



RSPB Briefing – last updated 17 November 2014

PIB and other Hazardous and Noxious Substances (HNS)

A serious hazard to the marine environment

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Summary and call for action

- **More than 4000 seabirds** were confirmed washed ashore along the coast of England in two separate occurrences early in 2013 covered in a form of sticky substance called **polyisobutylene (PIB)**, a man-made synthetic product. The actual impact at sea was likely to have been far greater. Despite detailed investigation by the Maritime and Coastguard Agency, the source of the pollution was never identified.
- Under the **MARPOL Convention** (which regulates marine pollution from ships), though PIB substances are considered to present a hazard to the marine environment, at the time of the 2013 incidents it was legal to discharge certain quantities of all forms of PIB directly into the sea, with conditions.
- The RSPB believed the **risk of PIB was seriously underestimated** and there was an urgent need to review its hazard classification, and implement regulations and a systematic monitoring programme to prevent *any* further tragic and wholly avoidable incidents like the ones in 2013.
- In May 2013, the RSPB, along with the RSPCA, Marine Conservation Society and Wildlife Trusts, signed a **joint statement with the UK Chamber of Shipping**, supported by the wider ports and maritime business sectors under MaritimeUK, calling for an urgent review of PIB's legal discharge status.
- Concerted action resulted in RSPB meeting with the Government Shipping Minister, Stephen Hammond, other MPs and the Maritime and Coastguard Agency in June 2013. Meanwhile, there was growing support for the campaign to stop the legal discharge of PIB from an outraged public, including local communities and schoolchildren who had seen dead and dying seabirds pile up on their local beaches.
- After months of lobbying, action was taken. A meeting of the International Maritime Organisation (IMO) Working Group on Evaluation of Safety and Pollution Hazards (ESPH) on 21 October 2013, attended by RSPB on behalf of the Clean Shipping Coalition, **banned the discharge of all high viscosity and highly reactive PIBs worldwide** by reclassifying them under Annex II of the MARPOL Convention. This means all such PIB products have now to be completely removed from ships' cargo tanks and safely disposed of in port, instead of being released into the sea as previously. This was officially adopted in 2014. This was fantastic news for seabirds and a major victory for the RSPB, its partners and the public who all campaigned for this positive change.

- However, the problems posed to seabirds and other marine wildlife from chemicals is not over. While there is now a ban on the discharge of high viscosity PIB, there are a large number of similar 'hazardous and noxious substances (HNS) currently classified under Annex II that are still legal to discharge, including palm and other vegetable oils and paraffin waxes, all of which pose hazards to the marine environment. The RSPB is continuing to call for a wider review of **all similar Annex II products** (based on more effective testing) so that these too can be strictly regulated.
- As a result of the PIB incidents, the RSPB has also asked the UK Government to ensure the national response plan for marine pollution incidents takes better account of substances other than oil and reviews procedures for incidents where large numbers of seabirds are killed by pollution but there is no obvious source or other sign of the pollution at sea or ashore.

What are PIBs?

Polyisobutene (PIB), also known as polyisobutylene or butyl rubber, is actually a range of substances. It is a non-toxic and non-aggressive substance, used for example to manufacture chewing gum, adhesive tape and sealants. It is also very sticky – PIBs are what makes cling-film stick to whatever it touches. In shipping, it is often used as a thickening agent for industrial lubricant oils.

PIBs were first developed in the 1940s as a synthetic alternative to natural rubber which was in short supply due to conflicts in rubber-producing regions. PIBs are generally colourless or light yellow, odourless, tasteless and cannot easily be identified. One of their special properties is being the only forms of rubber that are completely impermeable to gas as well as water.

PIBs, along with other non-petroleum products, are transported around the world on a regular and increasing basis. The global consumption of PIB products was over **850,000 tonnes** in 2011, with the USA as the leading producer, but Belgium and France together produce almost a fifth of the PIB market. The UK is also a major importer. As a consequence, there is considerable transport of PIBs around the UK and Western Europe. Global consumption is forecast to **increase by around 40%** by 2017 to 1.2 million tonnes per year¹.

What are the impacts of PIBs on seabirds and marine wildlife?

PIBs usually enter the water through ships 'flushing', or washing, their tanks and clearing ballast water. PIBs are hydrophobic substances, so on contact with water they coalesce into a waxy, glue-like formation, generally floating at or just underneath the surface. Some newer forms of PIB are 'highly reactive' and become especially viscous in seawater. As such they are extremely hazardous to a range of seabird species, which dive to find food and also 'loaf' (rest) on the surface of the water. These birds become covered in the substance, which sticks their wings to their bodies and prevents them from feeding, causing immobilisation, hypothermia, starvation and eventually death. There is also a risk of ingestion of bits of PIB in its waxy form.

