

Clean and safe



More information on the regions used in the Clean and safe assessment is available on the Assessment processes and methods page of the SMA2020 portal: <http://marine.gov.scot/sma/assessment-theme/assessment-processes-and-methods>

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Key words

nutrients
bathing water
PAH
viruses
organic
PBDE
hot spots
phycotoxins
marine litter
eutrophication
radionuclides
impulsive noise
continuous noise
BAC deoxygenation
metals microplastics
chemical discharges
disease contaminants
EAC PCB biological effects
imposex bacteria

What is covered

The marine environment is a sink for many hazardous substances, nutrients and litter. To establish the state of Scotland's seas, and how 'clean and safe' the seas are, consideration has been given to:

- The concentration and effects of heavy metals and organic contaminants in biota and sediments.
- The direct and indirect effects of nutrient enrichment.
- The dose of radiation to which individuals may be exposed from the authorised disposal of radioactive waste.
- Oil and chemical discharges and releases.
- The impact of microplastics, seafloor litter and beach litter, microbial contamination in shellfish, phycotoxin concentrations in harvested bivalves and the associated occurrence of toxin-producing phytoplankton in shellfish production areas.
- The consequences of continuous or impulsive noise on marine animals.

The basis of the assessment

The assessment both of hazardous substances and the effects of nutrient enrichment are based on well-established, internationally-recognised, long-term programmes that use agreed assessment values and thresholds.

The assessment of the microbial and toxin contamination of shellfish is based on a significant time series of data. The assessment of beach litter includes OSPAR reference beaches that are surveyed four times per year using an internationally-agreed standard method. This contrasts with both microplastics in the sea and noise, which are more recent issues of concern. For example, the continuous noise assessment, reported for the first time in 2020, used ten underwater recording stations, monitored in 2013 and 2014, to provide baseline data. The impulsive noise assessment is based on Marine Noise Registry returns from 2015-2017 while the assessment of microplastics in sea surface waters (top 10 cm) is the first using the data collected over the period 2014-2019.



Summary of key messages

Improvements in the condition of the seas around Scotland are being observed. However, it is important to note that for some regions there are many local concerns. For example, although the Irish Sea biogeographic assessment region is classified as having few or no concerns as a whole with respect to contaminant concentrations, it is noted that many local concerns, particularly in the Firth of Clyde, exist. Some sites exceed the assessment value above which biological effects are expected. A further issue is data availability. Confidence in the eutrophication assessment (both status and trend) is limited by a lack of data on dissolved oxygen. Due to the variable temporal and geographical extents in the data, it was not possible to undertake a meaningful status or trend assessment for microplastics in surface waters while there was a lack of both evidence and robust assessment criteria to make a status assessment for beach litter and sea-floor litter. In a similar vein, due to the high variability in both the presence of potentially toxic phytoplankton above the threshold level, and the frequency and intensity of biotoxin events between 2010 and 2018, it was not possible to identify any discernible trend regarding an overall increase or decrease in the toxin contamination of shellfish. A further example is that the lack of assessment criteria and the small number of shellfish production areas in each SMR meant that it was not possible to present a status assessment by SMR for shellfish water microbiology.¹

