



MARINE MICRO PLASTIC POLLUTION NEWSLETTER ISSUE 2

FORWARD

The Fifth International Marine Debris Conference came and went during March. Being ten years since the last conference there was a wealth of material presented and as we digest the information we will review and present this material in future issues. For now a simple taste of the conference proceedings is presented in the International section. Also in this issue is a summary of the plastic resin pellet situation in Port Phillip Bay, Victoria. Here various individuals and groups are clocking up observations and accumulating information showing pellets to be a pollutant of growing concern. There is opportunity here for a bay-wide monitoring programme to highlight the issue. A community based monitoring programme using agreed methods perhaps along the lines of those presented at the international conference (see below) would over time generate data and simultaneously raise community awareness. It is important in our view that this problem be seen as a systemic failure to anticipate, recognise and regulate for a pollutant known about in principle since the 1970s. We therefore further suggest that remediation of the problem will be best served through industry education and reform of practices combined with appropriate legislation and enforcement measures. A programme for plastic production establishments aimed at minimising the loss of pellets into the environment, known as Operation Cleansweep, has been available to plastic industry operators in the US and UK for some time and should be promoted here. Likewise, recognition of plastic pellets as a pollutant in the regulatory arena is overdue.



PLASTIC RESIN PELLETS IN PORT PHILLIP BAY, VICTORIA

A picture is beginning to emerge of the distribution of plastic resin pellets in Port Phillip Bay. Although observations are mainly for sites in the north east of the bay between the Yarra River and Sandringham the message is there are a lot of pellets on bay beaches and in the surrounding catchments of this sector. High numbers of pellets have also been recorded at Queenscliffe at the bay entry and in Corio Bay.

Additional observations at industrial sites, street drains, open drains, creeks and rivers show a trail of pellets from source to bay.



A range of colours, wear and hence age is evident on this Ellwood Beach sample



Pellets in a drain entry at Moorrabin

Plastic industry activity is widespread around the bay and distinct areas can be identified as primary catchment areas (corresponding to river, creek and drainage systems) for pellet delivery to the bay. On the eastern side industrial areas at



Dandenong, Hallam, Braeside and Moorabbin and perhaps as far north as Boronia and Vermont are potential source locations being linked through the creek and drainage systems into the Patterson River and Mordialloc Creek. The second area is around Melbourne with industry presence along the Yarra catchment. No information is available as to loss of pellets from Melbourne port operations at this stage. To the west of Melbourne plastic industries in Laverton and Altona form a third area connected to the bay by a number of systems between Cororoi Creek and Skeleton Waterholes Creek. Geelong forms the fourth area which can both feed into the bay via Cowies Creek from North Geelong and possibly the port or into the Barwon River and onto the Victorian coast from South Geelong.

What happens to the pellets once in the bay? In a very broad sense and based on some basic circulation factors in the bay area the following points are worth considering;

- Pellets may tend to remain in the bay due to the low exchange rate of bay and Bass Strait waters.
- Pellets may tend to accumulate on the eastern side of the bay due to bay circulation and perhaps an overall predominance of winds from the south and north west quarters.
- The complexities of bay weather, sea breezes and tides will leave their mark on the short term distribution of pellets.
- Sampling is needed on the western and southern sides of the bay to gain a better idea of overall distribution and accumulation.
- No information is available about entry of pellets into the bay food web (so far as we are aware).

There is a high probability that pellets will accumulate in river and creek flats and the sides of drains and creeks in dry periods and flush out in flooding events. Longer duration dry periods will allow time for the pellets to accumulate toxins from those

environments and if followed by large scale flooding events a high number of pellets with a potentially higher toxic burden will be released into the bay.

Pellet loss can occur during shipping and transport operations and during manufacturing operations. These are areas properly overseen by government agencies. To date we are unaware of any regulatory activities which specifically include plastic resin pellet loss in the Port Phillip Bay region.



PLASTIC RESIN PELLET SAMPLING

Tangaroa Blue Ocean Care Society has a PRP monitoring project, Pellet Alert, which aims to gather information on pellet sources and distribution in the environment.

To gather a sample for the Pellet Alert project simply collect pellets at random from the beach and place in a zip lock bag or envelope together with the name of the beach and a nearby road or landmark. No special handling precautions needed. Send to PO Box 1176, Margaret River, WA, 6285.

You can also make a rough estimate of pellet numbers on your beach. (1) Identify and estimate the size of the area where most pellets are concentrated. (2) Mark out one or more small square plots measuring 333cm (1 foot in the old language). (3) Multiply the number of pellets in the plot by 9. This will give you an approximate per square metre figure. Work out an average if several plots are involved. (4) Multiply the figure worked out in (3) by the number of square metres worked in step (1). This is a superficial estimate but gives you something to work with.