¹ Polyisobutylene: 2012 World Market Outlook and Forecast up to 2017, Merchant Research and Consulting Ltd Research Report, October 2012.

Auks are particularly affected by contact with PIBs. Gregarious in all seasons, they typically raft in large groups on the surface of the water and dive repeatedly into the sea to catch fish. As such, they are particularly susceptible to contamination from oil and other pollutant substances floating on or just under the surface of the water. Guillemots and razorbills are frequently the major casualty in marine pollution incidents.



The effect of PIBs on seabirds is graphically illustrated in this video:

<http://youtu.be/10FLdTkj8Os> (Note that this bird was on an isolated beach at the bottom of a steep cliff in February 2013 and could not be reached by rescuers; it was filmed from the top of the cliff.)



PIBs coat seabirds, preventing them from feeding or flying.
Photos: RSPB

PIBs are defined as 'persistent floaters'. They are also very slow to degrade (and are not biodegradable), so there are likely to be delayed and less visible wider impacts on marine ecosystems for a long time after any initial spillage. These effects are not however currently studied. PIB products are also often mixed with other additives or cleaning agents in the tank washing process, which can have corrosive or toxic properties, causing dissolution of soft body parts. Post-mortem on one affected seabird in 2013 found PIB within its muscles, liver and blood, indicating that the pollutant had also entered the bloodstream.

The 2013 incidents involving seabirds and PIB

At the end of January 2013 more than 500 seabirds (90% guillemots, 10% razorbills, and at least one puffin, one fulmar, one gannet, one kittiwake and one cormorant) were found ashore along the south coast of England, with most in Dorset at Chesil Beach near Portland but others reported from other counties, including Devon and Cornwall. Of the live casualties, 286 guillemots and 24 razorbills were taken for treatment by the RSPCA (unfortunately, many of these birds subsequently either died or had to be euthanised) with smaller numbers treated by the South Devon Seabird Trust. The affected live and dead birds were coated in a sticky substance that was subsequently identified as PIB (by both the Environment Agency and University of Plymouth).

Subsequently, more than 3,600 birds washed ashore after 10th April, mainly in Cornwall and South Devon. At least 157 birds were recorded on a small beach near Lansallos in Cornwall on 15th April alone. More than 250 live birds were taken into care across the region but unfortunately most had to be euthanised. As before, most of the casualties were guillemots, but 17 other species were affected in smaller numbers, including razorbills, gannets, puffins, oystercatchers, herring gulls, shags, fulmars, cormorants, great skuas, and singletons of arctic skua, great black-backed gull, black-headed gull, kittiwake, little auk, mallard, Manx shearwater and common tern.

A minimum total of recorded casualties from both incidents was 4,200 but the actual figure will have been far higher. Birds were recorded from accessible beaches but most areas of rocky coastline could not be checked and many more birds will have died unnoticed at sea.



Affected casualties of 2013 PIB April incident. Photos: BTO Image Library (top), Ian McCarthy (bottom)

In both incidents, there was no indication as to the source of the pollution and, despite considerable efforts by the Maritime and Coastguard Agency, particularly after the second and more serious incident, no source was ever identified. The MCA has confirmed that it is very unlikely that the source will ever be found.

Previous PIB incidents

In addition to the two incidents affecting the south coast of England in 2013, there have been at least three previous documented incidents involving spillage of PIB in European Waters. See Note 2 for further details.

1) Irish Sea 1994

The washing of tanks by a chemical tanker after carrying 2100 tonnes of lubricating oil additives (i.e. PIB) in the Irish Sea at the end of December 1993 is thought to have directly led to hundreds of seabird deaths in early January 1994. The actions of the ship cleaning its tanks were in full accordance with International Maritime Organization (IMO) regulations.

2) North Sea 1998

Hundreds of birds were washed ashore alive in Zeeland (SW Netherlands) in December 1998, covered in a whitish, sticky substance, and transported to a rehabilitation centre. Dead birds were recorded over the next 10 days across a wide area of the mainland coast and as far north as the Waddensee islands of Texel. At least 1,100 seabirds are thought to have been affected by this substance, soon identified as polyisobutylene (PIB; (C₄H₈)_n).

3) North Sea 2010

“Several dozen” dead birds and some live casualties, mainly guillemots, were recorded between the mainland coast of North Netherlands and the westernmost islands of Texel and Vlieland, in March 2010. These birds were covered in a “thick layer of glue-like material”, which was chemically analysed as most likely PIB.

