PollutionTracker: A new coast-wide initiative in British Columbia

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What's happening?

PollutionTracker was launched in 2015 by the Ocean Pollution Research Program (OPRP) of Ocean Wise's Coastal Ocean Research Institute (CORI) to generate high quality, comparable contaminant data for sediment and mussel samples collected along the coast of British Columbia. Results from Phase 1 show that several contaminants of concern, such as polychlorinated biphenyls (PCBs), are present in samples coast-wide – particularly in industrialized areas.

During Phase 1 of this program (2015–2017), data were compiled from 55 sites along the coast (Figure 1). The goal of *PollutionTracker* is to sample at each site every three years, as well as to add new sites to address geographical gaps and the interests of new partners.

Mussel filter feeding. (Photo: Ocean Wise)

Sampling bottom sediment and mussels. (Photos: *Ocean Wise*)

Sediment and mussels (*Mytilus sp.*) were collected in collaboration with government agencies, port authorities, community groups, and First Nations, and samples were submitted to specialized laboratories for high quality contaminant analysis. Samples were analyzed for over 400 contaminants, including hydrocarbons, flame-retardants, pesticides, pharmaceuticals and personal care products, and microplastics.

Bottom sediments are widely used to evaluate contaminant inputs into aquatic environments, as they are regarded as both contaminant 'sinks' and as potential 'sources' for adjacent food webs. Mussels are useful for monitoring as they are immobile, they are exposed to all of the contaminants present in the surrounding water, and they do not tend to metabolize contaminants.

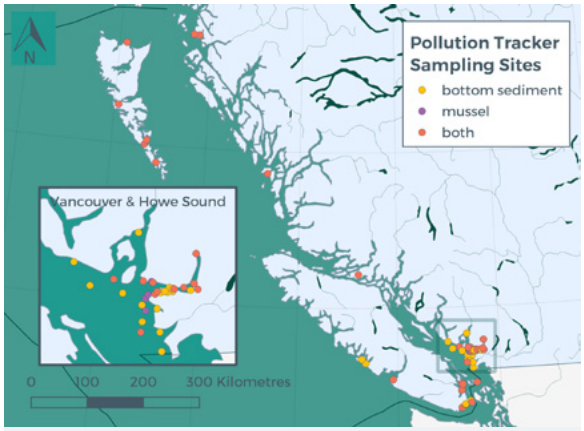

Figure 1. Phase 1 of *PollutionTracker* includes 55 sites along the coast of British Columbia.

Why is it important?

A multitude of chemicals and other contaminants are released or deposited into the marine environment on a continual basis. Contaminants may be of local or global origin, as both chemical and physical contaminants can be transported over long distances by oceanic and atmospheric currents. Monitoring helps to identify the priority pollutants of concern in coastal environments, locate potential sources, and inform

