

Potential impacts of fouling and planktonic cnidarians on farmed sea bass in the Western Mediterranean Sea

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Summary

In recent years, marine aquaculture farms across European seas have been repeatedly affected by fish mortalities following the occurrence of episodic high densities of gelatinous cnidarian zooplankters. Due to their stinging cells and venoms, these jellyfish species may severely damage fish gills. Gill disorders were observed in sea bass (*Dicentrarchus labrax*) fish farms along the Spanish Mediterranean coast. To investigate the potential for cnidarian-related pathologies affecting caged fish, two aquaculture facilities have been monitored monthly since December 2011. Data from the first two years of observations show significant, positive relationships between the densities of planktonic hydrozoans and fish mortality rate. Ongoing histological analysis of fish gills will clarify whether jellyfish envenomations may impact caged fish by gill damage and/or secondary infections. This work will provide baseline information to develop methodological action plans and protocols to prevent and mitigate the impacts of jellyfish proliferations on finfish aquaculture farms.

Introduction

Negative impacts of jellyfish proliferations on marine aquaculture facilities have been increased (Purcell *et al.* (2007)). Jellyfish species such as *Muggiaea atlantica*, *Phialella quadrata* and *Solmaris corona* have been classified as harmful species for marine fish aquaculture (Baxter *et al.* (2011)) owing to the fish mortalities recorded during high density peaks of these species. Many small jellyfish are capable of forming high density blooms and are small enough to pass through the mesh of the aquaculture cages and to be inhaled by fish. Their contact with gills can cause serious tissue damage with potentially toxic effects (Fosså *et al.* (2003)). Moreover, biofouling on fish cages includes sessile cnidarian species with planktonic propagules that exert a comparable negative impact on farmed fish health (Baxter *et al.* (2012)).

Several cases of fish mortalities due to jellyfish interactions with aquaculture salmon cages have been documented in northern Europe (Rodger *et al.* (2011)). Since 2010, similar mortality events have been recorded in various Spanish sea bream fish farms. Therefore, zooplankton and fouling monitoring started in 2011 and continues to now the present. The main objectives of this study were to identify and quantify the pelagic and benthic cnidarian communities at the aquaculture facilities, document their temporal and depth distributions and determine their relationship with the farmed fish mortalities.

Material and Methods

Samplings were performed biweekly during more than 2 years at two off-shore aquaculture facilities located in Almería and Águilas (southeastern Spain). Samples were collected using plankton net of 200 µm mesh with a flowmeter. Nine vertical net hauls were conducted at each site (3 replicates in each of 2 different cages and 3 net hauls at the perimeter buoys). Samples were immediately preserved in 4% seawater-formalin. All gelatinous zooplankton were identified and classified to the lowest possible taxonomic level. Abundance was calculated as numbers m⁻³. Fish gills samples were taken monthly, plus always after a mortality event. Gill samples were preserved in 10% seawater-formalin and histological analysis is in progress.

Normality and homoscedacity of data were tested prior to analysis using Levene's test. One-way analysis of variance (ANOVA) and SIMPER analysis were conducted, followed by a Pearson's correlation analysis.

Results and Discussion

Hydromedusae were the most species-rich taxon with 19 species/genera recorded in Almería and 15 in Águilas, including hydroid larvae (*Ectopleura larynx*). Seven and five species of siphonophore were recorded at the two sites, respectively, including the reproductive (eudoxid) stages of *Muggiaea* spp. Scyphozoan ephyrae (*Pelagia noctiluca*) also were recorded at both. All taxa were more frequently recorded and abundant in Almería than in Águilas. Fish mortalities were recorded just at the Almería facility; those events were significantly and positively correlated with peaks of the highest jellyfish densities. The cnidarian communities during the mortalities were characterized by 4 taxa: *Obelia* sp., adults and eudoxid stages of *Muggiaea* spp., larvae of *E. larynx*, and *Solmaris corona*. Ongoing histological analysis of fish gills will clarify whether jellyfish envenomations impact the caged fish by gill damage.

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