TESTING THE WATERS

MICROPLASTICS IN SCOTTISH SEAS

GREENPEACE

MICROPLASTICS IN SCOTTISH SEAS

Sampling using a towed manta net, on Beluga II in Scotland, May 2017. The end of the manta net, the Cod End, is then removed and the contents sieved. © Will Rose / Greenpeace

Almost two-thirds of Scottish coastal waters tested by Greenpeace have been found to contain evidence of microplastic pollution, in the most detailed scientific study of its kind in the region published to date.

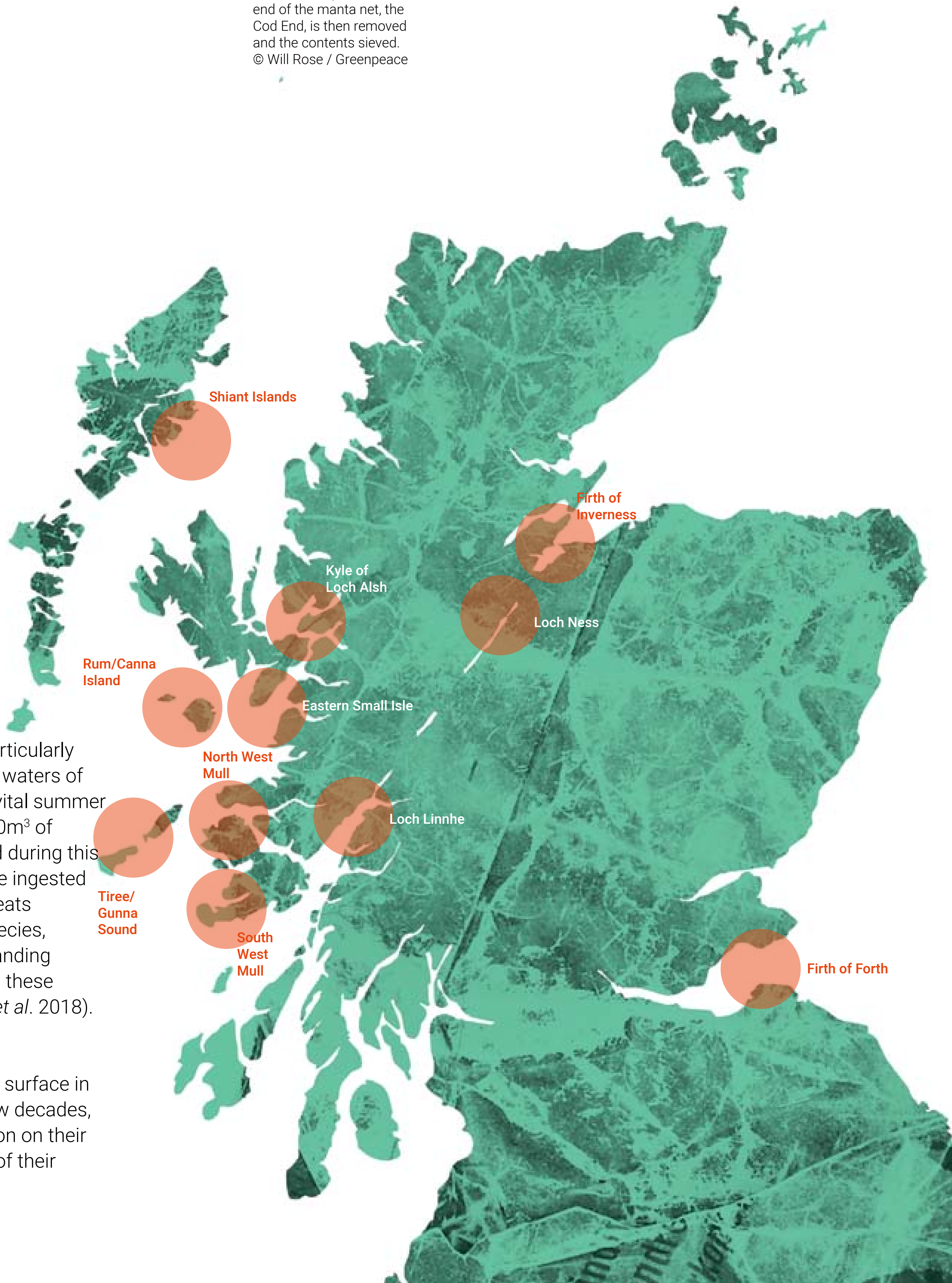
Scientists on-board Greenpeace ship MV Beluga II collected samples from 27 sites, with a focus on areas around the Hebrides known to be important feeding grounds for basking sharks and seabirds. A total of 49 individual samples were then analysed by Greenpeace's laboratory at the University of Exeter to determine the types of microplastics found, and any chemicals or contaminants carried on individual microplastic pieces.