PollutionTracker tiered approach

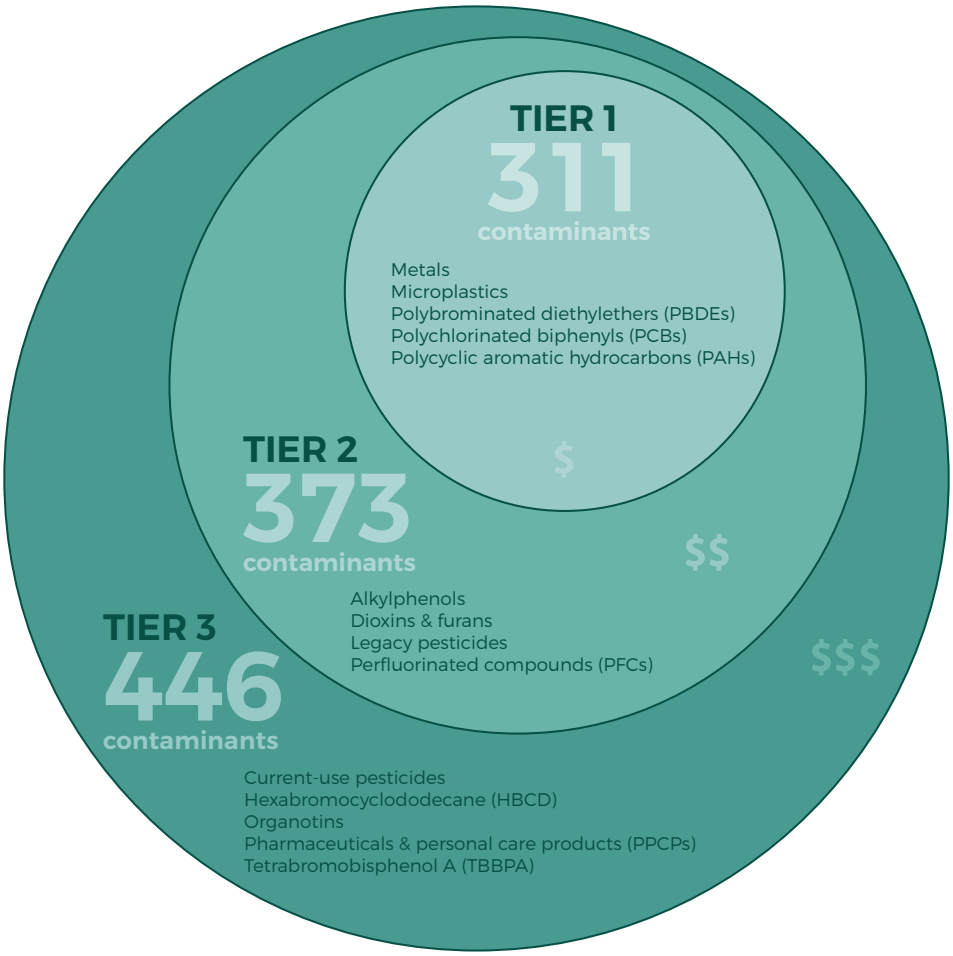

Figure 2. The *PollutionTracker* tiered approach to sample analysis. As high resolution contaminant analysis is costly, different options were provided to partners and choices reflect partner interests, current and historical anthropogenic activities in the region, and available funds. Tier 3 level analysis includes over 400 contaminants.

source control practices. *PollutionTracker* can include testing for over 400 contaminants (Figure 2).

British Columbia relies on a healthy marine environment – ecologically, culturally, and financially. Pollution threatens the relationships between humans, wildlife, and the marine environment and puts the existence of all marine organisms at risk. Some chemical contaminants, such as PCBs, accumulate in the marine food chain and are known to cause developmental, immunological, and reproductive impairment in animals. British Columbia's killer whale populations are among the most PCB-contaminated marine mammals in the world,[1] and contaminants have been identified as a threat to the recovery of all four British Columbia killer whale populations. The potential effects of many newer contaminants are largely unknown, as is the extent of their presence in the B.C. marine environment.

What is the current status?

Contaminant data from 51 of the 55 sites sampled along the coast have been collated and analyzed, and a summary of these results is available online at http://pollutiontracker.org/

Both legacy and current-use contaminants were detected in *PollutionTracker* samples. Legacy contaminants are those that are no longer being produced or used in new products in Canada, but that tend to persist in the marine environment (e.g., PCBs, tributyltin, and organochlorine pesticides), and these compounds were widely detected along the coast. Newer contaminants – such as the flame-retardants hexabromocyclododecane (HBCD) and tetrabromobisphenol A (TBBPA), current-use pesticides, and pharmaceuticals and personal care products – were also detected in some samples but were less widespread.

Total PCB concentrations in sediment and mussel samples varied along the B.C. coast (Figure 3). The highest PCB concentrations were found in industrialized and port areas. Despite their persistence, PCB concentrations have been declining in the marine environment since regulations were put in place. For example, concentrations measured in blubber biopsies from free-ranging harbour seal pups in Puget Sound, USA, declined by 81 percent between 1984 and 2003.[2]

Levels of PCBs measured in mussels did not necessarily correspond to levels measured in bottom sediments at a given site (i.e., while PCB levels in sediment were high relative to the other sites, levels in mussels from the same site may have been low relative to other sites, or vice versa). This likely reflects the partitioning of PCBs between bottom sediments and the water column. The specific PCB composition, bottom sediment characteristics, and the amount of particulate matter in the water column all affect the degree to which PCBs will adsorb to particulate matter, thereby affecting their uptake by mussels from the water column.

