

The Death of the Mar Menor:

Hazard, Vulnerability and Risk in the Asphyxiation of Europe's Largest Saltwater Lagoon

On October 12th, 2019, thousands of dead fish washed up on the shores of the Mar Menor, Europe's largest saltwater lagoon located in the southeast of Spain. For decades, environmentalists had warned that something like this could happen to the Mar Menor's delicate ecosystem. Massive rainfall washed agricultural sediment, which included excessive amounts of nitrates from fertilizers into the Mar Menor. These excessive amounts of nitrates depleted the levels of dissolved oxygen in the water, suffocating the fish. Pictures of the thousands of dead fish, crabs, eels and other marine life circulated widely, and local people expressed their horror and outrage that local authorities had allowed the Mar Menor to reach such a devastating point. The Mar Menor supported not just the marine life living within it, but also the people living around it. The lagoon forms the basis of the area's entire economy. After the asphyxiation, or anoxia of the Mar Menor, housing prices dropped, tourism screeched to a halt and the fishing industry was left in shambles. While other beaches in Murcia filled up this past summer despite the pandemic, beaches and towns along the Mar Menor stayed empty. According to locals, even people who own houses there stayed away (Vadillo). In this paper, I will look at the hazards that contributed to the collapse of the Mar Menor, the lagoon's specific vulnerability, the various responses to these factors by local and non-governmental actors.

In the fall of 2019, Spain suffered the worst 'cold drop' of 140 years, setting off a chain of events that would lead to the death of the thousands of fish that washed up on the shores of the Mar Menor (Bono). 'Cold drop' or *Gota fría* in Spanish, designates a meteorological phenomenon in which warm, humid air that has evaporated from the Mediterranean is abruptly cooled, leading to heavy and sudden rainfall as wind blowing off the sea pushes clouds towards

land. In the case of the South of Spain, mountains stop these clouds from travelling very far, focusing them over coastal towns like the ones surrounding the Mar Menor (El Independiente). These torrential rains, combined with agricultural runoff comprise the two main hazards leading to disaster.

The region of Murcia, specifically the area called ‘el Campo de Cartagena’ is one of the most important areas in Spain for agriculture, exporting products like citrus fruits, almonds and vegetables to European countries like France, Germany and the U.K. (Perez-Solero). In the 1970s, a major shift in the agricultural model of the Campo de Cartagena, which surrounds the Mar Menor, greatly increased the run-off that empties into the lagoon (El pais). Rain-fed crops were replaced by irrigated crops, and terraced fields disappeared (Vadillo). One of the major benefits of terraces is that they slow down the velocity of water from rain, conserving both soil and water, slowing down soil erosion (Wheaton and Monke). Agricultural lobbies expanded in the 1970s and 80s throughout the Campo de Cartagena to advocate for a model of intensive production, completely disregarding the natural vegetation of the area (Tena). Now, because of the removal of terraced fields and this shift towards intensive production, rain, even when it is not torrential, carries significant agricultural sediments with it (Vadillo). This runoff ends up almost entirely in the Mar Menor.

The main issue arises from the fact that the runoff carries considerable amounts of minerals that drastically alter the Mar Menor’s ecosystem. In the past few decades, agriculturalists in the region of Murcia have increasingly used fertilizers on their crops. Minerals from fertilizers, mostly nitrogen and phosphorus, enter the Mar Menor in astounding quantities, and increase the growth of phytoplankton, which is what turns the lagoon green, and invasive algae, like *Caulerpa prolifera* (Craido). This phenomenon, the excessive growth of algae

because of nutrients from agriculture, is called eutrophication. When these algae blooms from eutrophication die, their decomposition depletes the amounts of dissolved oxygen in the water (Chislock et al.). Without oxygen, organisms in bodies of water, like the Mar Menor, can no longer live, which is what happened in October of 2019. Although the events of October 2019 were horrific, there were major warnings that something like this was to come.

Since the 1970s, the Mar Menor had been the region's primary tourist attraction. The water, significantly warmer than the neighboring Mediterranean, was a sparkling saltwater pool that tourists from all over Europe flocked to. But, in 2016, a sudden and large scale growth of phytoplankton led to what locals call the 'green soup' episode. The Mar Menor, previously the gem of Murcia, turned bright green and opaque. Locals joked about how they would soon see fish with three eyes, like those featured in *The Simpsons*, coming from the fishermen's nets in the Mar Menor. Although the water eventually cleared up, since then, many of those who had seen the 'green soup' never dipped more than their toes in the water, preferring to go to nearby Mediterranean beaches. The 2016 "green soup" episode should have been warning enough that the Mar Menor was in danger. But, because the water of the Mar Menor cleared up, many people, encouraged by the nonchalant attitude and reassurances of the local government, believed that it was recovering. However, scientists like Juan Manuel-Ruiz from the Oceanographic Institute of the Region of Murcia say they knew that was not the case, and attempted to bring attention to the threats the Mar Menor continued to face, despite its normal appearance. Manuel-Ruiz affirmed in an interview with Spanish television station, rtve, that decomposing organic material and nutrients continued to contribute to the decline in oxygen in the Mar Menor after the 2016 'green soup' episode, and that local authorities continued to ignore that fact (rtve).