Despite the remoteness of Scottish coastal waters, and the low levels of coastal development of the areas surveyed, 31 of 49 samples tested contained microplastics. Chemicals found in the samples include those used as additives in plastics, like phthalate esters, heavy metals and flame retardants – some of which have been classified as 'toxic to reproduction' or are suspected to have hormone disrupting properties.

The country's coastal waters are important breeding and foraging areas for a wide range of marine species, including whales, dolphins, sharks and seabirds. Many of these feed predominantly at, or very close to, the sea surface, which makes the presence of any floating plastic debris – including microplastics – in their feeding grounds a particular concern. Therefore it was important in this expedition to collect seawater samples in key foraging areas and around internationally significant seabird colonies including Bass Rock and the Shiant Isles which are the home to over 20 seabird species including gannets, puffins, razorbills and shearwaters.

Basking sharks are also known to gather in particularly large numbers in certain 'hotspot' areas in the waters of the Hebrides (Witt *et al*. 2016), which provide vital summer feeding grounds. They can filter more than 800m^3 of water per hour (Sims, 2008) while feeding, and during this process tiny particles of indigestible plastic are ingested alongside the plankton. Given the range of threats already faced by large filter-feeding marine species, from overfishing to pollution, a better understanding of the implications for their health of ingesting these microplastics is urgently needed. (Germanov *et al*. 2018).

Surveys of the widespread problem posed by microplastics have been conducted at the sea surface in many areas around the world over the past few decades, but there is relatively little published information on their distribution in the waters around Scotland, or of their chemical characteristics.



How we gathered the data

Scientists on the Beluga II collected 49 laboratory samples from the sea surface in 27 locations in Scottish waters between 9 May and 16 June 2017. They were taken at sites on the east coast as well as Loch Ness, but the primary focus was the waters around the Hebrides off Scotland's west coast, particularly in areas popular as feeding grounds for basking sharks and seabirds.

The samples were collected using a towed manta net, so-called as it resembles a manta ray, with 'wings' that aid floatation and a broad mouth measuring 87cm across and 15cm deep. The size of mesh was the same as used in numerous previous studies elsewhere in the world: 0.33 mm.

At 23 of the 27 locations, a pair of samples were collected in fairly quick succession, towing over similar distances (between approximately 1km and 3.5km, depending on current flow) within a period of under three hours. These were recorded using a standard flow meter located in the mouth of the manta net.

After each use, the manta net was retrieved and the mix of biological material and floating debris it contained transferred to a clean self-sealing bag. The samples were then frozen on board and returned to the Greenpeace Research Laboratories, based at the University of Exeter, for analysis.

With the aid of a large lit magnifier lens and a dissecting microscope in the laboratory, all the possible microplastic items were manually separated from other biological and inorganic material in the samples. Infrared analysis was then used to identify the plastic type for each individual fragment of microplastic against commercial databases, and to remove non-plastics. Forensic chemical analyses were then carried out on the microplastic pieces to identify the array of chemical additives and contaminants carried by them, including pesticide residues and heavy metals.

It is already clear that the presence of microplastics in seawater can have physiological and behavioural consequences for marine organisms.

THE MICROPLASTIC MENACE

Although much of the recent focus on marine plastics pollution has been on the larger, more immediately recognisable pieces of plastic 'litter' that enter the ocean – up to 12.7 million tonnes every year (Jambeck *et al*, 2015) – there are growing concerns for the potential negative impacts of the exposure of marine species, including seabirds and filter-feeding sharks to microplastics – commonly defined as pieces of plastic with a diameter of 5mm or less (Arthur *et al*. 2009). This is both because of the direct effects of the plastics when they are ingested by the marine animal in question, and because of the mixture of potentially hazardous chemical additives and contaminants they can carry.

