The ocean we want: inclusive and transformative ocean science.
Pelegrí J.L., Gili J.M., Martínez de Albéniz M.V. (eds.). 2022. Institut de Ciències del Mar, CSIC, Barcelona.

1.5. Marine litter, the new plague of seas and oceans

Eve Galimany, Elena Marco-Herrero, Montserrat Ramón

Seas and oceans represent most of planet Earth. The good health of their waters is crucial to sustaining life, not only of aquatic ecosystems but also of terrestrial ones. But this health is threatened by what's called marine litter, the remains of all kinds of objects and materials, which are currently one of the main causes of pollution, creating severe environmental and economic problems around the world.

The great majority of marine litter comes from land-based activities, where waste is transported to the seas and oceans by wind, rivers, rain and a lack of proper management for a currently overpopulated Earth. Of the different types of marine litter that reach seas and oceans, including fabrics, paper, batteries and glass, the majority (61% –87%) is made up of plastic. This plastic, with dimensions ranging from microns (microplastics) to centimeters and occasionally meters (macroplastics), ends up on the seabed where they are perpetuated for years, even centuries.

Marine litter and its effects

The effects of marine litter are diverse and alter both organisms and communities and also the economic activities generated by these ecosystems. To date, effects have been described in 1400 species distributed worldwide (Galgani *et al.* 2019). Some of the most common physical effects observed in the fauna are entanglement, when they are entangled with marine litter, and starvation, when they ingest litter and it accumulates in the digestive systems preventing feeding and, even, damaging organs. In addition, plastics often carry chemical additives that can be toxic and bioaccumulate along the food chain. Economically, marine litter has very negative effects due to the increased cost of cleaning both the body of water and the beaches. Moreover, marine litter can generate costs in maritime economic sectors caused by the impacts on the ships' hulls and breakage of fishing gear, even ruining cooling systems and engines.

How is the Mediterranean Sea doing?

The Mediterranean Sea, which has culturally and traditionally supported all the civilizations that have occupied its shores, is especially vulnerable to the effects of marine litter. The Mediterranean geomorphology makes it a very closed sea, where the waste is trapped with almost no option to disperse and leave. It is because of the large accumulation of marine litter that it is currently considered one of the dirtiest seas on the planet (Galgani *et al.* 2014).

The exact amount of marine litter in the Mediterranean is difficult to assess due, among other things, to the fact that most research has been done mostly at depths >100m. The first study that quantified the amount and type of marine litter found on the seabed in shallow depths was recently published in 2019 (Galimany *et al.* 2019). By collaborating with shellfish fishers that worked between 10 and 68 m deep in Catalonia, the marine litter present in the catches was quantified in two areas, an urban one, located just south of Barcelona, and a rural one in the Ebro Delta (Figure 1). Results showed that, in areas close to heavily populated locations (Urban Zone) and with busy shipping routes, marine litter can account for 37.6% of

Figure 1. Image of the catch obtained by the artisanal fishery in the urban area (left) and in the rural area (right).

the total catch by weight per sampled area (Figure 2). In terms of mass densities, it represents between 198 and 393 kg of litter per km². In contrast, marine litter fished off the coast of less populated areas (Rural Zone) accounted for 5.2% of the total catches, which are much lower densities (34 and 56 kg of litter per km²) than in the urban areas.

Once marine litter has reached seas and oceans, it is very difficult to remove because

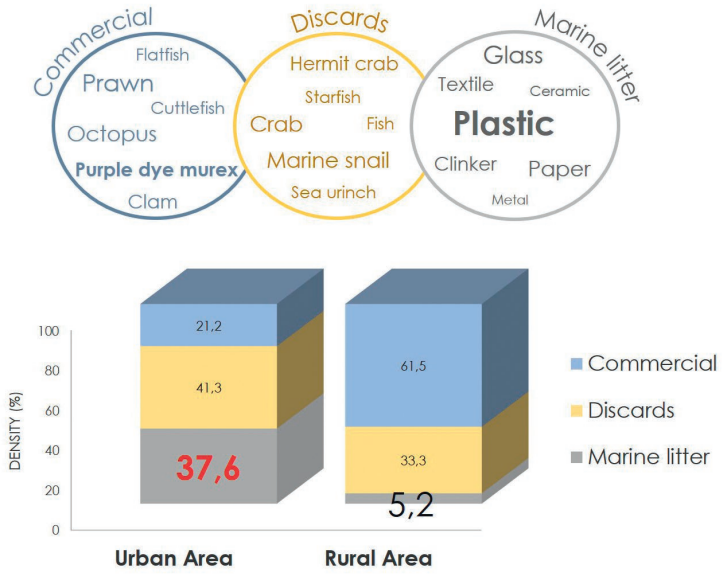

Figure 2. Comparison of the mass density (kg m^{-2}) in the percentage of marine litter catches, discards (organisms without commercial value) and commercial fraction in the artisanal fishing "rastell de cadenes" between the urban and rural area.

the drift and the spatial immensity through which they move, including great depths, make it extremely difficult to find an effective and economical solution. In addition, there are no efficient methods or strong legislation to clean the seabed. Thus, the best waste is that which is not generated and, for this, there must be a common effort of the population to break the current trend of waste production. Simple acts such as recycling, reuse of resources and a change in the habits of the population, especially with regard to the excessive use of plastic, can greatly help reduce the litter that reaches the sea. For that litter that have already accumulated in the depths, mechanisms could be established for collaboration with fisheries so they could help eliminate the litter that they accidentally catch on a daily basis. This would reduce fishing costs and potential hazards to marine ecosystems.

References

Galgani F., Barnes D., Deudero S., *et al.* 2014. Marine litter in the Mediterranean and Black Seas. CIESM Workshop Monograph 46. In: Briand F. (ed.), CIESM Publisher, Monaco, 180 pp.

Galgani L., Beiras R., Galgani F., *et al.* 2019. Editorial: Impacts of marine litter. Front. Mar. Sci. 6: 208.

Galimany E., Marco-Herrero E., Soto S., *et al.* 2019. Benthic marine litter in shallow fishing grounds in the NW Mediterranean Sea. Waste Manage. 95: 620–627.

DOI: https://doi.org/10.20350/digitalCSIC/14055