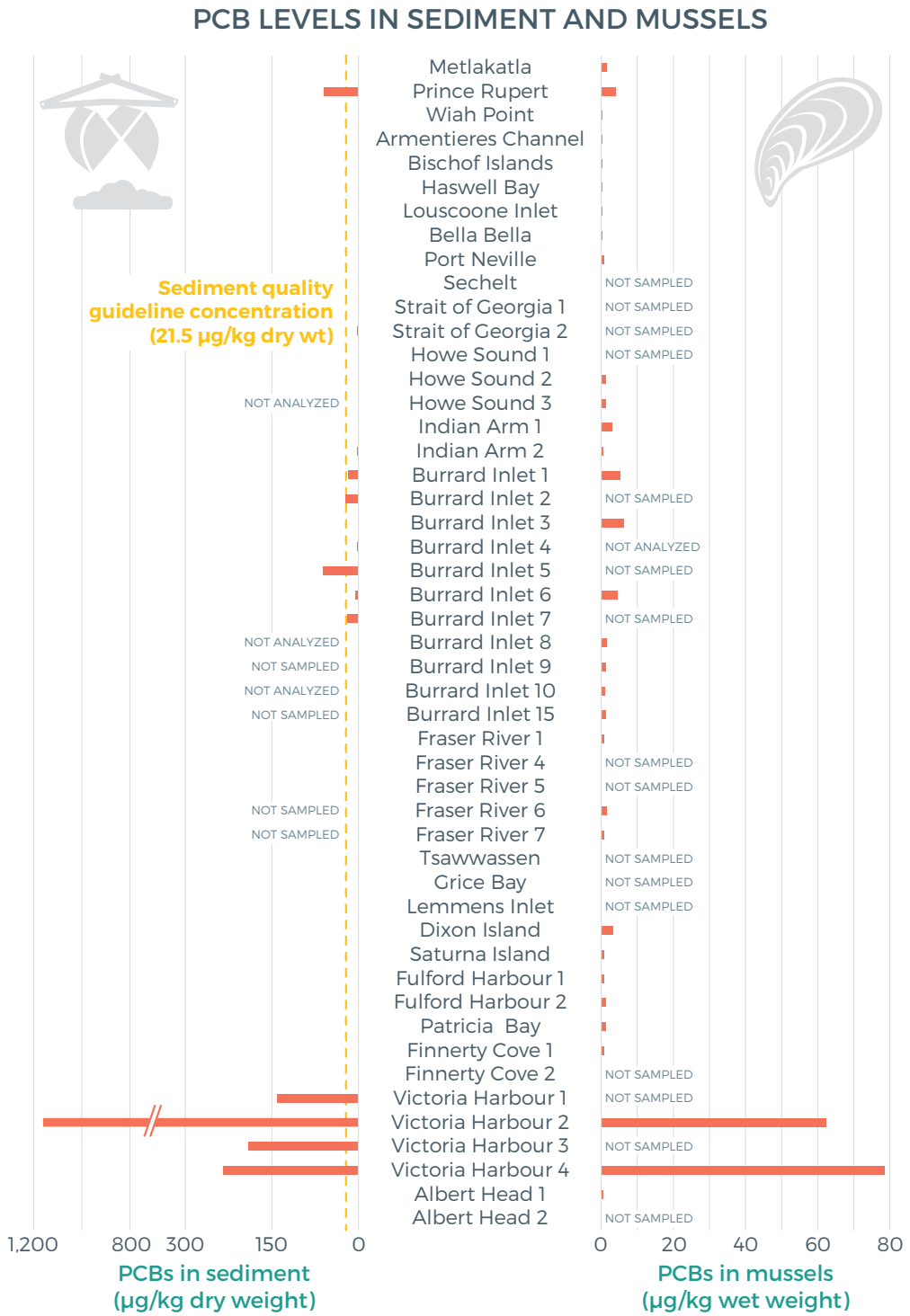

Figure 3. PCB levels varied along the B.C. coast, but the highest levels in sediment and mussels were found in Victoria Harbour, reflecting historical releases abd a vulnerable receiving environment. Data Source: *PollutionTracker.org*

What is being done?

Prior to the launch of *PollutionTracker*, a coast-wide pollutant monitoring program did not exist for British Columbia. Although individual groups and agencies carry out monitoring for specific parameters in localized areas, *PollutionTracker* aims to create an integrated, coast-wide initiative that provides high quality and comparable contaminant data across space and time.

