The use of pathology in conservation strategies: the case of the loss of the mediterranean Pen shell *Pinna nobilis* (Linnaeus, 1758)

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Wildlife pathology is an important practice for species conservation and surveillance. The noble pen shell (*Pinna nobilis*) is currently classified as a critically endangered species after a devastating Mass Mortality Events (MMEs) affecting the entire population of the Mediterranean basin, that resulted in the loss of 99% of the population in the open sea. After the first MME report in 2016, many pathogens were included as responsible, but only recent pathological investigations discovered the presence of an immunosuppressive virus belonging to the group of the Picornavirus (*PV*) (*Marnaviridae, Sogarnavirus*), affecting the bivalve immune cells.

In the context of the LIFE PINNACARE (LIFE24-NAT-ES-PINNACARE-101216239), a three-year PhD project was established to characterize the *PV* distribution in the past and in the residual population of the Mediterranean basin, along with its co-representation with other opportunistic pathogens. Firstly, using eRNA/eDNA approach, mortality dynamic of the population in sanctuary areas (Italy, Spain) will be characterized in terms of pathogens presence over seasons but also in matrices (water/sediments) reservoirs and alternative hosts. Moreover, the research will focus on the genetic characterization of disease resistance for those animals surviving the MMEs. The study aims to identify key genes involved in animal survival by analyzing the genomic profile of resistant individuals to provide a scientific basis for future restocking programs. In this context, considering the lack of immortalized marine invertebrate cell lines, it will be developed a primary culture, including hemocytes, tissues and microalgae, for an *in vitro* study, to define virus life cycle, host-pathogen interaction and infectivity. Finally, for animals maintained in captivity with purpose of reproduction, phytotherapy will be used and related to immune recovery.

The integration of genomic analysis, animal therapy, diagnostic and *in vitro* methodologies is crucial for the development of effective monitoring and conservation strategies for the protection of marine biodiversity.