Is it legal to discharge PIB into the sea?

Not any more – and this ban now applies to high viscosity and highly reactive PIBs across the globe! Whilst prior to the incidents in 2013 and despite being classed as a noxious substance, it *was* legal to discharge PIB into the marine environment, the deaths of thousands of seabirds demonstrated the severe environmental harm caused by discharging PIBs.

Polluting discharges at sea are regulated by the global MARPOL Convention (see Note 1). Under Annex II of MARPOL, PIB’s pollution risk was classed as category Y: “*Noxious Liquid Substances in bulk which, if discharged into the sea from tank cleaning or deballasting operations, are deemed to present a hazard to either marine resources or human health or cause harm to amenities or other legitimate uses of the sea and therefore justify a limitation on the quality and quantity of the discharge into the marine environment.*”. This is the higher of two categories of hazardous substance considered to have a potentially harmful effect if discharged, but where the current regulations allow their legal discharge, with conditions. It is important to note, however, that PIBs only fell into this higher category due to their floating nature, rather than any other environmental impacts, which are not currently tested under MARPOL requirements (see The risks from HNSs below). Other substances still classed as category Y include vegetable oils and paraffin waxes.

As part of the response to the PIB incidents, the RSPB arranged a [joint statement](#) between major NGOs and the UK Chamber of Shipping, supported by Maritime UK, which called for a review of the legal discharge status of PIB. This was backed by a statement by the Clean Shipping Coalition to the IMO in [May 2013](#) (MEPC report, Annex 31).

As a result of sustained campaigning pressure, however, and following a proposal from the UK Government, the IMO placed a world-wide ban on all discharges of high viscosity PIBs into the sea, moving it from Category Y (discharge under conditions legal) to Category X (no discharge permitted - “*Noxious Liquid Substances which, if discharged into the sea from tank cleaning or deballasting operations, are deemed to present a major hazard to either marine resources or human health and, therefore, justify the prohibition of the discharge into the marine environment*”). This ban is now in force.

What about other Hazardous and Noxious Substances (HNS) – is it still legal to discharge them into the sea?

Many other similar viscous chemicals still remain legal to discharge during tank washing operations. The amount of pre-washed Category Y substances that can be legally discharged from individual cargo tanks under these conditions depends on the age of the ship (350 litres per tank from ships built before 31/7/86, 150 litres per tank from ships built between 31/7/86 and 1/1/07, and 75 litres per tank from ships built after 1/1/07). It is illegal to transport these substances in ships other than chemical tankers if they were built prior to 2007.

The risk criteria for polluting substances are drawn up by the UN Advisory body to MARPOL known as GESAMP (Group of Experts on Scientific Aspects of Marine Environmental Pollution). The last major GESAMP review of noxious substances was in 2002.

The RSPB will continue to call for a review of the way in which Annex II substances are assessed to determine their classification (including testing in more realistic marine conditions instead of just in a laboratory), an urgent review of the hazard categories of existing legally dischargeable substances and the urgent testing of new substances which, we understand, may never have been tested at all in order to assign a hazard classification.

The risks from Hazardous and Noxious Substances (HNSs)

The global ban on the legal discharge of high viscosity PIBs is not the end of the story. It is our position that the risks from many other similar Category Y HNSs products (as PIBs were before the global ban on discharge of all high viscosity types), either alone or when mixed with other additives or cleaning agents, may be seriously underestimated under the current regulations, for three main reasons:

- the testing of these Category Y substances does not sufficiently consider the full range of their potential impacts of upon marine ecosystems when mixed with seawater (Note 2, below), from the visible effects on seabirds to the wider (but largely unknown) long-term effects upon benthic marine ecosystems
- since the last review of hazard classification of substances, new 'hazardous and noxious chemicals' have been developed and are currently being shipped across our seas in increasing quantities and residues legally discharged without knowledge of the risk they may pose to the marine environment.
- we simply do not know how much of any Category Y substance is released into the marine environment as part of routine tank-washing operations, and the cumulative impacts of these chronic releases. It is our understanding that 75-350 litres of a Category Y substance can be legally discharged in each tank washing, depending on the age of the ship²

Despite their hazard status under MARPOL, there is no systematic monitoring or research into the wider impacts of Category Y substance discharges to the marine environment, including to seabirds, beyond simply whether they float or sink. There is also no protocol for recording incidents and no consistent approach to describing these substances in the regulations and guidance documents (a mix of chemical and product names is used).