Microplastics include fragments of larger plastic items that have broken into smaller pieces by the effect of waves and sediment abrasion, and degradation in sunlight, among other processes (Thompson, 2015), as well as plastic particles deliberately manufactured to be in this size range, such as the microbeads included in cosmetics and personal care products that are increasingly coming under regulatory control.

While larger pieces of plastic are a very visible symptom of ocean pollution, microplastics are a far less visible part of the same problem, and arguably even more difficult to measure and address. The source of the plastic can be onshore and offshore, including from wastewater discharges from land and at sea, urban run-off, wind-blown litter, and even lost or abandoned fishing gear.

Because of their synthetic nature and their propensity to adsorb, or attract, chemicals from seawater on to their surfaces, microplastics can also carry substantial concentrations of a range of chemical additives and contaminants (GESAMP, 2016), contributing to the exposure of marine species to hazardous chemicals (Browne *et al*. 2013, Rochman *et al*. 2013).

Sieving a trawl sample on board the Beluga II in Scotland, May 2017. The remaining contents of the sample were then bagged, frozen and sent to the lab for analysis.

Microplastics have previously been reported in the guts or other tissues of a wide range of marine species, including fish and shellfish (Jabeen *et al*. 2017, Santillo *et al*. 2017), seabirds that feed on plankton (Amélineau *et al*. 2016), cetaceans such as whales and dolphins (Besseling *et al*. 2015, Lusher *et al*. 2015), and plankton that form the base of marine food webs (Steer *et al*. 2017, Sun *et al*. 2017).

While we are unaware of any specific studies into the significance of ingestion of plastic debris, including microplastics, by basking sharks while feeding, this has been suggested as a source of some of the plastic-related chemical contaminants identified in the tissues of basking sharks sampled in the Mediterranean Sea (Fossi *et al*. 2014). Taking into account the large volumes of near surface water that can be swept by an adult basking shark while feeding, perhaps more than 800m^3 per hour (Sims, 2008), it is vital to obtain greater understanding of the distribution and abundance of microplastics at the sea surface in the areas in which these sharks feed, as well as the chemical characteristics of those microplastics.

The exact nature and scale of the threats that microplastics pose to marine ecosystems remain to be fully determined (Ogonowski *et al*. 2018). However, it is already clear that the presence of microplastics in seawater, and their tendency to be taken in along with food particles by filter-feeding and foraging species, among other routes, can have physiological and behavioural consequences for marine organisms. This includes inflammation of gut and other tissues, impacts on energy balance and growth rates and changes in feeding behaviour and efficiency (Von Moos *et al*. 2012, Besseling *et al*. 2013, Cole *et al*. 2015, Xu *et al*. 2017, Lo & Chan 2018).