There are a number of laws and regulations that address the sale, transport, use, disposal, and/or cleanup of different chemicals or pollutants, all of which have implications on the state of the coastal environment. On an international scale, the Stockholm Convention aims to protect human health and the environment from persistent organic pollutants (POPs) by mandating that its signatories discontinue use of certain chemicals. The original twelve POPs covered by the Stockholm Convention include PCBs, dioxins, furans, and several organochlorine (legacy) pesticides. Today, 33 POPs are listed under the Convention. In Canada, the Canadian Environmental Protection Act (CEPA), Health Canada, and Environment and Climate Change Canada (ECCC) control the use, importation, manufacture, storage, and release of toxic substances.

Once released into the environment, the relative health of coastal environments is often evaluated using environmental quality guidelines, which serve to identify specific contaminants of concern, characterize risks to biota, and guide remediation. Environmental quality guidelines are issued federally by the Canadian Council of Ministers of the Environment (CCME) and provincially by the Ministry of Environment in British Columbia. For PCBs, sediment quality guidelines protective of marine aquatic life are available, but a guideline for PCBs in tissues (e.g., mussels) is not available.

PCBs have long been a priority contaminant of concern in the environment. The import, manufacture, and sale of PCBs were banned in Canada in 1977. However, limited continued use in certain types of equipment, contaminated sites, long range transport from other parts of the world, and cycling in the environment all underscore the threat that PCBs continue to pose.

Electrical transformers manufactured prior to 1977 may still contain PCBs. (Photo: Wikipedia)

What can you do?

Individual and Organization Actions:

- Learn more about contaminants of concern using the resource links below.
- Reduce or eliminate the use of toxic chemicals and single-use plastics around the household and garden.
- Recycle and dispose of waste responsibly.
- From Health Canada:
  - Never burn wood that has been treated or painted, since burning materials that contain PCBs can create dioxins and furans.
  - If you are at risk for exposure to PCBs in the workplace, be sure to take appropriate safety precautions and follow all prescribed decontamination procedures.
  - Follow regional/provincial/territorial advice about limiting your consumption of wild game and sports fish. In addition, you can prepare game and sports fish in a way that minimizes your exposure to PCBs. Discard the inner organs and remove the skin and all visible fat. Broil, bake, boil, or grill the flesh, but avoid frying as this cooking method retains the fat.
- *PollutionTracker* is dependent on partner funding and involvement. If your community or organization is interested in becoming involved in *PollutionTracker*, please contact us at oceanpollution@ocean.org.

Government Actions and Policy:

- Invest in monitoring and research to better understand the risks posed by current and emerging chemicals of potential concern.
- Develop regulations to prohibit and control the production, use, and disposal of contaminants.
- Share data and publish science to inform consumer decisions and responsible business planning.

Resources

Environment and Climate Change Canada
http://www.ec.gc.ca/pollution/default.asp?lang=En&n=77BC2971-1

http://www.ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=105

Canadian Council of Ministers of the Environment
http://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/

Health Canada
https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/chemicals-glance.html

https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/environmental-contaminants.html

https://www.canada.ca/en/health-canada/services/healthy-living/your-health/environment/pcbs.html#mi

Government of British Columbia
https://www2.gov.bc.ca/gov/content/environment/waste-management

City of Vancouver
http://vancouver.ca/home-property-development/recycling-and-disposal-facilities.aspx

Pacific Region Contaminant Atlas
http://pacifictoxics.ca/

The Stockholm Convention
http://chm.pops.int/TheConvention/ThePOPs/tabid/673/Default.aspx

Green Science Policy Institute
http://greensciencepolicy.org/

Plastic Oceans
http://www.plasticoceans.org/the-facts/

Footnotes

[1] Ross, P.S., Ellis, G.M., Ikonomou, M.G., Barrett-Lennard, L.G., and Addison, R.F. 2000. High PCB concentrations in free-ranging Pacific killer whales, *Orcinus orca*: effects of age, sex and dietary preference. Mar. Pollut. Bull. 40: 504–515.

[2] Ross, P.S., Noel, M., Lambourn, D., Dangerfield, N., Calambokidis, J., and Jeffries, S. 2013. Declining concentrations of persistent PCBs, PBDEs, PCDEs, and PCNs in harbor seals (*Phoca vitulina*) from the Salish Sea. Progress in Oceanography. 115: 160–170.