

# LIFE PINNARCA

LIFE NAT/ES/001265



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## Abstract

This report compiles available information on the maintenance conditions of pen shell *Pinna nobilis* in aquariums and mesocosms. The initial sections outline the most important abiotic factors for its successful ex situ maintenance, concluding with a section discussing the components involved in the culture systems of this species.

## Part I. Background

The fan mussel, *Pinna nobilis*, is a Mediterranean endemic bivalve mollusk that formerly extended along the entire coast of the Mediterranean basin, in very wide bathymetric ranges with diverse substrates (Guallart & Templado, 2012). As a sessile species, it is very vulnerable to certain impacts on the natural environment such as trawling, habitat degradation, or boat anchoring among others (Basso et al., 2015a). Additionally, it was formerly collected for decorating, for production of silk with its byssus, or for its use in gastronomy (Katsanevakis et al., 2021). This led to its classification as a Vulnerable to extinction species within the Spanish Catalog of Threatened Species (Guallart & Templado, 2012; Prado et al., 2020b). However, in 2016 a mass mortality event of *P. nobilis* individuals began and continues to date. In September 2016, the death of some fan mussel individuals was detected on Spanish coasts. The mortality of individuals began to be seen in other parts of the Mediterranean in 2017, and by 2018, it had already spread throughout the Mediterranean basin, leaving mortalities of 99% of the individuals in most areas (Cabanellas-Reboredo et al., 2019). These dramatic mortality rates led to the re-categorization of the species as Critically Endangered with a much higher level of protection (BOE 2018, UICN 2019). The cause of the death of individuals was unknown during the early stages of the mortality event, but in 2017 a new species of protozoan of the genus *Haplosporidium* was detected, which infects organisms and attacks their digestive systems. This protozoan was recognized as *Haplosporidium pinnae*, a species that only infects *P. nobilis* and no other bivalves (Darriba, 2017; Catanese et al., 2018). In addition, the presence of other parasites was later detected that, in synergy with *H. pinnae*, aggravate the situation and cause a faster death of the fan mussels, such as bacteria of the *Mycobacterium* genus (Carella et al., 2019).

Currently, the only surviving populations of *Pinna nobilis* known throughout the Mediterranean have been relegated to certain areas where, due to specific characteristics of the environment, *H. pinnae* seems to not have expanded or has little dispersal capacity; mainly coastal lagoons, deltas, and bays (Katsanevakis et al., 2021). On the Spanish coast, the only two remaining populations of *P. nobilis* are found in the Mar Menor coastal lagoon (Murcia) and in the Ebro Delta (Cataluña). It is believed that the differences in salinity levels with respect to the Mediterranean have prevented the spread of the pathogen in both areas (Prado et al., 2020b). *H. pinnae* has an optimal salinity range between 36.5 and 39 psu (Prado et al., 2022), while the Mar Menor has a higher salinity (around 42 psu) and the Ebro Delta's salinity is lower than 36 psu. Unfortunately, both ecosystems have significant anthropogenic influence, making it necessary to implement conservation measures to ensure the survival of the species. The Ebro Delta is impacted by discharges from adjacent paddy crops and activities related to the tourism sector or aquaculture (Prado et al., 2020a).