What Has Nature Ever Done for Us?
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Extract from Chapter 2 - Life from Light, pp68-71

Working oysters

There are also ways to deal with nutrient enrichments once they have escaped into the environment – one of which is making use of oysters.

Across many coastal areas there were once extensive areas of oyster reefs. These features, some of them hundreds of square miles in extent, were shallow-water areas where the seabed was carpeted with a dense layer of oysters. These two-shelled molluscs fix themselves to the sea floor, often on the empty shells of departed ancestors, sometimes comprising a layer of shell 1 metre thick. The crusty layer of living molluscs on top of the bed pump water through their bodies, and in the process extract microscopic food items from the water, including planktonic single-celled plants.

While we tend to think of oysters as an exotic food, less often do we see these animals as ecosystem engineers that build entire habitats. And they don't only create an environment for themselves; they provide a home for hundreds of other species that live on and between their dense layers. Among these are many kinds of fish, including the juveniles of commercially important ones. An array of invertebrates dwell among the oysters; some, such as bryozoans and barnacles, encrusted on the shells.

People of course have long exploited oyster beds, often with little thought for their future. Around New York Harbour, massive oyster reefs once existed, some 350 square miles in extent
and comprising an estimated 9 billion oysters. After they were plundered for food, the animals' calcium carbonate shells were cooked in ovens to be made into the mortar that holds many
of New York's older buildings together. But as the city grew, the degraded reefs were hit by sewage pollution, which killed the oysters – and some of the New Yorkers who were still eating
them. Finally, during the mid-twentieth century and the industrial age, chemical pollution finished them off. A similar story can be told from many coastal areas worldwide.

Much is said about the loss of different coastal habitats, including mangrove forests, corals and sea grass beds (we will come to those later), but research by the Nature Conservancy has found that the most seriously damaged marine habitat on Earth is in fact wild oyster beds. Some 85 per cent of what
once existed has been destroyed, while much of what remains is degraded.

The decline of oysters of course means less shellfish – and feedstock for making cement – but other very important benefits can disappear with oyster reefs as well. These include reduced habitat for baby fish (which can grow into the bigger fish we eat) and the loss of a hard sea bottom that prevents erosion and takes energy out of waves and storm surges, thereby protecting coastal areas from flooding. There is also the matter of nitrogen removal.

As nitrogen arrives at the sea via river estuaries and causes an explosion in the population of single-celled plants, oysters help by eating them, and in the process strip nitrogen from the water. The plants are digested and then the oysters' faeces ejected on to the seabed. Bacteria get to work on decomposing this, turning the nitrogen back into gas, which then harmlessly gets back into the atmosphere in its inert form.

While a little oyster might not seem up to the task of cleaning an ocean, bear in mind that an average-sized one is every day filtering up to 200 litres of water. With this kind of pumping capacity, a one-hectare patch of oyster reef (assuming a low density of about fifteen average-sized oysters per square metre, and fifteen juveniles) will each day filter the equivalent of twenty Olympic-sized swimming pools. That is a lot of water, and that is why over the course of weeks and months oysters can make a big difference to the quality of coastal waters.

No wonder lots of projects are underway to restore oyster beds. Across the USA between 2001 and 2011 more than a hundred oyster reef restoration projects have been started. The main motivation has been a desire to improve water quality, while in the process improving coastal protection, fisheries and wildlife.

Around Britain, too, the potential for oyster reef restoration is considerable – and it could be linked with wind energy. In the highly polluted southern North Sea (including around the Thames Estuary) there is ongoing construction of large numbers of offshore wind-power turbines. Fishing is not
permitted between the tall turbine towers, meaning that large areas of undisturbed seabed are set aside at the same time as the contribution of clean renewable energy increases. The turbines are mostly in the shallow water favoured by oysters, and in some cases could provide opportunities for creating more of these important and unique natural habitats. Aside from cleaning the water, the restoration of oyster beds in this part of the world would also help the recovery of highly depleted fish stocks.

Philine zu Ermgassen, an ecologist at the University of Cambridge, has been working with the Nature Conservancy to estimate the benefits humans derive from restored oyster reefs. She told me that 'healthy oyster reefs are instantly recognisable, jutting like castles out of the surrounding mud. As the oysters grow into their new habitat they create yet more habitat, not only for future generations of oysters, but for the plethora of fish, shrimp and crab species which flock there for protection. The spaces between the shells create ideal nooks and crannies to escape from predators, while the shell surfaces themselves become small forests of filter feeders, such as barnacles. An oyster of the size that is typically enjoyed on the half shell with a slice of lemon is capable of filtering up to 8 litres of water an hour. Oyster restoration can not only yield benefits through the habitat it provides, but can also directly impact and improve water quality.'