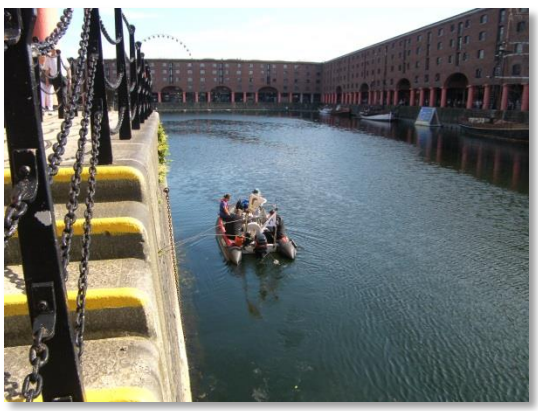
Management of biodiversity in disused docks – The case study of the Liverpool Docks



Urbane

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Management of biodiversity in disused docks – The case study of the Liverpool Docks

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Management aims and challenges

Disused docks are a common feature around the UK coastlines since the increased use of large, containerised ships that led to the decline in the use of smaller shipping ports in the 2nd half of the 20th century. Management activities such as maintenance dredging often cease once docks are no longer used for shipping, resulting in the in-filling of the docks with sediments and causing the accumulation of anoxic sediments. Also, water quality may drastically suffer if management of the dock stops, through eutrophic conditions, algal blooms and low oxygen concentrations of the water. This does not only lower their value as ecological habitat, but also their aesthetic value for recreational or commercial use.

Today, many former commercial docks are only used recreationally. Appropriate management is required to maintain their aesthetic value following closure to shipping, by for example avoiding poor water quality and the spread of undesired species and algal blooms.

Ecological potential of disused docks

Disused docks can be an unique marine habitat, due to for example highly variable salinity regimes. They can in fact be considered as 'artificial lagoonoids'. Moreover, disused docks are comprised of a variety of artificial hard structures such as dockwalls and pontoons. These have the potential to support a diverse benthic community. Filter feeders, for example the edible mussel *Mytilus edulis*, and other marine fouling organisms may colonise the structures.

However, at the same time, the poor water quality, high levels of siltation and anoxic conditions make disused docks a particularly stressful habitat. Ecological management is often necessary to maintain this habitat and enhance biodiversity.

Mussels and other organisms have the potential to foul the dock walls and other hard structures in docks.

Management aims and challenges
- The example of the Merseyside docks -

To maintain or restore their aesthetic value for recreational and commercial use (which often goes hand in hand with the maintenance of a good ecological status!), docks usually require extensive redevelopment following closure.

For example, the South Docks in Liverpool were closed to shipping in 1972. Gates were left open after their closure, resulting in the trapping of large amounts of fine sediments. To achieve restoration of the docks for recreational, business and housing use, extensive redevelopment took place in the 1980s. Gates were re-installed, sediments dredged and a series of ecologically-based management techniques set in place to increase water quality.

Using the example of the Liverpool Docks and other Merseyside docks, this guide illustrates how ecological management may result in the improvement of water quality, biological status and thus benefit recreational use due to an increase in aesthetic appeal.

The Albert Dock in Liverpool are today used recreationally. Cafes, bars and galleries line the water front, making it one of the main tourist attractions of Liverpool. Historic vessels anchor on the pontoons.

1) Improving water quality by artificial vertical mixing

Docks are characterised by particularly sheltered conditions and are often not connected to natural flow from rivers or the sea. The resultant stagnant water conditions and lack of water exchange may easily cause organic rich sediments leading to biological oxygen demand and anoxic bottom water conditions.

At the Sandon Docks at the Merseyside, an artificial air-mixer was installed to prevent stratification and increase vertical mixing of the water column. Water quality improved drastically, enabling the establishment of a diverse community.

Mussels and other organisms can be found on dock walls and other hard structures if maintenance of good water quality is successful through, for example, artificial vertical mixing that lowers stratification of water masses and low oxygenated bottom waters.

2) Improving water quality with artificially or naturally settled filter feeding communities

Filter feeders may also greatly improve water quality. For example, research in the Liverpool Docks found that natural populations of the mussel *Mytilus edulis* in the Albert Dock and Queens Docks and experimentally settled *M. edulis* populations in the Graving Dock successfully improve summer water quality by reducing phytoplankton blooms. Water quality improved noticeably, being largely desirable for recreational amenity use and tourism. Also, the presence of mussels tend to encourage settlement of other filter feeding species such as sponges and tunicates.

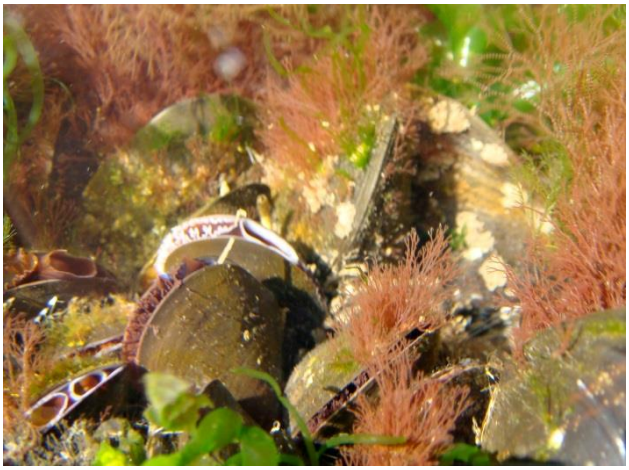
It should be noted, however, that negative effects of large mussel populations may exist, such as the potential build-up of detrital material on the bottom and oxygen depletion. Artificial vertical mixing (e.g. through the installation of the above mentioned air mixer) may prevent such negative effects.

Mussels and other filter feeders may settle on the dock walls, maintaining good water quality by biofiltration.

3) Maintaining a “natural” disturbance regime through carefully managed flushing and dredging

Siltation of the docks is likely, despite the installation of artificial mixing. Dredging of the fine sediments may need to be routinely undertaken. Also, frequent opening of the dock gates may be desirable as this will result in flushing with natural sea water. This would also allow connectivity of the dock communities to other natural habitats, potentially encouraging the establishment of a more “natural” community.

It is noteworthy, however, that docks are likely to also support invasive non-native species, such as the invasive tunicate *Styela clava*. This may be prevented if carefully choosing the correct level of the above mentioned disturbances – as this may encourage the establishment of native species and pre-empt space for invasives. This tends to occur at intermediate levels of disturbances.



If the right management scheme is carried out, a diverse native community is likely to establish on dockwalls and other structures (left). However, docks may also be likely habitats for invasives, such as the tunicate Styela clave (right).