

Effects of a storm surge on mussel off-shore farming in the Po Delta, northern Adriatic Sea

Abstract

In this note, the effects of a storm surge on the Po Delta offshore mussel farming are assessed. In November 2017, three stormy days caused damage to production and installations. Through a 2-phase census (self-certification by farmers, and random controls by our technicians), we assessed product and structure losses for 1.3 million euros. Due to climate change, these events will be increasingly frequent, with great concern for the Adriatic offshore mussel farming.

Keywords: Mussel farming, storm-surge, reste, Northern Adriatic Sea

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Introduction

The success of aquaculture production is closely related to environmental conditions. This is largely because the health of the product (finfish or shellfish) is heavily dependent on environmental conditions, such as temperature, salinity, oxygen solubility, etc.¹ Additionally, the physical processes of waves and tides may alter the suitability of the abiotic environment.

The Northern Adriatic, and in particular the area facing the Po Delta (Figure 1), is home to a thriving offshore mussel farming activity (approx. 26,000 tonnes in 2013). The “long-line” systems consist of floating structures formed by biconical buoys arranged at regular intervals that keep large horizontal ropes, called beams, anchored to the bottom by concrete dead bodies (plinths) at a depth of about 3 m. The “stocks” or “reste” (tubular structures in plastic mesh) containing mussels are tied to each beam at regular intervals (approx. 80cm). Seed procurement is based almost exclusively on finding the wild, collected directly from the plant by collectors for the collection of larvae. The seed is then placed inside the stockings, forming reste of variable length from 2 to 5m. The good practices plan to avoid the excessive weighting of the reste, which can lead to their detachment and consequently to the loss of the product. To reduce the risk of detachment, the reste are loaded in a weight range of between 40 and 60kg of product. In the Po Delta, the mussel production cycle varies from 8 to 12 months, being dependent on the hydrology and trophic status (i.e. phytoplankton concentration) of the farming areas.²

Being the success of mussel farming dependent on the complexity of the aquatic environment, the wide ranging impacts of climate change is a major concern considering.³ Northern Adriatic mussel farms are located in areas which bear the brunt of climate change impacts, being susceptible to changes, for example, in storm intensity.

An exceptional wave of bad weather, characterized by N / NE winds with gusts over 30m/s, struck the entire Po Delta in November 2017. The storm surges of 13-15 November triggered a violent swell, generating unusual swells with flooding in the most depressed areas of the Veneto and Emilia coasts. This note assesses the effects of the November 2017 storm surge on the Po Delta offshore mussel farming, both in terms of product (*Mytilus galloprovincialis*) and structural damage.

Monitoring activities were carried out in December 2017, involving as many as 8 subjects (Societies and Consortia), representative of almost all off-shore mussel farmers operating in the Po Delta of Rovigo. The census was carried out in 2 phases. The first phase consisted of the compilation, by all the subjects involved, of specific cards relating to: i) plant characteristics (coordinates, size, load), ii) loss of product estimated by the farmers, iii) loss of structures estimated by the farmers (perimeter buoys, plinths, etc.). In the second phase, portions of each plant were randomly chosen and, accompanied by the drivers of that plant, we assessed the amount of damage on-site (reste lost, twisted beams, missing buoys), thus verifying the accuracy of the estimates provided by the farmers (Figure 2).

A total of 8 offshore plants were monitored, 3 of which were located in the northern part of the delta cusp, and 5 in the southern part (Figure 1), for a total water surface of almost 1,400ha (900ha in the north, 500ha in the south). All facilities are at a distance of 1.5 to 2.5 miles from the coast. From a production standpoint, compared to over 50,000 reste lost or from which the mussels have been lost, the quantity of product lost was estimated at around 2,060 tons of mussels. Considering an average producer price of €0.60/kg, production mussels have been lost worth over €1,200,000. From a structural point of view, over 2,000 biconical buoys were lost (€39/each), a radar buoy with headlight (€8,000), and 4 125 q plinths (€1,000/each), for a total amount of approximately 100,000€.



Figure 1 Study area.



Figure 2 “Reste” twisted to beams.

Instant and short-term climatic phenomena (hurricanes, storms, etc.) have become increasingly frequent and increasingly intense in recent years. The amount of damages, considering only those that can be economically evaluated, to the Po Delta offshore mussel culture that occurred in the November 2017 event was estimated at 1.3 million euros. Environmental damage cannot currently be estimated. Similar events in the same area also occurred in February 2015 and October 2018. Mussel farming is highly susceptible to various effects of climate change, since it depends on wild spat for stock, plankton

for food and water quality for health. The increased frequency of exceptional climatic phenomena poses serious concern for the survival of the Po Delta offshore mussel industry.

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Conflicts of interest

The author declares that there are no conflicts of interest.

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