Wildlife casualties contaminated with hazardous and noxious substances are difficult to treat. As in the PIB incidents, the complex chemical nature of many substances within Category Y and uncertainty over their origin and composition can make it very difficult for animal welfare groups to respond to incidents in cleanup operations. Additionally, as a consequence of the tank cleaning process, these substances may also be mixed with other additives or compounds, which have corrosive properties, which can be toxic to humans as well as marine life.

² 75 litres for ships built after 2007, 100 litres plus 50 litres tolerance for ships built between 1986 and 2007, and 300 litres plus 50 litres tolerance for ships built before 1986

The argument to reclassify other high-viscosity chemicals to prevent their legal discharge is also an economic one: the cost burden to governments and landowners of cleaning up beaches and coastlines after such releases is increasingly prohibitive, especially as the source of the pollution is usually not found to recover costs.

RSPB action plan for HNSs

The RSPB wants to lessen the risks that discharges from shipping pose to the marine environment, and ensure that the increasing transportation of non-oil products is effectively regulated. As such, we are calling for:

1. An urgent review of the hazard classification of all hazardous and noxious substances (HNS) under Annex II of the MARPOL Convention where appropriate, in relation to their impacts on the marine environment (including seabirds) and the economic costs of their cleanup.
2. The testing of Annex II substances for their effects in more realistic marine conditions, which takes into account the effects of changes in consistency, time to degrade, toxicity if ingested and in-combination effects when mixed with other substances.
3. The establishment of a formal monitoring system and collated central database for recording pollution incidents involving Annex II substances.
4. The UK Government to ratify the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 1996 as revised by the Protocol of 2010 to the Convention (2010 HNS Convention)
5. Commitment to further scientific research on the effects of contaminating noxious substances on wider aspects of marine ecosystems, in addition to charismatic megafauna such as seabirds.
6. The strictest possible enforcement and prosecution of illegal discharges of any polluting substance at sea.

RSPB, 26 October 2014

Note 1: MARPOL

The International Convention for the Prevention of Pollution from Ships (MARPOL) was first established in 1973 by the International Maritime Organization (IMO). This is the United Nations agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships (<http://www.imo.org/About/Pages/Default.aspx>). The UK is a signatory to the MARPOL Convention.

Note 2: Further information on the effects of PIB and previous spillages

The background to the discharge of PIB and similar substances into the marine environment can be found in Chapter 5: “Case study: Environmental impact of hydrophobic chemicals with low water solubility released from merchant shipping.” in Roose P., Albaigés J., Bebianno M.J., Camphuysen C., Cronin M., de Leeuw J., Gabrielsen G., Hutchinson T., Hylland K., Jansson B., Jenssen B.M., Schulz-Bull D., Szefer P., Webster L., Bakke T., Janssen C. 2011. *Monitoring Chemical Pollution in Europe’s Seas: Programmes, Practices and Priorities for Research*, Marine Board Position Paper 16. Calewaert, J.B. and McDonough N. (Eds.). Marine Board-ESF, Ostend, Belgium. Available at <http://oar.marine.ie/bitstream/10793/734/1/Monitoring%20Chemical%20Pollution%20in%20Europe%20Seas.pdf>

In section 5.4.3 (Page 57), the authors address PIB in the context of MARPOL Annex II Category Z substances presenting a minor hazard.

Further information on the 1994 Irish Sea incident can be found at <http://www.icis.com/Articles/1994/01/24/33326/spill-casts-doubt-on-adequacy-of-imo-rules.html>

For the North Sea 1998 incident, Camphuysen et al. (1999) provide a detailed report on the mass stranding of seabirds in the North Sea in December 1998, in K.C.J. Camphuysen, H. Barreveld, G. Dahlmann, and J.A. van Franeker. 2011. *Seabirds in the North Sea demobilized and killed by polyisobutylene (C₄H₈)_n (PIB)*, *Mar. Pollut. Bull.*, 38(12):1171-1176, December 1999.

A summary of the 2010 incident can be found at Camphuysen, C. J., Schouten, S. & Gronert, A. 2010. *Mystery spill of Polyisobutylene (C₄H₈)_n off the Dutch coast affecting seabirds in March 2010*. *Seabird* 23: 143-145 Available at [http://www.seabirdgroup.org.uk/journals/seabird_23/SEABIRD%2023%20\(2010\)%20Camphuysen%20et%20al.143-145%20Short%20Note.pdf](http://www.seabirdgroup.org.uk/journals/seabird_23/SEABIRD%2023%20(2010)%20Camphuysen%20et%20al.143-145%20Short%20Note.pdf)