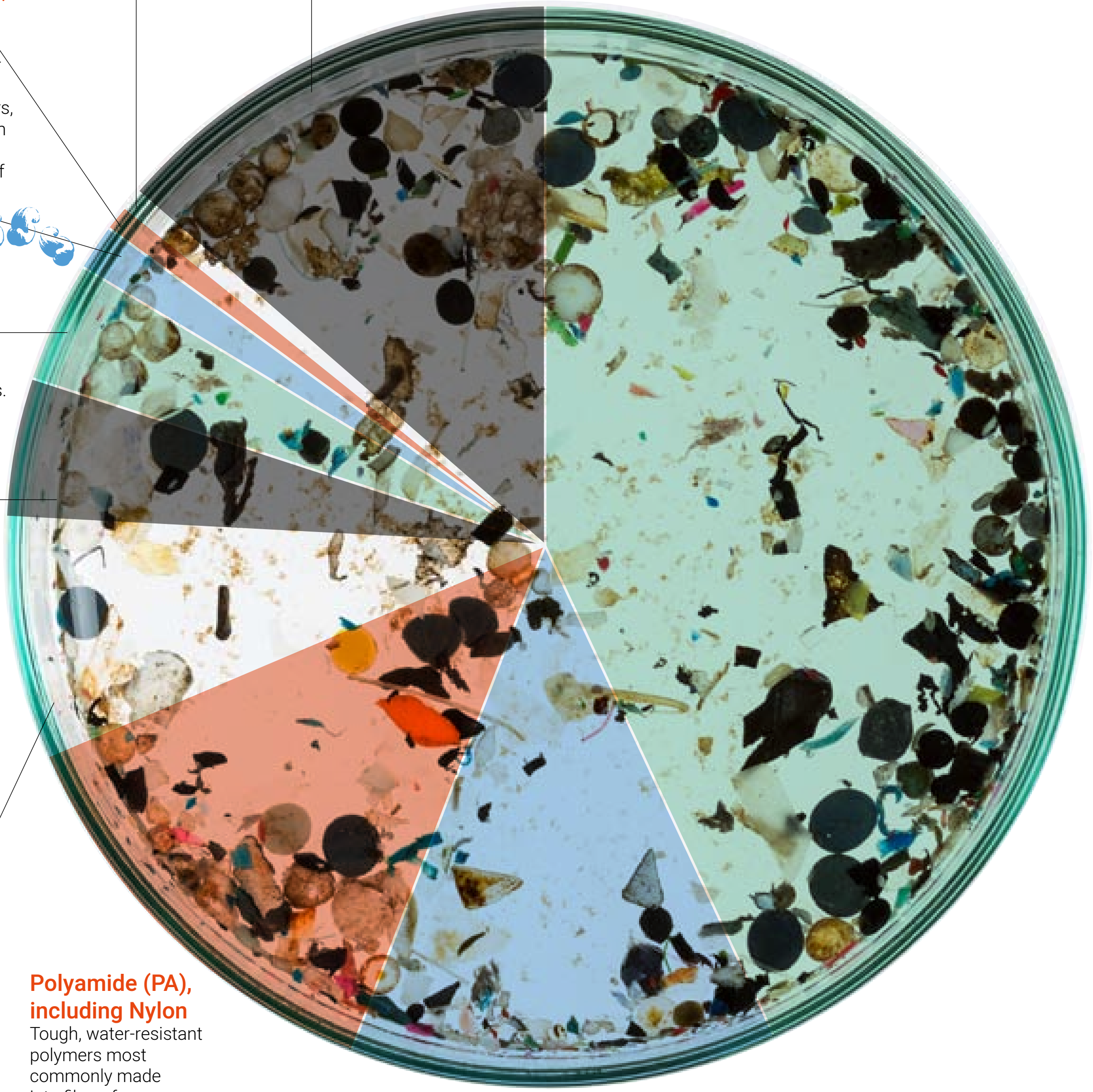
RESULTS

Almost two-thirds (31 of 49) of the samples collected by the Beluga II were found to contain at least one piece of microplastic in the size range 0.5–5.0mm diameter in two dimensions. Four samples contained 10 or more pieces of microplastic in that size range, including one sample from the Firth of Forth, one from Gunna Sound (close to Tiree) and two from waters around the Shiant Islands. Laboratory analysis also revealed the presence of almost 100 organic compounds associated with the microplastics, a number of which were man-made chemicals, including two insecticides, a fungicide and a herbicide (see page 8). Some of the samples also contained significant concentrations of toxic metals, including lead, copper and chromium.

Despite the widespread presence of microplastics in the waters surveyed, one notable aspect of the results was their great variability. Even when repeat samples were taken in the same location within a short time period, microplastics were sometimes found in one but not the other, illustrating the fact that microplastics are far from uniformly distributed, and that typical levels of exposure to them are therefore hard to predict.

Nevertheless, we can use the data collected to estimate the abundance of microplastics in Scottish coastal waters, which helps us to compare our findings – albeit with some qualifications – with other global studies. Based on the specific surface area sampled in each case, the numbers of microplastics found in the 31 net tow samples in the size range from 5 mm down to 0.5 mm translate to an estimated density of between 600 and 12,600 pieces of microplastic per square km (or between 600 and 15,300/km^2, if we also include within the counts eight additional fragments found in the samples which were slightly larger than the usual '5mm in all dimensions' definition for microplastics). The average abundance of microplastic pieces across all 49 samples analysed – including those that yielded no visible microplastics – was equivalent to 1,772 pieces per square km.