Sample locations and other information sent to us will be mapped and samples used to help in source identification.

MONITORING ACTIVITIES

DEFORMED PELLETS



Photo courtesy Silke Stuckenbrok

These deformed pellets were recently found by one of our supporters at Fremantle. Pellets like these will be rejected either at the pellet production end or at the pellet user end. In either case screening occurs and deformed pellets are separated and discarded.

If you find pellets on your local beach or in rivers or drains please let us know. By mapping pellet occurrence and estimating concentrations we will be able to begin identifying their sources and informing local management organisations.



GLOSSARY

You may be interested in the following definitions while reading about the conference.

Quadrat - (Ecology) An area of vegetation usually 1 square metre

Sorption, Sorb - (Chemistry) Assimilation of molecules of one substance by a material in a different phase



INTERNATIONAL

FIFTH INTERNATIONAL MARINE DEBRIS CONFERENCE

The Fifth International Marine Debris conference took place recently in Hawaii. Many topics and issues were covered and following is a very brief glimpse of these.

Richard Thompson from Plymouth University UK stressed in a paper entitled "How concerned should we be about microplastics" that "Reaching robust, environmentally relevant conclusions about the abundance and the potential impacts of micro plastic debris is not a trivial task and further research on this area should be considered a priority". He pointed to four priority actions of identifying key sources and sinks, identifying potential environmental problems along with their importance and priority in the context of the wider marine debris issue and identifying solutions based on a risk assessment approach.

Tri dimensional sampling of pellets was described in a paper from Brazil which discussed an experiment testing various sized augers (post hole diggers) and various sampling configurations. The results were analysed and indicated the most desirable auger size, sampling configuration and area of beach to survey. The authors concluded the process was time consuming but gave a superior quantitative estimate of pellets compared to superficial sampling.

Another paper from the UK described the use of a rapid assessment approach to sampling for both micro and meso-debris. Here the process involved using a portable frame divided into grids (forming a quadrat). The frame was located at selected survey points and a "plastic debris burden score" was assigned using visual assessment (0 to 5 - no debris to completely covered) and photographed. There is considerable detail in the follow up processing and analysis of data from this process but the initial data gathering



component, correctly guided, is very compatible with community based activity.

Plastic in the ocean does not simply float around. Life in the sea interacts with and changes it. A paper from the US described how organisms colonise micro plastics and form bio films thereon. From the Netherlands a revealing study showed that when some seabird species ingest plastic it is ground up in the ingestion process and subsequently excreted as micro plastic particles - raising a number of other concerns such as what happens to the toxins lodged on and in the plastic and where this micro plastic goes. When millions of seabirds are potentially involved in this process it follows that sizeable quantities of plastic will be ground down and redistributed as micro plastic.

Presentations about sorption of chemicals to the surface of plastic - particularly pellets - in the ocean raised two important points. Firstly in a UK paper it was shown that trace metals sorb to the surface of plastic pellets. In a paper from Greece the authors discussed differing sorption and desorption rates of micro pollutants on plastic and cautioned about making general assumptions about the process. Differing pellet surface conditions on different types of polymers will lead to different rates of gain and loss of micro pollutants - some materials being less problematic from this perspective and others being potentially more harmful than previously thought.

The conference organised jointly by the United Nations Environment Programme and the National Oceanic and Atmospheric Administration (NOAA USA) produced a strategy document "A Global Platform for the Prevention and Reduction of Marine Debris" within which micro plastics is seen as an emerging issue posing a significant threat to the marine environment with the problem as yet not fully understood and requiring further research.

Conference abstracts are available on request.



GOVERNANCE

THE PRECAUTIONARY PRINCIPLE

When deciding how much effort and resource to put into an issue we often come up against statements saying "there is no scientific evidence to support.." or "Levels have been shown to be below those considered safe ..." and so on. Usually these statements give the "No action is necessary" signal to policy makers and deflect public concern. When considering an issue such as the role of micro plastic pollutants as vectors for the transmission of toxic chemicals into the ocean food web the stakes are global in reach and very high. The precautionary principle has evolved in recent years as a response to situations where the science surrounding an issue is not yet conclusive but the risks of doing nothing are unacceptably high. A good definition can be found at:

<http://www.sehn.org/precaution.html>

More about the precautionary principle down the track.

EDITORIAL

Your input in the way of articles, photos or comments are very welcome.

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When submitting articles please make them relatively brief. We are especially looking for practical information that can be shared or helps broaden knowledge about research, governance and other practical matters related to marine micro plastic pollution.