

LIFE PINNARCA

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REPORT WITH THE RESULTS AND APPLICATIONS OF THE
STUDIES OF ENERGETIC PHYSIOLOGY



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Abstract

To carry out this report, different research related to the physiology of *Pinna nobilis* was collected, the most highlighted since 2016 after the massive death episode of the species caused by the parasite *Haplosporidium pinnae*. Each section explains the methodology used in the different studies and the conclusions drawn from them. The objective of this document is to update existing information about the physiology of the species.

Background

For some years now, populations of *Pinna nobilis* have been suffering direct or indirect effects associated with human activities, such as habitat loss, coastal works, anchoring of boats, illegal extraction or water pollution (Sureda *et al.*, 2013a, b), which have accelerated the decline of populations of this species in the Mediterranean Sea. As a result, this species was included in the list of threatened and protected species according to European Council Directive 92/43/EEC (EEC, 1992) and in ANNEX II of Barcelona Convention (Basso *et al.*, 2015). In addition, since late 2016, a disease caused by the parasite *Haplosporidium pinnae* is driving *Pinna nobilis* species to extinction (Vazquez-Luis *et al.*, 2017; Grau *et al.*, 2022). The infection started in Spain and spread over other Mediterranean countries like France, Italy, Greece, etc. and its mortality rate in infected individuals is up to 100% (Vazquez-Luis *et al.*, 2017; Caballenas-Reboredo *et al.*, 2019; Katsanevakis *et al.*, 2019; García-March *et al.*, 2020) in addition to its durability in the environment, which makes recolonization of affected environments almost impossible (Kersting *et al.*, 2020; Katsanevakis *et al.*, 2021). In Spain its current conservation status is "Critically Endangered" with a serious extinction risk (Order TEC/1078/2018) to which it reached in less than two years. It has also been included in the IUCN Red List as "Critically Endangered" (Kersting *et al.*, 2020).

Given the current situation, keeping this species in captivity, for reproduction and physiology experiments, seems to be one of the keys to avoid the total extinction of the species. However, efforts to accomplish this task have been met with mortality rates associated both with diseases such as *H. pinnae* infection and other more generalist pathogens (*Vibrio mediterranei* and *Mycobacterium sp.*), which are more prone to act on individuals under stress conditions (Carella *et al.*, 2020; Garcia-March *et al.*, 2020; Prado *et al.*, 2020) and to the special physiological and nutritional requirements of pinnids in captivity (Hernandis *et al.*, 2021; Hernandis *et al.*, 2022).

The present report is a compilation of previous and ongoing physiological studies conducted in laboratory to better understand the suitable energetic, physiological and environmental conditions for the survival of fan mussels. This report contains information that describes the best conditions for keeping *P. nobilis* in captivity and will help in the development of future studies and experiments that require periods of captivity, such as reproduction or treatment of infections.