This estimate of microplastic abundance is – unsurprisingly – substantially lower than that reported for microplastics collected at the sea surface using similar equipment from the major ocean gyres in the Pacific and Atlantic Oceans, which are known to accumulate floating debris (Law *et al*. 2014, Moore *et al*. 2011). Our estimates are also at the lower end of the ranges reported recently for surface waters in the Gulf of Lion off the south coast of France (Schmidt *et al*. 2017), in the Arabian Gulf (Abayomi *et al*. 2017) and around Australia (Reisser *et al*. 2014). The strong currents in the areas in which our study concentrated, and the routes those currents take to get to UK waters, may have contributed to the relatively low abundances of particles found. However, more research, including longer-term testing to determine whether the levels found are typical, would be required to establish this. Nonetheless, microplastics are now clearly present as a widespread and complex feature of marine pollution in Scotland's coastal waters, even in areas remote from centres of human population and inputs from rivers.



Proportions of different plastic types for the total number of plastic pieces found in all net tow samples.

Microplastics from water samples taken by manta trawl.
© Fred Dott / Greenpeace

> **"Microplastics are now clearly present as a widespread and complex feature of marine pollution in Scotland's coastal waters."**

Types of plastic found

Of the 141 pieces of plastic less than 0.5mm that were identified in the samples, the most common material found was polyethylene (43%), followed by polypropylene and polyamide (including nylon) in roughly equal proportions (around 12% each). Polyester (including polybutylene terephthalate) (7%) and various vinyl acetate (including EVA and PVA) fragments (5%) were less frequently encountered, and polystyrene was found in only one sample – in Gunna Sound.

The widespread presence of polyethylene and polypropylene in the samples collected at the sea surface is not unexpected, especially in those found some distance offshore. These plastics have a low density relative to seawater (Andrady 2011, 2017) and are therefore more likely to remain at the surface for extended periods than denser forms of plastic.[1]

It is not known whether the microplastics collected in this study were primarily local in origin or carried from more distant sources – for example, via currents from the wider Atlantic Ocean. What we can say, however, is that microplastics are a complex and diverse, but widespread and relatively common, component of Scotland's surface marine waters.

1 Polyethylene terephthalate (PET), a polyester plastic commonly used to make soft drink bottles, was not identified during the analysis of microplastic samples collected at the sea surface, despite many PET bottles being found on beaches in the area. This may be because PET has a density significantly greater than that of seawater, making particles prone to sink through the water column and less likely to be found in surface sampling, especially in offshore waters. Some polyester fragments and fibres were found among the microplastics in our samples, but aside from two fragments of polybutylene terephthalate (PBT), the others could not be identified to the level of specific polyester type.

A toxic cargo

Although the number and mix of chemicals associated with the microplastics in this study varied greatly from sample to sample, showing no clear geographical patterns, nor any apparent correlation with the numbers, sizes or total masses of microplastics isolated from the samples, a total of 95 individual organic compounds were identified. While a large proportion of these might be the natural components of microbial biofilms (a film of bacteria and algae attached to the surface), a significant number were man-made chemicals.

These included 12 compounds known as phthalate esters, which are used as additives in some plastics, inks and a range of other products; four pesticides, including two insecticides, a herbicide and a fungicide; three additional organophosphorus chemicals, (two of which are used as flame retardants) and two chemicals used to protect plastics from the degrading effects of ultraviolet radiation.

Several of the samples also contained notable concentrations of heavy metals, including instances of lead, copper, chromium, manganese and cadmium. While the origin of these are uncertain, a proportion is likely to have arisen from the presence of metal salts used as plastic additives rather than simply from adsorption from the sea water.

Some of the chemicals found are considered hazardous. A number of phthalate esters are classified as 'toxic to reproduction', while the organophosphate flame retardants are suspected of having hormone disrupting properties.

