



## ENVIRONMENTAL METABARCODING EMPLOYMENT IN FISHING MONITORING

*PhD Student:* Giulia Maiello / *Supervisor:* Prof. Tommaso Russo

35th Cycle - A.Y. 2019/2020

Since prehistoric times fishing has been an important activity for humans. Mostly due to the development of new technologies and the huge world population growth, fishery resource has recently been vastly over exploited, which has caused a steep decrease of fish populations in all the seas. The need to regulate and manage this activity in a sustainable way has become increasingly urgent. That is why studies in fisheries research and related advices for management bodies are becoming more and more important. However, monitoring activities of catch and related studies are mainly carried out with “classical” approaches, such as the visual inspection and sorting. A new and potentially useful approach could be the implementation and application of environmental DNA (eDNA) analysis in this field of research. Such an approach would greatly increase the efficiency and the accuracy of analysis, reducing both the duration and cost of research and the impact on the environment and the biodiversity. In addition, it would permit to understand the composition of the community targeted by fisheries in terms of species and to estimate their abundance. Furthermore, the use eDNA analysis permits to detect the presence of rare species that cannot easily be observed directly in the field.

The aim of this PhD project is to test the direct integration of eDNA analysis in the monitoring of fishing activities and in the frame of scientific surveys using as a source for molecular analysis - instead of water samples - mucous excretions, secretions, and lost tissues which are present in great abundance when the fishing gears are gathered and emptied on board of fishing vessels. In this way, it should be possible to gather information not only about the species that are fished but also about all those species, benthic and pelagic, that are damaged by fishing gears, especially trawlers, or that are present in the environment exposed to fishing pressure. Sampling will be carried out at various stations in the Central Mediterranean Sea (Strait of Sicily). Two mitochondrial molecular markers will be used for metabarcoding: the 12S with vertebrate-specific primers (Teleo2) and the COI with universal primers. A preliminary test to prove the real feasibility of this method will be achieved matching DNA data with species composition and abundance from data collected with traditional techniques. Fishing management analysis will be carried out by combining this data of species presence and abundance with spatial and temporal information from the VMS (Vessel Monitoring System), a satellite-based monitoring system used to track and monitor fishing fleets. The overlapping of taxonomic data (eDNA) with space-time data (VMS) will allow to make a precise analysis of the distribution of fishing activities and an accurate quantitative assessment of the fishing effort and model the behaviour of fishing vessels. A more methodical cross knowledge of fish stocks, spatio-temporal distribution and fishing effort will prevent overfishing, but also fishing activity in protected areas and fishing of protected species.