Mediterranean, *medio plasticae*. Analysis of Plastic Pollution in the Mediterranean during the Coronavirus Outbreak

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Mediterranean, from the Latin "*medio terrae*," means in the middle of land. This is the feature that has made the Mediterranean Sea a parcel of ocean unlike any other on the planet. Its geostrategic enclosure, between three different continents, has resulted in singularity and richness at all levels: ecological, socioeconomic and cultural. However, the closed nature of the Mediterranean is a double-edged sword that may do more harm than good in our times. Plastic pollution poses a new environmental threat for the planet. Waste collection systems cannot stem the drain of plastic waste into seas and oceans, and the Mediterranean is surrounded by plastic sources. Rivers, beaches and maritime traffic dump plastic into the Mediterranean Basin, which has no plastic leaks. It is a sea in the middle of plastic.

The Mediterranean Sea covers just 1% of the global ocean area, but shows disproportionate figures in terms of biodiversity, coastal demography and sea-based economy. It concentrates around 10% of all marine species, inasmuch as its isolation led to the origin of unique life forms (Bianchi and Morri, 2000). For centuries, the Mediterranean was also the hub around which many of the world's most prominent cultures flourished, while its waters provided an avenue for trading knowledge and goods between Africa, the Middle East and Europe. In our increasingly global and consumerist world, trade across the Mediterranean has been reborn as the shortest shipping path between Asia and Europe. The Mediterranean Sea now holds 7% of the world's shipping vessels and 9% of its coastal population; there are around 100 million people living within 10 kilometres of the Mediterranean coast (Cózar et al., 2017). Moreover, the overlapping of historical heritage and natural assets makes the Mediterranean a top tourist destination. Coastal nations currently receive 28% of all the world's tourists (WTO, 2020).

A Sea in the Middle of Plastic

Plastic drainage from coastal populations into the Mediterranean Sea has been estimated at approximately half a million tonnes per year, which means that it accounts for over 7% of the global load of plastic from land into the ocean (Jambeck et al., 2015). This is without taking into account inputs from activities such as shipping or beach tourism, also expected to be particularly significant. So, the Mediterranean has the enemy within, and its capacity to release plastic is virtually nil. The connection to the global ocean circulation is limited to the Strait of Gibraltar and, what is worse, through terminal surface currents (Cózar et al., 2015). In simple terms, plastic adrift tends to go in rather than out, making the Mediterranean a sink of plastic pollution.

In 1980, a study by R. J. Morris in waters off Malta first warned about the abundance of plastic litter in Mediterranean waters, but this did not strike a chord with the scientific community or society. Almost 50 years later, after the mapping of the global system of plastic litter accumulation of the five great ocean gyres (Cózar et al., 2014), an expedition across the Mediterranean finally demonstrated that this basin can be regarded as a great accumulation zone of marine plastic, with concentrations comparable to those found in the accumulation zones of the five

ocean gyres. But with a fundamental difference. The Mediterranean cocktail of plastic, biodiversity and sea-based industries should result in more frequent effects on marine and human life. The most conspicuous impacts of Mediterranean plastic pollution are likely the massive unloading of floating litter on bathing zones and beaches, or the reports of accidental ingestion of plastic and entanglement by marine life. Here we have a wide collection of examples for the Mediterranean, from small fish to tuna and swordfish, and from seabirds to turtles and whales. However, the biggest concern arises from the small fragments of plastics. In nature, bottles, clothes, bags, or any object made of plastic break down into multiple pieces during their weathering. These tiny particles, known as microplastics (< 5 mm) and nanoplastics (< 0.05 mm), stay out of sight, but are literally enveloping Mediterranean life. Microplastics are accidentally mistaken for plankton, the base of the marine food chain. They contain toxic compounds added during the manufacturing process or absorbed from seawater, and some of these plastic-associated contaminants may be transferred to organisms during digestion. Nanoplastics may even go straight to the bloodstream and be incorporated into the tissues. The significance of the transfer of plastic-associated pollutants to animals and humans through ingestion is still under scientific discussion. Either way, it is easy to suspect that an unmanaged Mediterranean, where plastic becomes prevalent in water and organisms, will not do us any favours.

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The Drive against Plastic Pollution in the Post-coronavirus Scenario

In the last five years, the struggle against Mediterranean plastic pollution has finally got underway. Clean-up activities take place along the Mediterranean shoreline, while fishermen battle to clean the deep seafloor. Proactive steps to get things moving were being made from governments on both shores of the Mediterranean. Morocco banned the distribution of plastic bags in 2016, and Egypt aimed to follow its lead. Europe sealed a ban on single-use plastics by 2021, and Italy had plans to apply an additional tax on non-recycled products in 2020. However, 2020 has brought with it a devastating health and economic crisis. The coronavirus pandemic has turned the hard-fought progress on waste management upside down overnight. The impetus for combatting marine plastic pollution risks being dangerously postponed (e.g., Plastics in Packaging, 2020).

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Looking around us, we can already glimpse some useful lessons and a number of threatening clouds arising from the present crisis. Firstly, we have to definitively accept that plastic resources are necessary for humankind. The global containment of the pandemic is being largely supported by the massive and cost-effective production of plastic-made items for our protection. On the other hand, the current collapse in oil prices, the raw material used to make new plastic, is critically outcompeting the use of recycled plastic resins. More worrisome is that the current scenario of social scaremongering and misinformation may be used to reverse the trend to reduce single-use plastics. While a fixed plastic panel can prevent fresh products from being contaminated with the coronavirus in a market, the plastic overpackaging does not. To date, science shows that the coronavirus lasts longest, up to days, on plastic surfaces (Chin et al. 2020).

The compulsory urgency of our response to tackle the coronavirus has forced the desperate production and consumption of plastic-made protective

equipment. But it is now time to think about what to do with the huge amounts of single-use protective items thrown away on a daily basis, and to look at the circular economy manual. If we focus on today's common surgical masks, they should firstly be designed to be easily recycled, using a single-plastic polymer instead of different polymers. Secondly, since they are often disposed of outdoors after short use, specific recovery facilities should be extended to their proper collection and treatment. Plastic pollution is due to the inappropriate disposal of plastic items, and not because things are made of plastic.

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Plastic is an ideal material to create anything at low cost and on a mass scale. It has therefore become a key ally in our defence against the coronavirus. However, the pandemic and ensuing economic crisis is not a reason to lay aside the urgent need to care for the Mediterranean. The production of plastic items will likely increase over the years (Plastic Europe, 2019), in the form of disposable masks, single-use bottles and other items. Sadly, the Mediterranean is being hurt and is particularly vulnerable to plastic littering, in any form. In the "new normal," our goal continues to be to stop more plastic entering the singular and precious Mediterranean; and we can still do it.

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