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Chemical pollution in UK seas

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Chemical pollution is impacting high priority waters around the UK, including Marine Protected Areas. There are no barriers to pollution entering these waters and the species afforded legal protection in these waters are not safe from the impacts of these chemical pollutants. Any restoration efforts that are implemented will be undermined by chemical pollution, unless these contaminants are stopped at source.[1] The Marine Conservation Society want to see contaminants stopped at source via better protections in chemical regulations, with more thorough monitoring and tighter regulations around pollution events to reduce pollution. Our specific pollution asks are contained within individual publications which can be found here.

Sources of contaminants to UK seas

Contaminants can enter marine waters around the UK via several different routes, either directly or indirectly. Direct releases of contaminants include examples such as bathers wearing sunscreen or cosmetics or pets and livestock treated with tick and flea treatment who enter the sea; industrial users such as shipping; or firefighting foams being discharged directly into the environment. Indirect releases of contaminants include sewage discharges, both with untreated sewage and treated wastewater effluent and run off from farms, landfill and roads. While there are often significant point sources of contaminants e.g. sewer overflows, it is probable they are not the only source. However, for certain pollutants, the source can be easier to determine. For example, a study conducted in 2022 found artificial sweeteners, pharmaceuticals and illicit drugs in marine wildlife, which the researchers concluded were likely to be due to the incomplete removal from wastewater.[2]

Wastewater

Data from the UK Water Industry Chemicals Investigation Programme (CIP)[3] demonstrated reduced levels of certain contaminants to safer concentrations after wastewater treatment due to the removal during treatment. This means, during a dry sewage spill (without rainfall), where these contaminants are not successfully reduced, they will be released into the environment at ecologically harmful levels. However, in this same CIP data, there are also contaminants that are not reduced to safe levels after treatment. Therefore, even treated wastewater is contaminating UK waters with chemicals like the flame retardant DBDPE or the flea treatment Fipronil, among others. In the event of a sewer overflow, the contaminant concentrations are diluted with rainwater, however the new concentrations are unknown therefore it is difficult to determine the harm that is caused. In this case, persistent chemicals are a particular concern because even with dilution, their levels will ultimately increase and eventually cause harm. Read more about persistent chemicals here.

Run off from land

Roads are a key source of pollutants from tyre wear particles, road materials and other road debris. Polyaromatic hydrocarbons (PAHs) are an example of a group of hazardous chemicals associated with road run off, although they have other sources too, including oil spills and shipping activities.

Farmland that is treated with plant protection products (pesticides) and fertilisers including sewage sludge have the potential to wash into rivers and into the wider environment. More information of the contaminants in sewage sludge can be found here.

Landfill can also be a source of chemical contaminant run off, there are large amounts of banned chemicals, including PCBs in UK landfill, some of which are suspected to be leaching directly into the environment.[4]

Evidence of contaminants in UK seas

A 2022 study found 145 emerging contaminants in UK and European marine predators and their prey. These included pharmaceuticals, pesticides, PFAS, illicit drugs, chemicals in personal care products and industrial chemicals.[2] Other examples of contaminants found in UK marine wildlife, including otters, gannets and gulls which are all legally protected and internationally important, include:

- PFAS in all Eurasian Otters studied in the UK, with over 80 % of them having 12 of the 15 PFAS investigated, in their livers.[5]
- Three different species of Gull breeding close to a landfill in the West of Scotland were found to have elevated levels of the flame retardant PBDE in their eggs. The study conducted in 2012 also found the highest DBDPE biota levels detected to date.[6]
- A cocktail of 50 different chemicals including pharmaceuticals and illicit drugs linked to sewer overflows have been detected in marine waters and organisms including oysters and crabs around Portsmouth.[7]
- The brominated flame retardants PBDEs were found in all Gannet eggs tested from the Ailsa Crag and Bass Rock Colonies in the UK.[8]
- Sediment dwelling snails and worms were detected to have higher concentrations of contaminants including pharmaceuticals and the neonicotinoid, imidacloprid. The study indicated that the source of these chemicals was the sediment.[9]

Often impacts of chemical pollutants are behavioural, hormonal or reduce an organism's resilience to other stressors such as climate change. These impacts can commonly be seen at relatively low contaminant concentrations, lower than what is considered in traditional toxicological endpoints.[10] There are not extensive studies on impacts of contaminants in UK marine life, however there are examples, particularly on legacy contaminants:

- The UK Orca population is heading for a complete collapse in the 100 years consistent with severe PCB pollution, because of their effects on reproduction.[11]
- Harbour porpoises have been shown to have reduced testes weight because of high PCB contamination.[12] PCB's have also been the result of a rise in infectious disease mortality in harbour porpoises in the UK.[13]
- Phthalates, chemicals used in plastics, have been investigated in grey seals, one specific phthalate (BBzP) has been shown to cause metabolic disruption in juvenile grey seals, which could impact their blubber formation or function.[14]
- Liver cancer rates in flat fish in the North Sea are increasing in relation to long term exposure to chemical contaminants, in particular cadmium and PCBs.[15]

Contaminants expected in the UK

Research from other countries has shown the presence of PFAS and flame-retardant chemicals in wildlife at all levels of the ecosystem from PFAS in plankton, oysters, polar bears, sea birds and otters[16] to flame retardants in mussels, sea urchins, Atlantic cod and turtles among many others.[17] These chemicals have been linked to a multitude of different impacts on wildlife, from cancers, hormonal imbalances, neurological impacts to reduced immunity. There are many examples from research around the world into impacts of chemical contaminants that would also be expected to cause impacts in the UK, these are just a few:


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- PFAS have been shown to negatively affect bottlenose dolphins in the USA with impacts on their immune, liver and kidney function.[18]
- PAHs have been found to accumulate in fish and invertebrates. They are shown to cause liver toxicity in multiple fish species and suppress spicule length in sea urchins.[19]
- A compound derived in the environment from 6PPD, a chemical found in tyre wear particles, was established as the cause of multiple mortalities of coho salmon in USA.[20]
- A 2014 review concluded that antidepressant pharmaceuticals could disrupt biological systems such as reproduction, growth, metabolism, immunity, feeding, locomotion, colour physiology and behaviour of two ecologically important invertebrate groups (molluscs and crustaceans).[21]
- Sharks, rays and skates have been shown to accumulate both organic (e.g. DDT) and inorganic (e.g. metal) chemical contaminants.[22] Due to contaminants in sharks, the NHS advises against eating or significantly limiting the amount of shark that is eaten, primarily due to impacts of mercury on the nervous system.[23]

In conclusion, contaminants are a concern for UK waters and action must be taken to stop pollution at source and further mitigate the risk of pollution, through better protections delivered by improved chemical regulation. In addition, further monitoring is needed to determine the full extent of the impacts in the UK.

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