Although it is clear that agricultural runoff is the main culprit for the anoxia of the Mar Menor, the lagoon's ecosystem is already especially vulnerable to hazards. One of the factors that makes the Mar Menor especially vulnerable to the increased level of agricultural sediments is that the lagoon is slowly separating from the Mediterranean. Four main channels connect the Mar Menor to the Mediterranean, allowing marine life to go in and out and regulating the lagoon's salinity, temperature, and the levels of nutrients from agriculture that can lead to explosions of algae (Criado). The main issue is that these channels are rapidly decreasing in size. The entry size of the main channel in and out of the Mar Menor, Las Encañizadas, has shrunk from 540 meters in 2009 to just 120 meters in 2017, with a depth of just 25 centimeters (Erena qtd. in Criado). This means that nutrients from agriculture are being concentrated more and more in the lagoon, since there is less exchange of water between the Mar Menor and the Mediterranean. Because the Mar Menor's water is not being refreshed with water from the Mediterranean, the risk of eutrophication is greater. According to Angel Pérez-Ruzafa, professor of ecology at the University of Murcia, the "Mar Menor's ability to defend itself against human aggression completely depends on its connectivity with the adjacent sea" (qtd. in Criado).

Rapid urbanistic development has also contributed to the vulnerability of the Mar Menor. Since the 1970s, towns and urban developments have sprung up quickly, with no one responsible for supervising this growth (Sanchez). The end of Franco's regime and the 1973 oil crisis unraveled the urbanization project of La Manga, the strip of land that separates the Mar Menor from the Mediterranean, which resulted in excessive construction (Alvarez). Poor sewage systems in many towns surrounding the Mar Menor mean that in times of rain and flood, sewers overflow. Because of the high level of urbanization and the fact that the ground is largely covered in asphalt, that water cannot be absorbed by the soil, further amplifying the issue of

runoff into the Mar Menor (Tena). The urbanization project of La Manga also included opening up one of the channels between the Mar Menor and the Mediterranean, which allowed more species from the Mediterranean to migrate into the lagoon. Among these species was *Caulerpa prolifera*, the invasive algae mentioned above that feeds off of the nutrients in agricultural runoff and is largely responsible for the depletion of oxygen in the lagoon (Alvarez).

The most frustrating aspect about the environmental crisis in the Mar Menor for many locals has been the lack of action by the government. Though the lagoon has been at risk for decades, the local government has continuously looked the other way when it comes to dangerous agricultural practices. Even after the 2016 ‘green soup’ episode, which scientists tied directly to agricultural runoff, government officials continued to allow agricultural runoff with high levels of nitrogen and phosphorus to flow into the Mar Menor. And, even though there were some prohibitions put in place, irrigation actually grew in supposedly protected areas, with no redress from the government (Sanchez).

After the anoxia of the Mar Menor in October of 2019, protests sprung up calling for immediate action to save the Mar Menor. Since then, there has been no news of any concrete action the government will take to improve the situation in the Mar Menor. In November of this year, Spain’s Secretary of State of the Environment, Hugo Morán Fernández assured that funds from the European Union would allow the reconstruction of the Mar Menor to advance much quicker than if it were solely in the hands of the state. However, it has not been made clear what those funds will be used for. Morán simply stated that the funds would go towards hydrological planning and direct investments (Gomez). Considering the past inaction of the government, this statement is insufficient to confirm that any action at all will be taken for the protection of the Mar Menor.

There has been a push by local people to protect the Mar Menor by making it a legal person. Professor of philosophy of law at the University of Murcia, Teresa Vicente Giménez, came up with the idea of recognizing the Mar Menor as a legal person, making space in the Spanish legal system to protect the rights of an ecosystem, “creat[ing] a new model of justice” (qtd. in Perez-Solero). This idea is not entirely new, as it follows the model of countries like New Zealand, Ecuador and India, who have all granted legal privileges to ecosystems. In July, Vicente Giménez presented the initiative in Spanish parliament, and has nine months to collect half a million signatures for it to be voted on in parliament (Perez-Solero). This means that roughly one-third of the population of the entire region of Murcia would have to sign the petition in order for the initiative to be voted on.

The options for risk mitigation are already limited, and the lack of initiative by local and national governments to find solutions to the lagoon’s ecological crisis makes the prospects of the Mar Menor surviving and recovering very unlikely. The Mar Menor is now, more than anything, a cautionary tale. Unchecked hazards combined with the ecosystem’s particular vulnerability led to a risk that will only continue to worsen with time and further inaction.

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