### Microplastics sampling

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#### Background / Summary

Plastic litter has globally been recognized as a major threat to marine ecosystems, but increasing reports of microplastics (items < 5mm) have led to heightened concerns about plastic pollution in the world’s oceans. Microplastics are categorized as: (1) primary microplastics, which are deliberately manufactured, such as industrial plastic resin pellets (nurdles) or microbeads used in personal care products, and (2) secondary microplastics, which are the breakdown products from larger products, such as food and beverage containers or fibers from synthetic ropes and textiles/wastewater effluent. Approximately 80% of all plastic litter in the ocean is estimated to originate from land based sources (Andrady, 2011).

The scope of the sampling effort during this expedition was to define the spatial distribution of microplastics at the surface (5 m) along the ship’s cruise track in the North Pacific, Bering and Chukchi Seas. In total, samples were collected from 18 locations from the seawater loop system with a few different types of blank samples collected to identify possible sources of contamination during sampling.

#### Sampling method

Equipment:

WS Tyler USA Standard Test Sieve No. 230, 63um, .0025in, looked to be new and in very good condition, glass funnel, natural bristle wood scrub brush, 20 ml glass scintillation vials, 1L glass Mason jars with plastic lids.

Sample Collection:

Seawater from the underway fluorometer outflow line, running through a plastic tygon tube, was sieved through a brass #230 mesh sieve for approximately 30 minutes, giving a total sieved volume of ~62 to 94L per sample. During the 30 minute collection the sieve was covered by a sheet of aluminum foil to minimize airborne contamination. Time and position were noted for both the start and end of sample collection. After 30 minutes the surface of the sieve was washed down thoroughly using directed flow from a glass beaker and then a plastic squirt bottle and funnelled into a 20 ml scintillation vial. An additional 1L bulk water sample (unsieved) was collected by filling a clean 1L glass mason jar with seawater from the same line. For the first three microplastics samples, tapwater filtered through a 1 µm glass fibre filter was used for washing down the seive but as this was more effort to collect, a switch was made to using 0.7 µm GF/F filtered seawater, a byproduct of the chl and HPLC sampling produced in copious amounts. Samples in scintillation vials and mason jars were labelled with loop number and placed in the lab fridge for storage.

Flow rate of the underway sampling line was measured after each sample using a stopwatch and a 1L graduated cylinder. The average of 3-4 fills was used to determine the flow in L/min. Flowrates ranged from 2.07-3.15 L/min with an average of 2.67 L/min.

Blanks:

A few different types of blanks were collected sporadically during the sampling survey. These consisted of:

1. Twice during the survey an air sample blank was collected by laying out a wetted filter paper on a piece of aluminium foil next to the sink during the 30 minute sampling to collect ambient plastic particulates that could contaminate the real sample. At the end of sample collection the filter was folded and wrapped back in its aluminum foil packet, labeled and placed in a ziplock bag in the fridge.
2. Once, a sieved blank was collected whereby a second sieve was left sitting next to the sink during regular sample collection to collect ambient air particles and then was rinsed and sample collected into scintillation vial using approximately the same volume of filtered seawater as used to process regular samples.
3. Once, a swipe blank was done with a wetted filter paper, wiping the counter area around sink and bench where sample processing was occurring to get an idea of the microplastic contamination present in the lab.
4. Three 1L samples were collected in the glass mason jars of the filtered seawater, filtered tapwater and ship system Milli-Q water for analysis of any potentially contaminating particles and to identify the best water to use in future for rinsing down samples.

Ideally more blanks would have been collected but since the majority of sampling was being conducted by Nina, time restrictions and other sampling priorities limited the collection of additional blanks. Every effort was made to collect a sample each day, except while in port and during one particularly busy sampling day. On one occasion two samples were collected in one day for a total of 18 samples.

A white cotton lab coat was worn for almost all sample collection and effort was made to note any synthetic fibres being worn by samplers underneath. After sample collection the sieves and other equipment were rinsed with hot tapwater and deionized Milli-Q water and stored back in the plastic tote provided. Occasionally the sieves were scrubbed with the natural bristle brush. Most samples were collected by Nina Nemcek (DFO-IOS), with 5 samples collected by Lauren Howell (VanAqua) early in the cruise.

Problems:

Aluminum foil used to keep the sieves clean between sampling did lead to some corrosion on the sides of the brand new sieves. It would be good to find an alternate material that wouldn’t lead to this damage. The glass funnel provided for transferring the samples to the scint vials broke on the 4th sample. This made it more difficult to divert the sample into the narrow mouth of the vials. A metal funnel from the oxygen kit was used for a couple of samples but it was too wide to fit in the vials and had a filter grid on it that may have trapped some particles. This became evident when transferring thick samples with a lot of particulate matter in them, they did not pass readily through the funnel and this sytem was subsequently aborted. In the end the squirt bottle was used to get samples into vials though there was some potential for loss of sample. In the future, either additional funnels should be supplied or the use of a plastic funnel should be investigated. While the natural brush was a good plastic free alternative for cleaning the sieve, it was stored in the microplastics sampling tote between samples and quickly became covered in mold. This should be stored hanging in the lab to air dry in the future.

#### Sample Log

