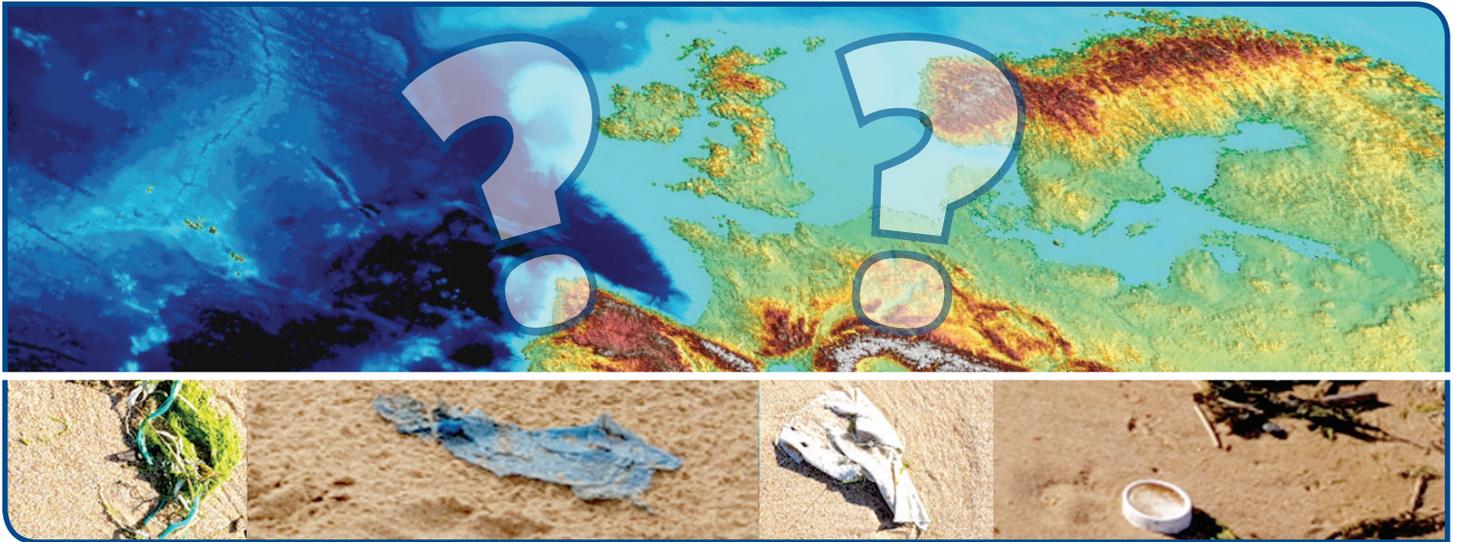


HOW MUCH PLASTIC ENTERS SCOTTISH SEAS AND WHERE DOES IT COME FROM?



Introduction

A study by Marine Scotland Science published in 2020¹ used simple models, with parameters from published international studies, to estimate the annual inputs of plastic (macro and micro) to Scottish seas from both the land and the sea. Macro plastic is bigger than 5mm across, while micro plastic is smaller than 5mm. The study modelled two regions of Scottish seas on the Scottish east and west coasts, with the modelled regions including 99% of Scotland's population. The models estimated

- 1) land-based sources of plastic (scaled by population size),
- 2) the oceanic supply of floating plastic from remote sources,
- 3) direct inputs of plastic litter created by fishing, and
- 4) the flux of plastic sinking onto the seabed.

The values from this study presented below should be viewed as first estimates, and need further observations to check and improve upon.

Principal conclusions

- That we need more information on plastic loads in Scottish rivers and seas
- But using estimates from Europe and the USA on how much plastic litter enters rivers per head of population in a developed, urban society, it would appear that local litter sources dominate plastic inputs to Scottish coastal seas
- If these estimates are correct, it means that local litter reduction actions within Scotland can be effective in reducing marine plastics in our waters

Current estimates - macro plastic

- More than 90% of plastic in Scottish seas come from Scottish littering on land
- Scottish littering puts about 1,000 tonnes of macro plastic into Scottish seas each year (uncertainty range 700 to 2,500 tonnes)

¹ Turrell, W.R. (2020). Estimating a regional budget of marine plastic litter in order to advise on marine management measures. Marine Pollution Bulletin, Volume 150, 110725, doi 10.1016/j.marpolbul.2019.110725.

- This is about 200 million pieces of macro plastic each year
- Another 40 tonnes (8 million pieces) of macro plastic litter enters Scottish seas from remote sources, carried by the sea (uncertainty range 0 to 600 tonnes).
- Fishing releases about 20 tonnes (4 million pieces) of plastic into Scottish seas each year.
- This is about 2% of the total plastic inputs.
- 93% of the plastic entering the sea from the land on the west coast comes from the Clyde catchment.
- 46% of the plastic entering the sea from the land on the east coast comes from the Forth catchment.
- About 550 tonnes of plastic from land-based littering (110 million pieces) ends up on the seabed around Scotland each year (uncertainty range 300 to 1,300 tonnes).
- Beach cleans remove somewhere between 50 and 220 tonnes of plastic each year from Scottish beaches, although there are no accurate records.
- Beach cleans remove somewhere between 5% and 20% of the total plastics entering Scottish seas.
- On average there are 500,000 pieces of plastic litter, weighing 2.5 tonnes, on Scottish east coast beaches at any one time (uncertainty range 1 to 6 tonnes).
- There are about 260 km of east coast beach
- On average, 150 pieces of plastic enter the sea from the Clyde catchment area every minute (uncertainty range 50 to 3,000 pieces).
- There is about 1 piece of plastic in every 55 cubic metres of river water coming from the Clyde catchment area.

Estimates - micro plastic

- There is much less information about microplastics, and so estimates are very uncertain.

- Typically, about 250 tonnes of microplastics enter Scottish seas each year, representing about 25 trillion pieces.
- About 90% of the microplastics entering Scottish seas come from Scottish rivers.
- Uncertainties are large..

Importance of citizen's action

- The study highlights the vital need for the work of the Marine Conservation Society, their surveys and their beach cleans.
- It also suggests projects on Scottish rivers such as Keep Scotland Beautiful's Upstream Battle can also provide important data and litter removals

Research needs

To improve the estimates we need:

- Better estimates from oceanographic models of inflows and outflows, and their variability, across the open sea boundaries of the Scottish sub-regions.
- Better measurements at sea of the areal density of floating plastic litter items.
- Investigation of sub-surface plastics at sea
- Measurements of the average weight per unit item of the plastic debris on Scottish beaches
- Measurements of the amount of floating plastic litter items in Scottish rivers.
- Estimates of direct inputs of plastics from other land based sources (e.g. coastal littering, coastal discharges, waste water treatment plants) and marine sources (e.g. shipping, fishing vessels, offshore platforms).
- A full three-dimensional hydrodynamic model of Scottish seas coupled to a particle tracking model of floating plastic litter which includes a realistic beaching / unbeaching sub-model, variable sinking rates and with realistic riverine inputs.