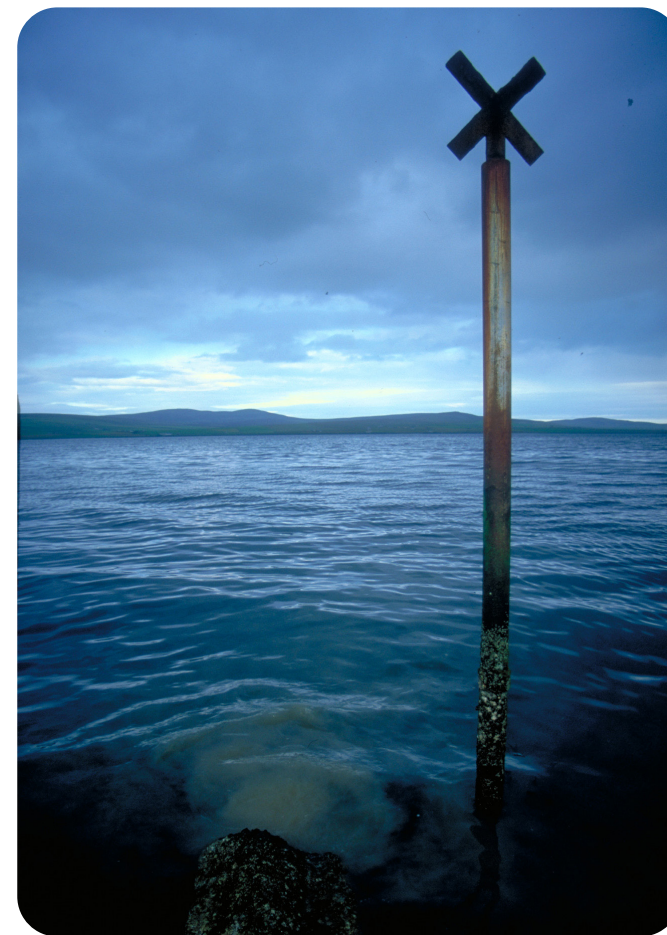


- Many contaminant concentrations are decreasing, but concerns remain.
- Biological effects of contaminants are observed, but are reducing.
- New methods to monitor and report on underwater noise are developing.
- Marine litter remains a problem, but with signs of improvement in some areas.
- Eutrophication is not an issue in Scotland's seas, but there are limited data on dissolved oxygen.
- Water quality at coastal bathing waters has shown a steadily improving picture since the 2006 EU Bathing Waters Directive was first reported in 2015.
- The environment and members of the public are adequately protected (i.e. doses are significantly less than the legal dose limit) from authorised disposal of radioactive waste.
- For some assessments, there are limited data or an absence of assessment criteria which prevents a full status assessment being undertaken, (especially at the scale of an SMR).
- There are savings to be made by utilising a cruise for multiple surveys (e.g. sea-floor litter data are collected during surveys designed to estimate the stocks of commercial sea-floor living fish) but this can limit the assessment that can be delivered for the survey which is not the main purpose of the cruise.

Summary of knowledge gaps

The following knowledge gaps have been identified:

1. Methodologies to accommodate new challenges in national monitoring. These include how to:
 - Improve the incorporation of biological effects into assessments.
 - Improve the methods for the analysis of microplastics.
 - Incorporate emerging contaminants, such as pharmaceuticals and personal care products into monitoring programmes to guide future actions.
 - Establish the assessment criteria necessary to negate the need to use food safety levels for an environmental assessment.
2. The spatial coverage of the data at the SMR/OMR scale. These include:
 - Contaminant concentrations, particularly in sediment.
 - Biological effects of contaminants (EROD, external fish disease, imposex in dogwhelks).
 - Chlorophyll-a concentrations.
 - Near-bed dissolved oxygen concentrations.
 - Nutrient inputs, particularly riverine inputs.
 - Metal inputs from rivers.
 - Atmospheric deposition of metals.
 - Impulsive noise.
 - Shellfish waters microbiology.
 - Beach litter.
3. A full understanding of the impacts of radioactivity on the environment.
4. Measurement of impulsive noise for unlicensed activities such as some acoustic surveys.
5. The appropriate criteria for undertaking monitoring to ensure adequate cover, as highlighted for bathing waters, or to avoid the possibility of underestimation of toxin occurrence.



“Scotland's seas are generally clean and safe and improvements are being seen, however, there is a lack of data in some areas, particularly for emerging concerns such as microplastics and noise.”

Lynda Webster, Topic lead

¹ see portal [Assessment processes and methods](#) page for information about regions used.