While it was not possible to determine the precise concentrations of the chemical additives and contaminants found in this study, the analyses conducted provide strong evidence that these additives and contaminants were present and could therefore be ingested by marine animals along with the microplastic particles. A recent review of the science on microplastics exposure of large filter-feeding sharks, rays and whales (Germanov *et al*. 2018) stresses that, while first-hand evidence for such exposure and resulting harmful effects remains limited, these threats cannot be ignored and require urgent investigation.

A basking shark in the waters of Gunna Sound between the islands of Coll and Tiree, on the west coast of Scotland. © Gavin Newman / Greenpeace

CONCLUSION

The abundance and types of microplastics vary greatly at different locations and different times in Scottish waters

The data gathered in this survey paint an extremely varied picture, not only in the apparent abundance and types of microplastics as pollutants at different locations and different times in the waters of Scotland, but also of the similar unpredictability of the chemical signatures that those microplastics carry. A basking shark – or other marine organism – filter-feeding or foraging at the surface of the sea might encounter few or no microplastics in the size range from 1mm and above within any particular hour of feeding. Or may unwittingly encounter many – just as was the case with our manta net tows.

These results only represent one aspect of the total pollution problem

Even though the abundances of microplastics found in this study are not as high as those reported for other sea areas around the world, they nonetheless represent a stark reminder of the historic and ongoing overproduction and misuse of plastics. Furthermore, a preliminary analysis of samples for microplastics that are smaller than 63 µm – that is, those too tiny to have been fully retained by the manta net mesh used in this study – indicates that these may also be a common blight of the waters in these areas, something that clearly deserves further investigation in order to establish overall levels of contamination. And as the study only addresses the issue of microplastics found floating at the sea surface and not the presence of denser plastics at lower depths, these results only represent one aspect of the total pollution problem.

Microplastics are an unwelcome part of marine ecosystems even in remote waters

From our research, it is not possible to identify particular pollution hotspots for microplastics in Scottish waters, not least because there is such a diversity of sources, and because the sea surface is constantly in motion under the influence of currents, tides and winds. Nor is it possible to use these data to define the precise risk posed by the presence of microplastics in surface waters, either to marine species or to humans through the consumption of seafood, nor exactly how far they may contribute to overall exposures of marine life to harmful chemical contaminants.

What the data does reveal, however, is that even in the relatively remote waters around the Hebrides on the north-west coast of Scotland, microplastics have become an unwelcome part of the fabric of marine ecosystems – one of the toxic legacies of our dependence on plastic that urgently requires attention.

Microplastics and other small pieces of plastic found on beaches and in the sea around Scotland, June 2017. © Kajsa Sjölander / Greenpeace

This report is based on a more detailed scientific report published by the Greenpeace Research Laboratories: **Santillo, D., Oakes, G., Labunska, I., Casado, J., Brigden, K., Thompson, K., Wang, M. and Johnston, P. (2018)** ***Physical and chemical characterisation of sea-surface microplastics collected from coastal and inland waters of Scotland in the summer of 2017***. Greenpeace Research Laboratories Technical Report 01-2018: 63 pp. Available at: http://www.greenpeace.to/greenpeace/wp-content/uploads/2018/02/GRL-TR-01-2018-Beluga-plastics-tour-Scotland-March-2018.pdf

References

Abayomi, O. A., Range, P., Al-Ghouti, M. A., Obbard, J. P., Almeer, S. H., & Ben-Hamadou, R. (2017). Microplastics in coastal environments of the Arabian Gulf. *Marine Pollution Bulletin*, 124(1), 181–188. https://doi.org/10.1016/j.marpolbul.2017.07.011

Amélineau, F., Bonnet, D., Heitz, O., Mortreux, V., Harding, A. M. A., Karnovsky, N., Walkusz, W., Fort, J. and Grémillet, D. (2016). Microplastic pollution in the Greenland Sea: Background levels and selective contamination of planktivorous diving seabirds. *Environmental Pollution*, 219, 1131–1139. https://doi.org/10.1016/j.envpol.2016.09.017

Andrady, A. L. (2011) Microplastics in the marine environment. *Marine Pollution Bulletin*, 62(8). pp 1596-1605

Andrady, A. L. (2017). The plastic in microplastics: A review. *Marine Pollution Bulletin*, 119(1), 12–22. https://doi.org/10.1016/j.marpolbul.2017.01.082

Arthur, C., Bamford, H. & Baker, J. (2009) Proceedings of the International Research Workshop on the Occurrence, Effects and Fate of Microplastic Marine Debris. Sept 9-11, 2008. NOAA Technical Memorandum NOS-OR&R-30.

