undergo processing (threading, freezing, homogenization, etc.) with the consequent **modification of the morphological characters** that make it difficult to recognize.

For these reasons, fraud in the fishing industry is among the most widespread and difficult to identify. Precious fish species can be replaced with other fish that are less expensive, easily available or not marketable due to being potentially harmful.





## SUSTAINABILITY

Today more than three quarters of fish stocks are fished as soon as they are exhausted or are even over-fished. **Many fish species and their habitats are endangered by fishing and by farms that do not use sustainable practices.** The use of these methods make reproduction difficult, putting at risk whole species whose populations are significantly reduced.

The problem of overfishing does not only affect species of greater commercial interest (target species), but also all those species that are accidentally caught by non-selective fishing equipment.

According to the **FAO data, world consumption of seafood will increase by 19% by 2026 (29 million tonnes)** but, 22 years after the FAO Code of Conduct for Responsible Fisheries was born, there is still a large number of fish caught by destructive and unsustainable fishing methods.

The demand for sustainability and traceability by consumers also grows all over the world due to the greater exploitation of fish resources. The sustainability of fish resources is the only way to ensure a future for the seas and for consumption.



## CONSCIOUS CONSUMER

In the last decade consumer behavior has been subject to a major change. **Today's consumer is increasingly aware and informed, he reads the labels, prefers products of which he knows the origin and composition and pays great attention to aspects related to the environment and sustainability.**

To ensure proper labeling and to know how to better communicate product quality and safety and sustainability commitments becomes a relevant aspect to respond to market needs.





# **GENETIC IDENTIFICATION FOR THE SEAFOOD MARKET**

and the DNA barcoding technique





# GENETIC IDENTIFICATION FOR THE SEAFOOD MARKET

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The use of new methods able to guarantee the quality, safety and traceability of the purchased and sold products becomes an increasingly important aspect today.

## GENETIC IDENTIFICATION AGAINST COUNTERFEITS AND FRAUDS

**Genetic analysis** of species is currently the only method useful in recognizing, distinguishing and ascertaining the species of fish belonging to a specimen, particularly in the case of morphologically similar species or following the loss of distinctive characteristics due to processing.



# GENETIC IDENTIFICATION FOR THE SEAFOOD MARKET

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## GENETIC IDENTIFICATION FOR SUSTAINABLE FISHING

Genetic identification is also a **guaranteed instrument for a sustainable fishery** aimed at protecting protected species by excluding their capture and demonstrating the belonging of sold products to species that are not over-exploited. Verifying the genetic identity of the products is an indication of attention to all the problems related to traceability, sustainability and defense of biodiversity, which are all important factors.







# GENETIC IDENTIFICATION FOR THE SEAFOOD MARKET

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## GENETIC IDENTIFICATION FOR CONSUMER PROTECTION

Genetic analysis is also a valid safeguarding tool for the consumer and for companies that can thus provide a correct labeling able to respond to the demands of safety, quality and sustainability imposed by the market.





# **DNA BARCODING**



# DNA BARCODING

For species identification analyzes, the DNA barcoding technique is used. This method consists in the analysis of a **precise portion of DNA characterizing the single species** taken into consideration, just as a bar code identifies only a specific product. This segment of DNA is **highly discriminating** because it tends to repeat itself in a very similar way among all the individuals belonging to the same species and, at the same time, to differentiate widely between different species.

## THE ADVANTAGES

Reliability of the method

Quick: only a few working days are needed

Possibility to work on small portions of a larger whole

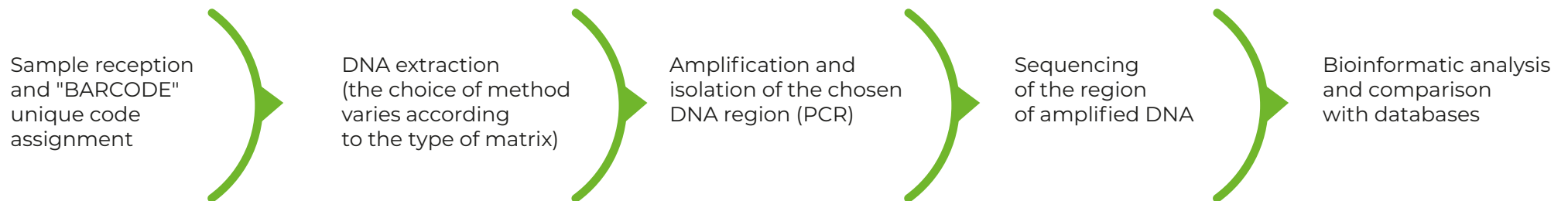
Low costs

# DNA BARCODING FOR FISHING INDUSTRY

This tool allows the recognition of species **from different types of samples:** fresh or frozen, fillets kept naturally or in oil, semi-finished or processed fish.

**A few grams of product** are sufficient to extract the DNA, read the sequence of interest and compare it with the reference databases to quickly determine the species of belonging.

## THE ANALYSIS CONSISTS IN







# **SCIENTIFIC PUBLICATIONS**



## **DNA BARCODING AND SOME CASE-STUDIES**

**DNA Barcoding Meets Nanotechnology:  
Development of a Universal Colorimetric Test for Food Authentication**

*P. Valentini, A. Galimberti, V. Mezzasalma, F. De Mattia...*  
*Angewandte Chemie International Edition, 2017*

**Towards a Universal Molecular Approach for the Quality Control of New Foodstuffs**

*A. Galimberti, A. Sandionigi, A. Bruno, I. Bruni, M. Barbuto...*  
*Advances in Food Biotechnology, 2015*

**A DNA Barcoding Approach to Identify Plant Species in Multiflower Honey**

*I. Bruni, A. Galimberti, L. Caridi, D. Scaccabarozzi...*  
*Food Chemistry, 2015*

**Towards a Universal Approach Based on Omics Technologies for the Quality Control of Food**

*E. Ferri, A. Galimberti, M. Casiraghi, C. Aioldi...*  
*BioMed research international, 2015*

**DNA Barcoding as a New Tool for Food Traceability**

*A. Galimberti, F. De Mattia, A. Losa, I. Bruni, S. Federici...*  
*Food Research International, 2013*

**DNA Barcoding Reveals Fraudulent Substitutions in Shark Seafood Products:  
the Italian Case of “Palombo”(Mustelus spp.)**

*M Barbuto, A Galimberti, E Ferri, M Labra, R Malandra...*  
*Food research international, 2010*



# FRIEND OF THE SEA

Friend of the Sea is a leading international certification scheme for sustainable fishery, aquaculture and other sea-related products and services.

**OUR VISION:**

To conserve the aquatic habitat while ensuring sustainable fish stocks for future generations.

**OUR MISSION:**

To protect the aquatic ecosystem by promoting sustainable practices that offer solutions to both businesses and consumers.





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## FEM-2 Ambiente

**FEM2-Ambiente** (Food, Environment, ManageMent) values the technologies developed in university research centers, transforming them into innovative tools to provide effective solutions to the needs of individuals and companies.

**FEM2-Ambiente** was born in 2010 and is among the longest-running spin-offs acknowledged by the University of Milano-Bicocca. The organisation boasts a multidisciplinary team able to operate in all fields of agri-food and environmental biotechnologies, with expertise also in the cosmetics, veterinary and pharmaceutical sectors.

**FEM2-Ambiente** is a young and growing company, which firmly believes in the value of research, which is carried forward thanks to a close bond of collaboration with the best research groups of the Milanese university, without departing from the demands of the market. This has always allowed FEM2-Ambiente to develop innovative and reliable solutions for their clients' businesses, even in the face of unconventional problems.





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