Besseling, E., Foekema, E. M., Van Franeker, J. A., Leopold, M. F., Kühn, S., Bravo Rebolledo, E. L., Koelmans, A. A. (2015). Microplastic in a macro filter feeder: Humpback whale *Megaptera novaeangliae*. *Marine Pollution Bulletin*, 95(1), 248–252. https://doi.org/10.1016/j.marpolbul.2015.04.007

Besseling, E., Wegner, A., Foekema, E. M., Van Den Heuvel-Greve, M. J., & Koelmans, A. A. (2013). Effects of microplastic on fitness and PCB bioaccumulation by the lugworm *Arenicola marina* (L.). *Environmental Science and Technology*, 47(1), 593–600. https://doi.org/10.1021/es302763x

Browne, M. A., Niven, S. J., Galloway, T. S., Rowland, S. J., & Thompson, R. C. (2013). Microplastic moves pollutants and additives to worms, reducing functions linked to health and biodiversity. *Current Biology*, 23(23), 2388–2392. https://doi.org/10.1016/j.cub.2013.10.012

Cole, M., Lindeque, P., Fileman, E., Halsband, C., & Galloway, T. S. (2015). The impact of polystyrene microplastics on feeding, function and fecundity in the marine copepod Calanus helgolandicus. *Environmental Science and Technology*, 49(2), 1130–1137. https://doi.org/10.1021/es504525u

Fossi, M. C., Copolla, D., Baini, M., Giannetti, M., Guerranti, C., Marsili, L., Panti, C., de Sabata, E. and Clò, S. (2014). Large filter feeding marine organisms of microplastic and pelagic environment: the case studies for Mediterranean basking shark (*Cetorinus maximus*) and fin whale (*Balaenoptera physalus). Marine Environmental Research*, 100, 17–24. https://doi.org/10.1016/j.marenvres.2014.02.002

GESAMP (2016). "Sources, fate and effects of microplastics in the marine environment: part two of a global assessment" (Kershaw, P.J., and Rochman, C.M., eds). (IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). Rep.Stud. GESAMP No. 93, 220 pp. http://www.gesamp.org/publications/reports-and-studies-no-90

Germanov, E.S, Marshall, A.D., Bejder, L., Fossi, M.C., Loneragan, N.R. (2018). Microplastics: no small problem for filter-feeding megafauna. *Trends in Ecology and Evolution* 2349, 6 pp. (IN PRESS) https://doi.org/10.1016/j.tree.2018.01.005

Jabeen, K., Su, L., Li, J., Yang, D., Tong, C., Mu, J., & Shi, H. (2017). Microplastics and mesoplastics in fish from coastal and fresh waters of China. *Environmental Pollution*, 221, 141–149. https://doi.org/10.1016/j.envpol.2016.11.055

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., Law, K. L. Plastic waste inputs from land into the ocean, *Science*, 6223, pp768-771 http://science.sciencemag.org/content/347/6223/768

Law, K. L., Moret-Ferguson, S. E., Goodwin, D. S., Zettler, E. R., De Force, E., Kukulka, T. & Proskurowski, G. (2014) Distribution of surface plastic debris in the Eastern Pacific Ocean from an 11-year data set. *Environmental Science & Technology*, 48 (9). pp 4732-4738. https://doi.org/10.1021/es4053076

Lo, H. K. A., & Chan, K. Y. K. (2018). Negative effects of microplastic exposure on growth and development of *Crepidula onyx*. *Environmental Pollution*, 233, 588–595. https://doi.org/10.1016/j.envpol.2017.10.095

Lusher, A.L., Hernandez-Milian, G., O'Brien, J., Berrow, S., O'Connor, I. & Officer, R. (2015). Microplastic and macroplastic ingestion by a deep diving, oceanic cetacean: The True's beaked whale *Mesoplodon mirus. Environmental Pollution.* 199. 185-191. https://doi.org/10.1016/j.envpol.2015.01.023

Moore, C. J., Moore, S. L., Leecaster, M. K. & Weisberg, S. B. (2001) A comparison of plastic and plankton in the North Pacific Central Gyre. *Marine Pollution Bulletin,* 42 (12). pp 1297-1300. https://doi.org/10.1016/S0025-326X(01)00114-X

Ogonowski, M., Gerdes, Z., & Gorokhova, E. (2018). What we know and what we think we know about microplastic effects – A critical perspective. *Current Opinion in Environmental Science & Health*, 1, 41–46. https://doi.org/10.1016/j.coesh.2017.09.001

Reisser, J., Shaw, J., Wilcox, C., Hardesty, B. D., Proietti, M., Thums, M. & Pattiaratchi, C. (2013) Marine plastic pollution in waters around Australia: Characteristics, concentrations, and pathways. *PLoS ONE*, 8 (11). pp e80466 https://doi.org/10.1371/journal.pone.0080466

Rochman, C. M., E. Hoh, B. T. Hentschel and S. Kaye (2013). Long-term field measurement of sorption of organic contaminants to five types of plastic pellets: implications for plastic marine debris. *Environmental Science and Technology* 47(3): 1646-1654. https://doi.org/10.1021/es303700s

Santillo, D., Miller, K. & Johnston, P. (2017). Microplastics as contaminants in commercially important seafood species. *Integrated Environmental Assessment and Management* 13(3), 516-521. https://doi.org/10.1002/ieam.1909

Schmidt, N., Thibault, D., Galgani, F., Paluselli, A., & Sempéré, R. (2017). Occurrence of microplastics in surface waters of the Gulf of Lion (NW Mediterranean Sea). *Progress in Oceanography,* (IN PRESS), 0–1. https://doi.org/10.1016/j.pocean.2017.11.010

Sims, D.W. 2008. Sieving a living: a review of the biology, ecology and conservation status of the plankton-feeding basking shark Cetorhinus maximus. *Advances in Marine Biology*, 54(08), 171–220. https://doi.org/10.1016/S0065-2881(08)00003-5

Steer, M., Cole, M., Thompson, R. C., & Lindeque, P. K. (2017). Microplastic ingestion in fish larvae in the western English Channel. *Environmental Pollution*, 226, 250–259. https://doi.org/10.1016/j.envpol.2017.03.062

Sun, X., Li, Q., Zhu, M., Liang, J., Zheng, S., & Zhao, Y. (2017). Ingestion of microplastics by natural zooplankton groups in the northern South China Sea. *Marine Pollution Bulletin,* 115(1–2), 217–224. https://doi.org/10.1016/j.marpolbul.2016.12.004

Thompson, R. C. (2015). Microplastics in the Marine Environment: Sources, Consequences and Solutions. In M. Bergmann, L. Gutow, & M. Klages (Eds.), Marine Anthropogenic Litter (pp. 185–200). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-16510-3_7

von Moos, N., Burkhardt-Holm, P. & Koehler, A. (2012) Uptake and effects of microplastics on cells and tissue of the blue mussel Mytilus edulis L. after an experimental exposure*. Environmental Science & Technology*, 46 (20), 11327-11335. https://doi.org/10.1021/es302332w

Witt, M. J., Doherty, P. D., Godley, B. J., Graham, R. T., Hawkes, L. A., & Henderson, S. M. (2016). Basking shark satellite tagging project: insights into basking shark (*Cetorhinus maximus*) movement, distribution and behaviour using satellite telemetry. Final Report. Scottish Natural Heritage Commissioned Report, (908), 72. http://www.snh.org.uk/pdfs/publications/commissioned_reports/908.pdf

Xu, X. Y., Lee, W. T., Chan, A. K. Y., Lo, H. S., Shin, P. K. S., & Cheung, S. G. (2017). Microplastic ingestion reduces energy intake in the clam *Atactodea striata. Marine Pollution Bulletin*, 124(2), 798–802. https://doi.org/10.1016/j.marpolbul.2016.12.027

Puffins on Shiant Isles in Scotland
© Will Rose / Greenpeace

© Will Rose / Greenpeace

GREENPEACE

END OCEAN PLASTICS

www.greenpeace.org.uk